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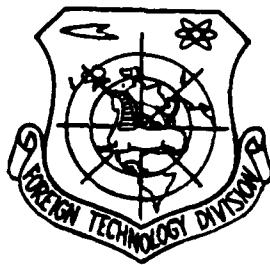
EXPERIENCE OF SOVIET MEDICINE IN A GREAT PATRIOTIC WAR  
1941-1945

by

Ye. I. Smirnov, Editor

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trace difficultly. Evidently, they subsequently degenerate. The described picture resembles the fate of muscular fibers in the free muscular transplant (B. I. Miguncv).

The first two variants of the resorption of muscles were observed mainly in the edges of wound, in the area of shaping of granulation, the latter - in the zone of concussion, i.e., where there were only miliary sectors of necrosis. As a result of the organization of the sectors of concussion necrosis in the muscles were formed/activated the foci of granulating tissue. Furthermore, in the damaged muscular fibers were observed the phenomena of regeneration in the form of the education of muscular kidneys, especially near the sectors of waxlike necrosis.

During festering of the bullet wounds of the calcification of the necrotized muscular fibers never it was observed, while in the edges of the surgical wounds (for example, after laparotomy/celiotomy), even which are festered, this process was regularly noted already from the fourth day after operation/process (B. I. Migunov). Absence of calcification is explained, apparently by acidosis and tissue hypoxia, that exist during entire festering in the bullet wounds and achieving greater degree in comparison with the surgical wounds. Acidosis, as is known, it impedes the fallout of lime salts in the sediment, in spite of their abundance in the blood

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PATRIOTIC WAR 1941-1945

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and in the intertissue fluid/liquid with festered break.

Large/coarse hematomas in subcutaneous and intermuscular cellular tissue gradually were organized and were resorbed, and at their place grew the loose-fibrous connective tissue, which contains a large quantity of grains of hemosiderin. The resorption of hematomas flowed/occurred/lasted within different periods which depended on the sizes/dimensicns of hematomas and intensity of suppurative process.

In arteries and veins of the mean diameter near the wound, especially with the large defect of muscles, were noted the phenomena of accomodation sclerosis, which were being expressed in the form of certain coarsening elastic membranes/diaphragms, the proliferation of intima and thickening of middle layer due to the contraction/abbreviation of vessel, which is connected with the decrease of the voluse of tissue, which it supplies with the blood. Thrombi in the veins and the arteries, located in the zone of concussion, was subjected to organization which was histologically noted already on a 2-3rd days after wound.

Together with the phenosena of proliferation, in the zone of collateral edema were observed the disseminated dystrophic and necrobiotic processes in the soft tissues and the bones. In the

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muscles such processes carried the focus character/nature (applying to the individual groups of fibers and individual muscular bundles) and were expressed in the disappearance of cross striation, vacuolization and obesity of myoplasm, pycnosis of nuclei/nuclei and finally in the lumpy decomposition of individual fibers according to the type of waxlike necrosis.

In the late periods of festering frequently was noted the death of the large masses of muscles due to the increasing atrophy, segmental decomposition and adipose dystrophy.

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At the same time was noted coarsening and thickening of endo- and perimysium, and also the growth of scar tissue on the spot of the perishing muscular fibers. In the maintained fibers was accumulated/stored a large quantity of grains of brown pigment.

Very heavy degenerate and inflammatory processes were noted in the large/coarse nerve trunks not only near the zone of festering, but frequently, also, for entire elongation/extent of the damaged extremity.

10-15 Days after the beginning of suppuration of bone wound in

the entire damaged extremity morphologically were determined diffusion atrophic processes in the form of the increasing thinning of muscular fibers, their winding, with a simultaneous increase in the quantity of nuclei/kernels of sarcolemma and the scanty growth of argyrophil and collagenic fibers of stroma, usually without the reproduction/multiplication of cellular elements/cells. The reasons for the onset of dystrophic and necrobiotic processes in the muscles, apparently were the violation of trophic system and the connected with it violations of metabolism, anoxia on the soil of edema, inactivity (immobilization), etc.

In perimysium in the zone of most intensive destructive processes gradually were formed/activated fine/small, and sometimes also larger/coarser perivascular infiltrates from the lymphoid and plasmatic cells with the admixture/impurity of macrophages; a size/dimension and a quantity of these infiltrates in the course of time increased, and frequently were formed/activated the typically constructed lymphatic follicles.

In bone marrow the processes of organizing of concussion damages were matched with the resorption of old bone, the formation of new bone structures and the hyperplasia of marrow elements/cells. The organization of hemorrhages was here realized as in the soft tissues, by histiocytic elements/cells; however, in bone marrow in this case

never was formed hemosiderin.

Around the sectors of the decomposition of the oil cells of bone marrow from the 5-6th day already began shaping with lipogranuloma: oil drops were encircled by the histiocytes, which generate 1-2 series/numbers of large/coarse cells with the presence in their protoplasm many fine/small oil vacuoles. Between these cells were formed the nets/systems of argyrophil fibers. In proportion to the resorption of fat at its place grew mesenchymal elements/cells, and, after all, scar tissue. Sometimes lipogranulomas were encircled by bone beams/gullies.



Fig. 66. Junction of the edges crack in the bone beam/gully, located in the zone of concussion, due to the growth of fibrous connective tissue. Osteocytes are necrotized (microphotogram, a great increase).

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The ends of the broken bone beams/gullies in the zone of concussion were united either by scar tissue or newly formed bone beams/gullies, which are transported in the form of the navigation bridges from one edge of crack to another (Fig. 66). In bone marrow in the neighborhood with the suppurative focus almost always was

formed the wide zone of the hyperplasia of marrow elements/cells, which frequently applied to third of entire diaphysis of the damaged bone.

Dystrophic processes in bone marrow were expressed in the atrophy of oil cells, vacuolization of the reticular cells of stroma, the pycnosis of their nuclei/kernels, and sometimes - in the decomposition of cells and argyrophil framework/body of bone marrow. By quite bone substance the dystrophia was evinced by the progressive rarefaction.

Summing up the result by the data, which were concerning the reaction of tissues, that encircled the focus of festering, it should be noted that the phenomena of inflammation beyond the limits of demarcation line, and later beyond the limits of pyogenic shell were reduced to the minimum and in the course of time disappeared entirely. All observed processes were reduced to the dystrophia, which with the course of time steadily increased/grew, which gradually led to a descent in the stability of tissues with respect to the actions of exogenous (mechanical, biological, etc.) and endogenic factors, composing the basis of the additional severe complications (see below). In the zone of concussion simultaneously occurred the proliferating processes, which led to the organization of concussion damages and the healing of the unit of the wound

according to the type of primary tension.

Changes in a wound during the sequestration.

During festering of wound, to the moment/torque of rejection/separation and removal/distance of sequestrations, the structure of suppurative focus constantly was changed in connection with the processes, which flowed/occurred/lasted in the pyogenic shell and its periphery. In some cases, together with the phenomena of proliferation beyond the limits of the focus of festering, occurred also the consolidation of break. In other cases the consolidation for long did not attack/advance and all changes in the suppurative focus were limited to the growth of the mass of scar tissue in the pyogenic shell. Finally, there were intermediate cases, when occurred insignificantly bone formation and consolidation also it did not occur.

One or the other regeneration effectiveness was determined by extremely different factors of general/common/total and local order/formation. Most important of them they were: the abundance of suppuration, sizes/dimensions and quantity of sequestrations, character/nature of suppuration (presence or the absence of rotting component), and also the general condition of organisa.

Consolidation attacked/advanced usually with the small abundance of festering and in the absence of the expressed alimentary disorders, traumatic exhaustion or severe somatic diseases/illnesses, under the condition of a good drain of pus from the wound. The greater there was the suppurative focus and the larger/coarser the sequestrations and the worse the condition of the drain of pus, the more weakly was developed the callus.

Addition of rotting inflammation, the development of the suppurative flows also held back regeneration. From the general conditions, which decreased the intensity of the education of corn, great value had alimentary deficiency, avitaminosis and hypovitaminoses, and also traumatic exhaustion, which was being developed on the soil of festering wound.

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The first signs of the formation of the callus was the formation of spongy bone structures in the periosteum on the edges of the break and in the periosteum of the fragments, which maintained viability, i.e., immediately in several places of wound. These signs appeared on the 6-7th day after wound. Subsequently an increase in the callus occurred multilocally. Initially was formed disorderly fibrous, soft, functionally defective here.



Somewhat later in the same places appeared the islets of chondral tissue; however during festering of their break never there was much, but their size/dimension was small, as opposed to what is observed with noncomplicated healing of fracture. Thus, the regenerate, which is generated on the spot of the festered bullet break, did not pass the stage of chondral corn how to a certain extent it is explained both the duration of its education and functional inferiority, since it is established/installed, that the preliminary corn, which consists of the chondral tissue, is most plastic (A. V. Rusakov). Chondral corn is formed rapidly and faster other forms/species of preliminary corn undergoes full/total/complete rearrangement, being basis for the strongest/most durable and functionally worthy final callus.

For the onset of cartilage in the preliminary corn an indispensable condition is the contact of the ends of the break, which is achieved by a good reposition, especially by the imposition of bone suture or the use/application of a pin. As is known, the character/nature of bullet breaks especially during festering of wounds, excludes the possibility of such conditions. With diastasis of broken ends and with their artificial stretching during the treatment by traction/extension chondral corn is barely created, but

appears the connective corn, in which is differentiated bone tissue. This corn is considerably less worthwhile in the sense of further rearrangement and function of final corn.

After the onset of the first spongy bone structures further apposition flowed/occurred/lasted not only in the periosteum, but also in paraosseal tissues, but frequently also around the pyogenic shell. Usually bone formation occurred only in the individual sections, thanks to which initially were formed 1-2 narrow bone navigation bridges, which united the arranged/located by series/number viable fragments, and are later the ends of the break.

The free bone fragments and the become numb ends of the break, which caught into the zone of proliferating processes, in the majority of the cases were surrounded by granulation and they entered into the general/common/total complex of regenerate. In similar cases bone fragments not only were encircled by granulation, but also into the lumens of Haversian canals and their narrow spaces grew in vessels and cells of granulation. Subsequently in the process of the rearrangement of corn the bone substance of such fragments partially was resolved and became framework/body for the formation of new bone beams/gullies. Thus, in the sectors where occurred the primary healing of bone damages, just as with the uncomplicated healing of fractures, the fate of free bone fragments and become numb ends of

the break it was analogous to the fate of free bone autotransplants.

Beginning from the end of the first month after wound, together with the formation of bone structures around the pyogenic shell, the granulation frequently grew in into the suppurative area, spreading over the surface of the sequestered sectors of bone; with the simultaneously occurred wrinkling of pyogenic shell sequestrations seemingly they would be insured in the granulation, and entire focus of festering was developed/extended by several those containing the sequestrations of the fine/small areas, connect/joined together and with the wound apertures by the narrow canals, which have the character/nature of fistula courses.

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In layer of these newly formed tissue complexes, just as around the pyogenic shell, were formed/activated spongy bone structures, in consequence of which around the sequestrations appeared the education, which remind sequestral capsules with vulgar chronic osteomyelitis. Between the ends of break in the course of time was formed the corn in thickness of which were located ulcers, the containing sequestrations and free bone fragments. This "duplist" corn was subject to surgical intervention, since the spontaneous removal/distance of sequestrations from its depth and, consequently,

also stopping festering was impossible (Fig. 67-68).

The consolidation of the break in the described form sometimes occurred already toward the end of the 2-3rd month after wound. In this case the structure of suppurative focus and pathoanatomically, and roentgenologically resembled the structure of the focus of vulgar chronic suppurative osteomyelitis. One should recall that this was purely external similarity; actually discussion dealt with sequestration of the sectors of the primary traumatic necrosis of bone, which was being escorted/tracked by shaping of corn.

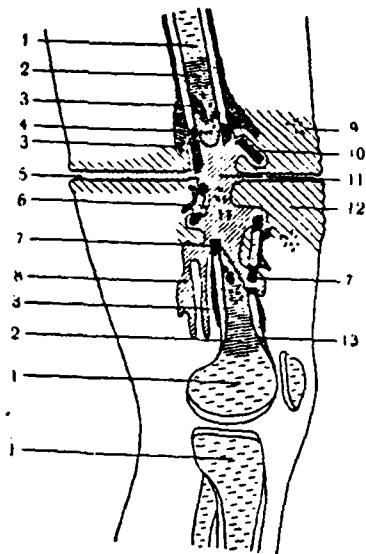


Fig. 67.

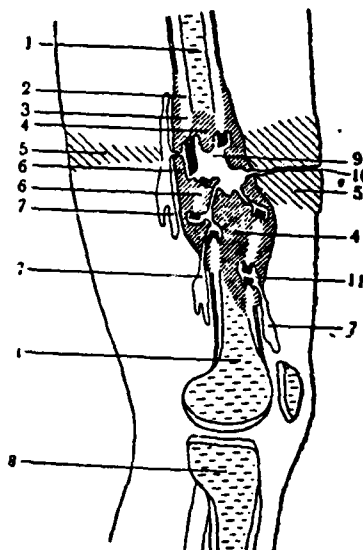


Fig. 68.

Fig. 67. Scheme of festered bone wound of thigh in period of sequestration. 1 - zone of dystrophic changes; 2 - zone of collateral edema; 3 - zone of bone formation; 4 - granulation in the edges of wound; 5 - wound canal; 6 - bone fragments, which maintained their viability; 7 - sequestering sectors of the primary traumatic necrosis of bone; 8 - suppurative flows; 9 - bone fragments, carried depthward of tissues; 10 - free bone fragment in the suppurative area; 11 - suppurative area; 12 - cicatrical tissue in the edges of wound; 13 - zone of the rarefaction of compact substance.

Fig. 68. Scheme of festered bone wound in period of formation of

corn. 1 - zone of dystrophic changes; 2-3 - included in the corn ends of the break; 4 - the callus; 5 - scar on the spot of wound canal; 6 - included in the corn bone fragment; 7 - suppurative flows; 8 - zone of dystrophic changes in the adjacent bones; 9 - suppurative area; 10 - fistula on the spot of wound canal; 11 - ulcers around the sequestrations.

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The complexity of the morphological picture of the festered break during this period was complicated even and by the fact that the suppurative inflammation was frequently propagated far beyond the limits of the basic suppurative focus on the course of cracks in the compact substance and of the additional canals in bone marrow, made by bone fragments. Because of this in the depth of bone were formed the new ulcers whose bond with the primary focus of festering it was possible to establish/install only after the thorough histological research of the entire region of damage in the serial histotopographical shear/sections. Therefore in the blade they frequently were treated as metastatical ulcers.

For the described variant of the course of festering bullet breaks typical is the following observation.

K. is wounded into the left thigh with subtrochanteric break of bone. Wounds are cut all over through 4 days, are removed free bone fragments, is superisposed deaf gypsum bandage. Temperature from the moment/torque of operation/process to 39°, the incorrect type. During further observation was noted the abundant liberation/excretion of pus from under the gypsum bandage; increased thinning. Through 2 weeks - shift/relief of gypsum bandage. During the research the wounds proved to be the covered succulent granulation.

In the X-ray photographs are discovered the phenomena of periostitis and the partial sequestration of the extremal broken end of bone. On the 36th day after wound hemorrhage from the wound. Dressing of femoral artery under the Poupart's ligament. During the operation/process the casualty died.

The data from the protocol autopsies: is somewhat lower than the large trochanter wound by the size/dimension 15x7 cm, carried out by the red, mushroom-shaped projecting granulation. Wound canal is narrow, they coiled. Break of femoral bone, in the proximal broken end the wide crack, which penetrates into the thickness of the neck/journal of femoral bone. Broken ends are located at a distance of 3 cm from each other, they are arranged/located at angle. They are connected by the dense corn which in the form of clutch encircles bone for the elongation/extent 12 cm. Succulent rose-colored

granulating tissue fills crack into the necks/journals. From the corn into the lumen of wound canal comes forward the sharp edge of the proximal broken end of the bone with a length of 4 cm, isolated from the remaining bone by sequestral sulcus/furrow/groove. In the thickness of callus around the sharp edge of extremal broken end, is discovered the ulcer in diameter into 4 cm, which is communicated with the wound canal and with the crack in the neck/journal. Along this crack is arranged/located the suppurative flow, which is finished with the ulcer, forced in the spongy substance of neck/journal, sub-cortical. The periosteum of neck/journal in this place is scaled by pus. Compact substance at the edge of break is sharply rarefied. In the thickness of corn two large/coarse fragments of bone, soldered in in the tissue of corn, that compose with it unit. In paracostal tissues purulent flow. A deep artery of thigh will withdraw above places of the dressing of femoral artery. In its wall near the place of break - large/coarse it is dummy of aneurism with the fresh gap of wall.

The second variant of the festered wound of bone was characterized by the almost full/total/complete absence of the phenomena of regeneration, in consequence of which consolidation it did not attack/advance. In such cases on the edges of break was formed only a small quantity of bone beams/gullies, and suppurative focus during the long time (frequently calculated by months) remained



the surrounded only pyogenic shell which in the course of time was thickened and was thickened due to the increase of the mass of scar tissue. The sizes/dimensions of suppurative focus in such cases were decreased very slowly, and granulation cicatrized almost by rear sight (Fig. 69).

As the example of this variant of the course of bullet break can serve the following observation.

R. is wounded into middle third of right thigh. Wounds are cut all over after 24 hours, is made contra-aperture, is superimposed the splint of Diterikhs. Through the week is superimposed gypsum bandage. Wounds are festered, they are covered with succulent granulation. In the course of the following month slowly increases exhaustion, incorrect type temperature, to 39°. 40 Days after wound the shift/relief of gypsum bandage. In the X-ray photograph is noted osteomyelitis of broken ends with the terminal sequestrations. it is produced sequestrotoomy. After this condition of patient noticeably it deteriorated, it is estimated as septic. Death 3 months after wound.

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Extraction from the protocol of autopsy. Sharp exhaustion, deep bedsores on the rump, in the region of the awned/spinal processes of

thoracic vertebrae and on the scapulas, with exposure and necrosis of bones. The right strut is shortened; on the front/leading and posterior surface of middle third of thigh two wounds by the size/dimension 6x5 cm each, with the cicatrizing edges. Femoral bone is broken; broken ends are displaced at angle, they are located at a distance of 5 cm from each other. Between the broken ends was formed the subglobose area, which is communicated with the external wounds; its walls consist of the dense scar tissue, which surrounds and which insures the ends of the break and that covering the apertures of marrow canal. Sequestrations is not found. The internal surface of area is covered by very slimy granulations, it is covered with liquid malodorous pus. Pericosteum in the edges of break bead-shaped is thickened, partially calcified. The compact substance of broken ends very brittle, resembles spongy bone, on the edges of break it is easily cut by knife. Bone marrow of oil. In a front-lower edge of area the narrow aperture, which leads into the area of the suppurative flow, arranged/located in paraossial tissues. This flow is communicated with the upper turn of knee joint. In the area of joint thick, malodorous pus. The large vessels of extremity are passed, muscles very flaccid, the pale yellow color; around the wound the muscles are pierced by the numerous strands of scar tissue.

In the internal organs/controls of the phenomenon of brown atrophy; adipose dystrophy of the liver. Numerous ulcers in the

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lungs; the suppurative inflammation of left elbow joint. Right  
suppurative pleurisy.

Data of the histological research: the walls of area consist of  
the scar tissue on surface of which are arranged/located only the  
individual accumulations of the cells of granulation with the  
pycnotic nuclei/kernels.

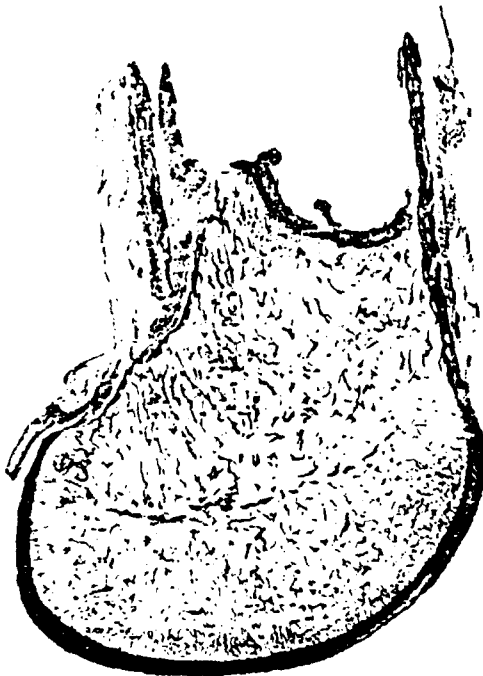


FIG. 69.

Fig. 69. Proximal and extremal ends of the break of femoral bone with the small flaky sequestrations of the external plate of compact substance and with the insignificant neoformation of bone tissue. The sharply pronounced rarefaction of compact substance the wide zone of collateral edema of bone marrow. Adherence of large bone fragment to the extremal edge of break the figure from a histo-topographic preparation (35 days after wound).

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Sharp rarefaction of the compact substance of bone, which arose due to the expansion of Haversian canals. In the periosteum near the walls of area are smaller the complexes of the newly formed bone beams/gullies and the islets of cartilage, the powerful/thick development of scar tissue.

During the cicatrization of skin wounds and with the education of the callus frequently the discharge for long was held up in the wound, which played important role in further course of suppurations.

For designation of the process of festering the bone wound with the education of the sequestrations of bone are proposed many terms: bullet osteomyelitis, osteitis, corticalitis the like. Most widely

used was term "bullet osteomyelitis". Summing up data presented above about the essence of suppurations in the bone wound and the dynamics of their development, one should come to the conclusion that this term is impossible to recognize sufficiently to those reflecting the content of process.

Of given above data, which are the result of very numerous clinical and pathoanatomical research (I. V. Davydovskiy, A. P. Avtsyn, S. M. Derizhanov, P. G. Kornev et al.), obviously following: festering bone wound was characterized by the fact that the suppurations in the bone, as a rule, were limited to the zone of primary fault, being propagated only on the course of cracks and canals, made in the tissues by bone fragments and foreign bodies. Of this type suppurative process in fact was the form of the secondary cleaning of bone wound, which was being escorted/tracked by the sequestration of the sectors of the traumatic necrosis of bones with the phenomena of regeneration. From the bacteriological side this process was characterized by the presence of the different microorganismas, which grew in the masses of primary traumatic necrosis and in the discharge of wound. In other words, during festering of bone wound nothing new in comparison with festering of wounds in other organs/controls it was observed. The specificity of festering bone wound depended, first of all, on the special feature/peculiarity of the structure of bone (processes of

sequestration).

There occurred inflammation of bone marrow and bone was unique manifestation of demarcation inflammation and was developed only on the boundary of the living and dead tissues. In the surrounding demarcation line departments of the damaged bone were observed only the dystrophic and regenerative phenomena, which flowed/occurred/lasted against the background of collateral edema, whereas inflammations was not noted.

The general/common/total reaction of organism to the presence of the prolongedly existing local suppurative focus was expressed in a pyo-resorptive fever (I. V. Davydovskiy). Its intensity and duration widely varied and depended in essence on the sizes/dimensions of the focus of festering. It is possible without the exaggeration to say that strongest and prolonged the fever was with the festered bullet breaks.

Resorption of the focus of festering appeared of one of the basic reasons of fever and increasing exhaustion of the organism of casualties. The second reason was the large loss of protein with pus (I. V. Davydovskiy). Finally, to the exhaustion, connected with indicated two factors, was added factor alimentary (A. P. Avtsyn). The immunobiologic shifts/shears, which appeared on the course of

festering the wound, were the basis of a descent in the resistivity of the organism of casualties to all possible external agencies, including microflora of wound.

Together with a descent in the general/common/total stability of organism during festering of wound, frequently progressed dystrophic and necrobiotic processes in the surrounding tissues and in the entire damaged extremity.



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These changes were repulsing those shifts/shears in the general/common/total reactivity of organisa, which appeared during a pyo- resorptive fever with all its ccnsequences. Especially abrupt changes of this type were noted with development in the process of festering the wound of sepsis or traumatic exhaustion.

During the combination of all facts indicated, especially with the prolonged deadlock of discharge, a quantity of microorganisms in the wound sharply increased/grew, frequently occurred the rotting decomposition of pus, which led to an increase in the concentration in it of the toxic substances which in large quantities were sucked in by granulation. In this case were noted progressive edema, pallor, apathy of granulation; frequently they were covered/coated with dull gray rather dry impositions or waldorous masses of rotting character/natura. During the histolcical research was determined the fusion of the film of fibrin and the disappearance of compact leukocyte shaft on the surface of granulation; in the exudate there was a vast quantity of microbes which germinated also into the thickness of granulation. The cells of the surface ones, and later

ard of deep layers proved to be those swelled, were rounded off, were homogenized; between the cells was saved/accumulated edematic fluid/liquid, in which settled the threads of fibrin. Subsequently occurred abundant leukocyte infiltration, and frequently also the suppurative fusion of granulation (Fig. 70). Simultaneously were noted abrupt changes from the side of vessels, caused by the necrosis of granulation; all layers of the walls of fine/small vessels were homogenized, were impregnated with protein fluid/liquid, in consequence of which appeared the pictures, reminiscent of fibrinoid necrosis. In the lumen of such vessels were formed leukocyte (fibrinogenic) thrombi.

The size/dimension of the necrotized sectors of granulation gradually increased/grew; individual sections decanted, dead masses were pierced by the threads of fibrin and formed on the surface of wound more or less thick films.



Fig. 70. Edge of purulent muscular wound with the progressive necrosis of granulation against the background of the prolonged deadlock of discharge in the wound (microphotograph, a great increase). Kray wounds are represented by necrotized decomposing muscles whose endomysium is abundantly infiltrated by leukocytes. In the masses of necrosis a vast quantity of microorganisms whose colonies take the form of the merging broad band.

This process was qualified as the pyonecrotic inflammation of the osteomuscular wound (A. P. Avtsyn, S. M. Derizhanov). A. P. Avtsyn considered it its typical for the so-called "septic" wounds. Subsequently the necrosis could capture entire thickness of granulation and unit of the callus, which led to the annihilation of the large/coarse sectors of regenerate.

The described changes were always escorted/tracked by reinforcing of collateral edema. In the ends of the broken ends and in the callus occurred the mass resorption of bone substance, in consequence of which the rarefaction of bone rapidly increased/grew, and the callus could even partially or completely resolve; with the already emergent consolidation this entailed disuniting the ends of the break. The resorption of bone acquired peculiar "sinus" character/nature, in contrast to the ordinary course of the festering when predominated smooth resorption (Fig. 71).

In the muscles against the background of sharp edema of endo- and perimysium appeared fresh waxlike necrosis and decomposition of fibers, and also was reinforced edema of fascias and intermuscular cellulose. In the fine/small vessels in the zone of collateral edema were observed the phenomena of stasis, thrombosis, numerous fresh

point and larger/coarser hemorrhages, and also vacuolization of fibrocytes with the pyknosis of nuclei/kernels and the decomposition of protoplasm, which was matched with the fusion of the nets/systems of the argyrophil fibers, which were being formed in the granulation (Fig. 72). Against the background of the described changes in the wound and surrounding tissues already for the second month after the beginning of festering the character/nature of suppurative inflammation could very sharply change, which was expressed in the onset of diffusion suppurations. In other words, the suppurative inflammation of wound lost the lines, specific to secondary cleaning, exceeding the limits of primary fault.

If in the first 1-2 months festering the ends of the break was the leading factor, which defines the reaction of the remaining components of wound, then within the later periods diffusion suppurations were observed identical frequently both in the bone and in its muscular component, and frequently even they predominated in the muscular wound. Such processes included suppurative flows, the sharp/acute phlegmon of bone marrow, soft tissues and suppurative Thrombophelbitis.



Fig. 71. Resorption of the newly formed bone beams/gullies in the callus with the prolonged deadlock of separable with the annihilation of large sectors bone substance. The sectors, subjected to resorption, take the form of sinuses/antrums and areas, which surround the maintained bone structures (microphotogram, average/mean increase).

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Earlier and more frequent than other suppurative complications were encountered suppurative foci. In the opinion of I. V.

Davydovskiy, the basis of the onset of these complications was enzymatic decomposition of tissues with the participation of most different microflora. A. P. Avtsyn, most in detail studied process of educating the flows, asserted that among the factors, which lead to the education of flows, or one of the first places it stood, the noted above dystrophic condition of tissues around the prolongedly festered wound, some properties of microflora, and also momentums.

As a result of dystrophic processes interstitial tissue around the focus of festering (fascia, intermuscular interlayers) frequently became coated with mucous and was loosened. During the prolonged festering under conditions of the deadlock of pus in the wound in connective tissue it was noted diffusion edema, dissolution of connective structures (especially with the phenomena of scurvy), dystrophic changes in the cells, hemorrhage. Such changes frequently applied to entire damaged extremity.

In the tissues where occurred dystrophic changes, under conditions of the elevated pressure of pus in the case of its delay in the wound especially easily appeared and progressed the suppurations; in this case the momentums had a value mainly of the factor, which is determining the routes/paths of the spread of festering.

By hypothesis of A. P. Avtsyn, the microtes possess the capability to secrete the substances, which change the permeability of tissues. This property is especially expressed in anaerobes.





Fig. 72. Dystrophic changes in muscles and intermuscular cellulose in the zone of collateral edema with prolonged suppuration of bone wound. Sharp thinning of muscular fibers, the disappearance of cross striation, edema of perimysium, the pycnosis of nuclei/kernels and the vacuolization of the protoplasm of fibrocytes, swelling, fibering of collagenic fibers (microphotogram, a great increase, 46th day after wound).

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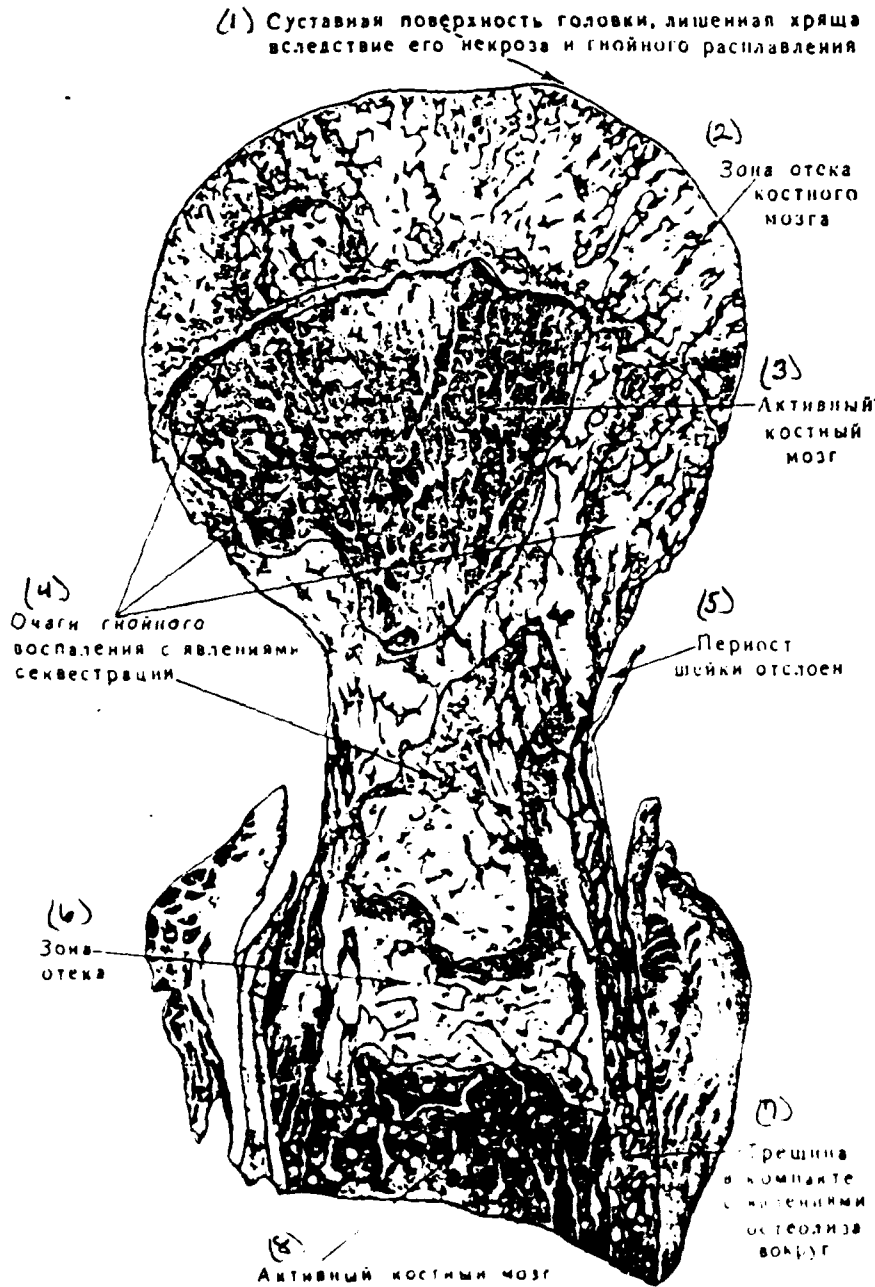


Fig. 73. Foci of phlegmon of bone marrow in neck/journal and head of femoral bone during festering tangential damage to region of intertrochanteric line.

Key: (1). Joint injector face, deprived of cartilage as a result of its necrosis and of suppurative fusion. (2). Zone of edema of bone marrow. (3). Active bone marrow. (4). Foci of suppurative inflammation with phenomena of sequestration. (5). Periosteum of neck/journal is scaled. (6). Zone of edema. (7). Crack in compact to phenomena of osteolysis all around. (8). Active bone marrow.

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These substances, assumes/sets A. P. Avtsyn, raising tissue permeability, they facilitate the dissemination of microflora depthward of tissues on the intermuscular and interfascial spaces.

On A. P. Avtsyn, education of flows it begins from the fact that against the background of dystrophic changes in the interstitial tissue appears necrotic suppurative inflammation of cellulose in course of which are noted two periods. Initially fascias - matte, gray color, easily are separated; between the fascial leaflets are formed fibrinogenous films, appears focus necrosis. In the presence of these changes, which frequently capture large territories,

macroscopically suppurative exudate yet it is not determined. Only during the histological research is noted the diffusion leukocyte infiltration of cellulose with the presence in it of different microorganisms. This initial stage of the formation of flows A. P. Avtsyn named/called "dry stage". Following it sets in the phase of suppurative exudation; later process can change to the surrounding muscles, moreover is developed destructive myositis.

Studying the pathogenesis of flows, A. P. Avtsyn arrived at the conclusion that they were the result of the active progressive infectious process, which was being propagated on the most "susceptible ones" to it as a result of the preceding dystrophia to tissues. Therefore A. P. Avtsyn resorted to the term "flow", which perverts the essence of process, and proposed to replace with its term "phlegmonous cellulite." "

However, factual material of A. P. Avtsyn does not remain in doubt of the fact that the leading factor in the pathogenesis of flows was the precisely dystrophic process in the tissues, which encircled the festered wound, and in granulation, composing pyogenic shell. These tissues, being the new foci of numbness, germinated by microbes, and a descent in the capability of dystrophic tissues for demarcation, their "unresponsiveness" they predetermined further dissemination of flows. Thus, the decisive factor in the pathogenesis

of flows should be considered not the "activity" of infection, but lowered viability of tissues (I. V. Davydovskiy).

Especially numerous and extensive were flows during festering of the bullet breaks of thigh. Against the background of alimentary dystrophia and traumatic exhaustion they frequently acquired the nature of "boundless ones", without restraint propagated for the extensive elongation/extent of subcutaneous and intermuscular cellular tissue. Frequently flows proceeded not from the wound, but from the bedsores on the spin and the rump. In the exhausted casualties the flows did not frequently give the expressed symptoms and with the life remained undiagnosed.

In contrast to the sharp/acute phlegmons with the flows the microflora was very different, in it frequently predominated suppurative, in consequence of which the process obtained the character/nature of an ichorous-necrotic inflammation.

Phlegmon of bone marrow (acute suppurative osteomyelitis) of the damaged bone.

The phlegmon of bone marrow rarely was developed earlier than the end of the first month after wound and it always flowed/occurred/lasted against the background of the sharp

intoxication of the organism of casualty and in the presence of heavy dystrophic changes in the tissues, which surround the focus of festering. Evidently, in its pathogenesis, together with a descent in the resistivity of tissues with respect to the microflora of wound, played role and the changes in the reactivity, connected with the prolonged absorption of the fission products of protein substances from the wound.

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Very frequently this process either preceded the development of sepsis or it escorted/tracked it.

Phlegmon usually was matched with a deep necrosis of the granulation which formed the walls of suppurative focus or encircled the isolated/insulated ulcers in the depth of bone marrow, about which it was mentioned above. Phlegmon more frequently was developed in the depth of bone, less frequent - in the direct contact with the basic suppurative focus. Frequently it appeared in the zone of the circulatory necroses of bone, which were being formed both at the moment of wound and in the course of festering the wound.

Phlegmonous inflammation usually began immediately in several places, in the form of the fine/small foci whose merging/coalescence

it conducted to the education of the extensive sectors of suppurative inflammation. Sometimes phlegmon was developed in connection with intraosseous/intraosteal/endoosteal thrombophlebitis or thromboarteritis, also in such cases occupied the sectors of bone marrow, located in the zone of propagation of the branches of the casualty vessel, resembling in form septic infarction, what was ordinary picture in the pineal systems. Here phlegmon frequently achieved joint cartilage, in consequence of which unavoidably was developed the suppurative inflammation of the corresponding joint. Such processes most frequently were observed in the head of femoral bone with the the subtrochanteric and especially with its transtrochanteric breaks (Fig. 73).

In the diaphysis phlegmonous inflammation frequently was propagated from bone marrow to the Haversian canals of complex substance and to the pericosteum, being escorted/tracked by the development of suppurative periostitis, sometimes with necrosis and scaling of periosteum and phlegmon of paraosseal tissues. In this case, as a rule, occurred the necrosis of the casualty departments of compact substance with the subsequent education of sequestrations. In the diaphysis the foci of phlegmonous inflammation could capture entire diameter of bone or only part of it periphery; the extent of the foci of phlegmon on length of bone did not usually exceed 4-5 cm.

During the study of the distribution of microorganisms in sections, stained according to Gram-Weigert, it turned out that in these foci was almost always only one form/species of microorganisms (most frequently streptococci or staphylococci), while in the basic suppurative focus and in the suppurative flows the flora was different.

All these special features/peculiarities of the phlegmon of bone marrow drew together it with acute hematogenic osteomyelitis not only morphologically, but to the known degree and pathogenetically, why to it it was with the full/total/complete right to use term "osteomyelitis".

The foci of phlegmon were rapidly delimited by demarcation line, and it is later and by the pyogenic shell of ordinary building/structure, in consequence of which they were converted into the intraosseous/intraosteal/endosteal abscesses or into the isolated/insulated foci of suppurative osteoperistitis. The sectors of the bone substance, arranged/located in these foci, they underwent sequestration exactly as in the foci of hematogenic osteomyelitis. However, in contrast to the latter almost never was observed the formations of sequestral capsules and generally expressed bone formation. This is explained, apparently by severe intoxication, exhaustion, and frequently also by the presence of sepsis at the



moment of the development of phlegmon, which, as is known, sharply decreases regenerative possibilities.

The phlegmon of bone marrow was observed mainly in those not treated, complex building/structure wounds, predominantly during festering of the bullet breaks of femoral and shoulder bone. The sharp/acute phlegmon of soft tissues around the focus of festering bullet [artillery] break was encountered rarely.

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As a result of the study of the sharp/acute phlegmon of bone marrow of the damaged bone is established, that it was developed in the late periods of festering wound against the background of sharp intoxication or sepsis. It was the actual infectious process, pathogenetically close to hematogenic osteomyelitis, and was the severe complication of suppurating break. In the essence only to this process in the festered bone wound let us apply term "osteomyelitis".

Suppurative thrombophlebitis.

Suppurative thrombophlebitis frequently appeared in the last stages of festering break, especially with the wounds of thigh (I. V. Davydovskiy, A. P. Avtsyn); with other localizations of wound it was

developed much more rarely. The pathogenesis of thrombophlebitis is various. According to A. P. Avtsyn, more frequently was observed the hematogenic infection of the thrombi, which were being formed in the large/coarse and fine/small veins of wounded extremity; less frequent it preceded suppurative periphlebitis. According to Ye. A. Kishkinoy's data, at the basis of thrombophlebitis frequently lay/rested mycotic embolism.

Suppurative thrombophlebitides usually began from the fine/small veins, arranged/located in the walls of suppurative focus both in the soft tissues and in the bone. According to A. P. Avtsyn, intra-marrow thrombophlebitis was characteristic for the early phases of festering wound. According to others data, it just as the phlegmon of bone marrow, appeared predominantly within the late periods of festering. Thrombophlebitis was propagated from the zone of primary localization in the proximal direction on the blood stream and changed to the large/coarse venous trunks/stems, v with the wound of lower extremities - frequently to iliac and lower caval vein and even to the veins of another extremity.

In the fine/small veins where began process, it was noted necrosis of walls and suppurative periphlebitis; in the large/coarse veins the macro-picture was very different; veins were thickened, their walls were infiltrated by pus, in the lumen were observed

suppurative- molten thrombotic masses.

In certain cases the picture of thrombophlebitis macroscopically did not differ from commonplace thrombosis, and only during the histological research it was possible to reveal the inflammation of the wall of vein and presence in thrombotic masses of microorganisms, most frequently streptococci. During the histological research was revealed the necrosis and the leukocyte infiltration of the walls of vein. One should note the extreme diversity of changes in one and the same vein: together with the necrosis and the suppurative fusion, could occur the phenomena of proliferating inflammation with the abundant histiocytic reaction and the organization of thrombotic masses. Suppurative infiltrative and necrosis could concentrically envelop either entire wall of vessel or its only some of segments. Frequently on the course of the casualty by thrombophlebitis vein were formed periphlebitic abscesses, especially frequently - in the zone of the necrosis of vascular wall.

Suppurative thrombophlebitis greatly frequently was septic focus. Thus, according to A. P. Avtsyn, suppurative thrombophlebitis is established/installed into 64.4% of all ending by death cases of sepsis when the bullet break of thigh is present,; with the septicopyemia this percentage was raised to 79.7. Frequently suppurative thrombophlebitis was the source of the phlegmon of bone

marrow.

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Consequently, thrombophlebitis played extremely large role in the pathogenesis of the heaviest infectious complications of the bullet breaks, but its value was frequently underestimated by both the clinicians and by anatomical pathologists and to the study of thrombophlebitis in casualties they gave insufficient attention.

The frequently encountered combinations of diffusion suppurations can be illustrated by the following observation.

K. is wounded into the right thigh with the break of bone. Is right after wound it delivered into the hospital where it was located in the course of the month. Wound was processed insufficiently, immobilization defective. Wound was festered; casualty strongly lost flesh, it was feeble.

In the hospital it entered with temperature of 38.5°C; on the spot of wounds - narrow fistulas from which is secreted much pus. Is superimposed deaf gypsum bandage. By the large continued to grow thin; its condition deteriorated. In a month gypsum bandage was substituted by the splint of Craver.

During the x-ray examination is established/installed consolidation of break and chronic osteomyelitis. Soon appeared jaundice; rarely began to be noted the staggering chills. Were opened the numerous flows of pus on the thigh, but the condition of casualty continued to deteriorate. 4 months after wound is produced the expansion and the carving of wound and the resection of the unit of the corn. Condition was not improved, and 2 weeks after this operation/process casualty died.

Extraction from the protocol of the autopsy: sharp exhaustion, jaundice. The right foot is edematous. On the front face of upper third of thigh the cicatrizing wound with the narrow winding fistula in the center; on the lateral ones and the posterior surface of this thigh - wide granulating wounds after the autopsy of suppurative flows. In upper third of femoral bone - grown together multifragment break; the corn of spindle form, by length in 20 cm. Between it and surrounding tissues - space, filled with pus, which is communicated with above course. Around soft tissues are pierced by thick Ruytsovs by the strands, between which are located several suppurative flows. One of them in paraosseal tissues reaches the popliteal pit and the capsule of knee joint. In the substance of corn several soldered in in it large/coarse fragments of bone. In layer of corn area in

diameter in 2 cm, filled with pus and uniting by narrow slit with the fistula. The substance of corn is easily cut by the knife: the compact substance of bone is sharply rarefied. In bone marrow of neck/journal and head of thigh numerous ulcers; some of them are arranged/located subchondrally, having a form of infarctions. In the area of hip and knee joint thick green pus. Cellulose of thigh is edematous; muscle flaccid, pale yellow color. In the internal organs/controls sharp dystrophic changes. Spleen flaccid, its pulp gives large biopsy specimen. In posterior departments of both light ones pneumonic foci.

data of the histological research: corn consists of spongy bone and extensive fields of scar tissue. The granulation, which compose the wall of the ulcer, arranged/located in the corn, are abundantly infiltrated by leukocytes, by places they are necrotized. In veins and arteries of the proximal broken end of bone and in the veins of neck/journal and head of thigh - thrombotic masses, which contain the colonies of microbes. The walls of thrombosed vessels are necrotized, abundantly infiltrated by leukocytes. In bone marrow - large/coarse sectors of the phlegmonous inflammation, arranged/located on the course and near the thrombosed vessels. In thrombi and foci of suppurative inflammation a large quantity of short chains of streptococci.

Secondary arthrites. In certain cases predominantly in the late periods of festering the breaks of diaphysis occurred the suppurative inflammation of the adjacent undamaged/uninjured joints (arthrites). At the basis of such arthrites lay/rested different mechanisms. In some cases occurred the march/passage of inflammation to the capsule of joint with the education of paracapsular suppurative flows, in others - suppurative inflammation was propagated on the intraosseous/intraosteal/endosteal cracks, which penetrated to the subchondral zone of pineal systems, which was observed mainly with subtrochanteric and transtrochanteric breaks of femoral bone and with the breaks of metaphyses of other bones of extremities. Had a value and intraosseous/intraosteal/endosteal thrombophlebitis with the onset periphebitic abscesses in bone marrow of pineal systems.

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Finally, was not eliminated the possibility of the hematogenic infection of joints, or dissemination of infection from the closely spaced to the joint bedscrews, what was the basis of the onset of coxitis and gonitis in the exhausted casualties, who were being prolongedly located in the gypsum bandage (A. P. Avtsyn).

In the significant part of the cases the onset of secondary arthritis was connected with the dissemination of infection from the

wound on the contact or on the continuation; much less frequent it was the result of the generalization of infection. However, in each individual case in order to solve a question about the origin of such arthrites, one ought not to have produced the thorough histotopographic research of the entire region of damage, and also adjacent tissues.

#### Outcomes of festering bullet break.

During festering of the bullet breaks of the bones of extremities were observed the following outcomes: the consolidation of break with the reduction of the function of extremity; the education of functionally defective corn or dummy joint; the progression of suppurative process, which led to the amputation of extremity or which produced death of casualty.

The consolidation of break was accomplished in the process of festering; however, generating in this case corn was worthy and presented never the conglomerate of the random bone growths, among which were arranged/located the ulcers, connected by winding fistula courses and the contained free sequestrations. Frequently in the thickness of this corn were encountered the extensive fields of scar tissue, smooth-walled cysts (Fig. 74). Frequently corn was represented only by a bone capsule around the pyogenic shell.





Fig. 74. Extremital unit of the callus, which was being formed in the process of festering the bone wound of thigh. Amputation is produced to the 93<sup>rd</sup> day at the level of the ulcer, which was being located into layer of corn. The latter is constructed from the scar tissue and the comple s of spongy bone (figure from histo- topographic preparation).

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In some casualties the ulcers were arranged/located only one unit of the corn, while in other places it was formed correctly.

In all these casualties were necessary additional, frequently repeated surgical interventions in the form of necrotism, partial or even full/total/complete resection of entire regenerate. Only after the elimination of the foci of festering operationally with the carving Rubtsov became possible the education of functionally worthy corn. However, after this corn, as a rule, was formed excess, in consequence of which its rearrangement was drawn very for long - of up to 2-3 years.

In the soft tissues around the zone of break up to the moment/torque of consolidation were formed the very numerous large/coarse scars; with the localization of break near the joints

the, were the reason for contractures.

Frequently the healing of earlier than the festered breaks occurred during the insufficiently correct reposition of broken ends, which produced different strains or shortening of extremities. The corns, which are generated on both bones of shin, especially forearm, frequently decanted or occurred the consolidation of one bone and welding into the corn only of the one end of the second damaged bone.

In some casualties in the depth of the formed corn for long were retained the fine/small ulcers, which contained free bone sequestrations. If these ulcers did not cicatrize, they served as the source of the relapses of suppurative inflammation (Fig. 75).

During the histological research of the healed bullet breaks with the full/total/complete reduction of the function of extremity it was sometimes noted that the leukocytes of ulcers lost the capability to receive nuclear stain/staining, being converted into the unstructured rose-colored spheres. Around the ulcer were accumulated/stored the macrophages; the granulation, which compose the wall of ulcer, in proportion to the resorption of pus gradually made its area and they underwent cicatrization.

When ulcers did not cicatrize, in casualties with the healed

break periodically were opened the fistulas, sometimes flashed suppurative periostitis and appeared suppurative flows in paraosseal tissues, which could be escorted/tracked by thrombophlebitis of bone and muscular veins. During worsening sometimes were formed metastatical ulcers in the lung or appeared sepsis.

In such casualties during the research of the region of the available break usually found the well formed callus with the fine/small abscesses at bone marrow, which contain the free sequestrations; around the ulcers was noted sharp edema of bone marrow, hemorrhage, and in the compact substance and in the beams/gullies of spongy substance - the phenomenon of the very lively sinus resorption with the disappearance of the large masses of bone substance.

As example can serve the following observation.

O. during November 1943 obtained the perforating fragmentation wound of middle third of right thigh with the break of bone. Transferred "bullet ones osteomyelitis". It is three times operated (sequesterotomy, the autopsy of suppurative flows). After the healing of fracture periodically was opened the fistula, which then independently was occluded. The function of extremity was reduced.

During June 1945 suddenly was increased the temperature, appeared edemas on the feet and sickliness in the region of the former break. It is placed into the clinic where was produced the section/cut of the soft tissues (pus it is not obtained); on the 3rd day after operation/process appeared pain in the joints, sharp shortness of breath, cough with the bloody mucus, pains in right hypochondrium, temperature was increased to 39°. ~~It~~ was diagnosed exudative pericarditis and left-side pleurisy.

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Fig. 75. Full/total/complete consolidation of bullet break of femoral bone (in process of festering twice was produced sequestrectomy. Death from metastatical suppurative pericarditis 2 years after

wound). In layer of compact substance in the region of the former break several fine/small ulcers with the free at them sequestrations. Bone marrow is edematic. On the surface of compact substance the neoformation of bone tissue (figure with the figure from histotopographic preparation).

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To September the condition was improved, but temperature remained subfebrile 6/XI 1945 again they arise pain and edema in the region of the former break, were renewed the symptoms of pericarditis 28 XI 1945 casualty it passed away.

Extraction from the protocol of the autopsy: on the front face of lower third of right thigh the drawn in, scldered with the bone scars. Sharp edema of entire by the law/right of foot; the shielding thrombosis of right femoral vein and all its branchings. The muscles of thigh are pierced by the thick strands of scar tissue, which in the form of clutch encircles lower half of femoral bone. On the boundary of middle and lower third femoral bone is spindle-shaped thickened. On the cut of bone in this place is determined the healed break; compact substance is thickened, its external plate is porous; bone marrow of gelatinous consistency with many fine/small hemorrhages. In the internal organs/controls of the phenomenon of

sharp venous deadlock. In the area of pericardium dense intergrowth and thick mucous-like pus.

During the histological research it is discovered, that the compact substance in the region of the former break consists of the typically constructed flaky bone; only in its sub-periosteal zone are beds of an in parallel-fibrous bone, which generate spongy structures. In the thickness of compact substance and in bone marrow are discovered three ulcers with a diameter of 3-4 mm each, containing free fragments of bone. In bone marrow, which surrounds ulcers, hyperemia, fine/small hemorrhages. In the lumen of marrow wounds amorphous thrombotic masses; the wall of veins are necrotized, abundantly infiltrated by the meristic leukocytes. In the periosteum abundant lymphoid-plasma-cell infiltration, in places by the significant admixture/impurity of polymorphonuclear leukocytes.

During festering of break sometimes was noted the formation of the dummy joint when the ends of the break on the elimination of festering were imured in the scar tissue in which either in no way was noted osteogenesis, or occurred the random education of the fine/small complexes of bone keas/cullies and islets of chondral tissue. Marrow canal in the course of time was occluded by the plate of the typically constructed flaky bone. Frequently between the ends of break was formed/activated slit and was formed the tissue, which



resembled the synovial membrane of joint.

Rarely as the complication of festering bullet breaks was observed general/common/total amyloidosis. The periods, during which amyloidosis, counting from the moment/torque of wound, conditioned lethal outcome, widely they oscillated. Are described the unitary cases of the early development of amyloidosis with the lethal outcome already toward the end of the first month and even it is earlier. It is more frequently, however, amyloidosis was noted through 3, 6, 9 months, and also it is later (through 3-4 years), especially in the cases, which were being characterized by the late relapses of inflammation in the thickness of corn and by the periodic onset of fistulas.

Among other reasons of death of casualties with the tightening themselves suppurations in the bone wound after the bullet breaks were noted the most different diseases, from which in the first place stood tuberculosis. However, the direct pathogenetic bond of these diseases/illnesses with festering of bone wound was not always obvious.

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Special ~~unit~~ <sup>PART</sup>.

Chapter I.

BULLET BREAKS OF SHOULDER.

Characteristic of anatomical changes with the bullet breaks of shoulder.

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General/common/total characteristic.

Bullet wounds with the break of shoulder bone composed 36.60/o of all wounds of shoulder.

After bullet wounds were encountered the different forms/species of the breaks of the shoulder bone distribution of which can be judged from data of Table 79.

Thus, large-splintered breaks composed almost half of all breaks of shoulder, whereas at the latter/last place stood the packed in and longitudinal breaks which were observed extremely rarely and they composed only 0.60/o of all breaks. In 70.60/c of all wounds of shoulder was observed the heavy decomposition of shoulder bone with the relatively extensive damage of soft tissues (with the comminuted and crushed fractures).

All wounds with the break of bone according to the character/nature of the wounding shell were divided into the bullet ones and the fragmentation ones.

Each of the enumerated forms/species of the bullet breaks of shoulder was encountered in different relationships/ratios in the group of both bullet ones and fragmentation.

Table 79. Distribution of casualties with artillery break of shoulder bone according to the means of wound and the form/species of break (in the percentages).

(1) Вид ранения	(2) Вид перелома	(3) Крупно-оскольчатый	(4) Раздробленный	(5) Косой	(6) Крайевой	(7) Мелко-оскольчатый	(8) Поперечный	(9) Дырчатый	(10) Включочный	(11) Продольный	(12) Всего
(13) Пулевое 56,7%		50,3	15,6	13,7	7,7	6,5	3,2	1,6	0,8	0,6	100,0
(14) Осколочное 43,3%		36,6	25,9	11,8	10,0	5,5	5,6	3,4	0,5	0,7	100,0
(15) В среднем		44,5	20,0	12,9	8,7	6,1	4,2	2,4	0,6	0,6	100,0

Key: (1). Means of wound. (2). Form/species of break. (3). Large-splintered. (4). Crushed. (5). By sand bar. (6). Edge/boundary. (7). Small-splintered. (8). Cross. (9). Perforated. (10). Packed in. (11). Longitudinal. (12). In all. (13). Bullet. (14). Fragmentation. (15). On the average.

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Large-splintered breaks most frequently were encountered with the bullet wounds and composed 50.3% of all bullet wounds of shoulder with the break of bone.

The crushed breaks were on their origin more frequent

fragmentation, composing 25.9c/c of all fragmentation wounds of shoulder. The remaining forms/species of breaks were encountered approximately/exemplarily equally frequently both among the bullet ones and among the fragmentation wounds.

The wounds of shoulder with the violation of the integrity of bone according to the character/nature of wound decompose into three basic groups: through, blind and tangential.

With the breaks of shoulder more frequently were encountered perforating wounds (73.9c/c), in the second place stood blind ones (19.0o/o), on the third - other (5.3c/o) and on the fourth - tangential wounds (1.8o/c).

The distribution of the breaks of shoulder according to the level of wound was following upper third - 31.6o/o, average/mean - 35.8o/o, lower - 26.1o/o several third - 6.5o/o.

The frequency of the breaks, which penetrate into the joint, was following: among the breaks upper third, which penetrate into the joint, it was 11.2o/o, middle third - 0.5c/o, lower third - 19.2o/o and several third - 4.0o/c; on the average the breaks of shoulder, which penetrate into the joint, were encountered into 9.3o/o.

The frequency of the wounds of vessels and nerves with the bullet breaks of shoulder was already given above.

The given above statistical evidence do not exhaust entire diversity of the bullet breaks of shoulder. It is below, in the description of individual forms/species, will be turned the attention to the level of break, to the damage of vessels and nerves, and also to crack formation. Only upon consideration of all these moments/torques, and also some anatomical data, that are of practical use, it is possible to more or less accurately establish/install the surgical anatomy of the dismantled wounds. Soft tissues unevenly encircle shoulder bone. Along its front/leading surface are arranged/located two muscles, while on the posterior - one. From external and inside of bone muscular tissue almost is absent (Fig. 76).

The front/leading group of muscles *m* biceps and *m* brachialis is surrounded by the dense fascial plate which, giving the branches, which are fastened to the internal and external surface of shoulder bone, forms together with the latter front/leading fascial space. The triceps of shoulder is also surrounded by the dense fascial plate which forms together with the bone posterior fascial bed. In an upper-external department of shoulder under *m* deltoideus is found the slit whose loose cellulose is communicated with supraspinous fossa

infraspinous fossa of scapula and the periarticular space.

This fascial slit is the bag whose boundaries correspond to the outlines of deltoid muscle. Basic vessels and nerves in the limits of two upper thirds pass to the flute between bicep and triceps and they fit closely closely to the bone.

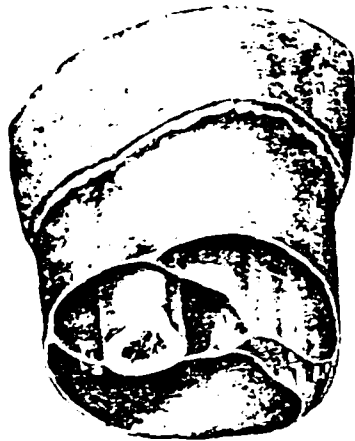


Fig. 76. Fascial spaces of right shoulder in middle third.



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In lower third of shoulder ulnar nerve departs to the posterior surface of lower pineal system its, median nerve and shoulder artery change to the front face and they achieve the middle of cubital pit. A deep artery of shoulder and radiation/radial nerve lie/rest directly on the bone at canalis humeromuscularis.

Axillary nerve and its escorting/tracking artery (a circumflexa humeri posterior) at the region of the head of shoulder lie/rest directly on the bone. Cellulose of axillary hollow on the course vessel-nerve bundle is communicated with the region of neck, with cellulose of subscapular space and with intermuscular cellulose of the front/leading wall of breast.

Described above general/common/total topographic-anatomic given define the possibilities of the wound of basic vessels and nerves with the breaks of shoulder and the fascial education indicated to the known degree define the routes/paths of the dissemination of both hematomas and suppurative flows (Fig. 76).

Large-splintered, crushed and small-splintered breaks.

The combined examination of three forms/species of the bullet breaks of shoulder indicated is admissible, because they all are in principle similar to each other, and their differences in the relation to surgical anatomy concern mainly degree and extent of the damage of individual tissues.

Large-splintered breaks composed 44.50/o of all breaks of shoulder, crushed - 20.00/o and small-splintered - 6.10/o. Thus, 70.60/o of all breaks of shoulder they fall on these three groups. Consequently, in the overwhelming majority of the cases surgeon met with the significant violation of the integrity of bone and not less significant decomposition of soft tissues. On their origin these forms/species of the breaks of shoulder are different. Thus, with the bullet wounds, which were being escorted/tracked by break, large-splintered they were observed into 50.30/o, finely fragmented - 15.60/o and small-splintered - into 6.50/o. It means, 72.40/o of all bullet wounds with the break were escorted/tracked by the onset of these forms/species of breaks. With the fragmentation wounds, accompanied by the violation of the integrity of shoulder bone, large-splintered breaks composed 36.60/o, crushed - 25.90/o and small-splintered - 5.50/o.

Thus, 68.00/o of all fragmentation wounds with the break they fell to the dismantled forms/species of the bullet breaks of shoulder. In the frequency, depending on damage level, all three forms/species of break had much in common. The large-splintered breaks of the diaphysis of shoulder among all its breaks composed 48.40/o, small-splintered - 7.40/o and those crushed - 18.40/o. Consequently, the frequency of these breaks in the region of diaphysis was not identical.

The large-splintered breaks of lower pineal system composed 44.60/o all of its breaks, small-splintered - 5.80/o and finely fragmented - 19.10/o.

From the comparison of these numerals it is possible to see that all three forms/species of the break of shoulder also not not equally frequently were not encountered in the region of lower pineal system.

The large-splintered breaks of upper pineal system composed 39.50/o all of its breaks, small-splintered - 4.70/o and those crushed - 20.50/o.

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Insignificant prevalence of finely fractured breaks in the

region of lower pineal system does not have special importance, since in a number of cases it is difficult to conduct division between the large-splintered and finely fractured break.

The given numerals attest to the fact that all three forms/species of break at different levels of bone were observed almost equally frequently. Most frequently these breaks were the result of wound by bullet and composed among other forms/species of the break of shoulder the greatest group, why the practical value of them is especially great.

Wound canals. Wound canals were different, which depended on the level of the damage of shoulder, degree of fracturing of bone and direction of the wounding shell.

For the elongation/extent of wound canal were secreted two different in its structure of the department: to place of the break of bone and after the place of break. Depending on the level of break and topographic-anatomic possibilities of damaging of vessels and nerves, the surgical anatomy of wound canals and individual means of wounds was different. Below will be examined the individual means of the wounds of shoulder, which are escorted/tracked by forms/species indicated above of the break of shoulder bone.

Perforating wounds. Large-splintered breaks with the perforating wounds, which were being escorted/tracked by the violation of the integrity of shoulder bone, were observed into 49.70/o, small-splintered - into 6.70/o and finely fractured - into 16.40/o.

Thus, 72.80/o of perforating wounds from the break of shoulder they fall on three given above groups.

Perforating wounds with the damage to shoulder bone decompose into two groups - bullet and fragmentation.

Bullet perforating wounds. Among the bullet straight-through wounds of shoulder are distinguished front- posterior and posterior-front/leading sagittal wounds, and also frontal wounds, with which the bullet pierces extremity outside inward, and less frequent - from within towards the outside.

Taking into account the direction of the wounding shell and damage level, it is possible to visualize the topographic-anatomic possibilities of damaging the individual elements/cells of extremity.

With the sagittal wounds of upper third of shoulder in a front-posterior direction of bullet (Fig. 77b) the first department of canal to the place of break is not especially complex. The degree

of the damage of skin, subcutaneous cellular tissue, fascia and muscles depends exclusively on the wounding shell, in this case from the bullet. This unit of the canal more or is less rectilinear, with the insignificant pockets in the muscle and the small wound aperture in the fascia.

The second department of wound canal, after the place of break, is characterized by the greater degree of the decomposition of soft tissues, which occurs not only as a result of operating bullet itself, which, striking against bone, can change its direction and form, but also as a result of the wound by the fragments of the shoulder bone which pierce soft tissues, their unit uncovering and taking away with itself. With this means of wound basic neurovascular bundle remains out of the zone of damage.

With the sagittal wounds of upper third of shoulder when bullet pierces extremity from behind in advance (Fig. 77a), the second department of wound canal, after the place of break, will be located on the front face where undergo destruction mainly muscles, whereas basic vessels and nerves, as a rule, in this case do not suffer.

Page 220a.

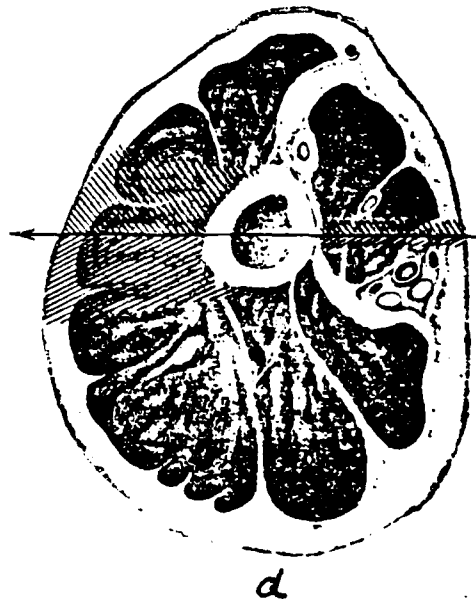
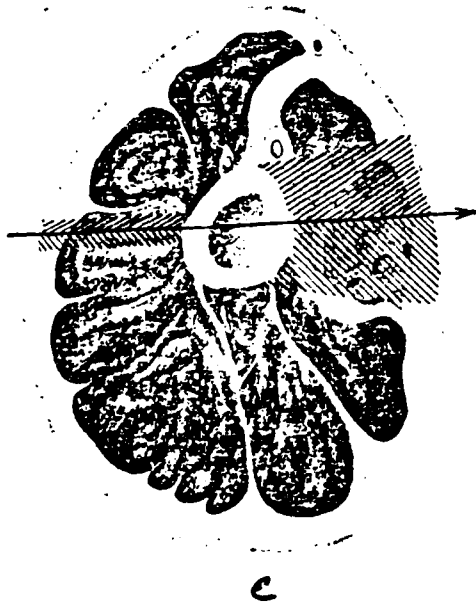
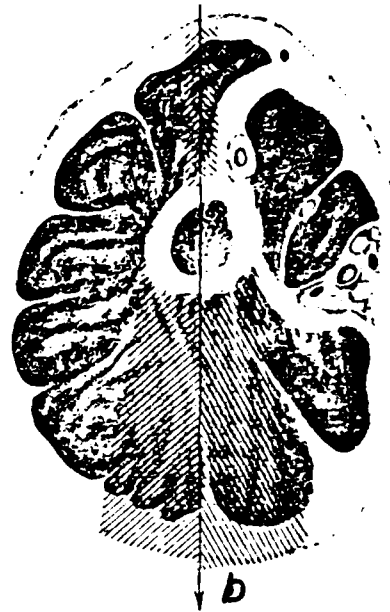
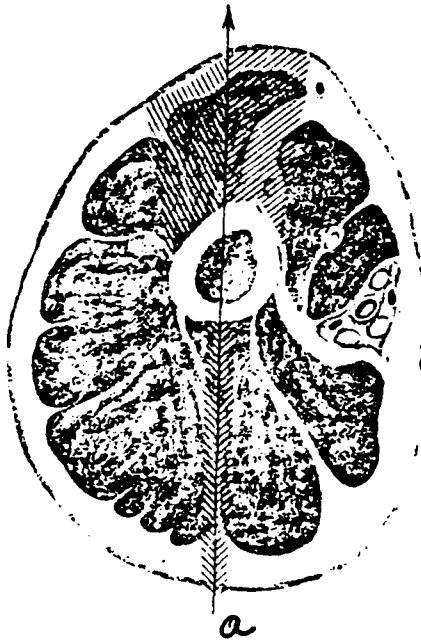


Fig. 77. **T**opography of damages of soft tissues of shoulder with its perforating frontal and sagittal wounds in upper third. a) the zone of the damage of soft tissues with the sagittal posterior-front/leading wounds; b) the zone of the damage of soft tissues with front- posterior sagittal wounds; c) the zone of the damage of soft tissues with the frontal outward-internal wounds; d) the zone of the damage of soft tissues with the frontal inside-outside wounds.



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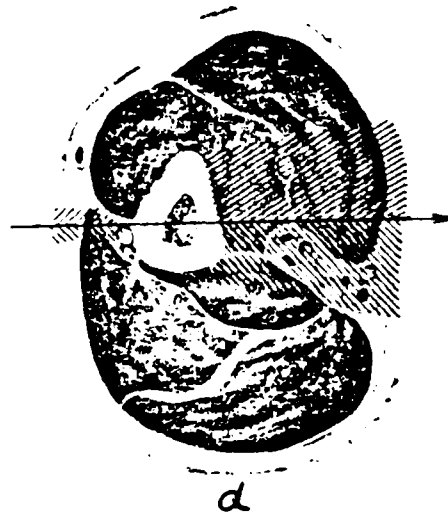
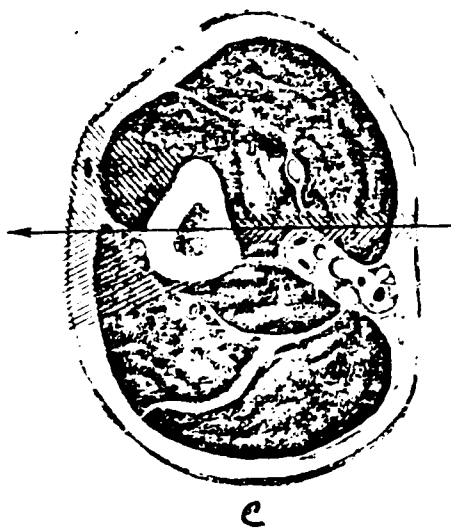
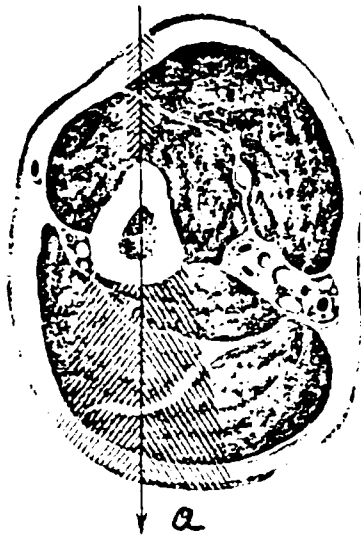


Fig. 78. Topography of damages of soft tissues of shoulder with its perforating frontal and sagittal wounds in middle third. a) the zone of the damage of soft tissues with the sagittal front-posterior wounds; b) the zone of the damage of soft tissues with the sagittal posterior-front/leading wounds; c) the zone of the damage of soft tissues with the frontal internal-external wounds; d) the zone of the damage of soft tissues with the frontal outward-internal wounds.

Page 220c.

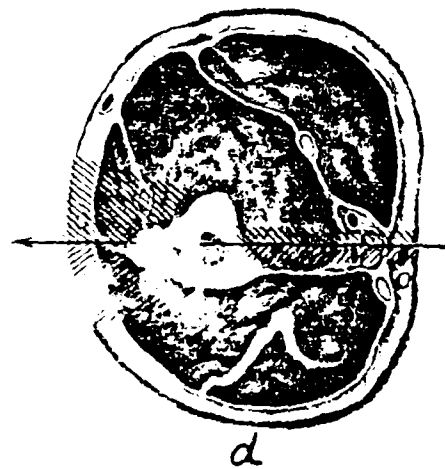
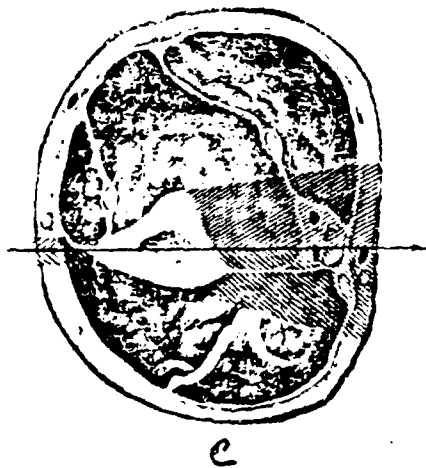
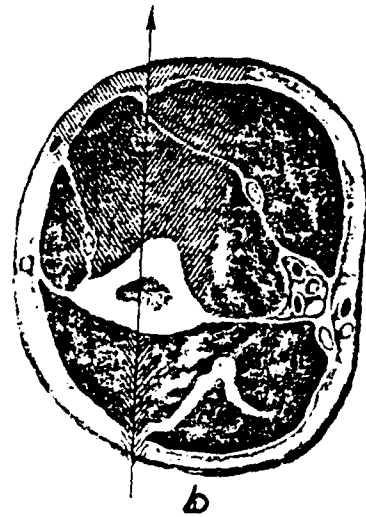
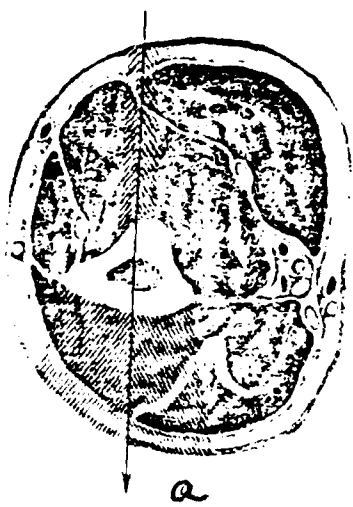


Fig. 79. Topography of damages of soft tissues of shoulder with its perforating frontal and sagittal wounds in lower third. a) the zone of the damage of soft tissues with front-posterior sagittal wounds; b) the zone of the damage of soft tissues with posterior-front/leading sagittal wounds; c) the zone of the damage of soft tissues with outward-internal frontal wounds; d) the zone of the damage of soft tissues with internal-external frontal wounds.

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With the perforating frontal wounds in the direction of bullet outside inside (Fig. 77c), as a rule, is damaged neurovascular bundle, since all its elements/cells are located in the zone of the second department of the wound canal where, as is evident of that presented above, occurs the great decomposition of soft tissues. In this direction of wound canal the bullet breaks of shoulder, as a rule, are combined with the wounds of chest.

Wounds strictly frontal with the direction of the wounding shell in upper third are from within towards the outside observed relatively rarely (Fig. 77d).

With this means of wound neurovascular bundle strikes into the zone of the first department of wound canal, to the place of break,

in consequence of which less he suffers.

With the sagittal wounds in middle third of shoulder in the front-to-back direction of bullet (Fig. 78a) the first department of wound canal passes through skin, subcutaneous cellular tissue, fascia and biceps of shoulder. However, in the zone of the second department where is noted the heavy decomposition of soft tissues, strikes, as a rule, radial nerve and its escorting/tracking a profunda brachii.

With posterior-front sagittal wounds (Fig. 78b) radiation/radial nerve and its accompanying artery, depending on level, are within the limits of the first department of wound canal, in consequence of which they do not always undergo decomposition.

In the zone of the second department of wound canal is located exclusively two-headed and shoulder muscle, and also a musculocutaneous. With this means of wounds of main neurovascular bundle does not suffer, but heavy decomposition undergo mainly the muscles of front/leading fascial space.

With outward-internal frontal wounds (Fig. 78d) into the zone of the second department of wound canal strikes basic neurovascular bundle, as a result of which with this means of wounds partially are destroyed the muscles, whereas main mode suffer basic nerves and the

vessels, which feed upper extremity.

In an inward-external direction of bullet (Fig. 78c) the first department of wound canal to the place of break passes through the region of neurovascular bundle, in consequence of which has the capability of damage by the bullet of its individual elements/cells.

The second department of wound canal passes through that department of the shoulder where the shoulder bone covers an insignificant quantity of soft tissues. Partially undergo decomposition the muscles of front/leading fascial bed (flexors) and the triceps of shoulder.

The more proximally passes the wound canal, the more probable the damage of radiation/radial nerve.

With the wound of shoulder in the lower third (Fig. 79) topographic-anatomic possibilities of damaging the individual elements/cells of soft tissues differ from those described above. Thus, with the sagittal perforating wounds in a front-posterior direction of bullet (Fig. 79a) the first department of wound canal passes mainly through the two-headed and shoulder muscles. The bullet, which penetrates here muscular tissue, does not cause large decomposition.

The second department, after the place of break, with this means of damages is also passed only through the muscular tissue, as a result of which is a heavy damage of the triceps of shoulder.

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With posterior-front wounds (Fig. 79b), into the zone of wound canal after the place of break strikes the musculocutaneous nerve and sometimes (with the low wounds) median nerve and shoulder artery. With the frontal wounds when bullet pierces shoulder outside inside (Fig. 79c), suffers in essence bone, also, in the very insignificant measure muscular tissue, mainly shoulder muscle. In this case into the zone of the first department of wound canal strikes passing here a radialis, and into the zone of the second department - ulnar nerve, and sometimes, depending on the level of wound, median nerve and its escorting/tracking a brachialis.

The damages of median nerve with this means of wounds are encountered the more frequently, the higher the level of the wound of shoulder in lower third.

In an inward-external direction of bullet (Fig. 79d) into the

zone of the greatest decomposition, into the second department of wound canal, strike partially triceps and two-headed shoulder muscles, and also radiation/radial nerve.

The given above general/common/total characteristic of wound canals with the through bullet breaks of shoulder and the topographic possibilities of the wound of the individual elements/cells of the soft tissues of shoulder are the approximate scheme, since the degree of the decomposition of the soft tissues of shoulder with the individual forms/species of the described breaks is different and is found in direct dependence on the degree of the decomposition of shoulder bone.

The greater the broken ends, the more significant the decomposition of soft tissues. As the example of large-splintered break it is possible to give the following observation (Fig. 80 and 81).

Wound 7/VIII 1944 death 9/VIII 1944. preparation No 2464.  
Blind-end fragmentation wound in the region of right shoulder joint.  
Fragmentation of bone. Fragmentation wound of head, neck, chest and right forearm.

The preparation: in the region of upper third of shoulder bone



is a large-splintered break along the line of surgical neck/journal. Bone broken ends: the first by the size/dimension 3x1 of cm, second - 5x7 cm and third 2.5x2 cm.

In the X-ray photograph in the spongy substance of head is determined metallic fragment by the size/dimension 0.1x0.2 of cm.

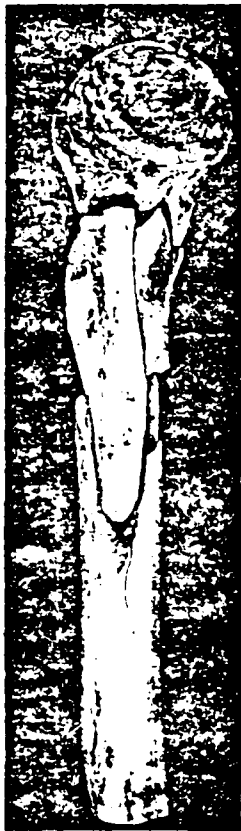


Fig. 80.



Fig. 81.

Fig. 80. Large-splintered break in upper third of shoulder.  
Form/species with anterointernal than the surface (preparation No  
2464).

Fig. 81. Large-splintered break in upper third of shoulder.  
Form/species from the anteroexternal surface (preparation NO 2464).

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With the described break of shoulder there was a little large/coarse broken ends and in similar cases soft tissues in the second department of wound canal less suffer than with finely fragmented breaks when a quantity of fragments and an extent of fine fragmentation of bone occur very they are great.

As the example of the crushed break it is possible to give the following observation (Fig. 82 and 83).

Wound 28/I 1943. Death 6/III 1943. Preparation No 975/4632. Perforating bullet wound of right shoulder by break of bone. Gaseous phlegmon.

The preparation: the upper unit of the shoulder bone is crushed to many fragments (24 fragments) with the uneven edges. The region of decomposition stretches from the surgical neck/journal of shoulder to the boundary of lower third of it.

This preparation it shows, what complex damages are possible with the perforating bullet wounds. With this extent of fine

fragmentation the second department of wound canal in the essence already on is canal, and it is the large wound with the uneven edges and the strongly destroyed muscles, on bottom of which it is possible to see the free and fixed/recorded broken ends of shoulder bone.

As the example of the perforating bullet wound where is visible degree the damage of soft tissues, it is possible to give the following observation.

Wound 2/II 1942. Death 2/III 1942. Preparation No 3626.  
Perforating bullet wound of right shoulder with the break of bone.

Preparation: the frontal cut of right shoulder. In middle third is visible the large-splintered break. The fragments of bone with the uneven edges, partially are laminated to each other. In bone marrow of upper broken end, in the place of the break of bone, is a restricted abscess with the well-marked boundaries by the size/dimension 3x1 of cm, with yellowish contents.



Fig. 82.

Fig. 82. Crushed break of shoulder bone. Form/species from the front face (preparation No 975/4632).



Fig. 83.

Fig. 83. Crushed break of shoulder bone. Form/species from the posterior surface (preparation No 975/4632).

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From the abscess upward to the head of shoulder is raised the filled with pus canal in wide to 0.3 cm. The walls of canal are well-marked. Almost at the very head of canal the last changes into the delimited, carried out by pus area by the size/dimension 2x0.4 of cm. Entire remaining tissue of bone marrow of brown color, by places is impregnated with the blood. Muscles in the region of break are considerably impregnated by blood of dark red color (Fig. 84).

In the X-ray photograph (Fig. 85) is visible the large-splintered break of shoulder bone in middle third with the displacement towards the inside on 1 cm. The outlines of broken ends are sharp.

With the large-splintered breaks, and also with the small-splintered ones and those crushed at the moment of wound is observed the hemorrhage both into the spongy substance of pineal systems and into bone marrow, moreover in a number of cases this does not depend on the level of break.

Subsequently, with the development of suppurative complications, intrasosseous/intraosteal/endoosteal hematomas lead to the education of intraosseous/intraosteal/endoosteal abscesses.

Fragmentation perforating wounds. The surgical anatomy of the perforating fragmentation wounds of shoulder with the damage to bone is very complex. This is explained first of all by the fact that with the fragmentation wounds the first department of wound canal, depending on value and forms of fragment, can acquire irregular form, and soft tissues can be to a considerable degree destroyed.

With the fragmentation wounds were more frequently observed fine fragmentation breaks, and in these cases both with large - and with the small-splintered breaks, the second department of the wound canal represented extensive wound, sometimes with the very large defect of soft tissues and with the lamination of muscles for the significant elongation/extent.

In all forms of perforating wounds, almost as a rule, are revealed all fascial and interfascial gaps/intervals. The degree of the decomposition of muscular tissue is closely related to the degree of the decomposition of bone, which determines the extent of wound canal in the proximal and extremital direction.

As the example of perforating fragmentation wound it is possible to give the following observation.

Wound 25/II 1944. Death 29/II 1944. Preparation No 2607/142. Blind-end fragmentation wound of chest, which penetrates to the right. Perforating fragmentation wound of right shoulder with the damage to bone. Blind-end fragmentation wound of right forearm, hand and left lumbar region.

Preparation: on the front face of upper third of right shoulder wound by the size/dimension 9.5x3.8 of cm with the surgical cut all over edges. The damaged muscle torn away, brownish red color, with the hemorrhages, comes forward into the lumen of wound. On the posterior surface the inlet is somewhat inverted towards the outside, by the size/dimension 4x2 of cm. Core forward the muscles of brownish red color. Hemorrhage.

On the frontal cut in upper third (Fig. 86) is visible the large-splintered break of shoulder bone. In the depth of soft tissues - individual bone fragments. Soft tissues around the wound canal are impregnated with the blood.

In the marrow area of the extremital and proximal broken end of hemorrhage, moreover internal hematoma in the extremital broken end applies to considerably greater elongation/extent, than in the



proximal.

In the X-ray photograph (Fig. 87) is visible large-splintered break on the boundary of upper and middle third of shoulder bone with the relatively insignificant displacement of broken ends. In the soft tissues are noted multiple free fine bone broken ends. Furthermore, in the soft tissues are visible two fine/small metallic fragments with the size/dimension 1x1 of mm.

From the description of the preparation and given figures it is possible to see that with the large-splintered breaks the soft tissues considerably suffer. The sizes/dimensions of outlet considerably exceed the sizes/dimensions of entrance.

In the cases of the crushed breaks of shoulder bone with the perforating wounds the decomposition of soft tissues can be especially large.

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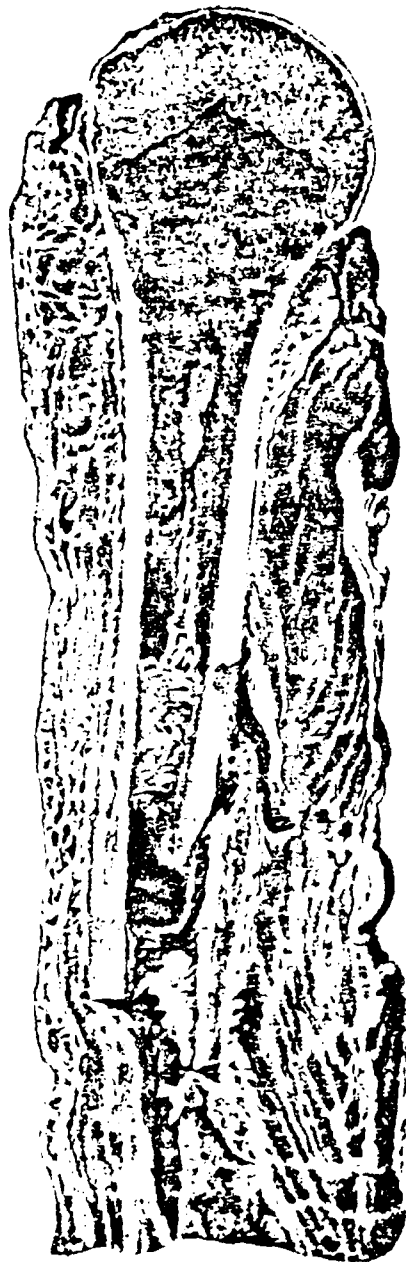


Fig. 84. Large-splintered break of shoulder. Preparation VM No 383/3626. (Artist of S. A. Moiseyev).

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Fig. 85.



Fig. 37.

Fig. 85. Large-splintered break of shoulder (X-ray photograph from preparation No 3626).

Fig. 87. large-splintered break of shoulder (X-ray photograph from preparation No 2607/142).

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As the example it is possible to give the following observation.

Wound 19/XII 1943. Death 6/I 1944. Preparation No 1441/2473. Perforating bullet wound in upper third of left shoulder with the break of bone.

The preparation: on the external surface of shoulder (Fig. 88) is a widely opened wound by the size/dimension 13x11 of cm. Wound uneven, the surface of wound is covered with gray-brown granulation with the large number of suppurative contaminated impositions with necrotic sectors. The depth of wound achieves 3 cm. In the wound are visible the multiple bone fragments of the crushed shoulder bone. Bone marrow is impregnated with blood of a dirty-reddish brown color. Are noted multiple hematomas.

In the X-ray photograph (Fig. 89) is determined fine fragmentation of upper third of shoulder bone. Broken ends of

different sizes/dimensions, various forms. Marrow area is opened to the level of half of shoulder.

Blind-end wounds. Among all blind-end wounds of shoulder with the violation of the integrity of bone large-splintered breaks composed 40.00/o, crushed - 11.70/o and small-splintered - 5.90/o. Thus, almost 60.00/o of all breaks of shoulder bone, which were being observed with the blind-end wounds, they related to the most heavy ones.

Bullet blind-end wounds. A quantity of blind-end bullet wounds was insignificant, composing only 7.50/o. Considerably more frequent (see above) were observed blind-end fragmentation wounds (34.00/o).

The aforesaid above relative to the structure of wound canal with the perforating bullet wounds by rear sight relates also to the blind-end wounds with the only the difference, that the length of the second department of wound wholly relates also to the blind-end wounds with the only the difference, that the length of the second department of wound canal, after the place of break, with the blind-end wounds was different, depending on the depth of penetration of bullet. Therefore in a number of cases with the blind-end wounds when bullet stopped in the region of the break of bone, the second department of wound canal, naturally, was absent.



Since soft tissues on the shoulder in its different departments are expressed to different degree and are arranged/located mainly along the front/leading and posterior surface, the general/common/total structure of wound canal, especially with the bullet frontal wounds, it was not characterized by special complexity.

With the sagittal wounds in accordance with the degree of the violation of the integrity of muscles was changed the structure of wound canal to the place of break.

Fragmentation blind-end wounds. In connection with penetrations, that the fragmentation blind-end wounds of shoulder, which were being escorted/tracked by the violation of the integrity of shoulder bone, were encountered into 34.00% of all fragmentation wounds, almost in each third wounded by fragment into the region of shoulder there were serious damages to the bone also of soft tissues.

With the fragmentation wounds in contrast to the bullet ones the department of wound canal to the place of break can have extremely irregular form, sometimes with the strong crushing of skin and deeper-lying fascias and muscles.

With the fragmentation wounds wound canal after the place of break does not differ from canal with the bullet wounds. If fragment was not stopped in the place of break, then, penetrating the soft tissues, it carried off after itself the unit of the bone fragments which pierced soft tissues in the different directions.

Since with these means of wounds wound discharge did not have a drain outside, the issuing from blood was propagated on the intermuscular gaps/intervals, interfascial slits in the proximal and extremital direction, as a result of which region of wound considerably was increased.

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Tangential wounds. With the tangential wounds of shoulder with the break of bone into 19.40/c were observed large-splintered breaks. The crushed breaks composed 9.7c/c and small-splintered occupied very insignificant place - 1.4c/c.

Similarly, in 30.50/o of all breaks of shoulder bone with the tangential wounds were observed the relatively heavy damage of the integrity of bone tissue.



According to the structure wound canals with the bullet and fragmentation tangential wounds in principle did not differ. This was the result of the fact that with this means of wounds, as a rule, the bone broken ends remained on the spot of damage for bone, whereas the decomposition of soft tissues depended mainly on value and form of the wounding shell, and also on its kinetic energy.

In certain cases it was difficult to determine, there was a tangential wound or through bullet with the crushing of bone. The latter depends on the fact that sometimes the bullet or fragment, encountering bone, ricocheted into the tissue and then exit wound aperture did not reflect actual form and direction of wound canal.

Damage of vessels and nerves. The described higher topographic relations of vessels and nerves of shoulder bone at its different levels tell about the fact that the shoulder artery had to be damaged considerably more frequent than others.

If we accept the damages of all vessels with the bullet breaks of shoulder for 100, then it appears that into 70.5% was damaged the shoulder artery. With the described forms/species of break the integrity of the basic arteries of shoulder was disturbed the more

frequently, the greater there was the decomposition of soft tissues.

Among all crushed breaks of shoulder the violation of the integrity of basic arteries was observed into 32.80/o, with the large-splintered breaks - into 3.40/o, with the small-splintered ones - into 5.10/o.

With the bullet breaks of shoulder the wounds of nerves were encountered in upper third into 26.20/o of cases, in middle third - into 44.50/o, in lower third - into 45.20/o.

The frequency of the damages of nerves in lower and middle third is explained by the fact that at this level the nerves all over periphery encircle shoulder bone and, therefore, during any damage was very probable the damage of any nerve.

With the individual forms/species of the described breaks was observed the following frequency of the damage of the basic nerve trunks: with the large-splintered ones - 36.60/o, with the crushed breaks - 45.90/o, more rarely were damaged nerves with small-splintered breaks (35.00/o).

Cracks in the bones. In the description of the individual forms/species of break was focused attention on crack formation. The

nearer to the pineal system the break, the greater was bases expect the crack propagation into the area of joint.

Consequently, on the basis of the frequency of arthrites, which were being observed with the dismantled forms/species of break, it is possible to indirectly visualize the frequency of cracks.

Thus, for instance, with the crushed breaks arthrites were encountered into 0.80/o of these breaks, with the large-splintered ones, and also with the small-splintered ones - into 0.40/o.

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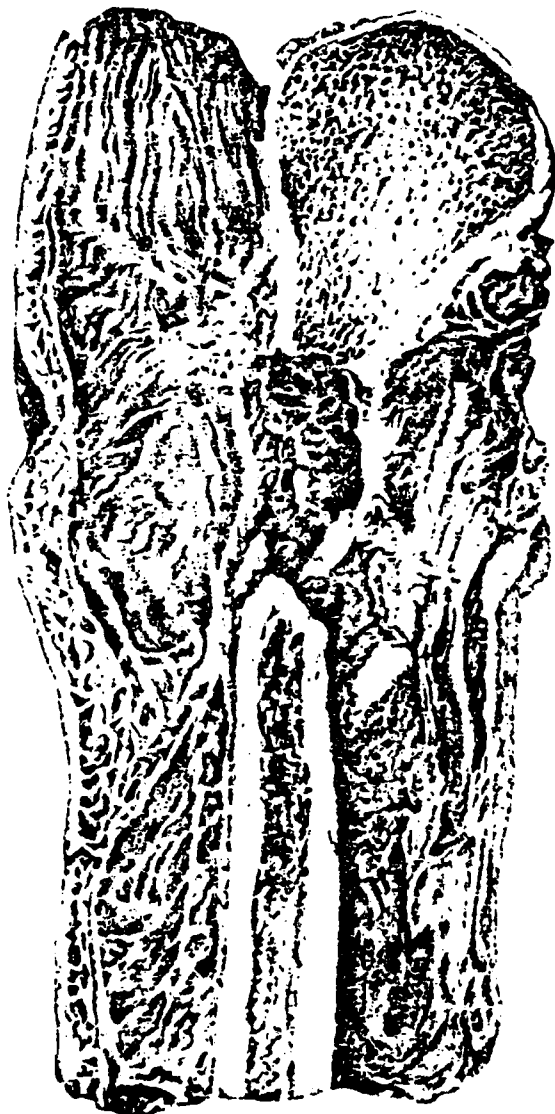


Fig. 86. Frontal cut of right shoulder. Large-splintered break.  
Preparation VMN No 2607/142. (Artist S. A. Moysayev).

Page 226b.



Fig. 88. Crushed break of shoulder. Preparation VMM NO 1441/2473.  
(Artist S. A. Moysyev).

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Given data attest to the fact that with the described forms/species of breaks the cracks relative to rarely penetrated the area of joint. It is logical that the nearer the level of break to the region of joint, the more probable and the violation of its integrity. The analysis of data of the deepened development of the histories of disease/illness, from this point of view, showed that arthrites with the wound upper third composed 1.10/c, lower third - 0.10/o and of middle third - 0.20/c.

The presence of hematomas, which are the result of the violation of integrity of fine/small and large vessels, and also the relative frequency of cracks and the degree of the decomposition of soft tissues determined to a certain extent and the frequency of suppurative flows.

The latter most frequently they were observed with the small-splintered breaks, with respect to total number of which they composed 15.00/o, with the large-splintered ones - 8.00/o and with those crushed - 7.30/o.

Edge/boundary, cross and perforated breaks.

The group of breaks in question has much in common. With them, as a rule, soft tissues suffered relatively less than with other forms/species, yes even a quantity of these breaks among all other breaks of shoulder did not occupy large place. Thus, the edge/boundary breaks of shoulder bone were observed into 8.7% of all breaks of shoulder, cross - into 4.2%, perforated - into 2.4%.

According to the form/species of the wounding shell they were very similar between themselves, namely: the edge/boundary breaks constituted 7.7% of all bullet wounds, cross - 3.2% and perforation - 1.6%. Among all fragmentation wounds edge/boundary breaks were observed into 10.0%, cross - into 5.6% and perforation - into 3.4%.

The given numerals show that each of the described forms/species of breaks was observed with the fragmentation wounds almost doubly more frequently than with the bullet ones.

If we examine the described forms/species of the breaks in the dependence on damage level, then it appears that the edge/boundary and perforated breaks were observed mainly in the limits of upper and

lower epi-metaphysis of shoulder bone, whereas cross - mainly in the region of diaphysis.

Thus, the edge/boundary breaks of shoulder bone in upper third were into 11.50/o, in lower third - into 12.00/o, in middle third - into 4.90/o.

Approximately/exemplarily the same relationships/ratios were also with the perforated breaks: in upper third - 4.30/o, in lower third - 1.80/o and in middle third - 1.60/o. Thus, the overwhelming majority of perforated and edge/boundary of breaks was observed in those departments of the bone where there is a spongy substance.

Cross fractures in upper third were observed into 3.10/c, in lower third - into 5.00/c in middle third - into 4.70/c and with the wound of several thirds - into 4.00/o. Consequently, most frequently cross breaks were observed in middle and lower third.

Wound canals. With the analyzed forms/species of break wound canals had much in common; the degree of the decomposition of soft tissues depended not so much on the degree of the violation of the integrity of bone, as from the direct effect of the wounding shell on the soft tissues and from the character/nature of wound. The latter affected also the frequency of the individual forms/species of the dismantled group of breaks.



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Perforating wounds. Among all perforating wounds, which were being escorted/tracked by the decomposition of shoulder bone, edge/boundary breaks composed 7.3c/c, perforated - 1.6o/o and transverse - 4.2o/o.

Thus, in the group of perforating wounds the edge/boundary, perforated and cross breaks occupy small place.

With the edge/boundary breaks in the department of wound canal after the place of break it was possible to reveal/detect the individual fine/small broken ends of the shoulder bone which, however, was not brought about the large decomposition of soft tissues. Then concerns perforated breaks. With the perforating wounds in this department of wound canal could be located the individual fine/small broken ends the zone of dispersion of which was small.

With the cross breaks sometimes were revealed insignificant sizes/dimensions the scarce broken ends of bones, which, as a rule,

remained in the region of the place of wound.

Fragmentation perforating wounds. Surgical anatomy of perforating fragmentation wounds in the discussed group of breaks in terms of a little differs from perforating bullet wounds, since in the overwhelming majority of the cases the perforated breaks of shoulder were brought in by the fragments which were somewhat more than bullet, and sometimes even it is considerably less it.

With the edge/boundary breaks the fragments could be considerably more than bullets. The degree of the decomposition of soft tissues and the complexity of wound canal with this form/species of break depended on the value of fragment, but not from the degree of the violation of the integrity of bone. Then relates also to the cross breaks, but here it should be noted that the frequently cross breaks were the result of the lateral activity of wounding shell, having significant kinetic energy, in consequence of which with the fragmentation wounds, which were being escorted/tracked by cross break, was observed the significant decomposition of soft tissues.

Blind-end wounds. Among all blind-end wounds, which were being escorted/tracked by the break of shoulder bone, edge/boundary breaks composed 13.50/o, perforated - 6.20/o and cross - 4.30/o. During the comparison of these numerals with the given data about the

perforating wounds attention is drawn to the fact that with the blind ones almost was doubled a quantity of edge/boundary breaks and almost 4 times increased/grew perforated, whereas crss stood on the same level. The latter indirectly speaks from that that in a number of cases the wounding shell with the blind-end wound stopped in the region of the break of bone, that, naturally, it affected the structure of wound canal.

General fundamental considerations relative to blind-end wounds with the large-splintered breaks are completely applicable also to this group of breaks with the only the difference, that, if the wounding shell penetrates the depth of tissues for the place of break, nevertheless the decomposition of soft tissues is insignificant and bone fragments as the for a second time wounding shells played the here very subcrdinate role.

As the exaample of cross break with the blind-end fragment wound it is possible to give the following observation (Fig. 90).

Wound 27/VII 1943. Death 16/VIII 1943. Preparation No 1867/2270. Blind-end fragmentation wound of chest to the left. Closed pneumothorax with the subsequent formation of pyopneumothorax. Right pneumonia. Blind-end fragmentation wound of left shoulder in middle third with the break of bone.

The preparation: in the region of middle third of left shoulder bone is a cross break. Edges of lines uneven, notched; are visible insignificant cracks of compact substance (Fig. 90).

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Tangential wounds. Among all tangential wounds, which were being escorted/tracked by the break of shoulder bone, edge/boundary breaks were observed into 38.9c/o of cases, perforated not at all were encountered, but cross composed 13.9o/o.

Tangential wounds, as noted above, were observed among all wounds of shoulder with the break of bone extremely rarely and they composed 1.8o/o; therefore, they had small practical value.

Both with the bullet ones and with the fragmentation tangential wounds the general/common/total structure of wound canal was simple and was determined not so much by the degree of the violation of the integrity of bone, as by form, by the size/dimension of the wounding shell and by its kinetic energy.

With the cross breaks in a number of cases both with the

tangential wounds and with the wounds, described above, it was possible to see the displacement of broken ends as a result of the natural draft of muscles. The latter fact to a considerable extent was reflected in the form of wound canal. In such cases with the tangential wound the canal irregular, the displaced fragments strained and partially destroyed soft tissues, opened intermuscular and interfascial slits, contribute to the formation of intermuscular and intramuscular hematomas.

Although with the cross breaks frequently were encountered the cracks of bone, however, as a rule, they were propagated from the line of the break in the proximal and extremal direction to the very short distance. Because of this with the cross breaks barely it was observed arthrites, caused by the cracks, which penetrated the joint.

Perforated breaks, as it spoke above, most frequently were observed in the limits epimetaphyses of shoulder bone. Cracks with them sometimes were propagated into the adjacent joints; therefore 2.10/o of all perforated breaks were complicated by arthritis.

In the frequency of arthrites perforated break stood in the second place.

Damage of vessels and nerves. According to the data of the deepened development of the histories of disease/illness, the violation of the integrity of large/coarse arterial vessels with the described forms/species of break was observed with the cross breaks into 1.80/o, with the edge/boundary ones - into 6.00/o, with the perforated ones - into 3.30/o.

Attention is drawn to the relatively high percentage of the damages of arteries with the edge/boundary breaks, which is explained by the fact that the edge/boundary breaks were encountered more frequently in the region of epimetaphyses, i.e., where the artery usually adjoins directly to the bone.



Fig. 90. Cross break of left shculder (preparation No 1867/2270).

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The damage of nerves with the cross breaks was observed considerably more frequently than with the perforated ones and the edge/boundary ones, which is also explained by the special features/peculiarities of topography. Thus, with the edge/boundary breaks nerves were damaged into 29.50/o, with the cross ones - into

39.30/o, with the perforated ones - into 22.80/o.

The development of suppurative flows in the described group of breaks was observed comparatively frequently. This is explained by the fact that the common picture of these forms/species of break, which was not being characterized by large complexity, did not always draw the attention of the doctor in attendance, in consequence of which comparatively late they resorted to active interventions, but the periods, which passed from the time of wound, contributed to the development of suppurative flows. Thus, with the cross breaks suppurative flows were observed into 9.80/o, and in this respect this form/species of the break will cost in the second place for afterward small-fragment with the edge/boundary ones - suppurative flows were encountered into 7.70/o, with the perforated ones - into 7.60/o.

Oblique, longitudinal and packed in breaks.

The packed in and longitudinal breaks among all bullet breaks of shoulder were encountered very rarely: each of them into 0.60/o of all bullet breaks. Considerably more frequently were observed the oblique breaks, which composed 12.90/o.

In the relation to the level of break the individual forms/species of this group considerably differed from each other.



Thus, the packed in breaks were observed in the region of upper pineal system and metaphysis into 1.30/o, in the region of lower pineal system - into 0.40/o and in the region of diaphysis - into 0.40/o. A somewhat different picture was with the oblique breaks which in upper third were encountered into 14.50/o, in lower third - into 10.80/o; in the region of diaphysis they composed 13.30/o, and with the wound two third - into 11.40/o.

The frequency of longitudinal break on its localization relative to level was determined as follows: in middle third - 0.90/o, in the upper - 0.60/o, in the lower - 0.50/o and with the wound two third - 0.60/o.

Wound canals. In this group of the breaks of shoulder wound canals were characterized by very irregular form. With the oblique breaks sharp/acute fragments, being easily displaced, damaged soft tissues with the subsequent education of different form/species of complications both from the side of vessels and nerves.

With the longitudinal breaks also was observed the deformation of wound canal and its considerable range in the proximal and extremal direction. The latter depended on the fact that on the

crack of bone, which goes lengthwise, frequently it was possible to see the education of hematomas which were arranged/located both sub-periosteal and parasally. With the packed in break in connection with the shortening of extremity which depended on the size of the zone of the crushing of bone and degree of the longitudinal displacement of broken ends, wound canal considerably was strained. In this case unavoidably suffered soft tissues.

In all forms of the described breaks to a certain degree, but were always sufficiently widely opened intermuscular and interfascial gaps/intervals.

Perforating wounds. In the group of the perforating wounds of shoulder, which were being escorted/tracked by the break of shoulder bone, the oblique breaks composed 12.80/o, longitudinal - 0.50/o and impacted - 0.80/o.

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Consequently, great practical value in this group had the oblique breaks which, however, were not always oblique literally, since they were frequently escorted/tracked by the education of the significant broken ends, closely related to the periosteum.

As the example of oblique break with the perforating bullet wound of shoulder it is possible to give the following observation (Fig. 91).

Wound 1/IX 1943. Death 10/X 1943. Preparation No 1871/2041. Perforating bullet wound of chest with the surface damage of the handle of breast bone and upper third of right shoulder, with the complete break of shoulder bone. Festering on the course of wound canal. Two-sided pneumonia.

Preparation (Fig. 91): in the region of the surgical neck/journal of right shoulder is an oblique, uneven line of break. In the X-ray photograph of preparation it is possible to see oblique fracture of proximal third of right shoulder bone. Outlines of the ends of the broken ends sharp, ends their sharp/acute. Cracks of the diaphysis of the same bone for the elongation/extent 2 cm upwards from the place of break and on 5 cm down from it.

With the perforating fragmentation wounds, according to presented, oblique breaks did not present large rarity. Wound canals both with of the bullet and with the fragmentation perforating wounds described forms/species of breaks the same as with the perforating wounds, described with the large-splintered breaks, with the only difference that in the department of wound canal after the place

of break here rarely were observed the bone fragments in the soft tissues which with the longitudinal and packed in breaks almost completely were absent. Therefore the decomposition of soft tissues, sometimes sufficiently significant, was the result of the direct effect of the wounding shell on the tissue.

Blind-end wounds. Longitudinal and oblique breaks were encountered with the blind-end wounds more frequently than with the through ones. Thus, oblique breaks with the blind-end wounds composed 16.50/o of all breaks of shoulder bone, longitudinal - 1.40/o and those packed in - 0.50/o.

However, with the blind-end wounds, which were being escorted/tracked by oblique and longitudinal break, the wounding shell (bullet, fragment) most frequently was within the limits of the damaged bone, in some cases in the soft tissues beyond the place of break. A quantity of bone fragments, free at the tissues with the blind-end wound, as a rule, was very insignificant, and they all were small sizes/dimensions.

With the blind-end wounds, which were being escorted/tracked by oblique break, wound canal was rectilinear only in the initial unit, whereas the region of break and the unit of the wound canal after the place of break did not have linear form, and the area of wound,

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depending on the direction of the line of break, could apply to significant distance both in the proximal and in the extremal direction.



Fig. 91. Oblique break of right shoulder bone (preparation No 1871/2041).

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Tangential wounds. Among the tangential wounds, which were being escorted/tracked by the break of shculder, as is evident from the data of the deepened development of the histories of disease/illness, the longitudinal and packed in breaks were not observed. However,

oblique breaks in the frequency stood in the third place and composed 16.70/o. With the bullet and fragmentation tangential wounds, which were being escorted/tracked by oblique break, the structure of wound canal and its complexity depended exclusively on form and direction of the wounding shell, its original velocity, degree of the displacement of fragments and sizes/dimensions of break.

The aforesaid above relative to the topographic-anatomic possibilities of damaging the soft tissues by rear sight is added to the described forms/species of breaks.

Thus, damage basic of the vessels, which feed upper extremity, with the packed in break was observed into 8.00/o, but with the longitudinal barely it was observed.

The relatively high percentage of the damage of large vessels with the packed in breaks did not have great practical value, since the packed in breaks were generally encountered very rarely (0.50/o). The damage of nerves with the oblique breaks was observed into 27.60/o, with those packed in - into 12.00/o and with the longitudinal ones - also into 12.00/o. The low percentage of the damage of nerves with the packed in and longitudinal breaks is explained by very mechanism of wound and by insignificant displacement of bone broken ends.

Among the complications, which escorted/tracked the individual forms/species of the breaks of the dismantled group, the percentage of arthrites was various.

With the packed in breaks arthrites were observed into 4.00/o of all breaks of this form/species, and in this respect they will cost among other breaks of shoulder in the first place. This is explained by localization of the packed in breaks and by mechanism of their origin. At that moment/torque when occurred impacting, the formed in the pineal system cracks easily were propagated into the area of joint, which raised the probability of complications from the side of joint.

With the oblique breaks arthrites were encountered only into 0.40/o, while with the longitudinal ones not at all they were observed.

Suppurative flows with the packed in breaks barely were encountered, then 8.00/o both of oblique and longitudinal breaks were complicated by suppurative flows.

Relatively high percentage of suppurative flows with the



longitudinal breaks is explained by the fact that along the crack of shoulder bone, at the significant distance from the axis of wound canal, were formed deep hematomas, which were being difficultly determined in the process of surgical treatment. The developing following the wound festering of hematoma in the wound contributed to the education of suppurative flows.

With the oblique breaks the displaced broken ends destroyed for the significant elongation/extent soft tissues, in this case were revealed individual fascial spaces, appeared intermuscular and interfascial hematomas, which subsequently could serve as the source of intermuscular phlegmons and suppurative flows.

The described forms/species of the break of shoulder bone and their surgical anatomy do not exhaust entire diversity and entire complexity of the observed breaks, especially with the multiple fragmentation wounds.

High value had also the fact that in the majority of the cases the breaks of shoulder were combined with the penetrating (2.30/o) and nonpenetrating wounds of chest, with the wound of scapula, which considerably complicated the anatomical picture of wounds.

Sometimes were observed two-sided damages to shoulder bone, as the example of what can serve the following observation.

Wound 10/III 1942. Death 6/IV 1942. Preparation No 979/3685.

Bullet perforating wound of left shoulder with the break of bone. Fragmentation blind-end wound of right shoulder joint with the break of the joint hollow of scapula. Fragmentation blind-end wound of the soft tissues of chest. Two-sided pneumonia.

Specimen (Fig. 92): in lower third of left shoulder bone the oblique break with the education of the small free bone broken end size 2x0.7 cm. On the surface of broken ends along the line of break is visible initial sequestration of the ends of the bone. On the peripheral broken end the width of the sequestered bone surface from 0.2 to 0.1 cm. Width of the same surface of central broken end from 0.5 to 1.5 cm. On the edges of demarcation line takes tuberosity by place with the flat/plane increases and fine/small depressions.

Symptoms diagnosis of the bullet breaks of shoulder.

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In the basis of the treatment of the bullet breaks of the long tubular bones in the Great Patriotic War was placed their correct and timely diagnosis in the foremost stages of evacuation. The success of this diagnosis, especially with the breaks of shoulder, depended, first of all, on the character/nature of a military-tactical circumstances.

Under conditions of stable defense after the insignificant entry of casualties the circumstances favored the accurate and timely identification of the break of shoulder. However, after the entry of a greater quantity of casualties during the offensive combat and in the period of the penetration of the defense line of enemy the circumstances of work in the foremost medical installations sharply was changed and forced to limit and to narrow the volume of surgical aid, mainly during the bullet damages to upper extremity as more than the lungs in order to have the capability to render surgical assistance the more heavy to casualties, who need it from the vital readings/indications.

Under these conditions the diagnosis of the break of shoulder in a known number of casualties was placed not on PHP and DHP, but in the therapeutic installations of army area.

According to data of the author's development of the histories of disease/illness, the diagnosis of the break of shoulder is set on PMP in 54.80/o; on DMP - into 30.70/o; in army KhPPG and SEG - into 11.10/o; in the front line evacuation hospitals - into 3.40/o; into 15.00/o stage it is not established/installed.

From represented data it is evident that the correct diagnosis of the break of shoulder on PMP and DMP was set in 6 casualties of seven. Each of the seventh casualty with the damage of shoulder (14.50/o) reached without the correct diagnosis the army (11.10/o) and front line (3.40/o) area.



Fig. 92. Oblique break of lower third of left shoulder (preparation No 979/3685).

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As can be seen from Table 80, break was diagnosed in the therapeutic installations of army area in short periods.

From the preceding information it is evident that on PMP correct

diagnosis in the majority of casualties was set for the first 6 hours after wound, almost in third - for 6-24 hours and in an insignificant number of casualties - during the second day.

On DMP in the first 6 hours after wound were identified about third of all breaks of shoulder bone, and the course of the first day - significant majority.

The period of diagnosis depended first of all on the time of the entry of casualties into the therapeutic installations.

To the speed of the passage of the majority of casualties with the break of shoulder in the forecast stages of evacuation contributed their possibility independently to be moved.

To recognize the break of shoulder bone in all casualties during the first stage of evacuation and moreover within the early period was not always not possible.

Besides a difference in a military-tactical circumstances, this is explained also by the fact that the signs on the basis of which diagnoses itself of damage to the integrity of bone, could be completely established/installed only under specific conditions: furthermore, conditions for the diagnosis in different stages were

not identical.

The signs, which put to use in the stages the evacuations during the identification of the bullet breaks of shoulder bone, were following:

- 1) deformation or the faulty position/situation of extremity;
- 2) the pathological mobility of extremity;
- 3) the violation of the function of extremity;
- 4) the sharp sickliness of the place of the break, during the palpation, especially with the load along the axis of extremity and with the transport of casualty;
- 5) the presence of bone fragments in the wound;
- 6) crepitation;
- 7) the presence of oil drops in wound discharge;
- 8) the direction of wound canal;

9) data of the measurement of the length of extremity;

10) roentgenological data.

The generality of origin, abundance of symptoms, homogeneity of clinical picture facilitated the diagnosis of bullet breaks. Diagnosis began already on the field of battle where it tried to carry out aidmen and feldsher, that exerted casualty first aid; sometimes the presence of break established/installed casualty himself. On BMP the conditions for the identification of break were better, but they nevertheless remained restricted.



Table 80. Periods, which passed from the moment/torque of wound to the setting of diagnosis on PMP and DMP (in the percentages).

(2) Лечебное учреждение	(1) Срок В течение первого часа	(3) От 2 до 6 часов	(4) От 7 до 24 часов	(5) Позже суток	(6) Итого	(7) Срок неизвестен	(8) Всего
ПМП . . . . .	8,1	58,5	32,5	0,9	100,0	13,6	100,0
ДМП . . . . .	—	30,1	62,2	7,7	100,0	12,7	100,0

Key: (1). Period. (2). Therapeutic installation. (3). For first hour. (4). From — to — hours. (5). It is later than days. (6). Altogether. (7). Period is unknown. (8). In all.

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The medical diagnosis of break became possible, only beginning with PMP. The tendency to recognize break in all casualties, besides as early as possible, it was dictated by the imperative need for ensuring the transport immobilization of extremity with the aid of the splints.

First of all gave grounds to suspect break anamnesis and complaints of casualty. Anamnesis was always short: felt the strong blow into the hand; hand was barging as lash; any movement reinforced pain; the shot through hand it supports with healthy/sound hand", etc.

Anamnestic information was supplemented by medical examination/inspection. During the objective research on PMP it was not the possible to come to light/detect/expose all enumerated signs and to use by them. On PMP the casualties did not undress, primary bandage was removed/taken only in individual casualties, wound treatment did not undergo; therefore the series/number of symptoms settled from the field of the view of doctor. However, under these conditions via careful fact systematic examination/inspection it proved to be possible to recognize the break of shoulder bone more than in half of casualties.

A question about the diagnosis of break very was intimately connected with the imperative need for the imposition of transport immobilization. Diagnostic errors during the identification of break appeared in the foremost stages in those doubtful cases when, fearing to pass "unsplinted" break of shoulder, was placed the assumed diagnosis: the "break of shoulder", and was laid "just in case" the splint which after the uselessness subsequently was removed/taken. It was possible to be mistaken in the diagnosis, after assuming break, where it does not exist, but it was not possible to leave break without the immobilization.

During the Great Patriotic War basic work on the development/detection of the breaks of shoulder bone was carried out

on PMP.

Known effect on volume and quality of diagnosis on PMP showed/rendered the fact that the casualty with the break of shoulder without the accompanying wounds was moved, as a rule, independently was not produced impression of serious casualty. This made it possible for some of them to enter on DMP, passing PMP. The danger of survey on the same basis could arise in the receiving and sorting separation/section DMP - such "easily casualties" sometimes did not strike into main surgical dressing DMP, and therefore did not undergo the examination/inspection of qualified specialist-surgeon and were evacuated with DMP without the correct diagnosis.

The correctly organized work on the development/detection of breaks began on DMP in receiving and sorting and was realized by a doctor-surgeon with the classification.

On DMP there were completely favorable conditions for the diagnosis: 1) qualified specialist-surgeons' presence 2) the undressing of casualty, which gave the possibility to conduct thorough inspection and to compare the damaged extremity with the healthy/sound; 3) production in the primary surgical treatment in process of which was revealed/detected the series/number of the very valuable signs of damage to bone.

Diagnostic work on DMP had by its target either a confirmation of the diagnosis, set on PMP, or its correction.

Changing to the examination of the described above symptoms, it is necessary to explain the diagnostic value of each of them, to establish/install, as frequently each of them was encountered and to what degree could be used under conditions of stage treatment.

With the diagnosis of the bullet breaks of shoulder were noted the following symptoms.

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Deformation - one of most frequently encountered symptoms (34.00/o). Casualty keeps the damaged hand of that bent in the elbow joint to the bearing/angle in 90° with the led to the body shoulder. During the attentive examination/inspection and its comparison with the healthy/sound hand is determined the deformation of shoulder, which lies in the fact that the extresital unit of the shoulder is located at angle to its proximal unit. This usually obtuse angle is opened toward the rear. Degree and character/nature of deformation depended on the level of break. Most frequently this symptom was

noted with the breaks of shoulder in middle and lower third, and its presence did not remain in doubts of the correctness of diagnosis.

With the edge/boundary and perforated breaks of shoulder the symptom of deformation was absent.

Pathological mobility, second pathognomonic symptom of the full/total/complete break, it was noted into 17.00/o. Pathological mobility was determined by the presence of such visible by rule of thumb unusual movements which appear for the elongation/extent of shoulder bone, mainly its diaphysis, on the spot of wound.

The symptom of pathological mobility with the breaks in middle third was noted more frequently than with the break in lower third, since to establish/install the presence of this symptom with this break is more difficult.

The fact calls attention to itself that this diagnostically important sign comparatively rarely was used during the identification of the breaks of shoulder. This position/situation can be explained by the fact that the onset of the symptom of pathological mobility is always escorted/tracked sharp reinforcing of local sickliness on the spot of break, which, apparently held doctors from the attempts to establish/install this sign in view of the

unwillingness to obtain by its too high price.

Entire presented entirely relates to this pathognomonic symptom, such as is bone crepitation. For obtaining this symptom it is necessary that the ends of the fragments of bone under the effect of the external violence, produced by doctor during the research, would arrive into the contact and they began to be rubbed against each other. The severe pain, which in this case is tested/experienced casualty, also could not contribute to the wide utilization of this symptom in practice, according to the data of entries in the histories of disease/illness, this symptom was noted with the diagnosis of the break of shoulder only into 2.00/o.

Sickliness on the spot of break as the basic symptom of traumatic damage is noted almost in all casualties. The diagnostic value of this sign, taking into account the presence of the bullet wound of soft tissues, is relative. However, during sharp reinforcing of local sickliness, with any movement by extremity, and also with the load along the axis of extremity the value of this sign considerably increased/grew. This diagnostic reception/procedure - the appearance of sickliness with the load along the axis of extremity, judging by the records in the histories of disease/illness, was used in all stages of evacuation with the diagnosis of the break of shoulder only in the unitary cases.

Thus, the method of palpation and the adjustable with its aid symptoms did not obtain in the experiment/experience of the war of sufficient repulsing.

Very valuable diagnostic data were obtained with the examination/inspection of wound, especially during the primary surgical processing. For the perforating wounds was used the possibility establish/install the presence of damage to bone and the level of this damage on the basis of the direction of wound canal and disposition of the entrance and exit wound apertures whose location on the shoulder in the overwhelming majority of casualties was accurately noted. With the blind-end wounds this diagnostic possibility disappeared.

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The very valuable sign of damage to bone is detection in the wound with its examination/inspection or processing of bone fragments. This sign of the doubtless violation of the integrity of bone was noted almost in each third casualty (into 32.00/o).

With the crushed and comminuted fractures this sign, naturally,

was encountered more frequently and it was more expressed than with other breaks (Table 81).

In a few casualties to correct diagnosis contributed the finding in wound discharge of the droplets of fat which testified about the violation of the integrity of marrow canal.

On the measurement of the length of extremity during the diagnosis of the break in the stages of army and army area in documents of casualties it remained no trails. In the installations of the front line area and deep rear it frequently was used, but not so much for the diagnostic target, as for determining the functional disorders, occurring as a result of wound.

The violation of the function of upper extremity is noted into 11.00/o. This symptom they frequently put to use in combination with other signs of break. Its presence established/installed on the basis of anamnesis and complaints of the impossibility to raise hand. The value of this sign with the diagnosis of the breaks of the bones of upper extremity cannot go with the comparison with that value which has this symptom with the diagnosis of the breaks of the bones of lower extremities. With these breaks the violation of function is one of the basic diagnostic signs. The presence in wound of the droplets of fat, the utilization of a direction of wound canal and other signs



on the whole composed 4.00/o amng the given signs.

As can be seen from Table 81, the greatest difficulties presented the identification of break on PMP and DMP with the edge/boundary and perforated breaks of shoulder bone, since clinical picture in this case was quite skimpy on quantity and manifestation of symptoms.

Table 81. Distribution of the basic clinical signs of the break of shoulder in the dependence on the form/species of the wounding shell, character/nature of wound and form/species of break during the establishment of diagnosis on PMP and DMP (in the absolute numerals).

(1) Симптомы	(2) По виду ранения		(5) По характеру ранения		(8). По виду перелома		
	(3) пулевое	(4) осколочное	(6) слепое	(7) сквозное	(9) краевой, дырчатый	(10) поперечный, косой	(11) раздробленный, оскольчатый
(12) Деформации . . . . .	32	36	35	33	—	30	36
(13) Патологическая подвижность . . . . .	18	11	14	18	—	16	21
(14) Костные осколки в ране . . . . .	31	35	31	36	72	20	36
(15) Нарушение функции . . . . .	9	15	12	10	3	14	3
(16) Прочие . . . . .	10	3	8	3	25	20	4
(17) Итого . . . . .	100	100	100	100	100	100	100

Key: (1). Symptoms. (2). According to means of wound. (3). bullet. (4). fragmentation. (5). According to character/nature of wound. (6). blind. (7). through. (8). According to form/species of break. (9). edge/boundary, perforated. (10). cross, by sand bar. (11). crushed, fragmented. (12). Deformation. (13). Pathological mobility. (14). Bone fragments in wound. (15). Violation of function. (16). Other. (17). Altogether.

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As the basic sign of these forms/species of break served the presence of bone fragments during processing of wound and their

detection during the x-ray examination.

With the crushed, comminuted, and also cross and oblique fractures they noted a large quantity of symptoms.

With the perforating and blind-end, bullet and fragmentation wounds the degree of frequency and manifestation of the symptoms of break remained almost identical.

Data relative to a number of symptoms on the basis of which is diagnosed itself of the break of shoulder in the foremost stages, were such: the diagnosis of break was based on one symptom into 64.00/o, on two symptoms - into 27.00/o, on three symptoms - into 8.00/o and on four symptoms - into 1.00/o. Hence it is apparent that under conditions for the work of army and army medical installations the diagnosis of the break was based in majority of casualties on one or two straight/direct signs, which unconditionally indicated the damage to bone. This is explained by the fact that for explaining all clinical symptoms, which characterize break, and their introductions into the medical documents it fell short time, especially in the periods of the entry of a large quantity of casualties to the foremost stages of evacuation.

Furthermore, diagnosis according to a few signs was sufficient

to accurate ones and only in an insignificant number of casualties appeared need or there was a possibility to base diagnosis by a large number of symptoms.

In 38.70/o of total number of identified breaks of shoulder bone it was in no way standard, on what symptoms was based the diagnosis, that one should relate due to the special features/peculiarities of the formulation of medical documentation in the foremost stages of evacuation. In the majority of the cases of entry in the documents about the presence of one or the other symptoms of break they were absent from the card of forward area, since for lack of the time of doctor during filling of card it could not carry into it the clinical signs on the basis of which diagnosed itself.

Clinical diagnosis in the foremost stages of evacuation could not be being all-inclusive; for this it was necessarily x-ray examination.

X-ray examination was produced not only for the confirmation of diagnosis, but also for explaining the series/number of important diagnostic details - determination of level, form/species, character/nature of break, disposition of bone fragments, degree and character/nature of the shift of the ends of the shoulder bone which could not be accurately established/installed on the basis only of

the clinical methods of research.

X-ray examination with the bullet breaks of shoulder was used mainly beginning from the army medical installations and it was not produced only into 21.10/o of cases.

According to S. G. Yartsev's data, obtained with examination of X-ray photographs, incomplete, and still more frequent full/total/complete breaks were escorted/tracked by the cracks, which were being sometimes observed for the very significant elongation/extent.

With the full/total/complete bullet breaks of the shoulder of the shift of broken ends it was not into 4.50/o; the satisfactory standing of broken ends was into 33.70/o, unsatisfactory - into 61.80/o. In the absence of the shift of broken ends in 2/3 casualties were observed the oblique, cross and slantwise-cross breaks, and into 1/3 - many, large/coarse and small-splintered breaks.

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First, first medical and first medical aid transport immobilization with the bullet breaks of shoulder.

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In the Great Patriotic War, beginning from the line of combat, rendering of first aid, and also first medical aid with the bullet breaks of shoulder was conducted in accordance with the basic principles of military field surgery, directed toward the struggle with the shock, by blood loss and by infection and presented in the official instructions and the leadership/manual.

Place and time of rendering of first aid with the bullet breaks of shoulder had high value in prophylaxis of complications.

In 88.80/o of bullet breaks of shoulder the first aid by casualty was shown/rendered in the company sector (pg. 141).

Somewhat more than 1/3 casualties with the break of shoulder, it was shown/rendered by way of auto- and mutual assistance. This is explained by relative simplicity, accessibility and convenience in the imposition of sling on the wound of shoulder, which allowed for soldier on the field of battle very to use first aid kit or to resort to comrade's aid, without expecting aidman's arrival.

More than in half of casualties first aid with the breaks of

shoulder was shown/rendered by aidman. .

Of the small unit of the casualties (8.80/o) first aid was shown/rendered by doctor, and to an even smaller number of casualties (2.40/o) - by feldsher when wound proceeded near from PMP or BMP.

First aid by casualty with the bullet break of shoulder in the overwhelming majority was shown/rendered for the first hour after wound.

The later periods of rendering of first aid by wounded with the bullet break of shoulder and associated wounds in comparison with the fact that had the place in cases when of this type break was not matched with any other wounds, they are explained by the fact that the associated wounds burdened the condition of casualty, by virtue of which it was deprived of the possibility to be moved independently.

In the system of stage treatment the volume of medical aid for each stage was established/installed completely definitely and it were changed depending on the character/nature of the combat operations/processes, offensive or defensive. According to the data of the Great Patriotic War, the first aid with the bullet breaks of shoulder was expressed into 70.20/c in the application of aseptic dressing and into 29.80/o - in the application of dressing with the use/application of antiseptics.

Table 82. Periods of rendering of first aid with the bullet breaks of shoulder bone (in the percentages).

(2) Группа раненых	(1) Срок в часах	1	2-5	(3) 6 и позже	(4) Итого
(5) Без сопутствующих ранений		72,4	15,3	12,3	100,0
(6) С сопутствующими ранениями		67,6	17,7	14,7	100,0

Key: (1). Period. (2). Group of casualties. (3). and it is later. (4). Altogether. (5). Without associated wounds. (6). With associated wounds.

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As the antiseptic in the predominant majority of the cases was used iodine liquid for the lubrication of skin on the edges of wound.

For the temporary/tise stop of hemorrhage by way of rendering to first aid into 5.20/o to the extremity was superimposed the tourniquet.

The fact that on BMP the primary bandage to the wound was superimposed to an insignificant quantity of casualties (2.40/o), is in full/total/complete agreement with the volume of work, determined for BMP, which consisted of the correction of primary bandage, the



inspection/check of tourniquet, the struggle with the shock and the imposition of simple splints on the extremity. The majority of casualties with the break of shoulder, without needing aid BMP, was evacuated on PMP, their certain unit striking on PMP, passing BMP.

The first medical aid by casualty with the break of shoulder proved to be on PMP. The periods of its rendering depended, first of all, on the time of the entry of casualties to this stage.

For the first hour entered 8.80/o, in time from two to six hours - 58.00/o, from six hours and later - 33.20/o of casualties.

Given data show that into 2/3 cases the casualties with the break of shoulder obtained medical aid on PMP for the first 6 hours after wound.

Into the volume of work on the rendering on PMP of the first medical aid by casualty with the break of shoulder they entered: struggle with the shock, inspection/check of the correctness of the imposition of bandage and tourniquet, the thorough immobilization of upper extremity, the preventive introduction of anti-tetanus and anti-gangrene serum and the accurate documentation of wound.

Primary aseptic bandage was laid on the wound after the

preliminary processing of skin around the wound by iodine liquid; frequently bandages wetted by the solution of chloramine or wound powdered by the powder of sulfanilamide.

For dealing with shock 42.00/o of casualties with the bullet break of shoulder was introduced the solution of morphine.

Furthermore, were conducted the heating of casualties, the immobilization of break, the transfusion of blood and blood-replacing fluids/liquids.

The blood transfusion as powerful therapeutic substance against the blood loss and the shock with the breaks of shoulder was used on PMP into 1.60/o of cases, on DMP - into 14.60/o, in the front line therapeutic installations - into 15.20/o, in the rear ones - into 21.90/o and in the different stages it is repeated - into 20.00/o.

These data show that the blood transfusion on PMP and DMP with the bullet breaks of shoulder was used fairly often (about 36.20/o of all cases of the blood transfusion, taking into account 20o/o of repeated transfusions.

Table 83. Use/application of preventive sera in the stages of evacuation with the breaks of shoulder (in the percentages).

(1) Этап эвакуации (2) Вид сыворотки	ПМП	ДМП	ГБА	ГВФ	(3) Тыловой госпиталь	(4) Разные этапы	(5) Итого
(6) Противостолбнячная . . . . .	39,5	29,1	14,5	5,0	0,9	11,0	100,0
(7) Антигангренозная . . . . .	9,5	38,7	36,2	6,4	2,8	6,4	100,0

Key: (1). Stage of evacuation. (2). Form/species of serum. (3). Rear hospital. (4). Different stages. (5). Altogether. (6). Antitetanus. (7). Anti-gangrenous.

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In the responsibility of those exerting the first medical aid entered the introduction under the skin of the preventive doses of antitetanus and antigangrene serum.

As can be seen from Table 83, the introduction of antitetanus serum with the breaks of shoulder bone began with PMP, moreover to the army area it was 79.60/o (into this percentage entered the given graphs/counts (different stages", since into a number of "different stages" they entered and army therapeutic installations).

The introduction of antigangrene serum on PMP is produced in a

comparatively insignificant number of cases (9.50/o).

Transport immobilization with the breaks of shoulder.

The correct and in proper time applied transport immobilization in the Great Patriotic War was the powerful/thick combat means with the shock, infection and hemorrhage.

Surgeons' majority counted the transport immobilization of very desirable, beginning from the company sector, and necessary in the subsequent stages. On PMP the immobilization of extremity by transport with casts had to be realized in all cases of the identified or suspected break of shoulder. Shipment without the immobilization of casualties with PMP to DMP the bullet break of shoulder considered inadmissible.

All authors on this question adhered to one opinion. This position/situation was one of the basic principles of the stage treatment of the bullet breaks of the bones of extremities.

For the characteristic in this respect of the conducted for the time Great Patriotic War of work it is necessary to examine the data about the period, the stage and the character/nature of transport immobilization during the stage treatment of the breaks of shoulder.

Data of the deepened development of the histories of the disease/illness of casualties with the bullet break of shoulder showed that the transport immobilization was applied in the significant majority of casualties with the break of shoulder - in 6 cases of 7, i.e., into 84.80/o. In remaining 15.20/o of information about the immobilization of upper extremity with the break of shoulder in the medical documents there was not.

In the group of casualties with the break of shoulder without the associated wounds a number of casualties without the instructions in the medical documentation relative to the imposition of transport immobilization is equal to 17.6c/c.

During the evaluation of the obtained results it is necessary to have in mind that a question about the immobilization of break very is intimately connected with a question of its diagnosis. To recognize damage to shoulder bone in the foremost stages on the basis only of clinical symptoms was not always easy. Furthermore, the strained military-tactical circumstances in the individual periods and the entry of a large quantity of casualties created in the foremost stages the conditions, which did not favor diagnostic work, which led to the diagnostic errors and because of this to the

violation of the established/installed rules/handspikes of immobilization.

Transport immobilization with the break of shoulder bone was superimposed for the first hour into 7.50/o, during the second and to the sixth hour - into 30.00/o, for the sixth hour it is later - into 62.50/o.

Before estimating the findings about the periods of the imposition of transport immobilization, it is necessary to establish/install, in what stages of evacuation it was realized.

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The stages of the medical evacuation, on which was applied transport immobilization and was established diagnosis, are represented in Table 84.

From the given materials it is evident that only into 5.10/o transport immobilization of upper extremity with the break of shoulder was realized in the sector of company and battalion, whereas basic part of the work on the immobilization of the breaks of shoulder was carried out in other stages, beginning from PMP and finishing with front evacuation hospitals.

From the data of table 84 evident also that a number of breaks of shoulder, identified on PMP (inclusively), somewhat exceeds a number of breaks of shoulder, with which was realized transport immobilization. This simple comparison can bring to the incorrect conclusions, if we do not take into consideration the important fact that from a total number of those wounded with the break of shoulder, that were subjected to immobilization, in 200/o it was not

established/installed, in what stage was realized primary immobilization.

The study of medical documentation showed that the greatest difficulties during the determination of the stage of the primary immobilization of break relate precisely to PMP. Thus, for instance, in the card of forward area it was not frequently instructions about the imposition of transport immobilization, whereas in the hospital map/chart/card of army KhPPG it is registered that the casualty entered on DMP with the immobilized extremity.

Since with the filling of the card of forward area on PMP was emphasized the presence of the damaged bones, is most probable the assumption that the immobilization was superimposed, where it was set diagnosis of break, i.e., on PMP. Therefore certain unit of the cases of transport immobilization, realized on the unknown stage, should be related to PMP. Under this condition a number of cases of the imposition of transport immobilization on PMP will correspond to a number of cases of the identified on PMP breaks of shoulder.

A number of cases with the immobilization, produced on DMP and in the army therapeutic installations, also corresponds to a number of diagnosed in these stages cases of the break of shoulder. A somewhat larger number of breaks with the immobilization in



comparison with a number of identified breaks can be explained by the fact that to a certain extent the immobilization, produced in these stages, was secondary or therapeutic (with the aid of the gypsum bandage), and recorded it was as transport.

Table 84. The distribution of casualties with the bullet break of shoulder in the stages of the medical evacuation, on which was applied transport immobilization and was established/installed diagnosis (in the percentages).

	(1) Рота	БМП	ПМП	(2) ДМП и другие	(3) Итого
(4) Имобилизация осуществлена . . . . .	1,3	3,8	34,3	60,6	100,0
(5) Диагноз поставлен . . . . .	—	—	—	45,2	100,0

Key: (1). Company. (2). and others. (3). Altogether. (4). Immobilization is realized. (5). Diagnosis is set.

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Thus, the use/application of transport immobilization in the foremost stages of evacuation depended on that how after wound was soon established/installed or suspected the break of shoulder. Consequently, transport immobilization was connected with the diagnosis of break.

As has already been indicated above, transport immobilization was absent or about it it was not mentioned into 15.20/o of cases. So that in explaining the reasons in view of which the casualties with the damage to shoulder bone changed from one stage to another without

the immobilization, must be examined, with what forms/species of break it was absent (Table 85).

Data of the deepened development of the history of disease/illness show that the immobilization was absent mainly with the perforated and edge/boundary breaks of shoulder bone.

Since the diagnosis of these means of damages to shoulder bone presents difficulties, such breaks in the foremost stages it was possible to recognize not always, and these casualties they evacuated into the army or army area without the immobilization. With other forms/species of break the errors also occurred, but then it was considerably less.

The distribution of the periods of the imposition of transport immobilization depending on the forms/species of the break is shown in Table 86.

Table 85. Distribution of casualties with the bullet break of shoulder according to the form/species of break in connection with the use/application of transport immobilization (in the percentages).

(8) Группа раненых	(1) Вид перелома	(2) Дырча- тый в краях	(3) Продоль- ный, по- перечный, косой	(4) Крупно- и мелко- оскольча- тый	(5) Раздроб- ленный	(6) Вид пе- релома неизвестен	(7) В сред- нем
(9) Без иммобилизации и с невыясненным видом иммобилизации . . . .		29,2	8,4	8,2	11,0	22,0	15,2
(10) С иммобилизацией . . . .		70,8	91,6	91,8	89,0	78,0	84,8
(11) Итого . . . .		100,0	100,0	100,0	100,0	100,0	100,0

Key: (1). Form/species of break. (2). Perforated and edge/boundary. (3). Longitudinal, cross by sand bar. (4). Large/coarse and small-splintered. (5). Crushed. (6). Form/species of break is unknown. (7). On the average. (8). Group of casualties. (9). Without immobilization and with unexplained form/species of immobilization. (10). With immobilization. (11). Altogether.

Table 86. Periods of the imposition of transport immobilization depending on the form/species of break (in the percentages).

(6) Вид перелома	(1) Срок приме- нения транс- портной иммобилиза- ции (в часах)	1	2-5	(2) 6 и позже	(3) Итого	(4) Срок неизвестен	(5) Всего
(7) Дырчатый и краевой ...		4,4	30,6	65,0	100,0	26,0	100,0
(8) Поперечный, продоль- ный, косой . . . . .		8,0	28,5	63,5	100,0	12,8	100,0
(9) Крупно- и мелкоосколь- чатый . . . . .		7,5	28,0	64,5	100,0	11,2	100,0
(10) Раздробленный . . . . .		11,1	31,8	57,1	100,0	27,1	100,0
(11) В среднем . . . . .		7,8	29,2	63,0	100,0	19,3	100,0

Key: (1). Period of the use/application of transport immobilization (in the hours). (2). and later. (3). Altogether. (4). Period is unknown. (5). In all. (6). Form/species of break. (7). perforated and edge/boundary. (8). Cross longitudinal, by sand bar. (9). Large/coarse and small-fragment. (10). Crushed. (11). On the average.

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Hence it is apparent that with the edge/boundary and perforated breaks the transport immobilization was laid more lately than with other forms/species of break.

Thus, measures for transport immobilization with the breaks of shoulder - the frequency of use/application and the period of its realization - were determined by the correct and timely diagnosis of breaks.

On the basis of the above the results of the transport immobilization of the breaks of shoulder in the foremost stages, achieved in the Great Patriotic War, should be recognized completely satisfactory ones.

For the transport immobilization of the breaks of shoulder were used into 0.30/o of cases the improvised splints, into 46.5% - wire splints, into 1.80/o - cross-linked splints, into 15.30/o - other forms/species of fixation and into 36.10/o of cases - "splint" without the instruction of their form/species. The fact calls attention to itself that for the immobilization of the break of shoulder the improvised splints were used rarely. This can be

explained by the possibility of using for this purpose with the rendering of first aid on the field of battle of knee plate.

The most widely used form/species of transport immobilization of upper extremities with the breaks of shoulder was immobilization with the aid of the wire splint. According to the data G. A. Podolyak, transport immobilization in the foremost stages of the operating division with the breaks of shoulder it was realized with the aid of the wire splint into 87.00/o (1942) and into 96.30/o (1943).

Prior to the beginning of the Great Patriotic War it was known that with the break of shoulder with the aid of the wire splint to attain a good immobilization of upper extremity is very difficult, since it is impossible to solidly fix/record the suprascapular unit of the splint. As a result of the mobility of upper end of the splint of the full/total/complete immobilization of shoulder belt/zone occurred.

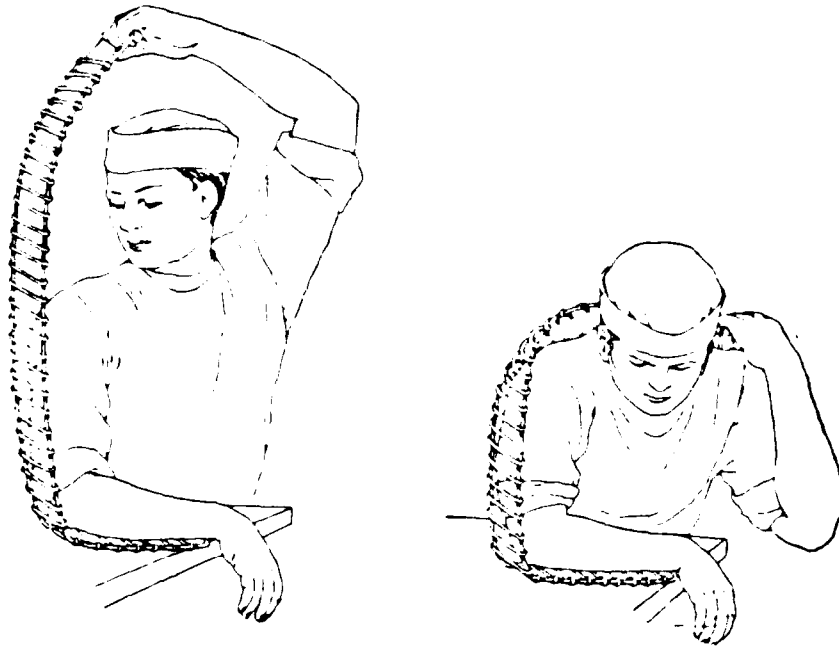


Fig. 93. and 94. Preparation of the transport splint of Cramer for the immobilization of shoulder with the bullet break.

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This can be explained by the fact that during the imposition of splint was captured entire/all extremity with the hand and the fingers/pins inclusively, in this case upper end of the splint reached only the scapula of sick side and could not be well fixed/recorded; respectively with the aforesaid it was not possible to achieve complete immobilization in the shoulder joint.



Were proposed new methods and splints (I. V. Fishkov, V. Ya. Tarkovskaya and N. N. Veselkina, A. T. Lidskiy and S. Sosni et al.) or were perfected already known (I. P. Linkya, M. A. Shmachin). However, the newly proposed methods and splint did not obtain or did not have time to obtain wide disseminations.

In beginning of the Great Patriotic War to one of fronts N. N. Yelanskiy began to introduce in the practice the original procedure of the fixation of extremity the wire splint at which was achieved the more reliable immobilization of upper extremity with the break of shoulder.

Splints procure previously, wrap by their cotton and by bandages. To upper end of the splint tie two zones of gauze on 75 cm each. The arching of splint aidman produces on himself. At a distance equal to the length of the forearm of casualty, splint they bend at the right angle. Aidman, capturing by other hand the second end of the splint, bends down it to his back. After leaning by hand to the table, aidman adds by his corps necessary curvature of wire, continuing to hold its free end in shoulder joint. Is obtained the proper modelling of splint, in the accuracy which corresponds to the bends of shoulder and spine.

Splint is laid on damaged shoulder of casualty. Shoulder is

ejected forward on 30°; into the subaxillary region on the side of wound place kiloohm of cotton, and the ends of the bandage, which go from the free (upper) end of the splint and which envelope from the front and from behind healthy/scurd shoulder, they tie to the second (lower) end of the splint on the forearm. Thus forearm by its severity forces splint against back and does not give the possibility to upper end of the splint to be displaced upward or to withdraw from the back. Splint is fixed/recorded additionally with the aurocks of bandage to the extremity and to the body.

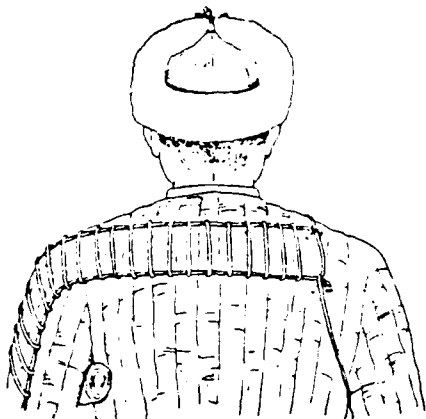


Fig. 95.

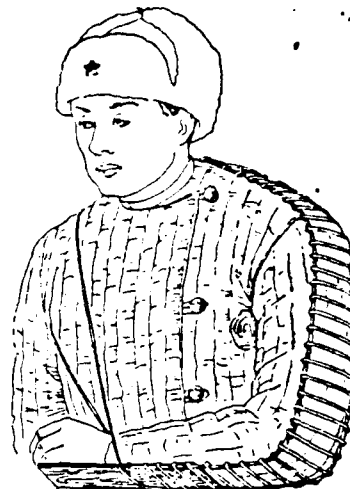


Fig. 96.

Fig. 95. Imposition of transport wire splint with bullet break of shoulder. Back elevation.

Fig. 96. Imposition of transport wire splint with bullet break of shoulder. Hanging from the front.

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For the hand the lower end Kramer splint "increase" by plywood or cross-linked splint (Fig. 93-96).

On the basis of the experiment/experience of the Great Patriotic

War this method of transport immobilization of the break of shoulder must be considered one of the good ones.

A question about the carrying out/removal of casualties with the break of shoulder (without the associated wounds) from the field of combat did not draw special attention, since the overwhelming majority of these casualties could independently be moved and went out from the field of combat without the alien aid. The locomotion of casualty with the break of shoulder after the rendering to it of first aid was realized in the company and battalion sector on foot into 52.80/o, on the stretchers - into 0.50/o, by the combined method - into 7.50/o and into 39.20/o form/species of transport it was not indicated. With PMP to DMF the casualties with the break of shoulder (without the associated wounds) after rendering first aid into 90.00/o of cases were evacuated with the mark "sitting".

In order to explain the value of first aid and transport immobilization in the system of the stage treatment of the bullet breaks of shoulder in the Great Patriotic War, it is necessary to trace, what dependence existed between the clinical outcomes, the periods of rendering of first aid and the periods of the imposition of primary transport immobilization.

The data, which relate to these questions, are represented in

Tables 87, 88 and 89.

The experiment/experience of the Great Patriotic War showed that among the casualties, which the first aid was shown/rendered through the days, a number of good clinical outcomes was less, and a number of osteomyelitis and amputations was more than in casualties with the earlier periods of obtaining first aid.

Later than 24 hours first aid obtained a very small number of casualties (0.8-1.50/o). Here, it is doubtless entered the heavily casualties, who could not themselves move out from the field of combat, or those the easily wounded who did not move out according to the conditions for combat.

Clinical outcomes in casualties, who obtained first aid for a period of the first day, but into the different ones are frequent, they proved to be more or less identical. This will be in complete agreement with the form/species of the break in casualties, obtaining first aid in the different time (Table 88).

Table 87. Clinical outcomes of the bullet breaks of shoulder in connection with the periods of rendering of first aid (in percent).

(4) Исход	(1) Срок оказа- ния первой помощи (в часах)			(2)	(3)
	1	2 - 5	5 - 23	24 и позже	в среднем
(5) Хороший анатомический и функцио- нальный результат . . . . .	16,1	15,8	16,9	9,1	16,1
(6) Ампутация . . . . .	9,5	7,5	6,4	9,1	9,1
(7) Остеомиелит . . . . .	8,0	7,5	6,6	13,6	8,0
(8) Прочие . . . . .	66,4	69,2	70,1	68,2	66,8
(9) Итого . . . . .	100,0	100,0	100,0	100,0	100,0

Key: (1). Period of rendering of first aid (in the hours). (2). and it is later. (3). On the average. (4). Outcome. (5). Good anatomical and functional result. (6). Amputation. (7). Osteomyelitis. (8). Other. (9). Altogether.

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Among wounded obtained first aid into the different times first day, was observed approximately an identical number of different breaks, whereas the composition of the casualties, who obtained first aid later than 24 hours, it was completely different among them the crushed breaks it was almost two times more, and perforated one and a half times it is less and so forth.

Consequently, poor clinical outcomes in casualties, who obtained

first aid into the second day, are explained not only by late rendering aid, but also by considerably large number of heavy breaks.

The data, which make it possible to explain the relation between the clinical outcomes and the periods of the imposition of primary transport immobilization, are represented in Table 89.

As can be seen from these data, with the realization of transport immobilization of later than 24 hours a number of good final anatomical and functional results was increased, and a number of amputations considerably was lowered. This is the apparent at first glance contradiction is easily explainable.

Table 88. Form/species of bullet break of shoulder bone in the groups of the casualties, which obtained first aid within the different periods (in the percentages).

(3) Вид перелома	(1) Сроки оказания первой помощи (в часах)			
	1	2-3	6-23	(2) 24 и позже
(4) Дырчатый и краевой . . . . .	11,1	10,1	11,5	7,0
(5) Поперечный, продольный и косой . . . . .	17,8	18,7	15,7	7,0
(6) Оскольчатый . . . . .	51,4	53,0	54,0	52,0
(7) Раздробленный . . . . .	19,7	18,2	18,8	34,0
(8) Всего . . . . .	100,0	100,0	100,0	100,0

Key: (1). Period of rendering of first aid (in the hours). (2). and it is later. (3). Form/species of break. (4). Perforated and edge/boundary. (5). Cross longitudinal and by sand bar. (6). Fragmented. (7). Crushed. (8). In all.



Table 89. Clinical outcomes in connection with the periods of the imposition of primary transport immobilization (in the percentages).

(3) Исход	(1) Срок наложения транспортной иммобилизации (в часах)				(2) 24 и позже
	1	2 - 5	6 - 23		
(4) Хороший анатомический и функциональный результат . . . . .	15,3	15,1	17,6	19,7	
(5) Ампутация . . . . .	8,6	5,6	4,6	1,5	
(6) Остеомиелит . . . . .	5,9	7,1	8,7	10,2	
(7) Прочие <sup>1</sup> . . . . .	70,2	72,2	69,1	68,6	
(8) Итого . . . . .	100,0	100,0	100,0	100,0	

Key: (1). Period of the imposition of transport immobilization (in the hours). (2). and it is later. (3). Outcome. (4). Good anatomical and functional result. (5). Amputation. (6). Osteomyelitis. (7). Other<sup>1</sup>.

FOOTNOTE<sup>1</sup>. Into heading "other" enter the damages of nerves, ankylosis, contractures and other outcomes, which cannot be set in the bond with the primary transport immobilization. ENDFOOTNOTE.

(8). Altogether.

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The periods of the application of the transport immobilizing dressing

were determined by the diagnosis of break; within the latest periods were immobilized those breaks, which most difficultly yielded to identification, namely perforated and edge/boundary, treatment of which, in spite of their late immobilization, must give a good final result.

Actually/really, among casualties, whose first transport immobilization was used during the first day, there were heavier breaks than among those, whose immobilization was produced into the second day (Table 90).

Clinical outcomes were in full/total/complete agreement, first of all, with the severity of wound and break, but also the periods of the realization of transport immobilization had also specific value: with the late immobilization it was increased number of suppurative processes, as a result of which increased/grew number of the complications of osteomyelitis.

Table 90. Form/species of bullet break of shoulder bone in the groups of the casualties, which obtained the first transport immobilization within the different periods (in the percentages).

(3) Вид перелома	(1) Срок приме- нения транс- портной им- мобилизации (в часах)	(2) и позже			
		1	2-5	6 - 23	24
(4) Дырчатый и краевой . . . . .		5,7	10,3	8,5	11,8
(5) Поперечный, продольный и косой . . . . .		18,8	18,2	18,2	19,0
(6) Оскольчатый . . . . .		51,3	52,3	55,1	55,8
(7) Раздробленный . . . . .		24,2	19,2	18,2	13,4
(8) Всего . . . . .		100,0	100,0	100,0	100,0

Key: (1). Period of the use/application of transport immobilization (in the hours). (2). and it is later. (3). Form/species of break. (4). Perforated and edge/boundary. (5). Cross, longitudinal and by sand bar. (6). Fragmented. (7). Crushed. (8). In all.

Primary surgical processing treatment on GBA of the bullet breaks of shoulder.

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The primary surgical processing of bullet breaks was performed in the Great Patriotic War in accordance with the basic principles of surgical treatment of wounds. Volume, period, character/nature, and also frequency of this intervention were changed in proportion to gaining of experience and depended on the varied conditions of combat situation and on an improvement in the organization of the carrying out/removal of casualties.

According to the data of the deepened development, the primary surgical processing of the break of shoulder was applied into 69.70% of cases; into 30.2% it was not produced or about it it was not mentioned in the medical documents. However, for the accurate characteristic of the frequency of the primary surgical processing of the breaks of shoulder should be examined it on the years of war (Table 91).

A number of casualties with the break of shoulder, not requiring substances to primary surgical processing, with each year was decreased, while the number of casualties by which it was shown, it was increased.

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Thus, in the Great Patriotic War during the treatment of the bullet breaks of shoulder increasingly more widely were used active surgical interventions in the foremost stages of evacuation, and readings/indications to them were expanded.

The periods of the primary surgical processing of the bullet breaks of shoulder, and also the stage, in which was performed this processing, depended, first of all, on combat situation. In the relatively calm position/situation at the front and with arrival of a small number of casualties primary surgical treatment on DMP was produced fully and in short periods. After the entry of a large quantity of casualties surgical work on DMP was expanded in the direction of rendering of surgical aid to heavy casualties, predominantly from the vital readings/indications, and were decreased readings/indications to production in the primary surgical processing in less than the heavily wounded, first of all wounded the upper extremity, whom they evacuated with DMP to GBA without the primary

processing. In connection with this after the entry of a large quantity of casualties the periods of production in the primary surgical processing with the breaks of shoulder somewhat were increased.

From Table 92 it is evident that to the majority of casualties the primary surgical processing of wound with fracture of shoulder bone was produced during the first day.

Table 91. Frequency of primary surgical processing with the bullet breaks of shoulder on the years of war (in the percentages).

(3) / (1) Год	1941	1942	1943	1944	1945	(2) В среднем
Первичная хирургическая обработка						
(4) Производилась . . . . .	48,0	56,6	72,4	82,4	87,4	69,7
(5) Не производилась или же не отмечена в медицинских документах . . . . .	52,0	43,4	27,6	17,6	12,6	30,3
(6) Итого . . . . .	100,0	100,0	100,0	100,0	100,0	100,0

Key: (1). Year. (2). On the average. (3). primary surgical processing. (4). It was produced. (5). It was not produced or it was not noted in medical documents. (6). It.

Table 92. Periods of the primary surgical processing of the bullet breaks of shoulder from the moment/torque of wound (in the percentages).

(9) Группа раненых \ (1) Срок	(2) в часов	(3) От 7 до 12 часов	(4) От 13 до 24 часов	(5) В течение первых суток (час неизвестен)	(6) В течение 2 суток	(7) Время не указано	(8) Итого
(10) Без сопутствующих ранений . . . . .	18,4	20,5	15,4	14,8	21,7	9,2	100,0
(11) С сопутствующими ранениями . . . . .	18,7	20,5	14,0	14,7	23,1	9,0	100,0
(12) В среднем . . . . .	18,6	20,5	14,7	14,8	22,3	9,1	100,0

Key: (1). Period. (2). hours. (3). From 7 to 12 hours. (4). From 13 to 24 hours. (5). During first day (hour is unknown). (6). during 2 days. (7). Time is not indicated. (8). Altogether. (9). Group of casualties. (10). Without associated wounds. (11). With associated wounds. (12). on the average.

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Casualties with the break of shoulder they delivered by medical or incidental transport on DMP, where by it was performed surgical processing within the shortest periods.

As can be seen from table 92, from each 10 casualties four obtained primary surgical processing for the first 12 hours after wound, the presence of the associated wounds not wriggling for the



periods of processing.

The stages of the medical evacuation, on which was produced primary surgical processing, were represented in Table 93.

From this table it is evident that more than 3/4 casualties from fracture of the shoulder underwent primary surgical processing on DMP. However, the significant part of the casualties (about one fifth) was operated beyond the limits of DMP - in the army medical installations, and insignificant unit - in the front line and rear installations.

The periods of primary surgical processing and the stages, in which it was produced, in the various forms of break were dissimilar (Table 94 and 95).

Table 93. Stages of the primary surgical processing of the bullet breaks of shoulder (in the percentages).

ДМП	ГБА		ГБФ		Тыловая ЭГ	Прочие этапы	(3) Этап неизвестен	(4) Итого
	ХПНГ	ЭГ	СЭГ и ЭГ	ГЛР				
76,9	15,6	2,3	0,6	0,4				
	17,9		1,0		0,1	1,4	2,7	100,0

Key: (1). Rear. (2). Other stages. (3). Stage is unknown. (4). total.

Table 94. Periods of primary surgical processing depending on the form/species of the break of shoulder in wounded without the associated wounds (in the percentages).

(9) Вид перелома	(1) Срок	(2) 6 часов	(3) От 7 до 12 часов	(4) От 13 до 24 часов	(5) В течение первых суток (час неизвестен)	(6) В течение 2 суток	(7) Время не указано	(8) Итого
(10) Дырчатый . . . . .		16,0	21,0	26,3	26,3	5,2	5,2	100,0
(11) Краевой . . . . .		27,3	16,8	22,4	7,7	18,1	7,7	100,0
(12) Косой . . . . .		21,3	14,7	18,8	14,2	23,9	7,1	100,0
(13) Раздробленный . . . . .		19,0	20,1	13,3	17,2	24,2	6,2	100,0
(14) Поперечный, продольный . . . . .		21,0	20,0	14,4	13,1	18,4	13,1	100,0
(15) Крупно- и мелкооскольчатый . . . . .		17,5	22,5	14,3	14,7	21,7	9,3	100,0
(16) Вид перелома не установлен . . . . .		14,7	20,2	14,7	22,1	15,3	13,0	100,0
(17) В среднем . . . . .		18,4	20,5	15,4	14,8	21,7	9,2	100,0

Key: (1). Period. (2). hours. (3). From 7 to 12 hours. (4). From 13 to 24 hours. (5). During first day (hour is unknown). (6). During 2 days. (7). Time is not indicated. (8). Altogether. (9). Form/species of break. (10). perforated. (11). Edge/boundary. (12). By sand bar. (13). Crushed. (14). Cross, longitudinal. (15). Large/coarse and

small-fragment. (16). Form/species of break is not established/installed. (17). On the average.

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With the simpler forms/species of the break of shoulder (perforated and edge/boundary) the periods of production in the primary surgical processing were considerably less than with the crushed or comminuted fractures (almost quarter of casualties with such breaks were operated into the second day). At the same time a number of unoperated casualties with the crushed break proved to be smallest (21.20/o), and a number of unoperated wounded with other forms/species breaks (edge/boundary, perforated) - greatest (37.40/o).

From Table 95 it is evident that on DMP and in the army and front line hospitals they operated those wounded with the break of the shoulder of all forms/species.

Processing was not produced by greater unit with the perforated ones, the edge/boundary ones, the oblique ones and the cross ones, i.e., with the simpler forms/species of the break of shoulder. Processing did not undergo also the significant part of perforating wounds of shoulder with the sharpened entrance and exit wound

aperture (Table 96).

These data show that with the bullet breaks of shoulder, which were not subjected to primary surgical processing, the inlet was minimum (to 2 cm) in 3 cases of four, but the outlet of the same sizes/dimensions was almost in half of casualties.

Table 95. Stages of primary surgical processing in the various forms of the bullet break of shoulder (in the percentages).

(8) Вид перелома	(1) Этап ДМП	(2) Армей- ский ХППГ и ЭГ	(3) Фронта- вой ЭГ и СЭГ	(4) Прочие этапы в пункты	(5) Итого	(6) Не было обработки	(7) Всего
(9) Дырчатый и краевой	81,3	13,3	1,4	4,0	100,0	37,4	100,0
(10) Поперечный, продоль- ный и косой . . . . .	77,0	18,8	0,4	3,8	100,0	33,1	100,0
(11) Крупно- и мелкосколь- чатый . . . . .	75,3	19,4	1,6	3,7	100,0	31,6	100,0
(12) Раздробленный . . . . .	75,1	20,0	0,8	4,1	100,0	21,2	100,0
(13) Вид перелома не уста- новлен . . . . .	78,5	15,5	0,1	5,9	100,0	32,1	100,0
(14) В среднем . . . . .	76,6	18,2	1,0	4,2	100,0	30,3	100,0

Key: (1). Stage. (2). Army APFG and EG. (3). Front line EG and SEG. (4). Other stages and points/posts. (5). Altogether. (6). It was not processing. (7). In all. (8). Form/species of break. (9). Perforated and edge/boundary. (10). Cross, longitudinal and by sand bar. (11). Large/coarse and small-splintered. (12). Crushed. (13). Form/species of break is not established/installed. (14). On the average.

Table 96. Size/dimension of entrance and outlet with the bullet breaks of shoulder in casualties, who were not subjected to the primary surgical processing (in the percentages).

(6) Вид раненого отверстия	(1) Локализация раненого отверстия и размер его в сантиметрах									(5) Всего
	(2) спереди			(3) сзади			(4) сбоку			
	2	3-10	11 и более	2	3-10	11 и более	2	3-10	11 и более	
(7) Входное . . . . .	26,4	6,3	0,6	17,0	5,4	0,6	33,2	6,3	4,2	100,0
(8) Выходное . . . . .	9,0	10,5	0,7	19,6	16,5	1,9	19,0	16,6	6,2	100,0

Key: (1). Localization of wound aperture and its size/dimension in the centimeters. (2). from the front. (3). from behind. (4). on the side. (5). In all. (6). Form/species of wound aperture. (7). entrance. (8). exit.

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Before beginning the selection/analysis of the data about the character/nature of primary surgical treatment with the breaks of shoulder, it is necessary to be stopped at what forms/species of anesthetization were used during the processing in the Great Patriotic War.

That deepened the development of the histories of

disease/illness showed that during the surgical processing of the breaks of shoulder were used the most different forms/species of general/common/total and local anesthetization. Here were repelled surgeons' skills, which were manufactured even in peacetime. Some authors preferred the general/common/total anesthetization to local, joining anesthesia/narcosis with the great possibilities of the worthy primary processing of break (N. N. Yelanskiy, M. N. Akhutin, A. A. Bocharov, T. V. Putilin, G. A. Shirokov, M. Ya. Schur). Other authors recommended the local anesthetization (A. A. Vinyovskiy, K. N. Kochev, S. M. Sukhovatykh).

According to the data of the deepened development of the histories of disease/illness, 54.30/o of casualties there were operated under the local anesthesia, and in the remaining cases were used the different types of the general/common/total anesthetization: inhalation anesthesia with the aid of ethyl chloride, ether/ester and their combination, etc.

Combined hexenal-ether/ester anesthesia/narcosis during processing of the breaks of shoulder in no way was used.

The individual authors used during processing of the breaks of shoulder during the Great Patriotic War anesthesia of the brachial plexus (A. P. Nadein).

Thus, during the surgical processing of the breaks of shoulder most frequently were used the simplest and accessible methods of the general/common/total and local anesthetization, which require the smallest expenditure of time.

Data of the deepened development showed that the primary surgical processing of the breaks of shoulder in the character/nature of undertaken interventions was different in the dependence on the character/nature and the severity of wound and medical circumstances.

During the primary surgical processing most frequently they were used: splitting up of wounds (44.60/o), splitting up and carving with the removal/distance of bone fragments and foreign bodies (25.20/o), the carving of the soft tissues of wound (12.60/o).



(1) Характер обработки	(2) Процент
(3) Рассечение раны без других вмешательств	44,6
(4) Иссечение мягких тканей раны без других вмешательств	12,6
(5) Рассечение и иссечение с перевязкой сосудов	1,9
(6) Рассечение и иссечение с удалением инородных тел	5,5
(7) Рассечение и иссечение с удалением костных осколков	20,0
(8) Рассечение и иссечение с обработкой костных фрагментов	0,9
(9) Ампутация и экзартикуляция	8,6
(10) Комбинированная (кроме ампутации)	1,8
(11) Не указано	4,1
(12) Итого . . .	100,0

Key: (1). Character/nature of processing. (2). Percent. (3). Splitting up of wound without other interventions. (4). Carving of soft tissues of wound without other interventions. (5). Splitting up and carving with dressing of vessels. (6). Splitting up and carving with removal/distance of foreign bodies. (7). Splitting up and carving with removal/distance of bone fragments. (8). Splitting up and carving with processing of bone fragments. (9). Amputation and exarticulation. (10). combination (besides amputation). (11). it is not indicated. (12). Altogether.

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Thus, in the majority of the cases the primary surgical processing of the bullet breaks of shoulder consisted of small according to the character/nature surgical interventions.

The peculiar anatomical special features/peculiarities of upper extremity in comparison with the lower, namely: a comparatively small volume of shoulder bone, the insignificant development of muscles, the absence of powerful/thick fascial interlayers, and also smaller bacteritic pollution/contamination skins made it possible to simplify it. To this contributed both the frequency of perforating bullet wounds with the point entrance and outlet and also the preponderance of the bullet wounds of shoulder (56.70/o) above the fragmentation ones (43.30/o).

Thus, with the perforating trifling wounds with the small entrance and outlet casualties with the break of shoulder either in no way were operated in the foremost stages, or they underwent simpler interventions, in particular, to splitting up of wound apertures.

The character/nature of surgical interventions during the primary processing of the breaks of shoulder on the years of the Great Patriotic War they were changed (Table 97).

From Table 97 it is evident that a number of splitting up of wounds during the war remained at the relatively high level, being

raised in 1942-1943; a number of carvings of wounds was decreased from year to year, always remaining on the low numerals.

A number of removals/distances of foreign bodies in 1943 in comparison with 1941 decreased almost 2 times. A number of splitting up and carvings of wounds with the removal/distance of bone fragments was increased from year to year and to end of the Great Patriotic War composed almost third of all interventions, although some surgeons in a question about relation to the bone fragments to the end of the war remained on the conservative positions. Thus, for instance, G. A. Podolyak (1947) disputed the need for the removal/distance even of the free at the wound bone fragments, "thus far was not proved the bond between remaining bone fragments and osteomyelitis", hoping for their adherence.

Table 97. Character/nature of the primary surgical processing of the bullet breaks of shoulder on the years of war (in the percentages).

(2) \ (1) Год	1941	1942	1943	1944	1945
Характер операции					
(3) Рассечение мягких тканей раны . . .	45,4	51,7	53,4	44,5	34,8
(4) Иссечение мягких тканей раны . . .	19,1	13,8	9,1	11,5	13,4
(5) Рассечение и иссечение с перевязкой сосудов . . . . .	1,7	2,0	1,6	2,1	1,2
(6) Рассечение и иссечение с удалением инородных тел . . . . .	8,1	5,2	4,3	5,5	5,0
(7) Рассечение и иссечение с удалением костных осколков . . . . .	9,9	12,4	15,1	23,0	29,0
(8) Ампутация . . . . .	9,9	8,0	8,4	6,4	10,6
(9) Прочие . . . . .	5,9	6,9	8,1	7,0	6,0
(10) Итого . . . . .	100,0	100,0	100,0	100,0	100,0

Key: (1). Year. (2). Character/nature of operation/process. (3). Splitting up of soft tissues of wound. (4). Carving of soft tissues of wound. (5). Splitting up and carving with dressing of vessels. (6). Splitting up and carving with removal/distance of foreign bodies. (7). Splitting up and carving with removal/distance of bone fragments. (8). Amputation. (9). Other. (10). Altogether.

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The frequency of amputations and exarticulation from year to year was decreased and the lowest level reached in 1944. In the last months of war (1945) the percentage of amputations achieved 10.6, which is connected with the severity of wounds, since as reading/indication to the primary amputations of shoulder served most

frequently the massive decomposition of bone and soft tissues with damage of large vessels and nerves.

I., 35 years, is wounded 25/VIII 1942 17 hours. On PMP was set the diagnosis: the perforating bullet wound (by the explosive bullet) of left shoulder with the damage to bone. In view of the significant decomposition of soft tissues to casualty on PMP was introduced one dose of antitetanus and five doses of antiganrene serum.

26/VIII on DMP, in view of sharp exsanguination to casualty transfused 450 cm<sup>3</sup> of the blood and under ether anesthesia/narcosis is amputated in the region of surgical neck/journal left shoulder in view of its explicit lack of vitality. Is removed a large quantity of metallic fragments. Is superimposed bandage with A. V. Vi<sup>sh</sup>kovskiy's ointment.

Subsequently - smooth course. In 2 months the casualty was directed toward the commission with the completely healed wound.

Operation/process apropos of hemorrhage was produced for its final stop to an insignificant number of casualties (1.90/o).

The character/nature of primary surgical processing depended on the form/species of break (Table 98).

As can be seen from given data, the overwhelming majority of amputations was produced with the crushed breaks.

The removal/distance of bone fragments with the comminuted and crushed fractures was produced two times more frequently than with the edge/boundary ones and the perforated ones.

The operation/process of processing bone fragments was employed in an insignificant number of cases, most frequently with the cross and longitudinal breaks.

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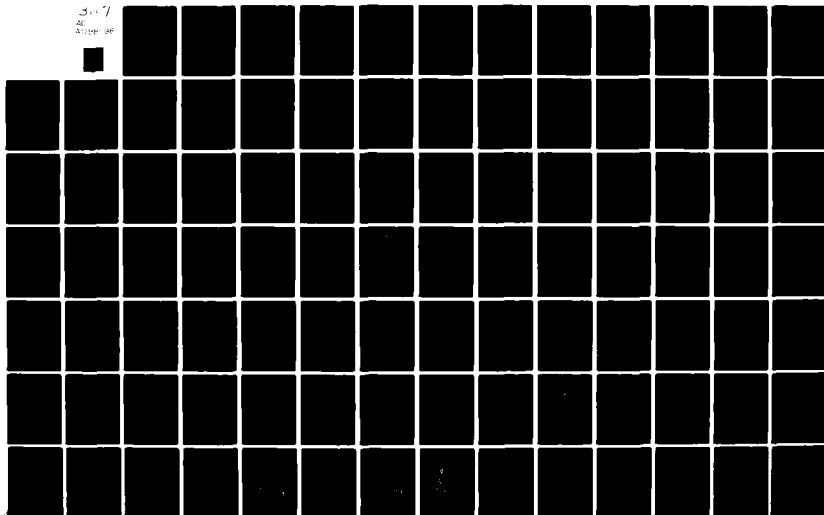


Table 98. Character/nature of primary surgical processing in the various forms of bullet break of shoulder without the associated wounds (in the percentages).

(1) Характер первичной хирургической обработки	(3) Вид перелома	(4) Расщепление	(5) Расщепление и иссечение	(2) Расщепление и иссечение					(10) Ампутация	(11) Прочие	(12) Характер обработки не установлен	(13) Итого
				(6) с персепзией сосудов	(7) с удалением инородных тел	(8) с удалением костных осколков	(9) с обработкой фрагментов кости					
(14) Дырчатый . . . . .		71,0	5,3	—	5,3	10,5	—	—	—	2,6	5,3	100,0
(15) Поперечный и продольный . . . . .		47,4	23,7	—	8,0	13,1	2,6	—	—	—	5,2	100,0
(16) Косой . . . . .		53,6	15,6	1,0	10,5	13,7	0,5	—	—	2,6	2,5	100,0
(17) Раздробленный . . . . .		23,4	7,0	1,8	3,8	27,6	0,9	30,5	—	2,4	2,6	100,0
(18) Крупно- и мелкооскольчатый . . . . .		47,7	11,8	1,3	5,4	26,9	1,0	—	0,1	1,8	4,0	100,0
(19) Краевой . . . . .		47,7	19,0	5,6	12,7	11,2	—	—	0,7	0,6	2,5	100,0
(20) В среднем		45,2	12,3	1,6	6,2	23,2	0,9	6,2	1,2	3,2	3,2	100,0

Key: (1). Character/nature of primary surgical processing. (2). Splitting up and dissection. (3). type of fracture. (4). Splitting up. (5). Splitting up and carving. (6). with tying of vessels. (7). with removal/distance of foreign bodies. (8). removal of bone fragments. (9). with processing of fragments of bone. (10). Amputation. (11). Other. (12). Character/nature of processing is not established/installed. (13). Altogether. (14). Perforated. (15). Cross and longitudinal. (16). By sand bar. (17). Crushed. (18). Large/coarse and chalk fragmented. (19). Edge/boundary. (20). On the average.



As can be seen from given data, the overwhelming majority of amputations was produced with the crushed breaks.

The removal/distance of bone fragments with the comminuted and crushed fractures was produced two times more frequently than with the edge/boundary ones and the perforated ones.

The operation/process of processing bone fragments was employed in an insignificant number of cases, most frequently with the cross and longitudinal breaks.

The primary surgical processing of wounds with the bullet breaks of shoulder in the majority of the cases was fulfilled on DMF without the x-ray examination and consisted of simple surgical interventions. This processing, even produced by experienced surgeon, could not be in all cases of that being all-inclusive and final, although was fulfilled the straight/direct designation/purpose - warning/prevention of anaerobic and sharp/acute pyogenic infection. All authors (N. N. Yelanskiy, S. S. Girolav, P. A. Cyprian, M. N. Akhutin, M. N. Petrov et al.) shared opinion about the need for repeated interventions, which have as a goal to supplement from the readings/indications primary processing, especially after roentgenological supervision.

In many instances as reading/indication to the repeated operation/process served the dissemination of infection, phenomenon of the secondary necrosis of broken ends and basic fragments of bone.

According to the data of the deepened development, repeated operations/processes after primary surgical processing were not produced into 49.90/o, but in the case of absence of this treatment - into 61.50/o (Table 99).

With the cross, longitudinal and oblique breaks to the repeated ones by operations/processes after primary surgical processing resorted most rarely while in the absence of primary surgical processing late operations/processes<sup>1</sup> most rarely they were used with the oblique and large-splintered breaks.

FOOTNOTE<sup>1</sup>. Here operations/processes are named "late", since in this case of primary processing it was not produced. ENDFOOTNOTE.

An average number of repeated operations/processes to one casualty as after primary processing, and without it composed 1.4; depending on the form/species of break an average number of repeated operations/processes to one casualty composed 1.2-1.5 (Table 100).

Table 99. Frequency of the absence of the subsequent operations/processes in casualties from the bullet ones by the break of shoulder in the dependence on the production of primary surgical treatment and form/species of the break in (percentages).

(2) Первичная обработка \ (1) Вид перелома	(3) Крупно-оскольчатый	(4) Краевой	(5) Косой	(6) Дырчатый	(7) Раздробленный	(8) Мелко-оскольчатый	(9) Поперечный и продольный	(10) В среднем
(11) Производилась . . . . .	43,6	56,6	61,1	47,0	50,2	32,7	63,2	49,9
(12) Не производилась . . . . .	62,5	60,4	65,7	61,5	42,1	49,3	59,6	61,5

Key: (1). Form/species of break. (2). Primary processing. (3). Large-splintered. (4). Edge/boundary. (5). By sand bar. (6). Perforated. (7). Crushed. (8). Small-splintered. (9). Cross and longitudinal. (10). In average. (11). It was produced. (12). It was not produced.

Table 100. Average number of repeated operations/processes in casualties with the bullet break of shoulder in the dependence on the production of primary surgical processing and form/species of break.

(2) Первичная обработка \ (1) Вид перелома	(3) Крупно-оскольчатый	(4) Краевой	(5) Косой	(6) Дырчатый	(7) Раздробленный	(8) Мелко-оскольчатый	(9) Поперечный и продольный	(10) В среднем
(11) Производилась . . . . .	1,5	1,2	1,3	1,2	1,4	1,5	1,5	1,4
(12) Не производилась . . . . .	1,5	1,2	1,4	1,3	1,4	1,5	1,5	1,4

Key: (1). Form/species of break. (2). Primary processing. (3). Large-splintered. (4). Edge/boundary. (5). By sand bar. (6). Perforated. (7). smashed. (8). Small-splintered. (9). Cross and longitudinal. (10). In average. (11). It was produced. (12). It was not produced.

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Simple breaks required a smaller number of repeated operations/processes.

Data characterizing repeated interventions, they are represented in Table 101, from which it is evident that after different means of primary surgical processing appeared the need in the repeated operations/processes. Here were involved the operations/processes, undertaken for the diagnostic target (for example, the examination of wounds), the operations/processes, which carried the preventive character/nature (removal/distance of bone fragments during the first two weeks after primary surgical processing, and also processing fragments), and finally the operations/processes, undertaken apropos complications (sequestrectomy, the autopsy of suppurative flows, amputation, etc.).

It should be noted that most frequently (62.50/o) the amputations were produced after the dressing of vessels during the primary surgical processing. The final stop of hemorrhage was

necessary during the primary surgical processing. Nevertheless subsequently clinical course into 1.50/o of cases was required repeated intervention for the purpose of the stop of hemorrhage.

The difference in number and character/nature of repeated operations/processes after splitting up and carvings, produced by way of the primary surgical processing of wounds, is insignificant.

The frequent in comparison with splitting up use/application of amputations after the carving of wound is explained by the fact that splitting up of wounds was used with the lighter bullet breaks of shoulder, than carving.

Table 101. Frequency of different repeated operations/processes after the individual means of primary surgical processing with the bullet breaks of shoulder (detachment on 100 casualties according to each means of processing).

(1) Повторные операции	(3) Резаная рана	(4) Удаление костных осколков и инородных тел	(5) Обработка фрагментов кости	(6) Вскрытие гнойных ватек	(7) Переплата сосудов	(8) Ампутация	(9) Реампутация	(10) Секвестрэктомия	(11) Секвестрэктомия в сочетании с другими операциями	(12) Прочие операции	(13) В среднем
(14) Рассечение . . . . .	6,2	13,6	2,6	14,1	2,1	5,5	0,8	49,9	11,3	13,2	119,3
(15) Иссечение . . . . .	7,5	11,7	5,1	8,4	2,3	9,8	—	42,5	10,7	21,0	119,0
(16) Рассечение и иссечение с перевязкой сосудов . . . . .	6,3	3,2	6,3	9,5	—	62,5	—	9,5	6,3	15,6	119,2
(17) Рассечение и иссечение с удалением инородных тел . . . . .	8,8	3,8	2,5	10,0	1,3	3,8	—	62,5	6,3	13,5	112,5
(18) Рассечение и иссечение с удалением костных осколков . . . . .	2,9	7,9	6,8	8,9	0,3	10,2	0,3	61,0	10,7	7,9	116,9
(19) Рассечение и иссечение с обработкой фрагментов . . . . .	6,7	13,4	—	20,0	—	13,4	—	40,0	13,4	—	107,9
(20) В среднем . . . . .	5,4	10,8	4,1	11,9	1,5	8,1	0,4	49,9	10,3	13,2	117,5

Key: (1). Repeated operations/processes. (2). Character/nature of primary processing. (3). Examination of wound. (4). Removal/distance of bone fragments and foreign bodies. (5) Processing the fragments of bone. (6). Autopsy of suppurative flows. (7). Dressing of vessels. (8). Amputation. (9). Re-amputation. (10) Sequestrectomy. (11). Sequestrectomy in combination with other operations/processes. (12). Other operations/processes. (13). On the average. (14). Splitting up. (15). Carving. (16). Splitting up and carving with tying of vessels.

(17). Splitting up and carving with removal/distance of foreign bodies. (18). Splitting up and carving with removal/distance of bone fragments. (19). Splitting up and carving with processing of fragments. (20). On the average.

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In spite of the removal/distance of bone fragments and foreign bodies during the primary surgical processing, in a number of cases it was necessary to resort to the removal/distance of sequestrations. As illustration can serve the following observation.

V. S. Ye., 38 years, was wounded on 2/V 1944 4 hours. Is delivered on PMP 7 hours after wound diagnosis - perforating bullet wound of middle third of left shoulder with the damage to bone. Due to the hemorrhage 11 hours, was superimposed the tourniquet; to casualty were introduced antitetanus serum, camphor, caffeine, morphine, was produced dress/lavatory of wound it was superimposed aseptic bandage and splint of Craver.

Then casualty was in the extra order/formation sent on DHP, where he arrived in the same day 14 hours. Under the novocaine local anesthetization is produced splitting up and carving of the crushed soft tissues and broken ends of bones and the dressing of the



bleeding vessels in the wound. Is superimposed bandage with Rivanol and splint of Cramer. 3/V casualty arrived in KhPPG; temperature of 37.6°, pulse of 108 strikes/shocks per minute, weak filling. Casualty complained about the overall weakness and the vertigo. Skin integuments are pale. Are poured 250 cm<sup>3</sup> of blood and 500 cm<sup>3</sup> of Petrov's fluid/liquid intravenously; is subcutaneously introduced camphor and caffeine.

With the dressing 4/V on the shoulder are discovered two split wounds by size/dimension one 11x5 cm, and another 6x3 cm. Wounds pure/clean, there is no edema around them.

Is noted the paresis of radiation/radial nerve. Is superimposed bandage azodichloroamide and the splint of Cramer.

5/V casualty is evacuated into the front line evacuation hospital, where he arrived 10/V in the condition of average/mean severity. Wounds pure/clean, with that moderated by suppurative separated. 15/V is superimposed the offtake gypsum bandage. 30/V gypsum bandage is taken/removed and superimposed new with the corset; upper extremity is diverted.

15/VI casualty was evacuated in the rear, where it arrived 27/VI in a good condition.

17/VII with roentgenoscopy is discovered the comminuted grown together fracture of left shoulder with the blurred deformation in the place of break.

Casualty was exposed to ultraviolet lighting and dealt with therapeutic gymnastics. 8/VIII neuropathologist noted the phenomena of traumatic neuritis of left radiation/radial nerve.

5/X was produced the operation/process of the removal/distance of sequestrations from the region of wound. 30/XI wounds healed, and casualty was represented to the commission with unstrengthened scars, soldered with the bone, by the limitation of mobility in the elbow joint (in limits of 50°), with the phenomena of traumatic neuritis of left radiation/radial nerve.

Thus, the experiment/experience of the Great Patriotic War showed that almost in half of the cases of the bullet breaks of shoulder after primary surgical processing attacked/advanced the healing without any repeated interventions. In the remaining cases for the final healing after primary surgical processing were required repeated surgical interventions.

As has already been communicated above, into 30.30/o of bullet breaks of the shoulder of primary surgical processing it was not produced. It is very important to explain, as frequently in this case subsequently were required surgical interventions.

Among the casualties, who were not subjected to primary surgical processing, late operations/processes were produced into 38.50/o. This is explained by the fact that the bullet breaks of shoulder in the absence of primary surgical processing related to the lightest forms/species of break.

M. V. N., 25 years, is wounded 19/III 1944 12 hours, 13 hours of the same day it entered on PMP, where was set the diagnosis: the perforating bullet wound of left shoulder in lower third with the break of bone. To casualty is introduced antitetanus serum, morphine, camphor is superimposed the splint of Cramer.

Then casualty is evacuated on DMP, where he arrived in the same day 15 hours of 30 minutes. On DMP the diagnosis was confirmed, but in view of the fact that the wounds were point, primary surgical processing was not performed, casualty to the same day was directed in SEG, and then into the evacuation hospital, where he entered 22/III in the satisfactory condition, with the splint of Cramer.

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Complaints on the pain in the wound. The general condition of casualty was good. The pulse of 88 strikes/shocks per minute, temperature is normal. On pat of internal organs/controls of no deflections from the norm it is discovered.

In middle third of shoulder on the front/leading and posterior surface of two point wound aperture, closed with blood clots. The soft tissues of shoulder are edematous and strained, in the subaxillary region is determined the hemorrhage. Is determined osseous crepitation of skin. Is produced "late" primary processing of both wounds. Under the local anesthesia the wounds split- / of the tissue of clear red color, bleed good; gas is not determined. Wounds are washed below the solution of peroxide of hydrogen. Is superimposed bandage and wire splint.

24/III in the X-ray photograph is confirmed the major comminuted fracture on the boundary of middle and lower third of left shoulder.

Analysis of the blood from 24/III: Hb 57o/o, eras. 3 210 000, l. 7500, s. 79o/o, p. 1o/o, lymphs. 19o/o, mon. 9o/o, e. 1o/o, colorindicator 0.9; ROE of 15 mm an hour; small anisocytosis.

From the side of the uriae no deflections from the norm.

26/III is superimposed the deaf offtake thoracobrachial bandage with the removal/diversion of shoulder and the bent at the right angle forearm.

27/III casualty was evacuated and 1/IV he arrived in the evacuation hospital in a good condition, with the normal temperature.

14/IV casualty is converted into another evacuation hospital where 17/IV was taken/removed gypsum bandage and was produced the control X-ray photograph, in which was discovered large-splintered break with the satisfactory position/situation of broken ends. Wounds in a good condition. Is superimposed gypsum cast.

3/VI it is converted into the new evacuation hospital, from which 8/VI it was represented to the commission with the healed wound and the grown together break. Flexing in the elbow joint to 90°, straightening is full/total/complete.

The given wound according to the character/nature of bone wound (large-splintered break) must be referred to comparatively heavy ones.

However, clinical course in this case was exclusively favorable. This is explained, first of all, by small sizes/dimensions of wound and by insignificant damage of soft tissues (point entrance and outlet), by absence of the damages of large vessels and by sufficient general/common/total resistivity of organism, in consequence of which the available in the wound microbial flora did not lead to suppuration of wound.

Due to the absence of readings/indications to the early primary processing should be recognized the correct and the tactics of surgeon, who restrained from the primary surgical processing on DMP, and the tactics of the surgeon of SEG, which produced splitting up of the wound 3 days after wound (the so-called "late" primary processing) with the emergent inflammation of wound.

Immediately after the wound (with the examination/inspection of wound on DMP) of readings/indications to surgical processing there was not, since wounds were minor, in the soft tissues there was neither edema nor hemorrhages. After 3 days (with the examination/inspection of casualty in SEG) appeared edema, stress/voltage of tissues into the region of wound and the bruise in the subaxillary region. Although edema and the hemorrhage should have been related completely due to the trauma and the infection of wound could be excluded, since temperature remained normal, and the general

condition of casualty was good, nevertheless it swelled and the stress/voltage of tissues could create the difficulties of blood circulation in the extremity and contribute to a reduction in the resistivity of tissues and to development infections.

"Late" processing, thus, was completely shown and theoretically substantiated, that by the confirmed subsequent course and by the outcome of wound.

In spite of the heavy violation of the integrity of bone (large-splintered break), casualty was cured in 2 months and 20 days, moreover he maintained extremity and remained able-bodied.

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Casualties, who were undergoing primary surgical processing, had the heavier break, which required in the high percentage of cases (50.1) of additional operations/processes.

The character/nature of interventions, undertaken in casualties without primary surgical treatment, and also after it, is represented in Table 102.

The large difference in the frequency of individual repeated

operations/processes in these groups it was not noted.

Clinical outcomes in the given two groups of casualties proved to be different. Good anatomical and functional results in casualties, who were not undergoing the primary surgical processing, are established/installed into 22.70/o, in casualties, which produced the primary surgical processing of the break, into 13.30/o of cases. Difference is explained by the fact that good results were obtained in casualties with the lighter damages of shoulder, which did not require the use/application of primary surgical treatment; with more serious wounds of good results, naturally, it was less, in spite of primary surgical processing.

In order to more clearly present the bond of primary surgical processing with the character/nature of complications and clinical outcomes, was selected the special group of casualties with the break of shoulder. Into it did not enter the casualties with the associated wounds, that obtained first aid after 6 hours, with the late imposition of transport immobilization, or casualties with the inadequate transport immobilization (improvisation, unknown form/species, etc.) and all casualties by which the primary surgical processing was produced to the second day and it is later.

In this group primary surgical processing was not performed into



18.50/o of cases, into 51.10/o - it concerned only the soft tissues (splitting up, carving, the removal/distance of foreign bodies from the wound, the dressing of vessels); furthermore, into 26.00/o was produced processing bone and bone fragments, into 4.40/o - amputation.

Clinical outcomes in this group proved to be different depending on the character/nature of the primary surgical processing: in the absence of primary surgical processing a good anatomical result was obtained into 22.70/o, during processing only of soft tissues - into 15.30/o, and during treatment of bones - into 9.80/o. The smallest lethality was noted during processing of bones, average - in the absence of processing and the largest - during processing only of soft tissues.

Table 102. Character/nature of repeated operations/processes in casualties with the break of shoulder without the primary surgical processing and after the primary surgical processing (on 100 casualties).

(1) Вид вмеша- тельства	(2) Первичная хирургическая обработка	(3) Исследование раны	(4) Удаление кост- ных осколков и инородных тел	(5) Обработка кост- ных фрагментов	(6) Вскрытие гной- ных ватенов	(7) Перевязка сосудов	(8) Ампутация и экзартикуляция	(9) Резанпутиция	(10) Секвестрэктомия	(11) Секвестрэктомия в сочетании с другими опе- рациями	(12) Прочие
(13) Производилась		5,4	10,8	4,1	11,9	1,5	8,5	1,9	49,9	10,3	13,2
(14) Не производилась		5,5	12,9	3,8	16,5	0,9	8,6	0,3	44,2	10,7	12,9

Key: (1). Means of intervention. (2). Primary surgical processing. (3). Examination of wound. (4). Removal/distance of bone fragments and alien ISL. (5). Processing bone fragments. (6). Autopsy of suppurative flows. (7). Tying of vessels. (8). Amputation also exarticulation. (9). Re-amputation. (10). Sequestrectomy. (11). Sequestrectomy in combination with other operations. (12). Other. (13). It was produced. (14). It was not produced.

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Findings speak for the fact that a good anatomical and functional result depended first of all on the severity of break, and the happy outcome of the treatment of break - from the being all-inclusive surgical processing. The great number of compound

fractures (crushed and fragmented) was observed in those casualties, with which was produced the removal/distance of bone fragments (24.5 and 61.60/o); then it was less in wounded in no way those processed (14.7<sup>9</sup> and 56.40/o), but least of all in the casualties who were treated only of soft tissues (9.8 and 54.70/o).

A question about tamponade of wound after the end of primary surgical processing was permitted differently.

According to the data of the author's development of the histories of disease/illness it is evident that with the application of deaf gypsum dressing after the primary surgical processing of tampons into the wound shoulder they did not introduce. In the majority of cases (78.00/o) of the breaks when primary treatment was finished with the imposition of transport immobilization, for the purpose of an improvement in the drainage was used loose tamponade of the wound of shoulder.

Was recommended the batting of the surgical processed wound with the tampons, moistened by the hypertonic solution of common salt.

The immobilization of extremity after primary surgical processing was applied in 90.00/o of casualties with the break of shoulder. Relative to remaining 10.00/o of casualties a question

about the immobilization after processing remained unexplained. For the immobilization were used different types of the transport splint: wire splint was superimposed into 62.50/o of cases, plywood and cross-linked - into 2.70/o, gypsum - into 5.50/o, deaf gypsum bandage - into 2.80/o, were applied other forms/species of immobilization and the form/species of immobilization was not established/installed into 26.50/o of cases.

Most frequently (into 62.50/o) for the immobilization of extremity after primary surgical processing was used wire splint.

Immobilization with the aid of the gypsum splints, in particular deaf gypsum bandage with the removal/diversion of extremity, was superimposed only in an insignificant number of cases.

Thus, after the primary surgical processing of the bullet breaks of shoulder in the army and army area was used mainly transport immobilization.

Further specialized aid with the breaks of shoulder under the roentgenological supervision with the reposition of broken ends and the imposition of the therapeutic deaf gypsum immobilizing bandages with the removal/diversion extremity proved to be in GBA and in GBP.

Course treatment of the bullet breaks of shoulder in front line and rear evacuation hospitals.

Major of the medical service B. L. Bishko, professor Colonel MC <sup>5</sup> V. D. Dobychin.

The experiment/experience of war with the White Finns in 1939-1940 played large role in the review of the previous, now left methods of the treatment of the bullet breaks of shoulder, after showing worthwhileness of applying the ofttake deaf unpadded gypsum bandage and entire importance of complex treatment, including primary surgical processing, the in proper time initiated and systematically conducted therapeutic exercise, and also physiotherapy. During the war with the White Finns all authors noted that with the breaks of shoulder the bullet wounds considerably predominated above the fragmentation ones, through - above the blind ones; the large/coarse and small-splintered and crushed breaks were observed much more frequently than simple linear. Furthermore, predominated the wounds, complicated by infection.

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Authors' majority is found worthwhile after primary surgical processing to lay deaf gypsum bandage only in the front line and deep

rear, whereas authors' unit considered it possible to use this form/species of immobilization, also, in the army area, and some underscored that gypsum should be used not in all cases - the unit of the breaks is subject to treatment on the offtake splint with the traction/extension.

L. L. Libov during the war with the White Finns to 117 breaks of member applied gypsum cast into 47.40/o of cases, circular gypsum bandage - into 14.10/o, the offtake gypsum bandage - into 21.30/o and traction/extension - into 17.20/o.

V. M. Belogorodskiy in first half of war with the White Finns conducted treatment, putting to use mainly the abducent splint of the system of the Moscow institute of traumatology and orthopedics (MOITOP); whereas into second half of war it it changed to lightened type offtake gypsum bandage (according to V. G. Weinstein). V. M. Belogorodskiy considered that the best method of the treatment of the bullet breaks of shoulder is the use/application of a deaf gypsum bandage, but sometimes should be used abducent splint.

L. Ye. Rukhsan during war with the White Finns of 51 cases of the bullet break of shoulder applied the gypsum splint of Turner in 28 cases, the offtake gypsum bandage - into 19, splint MOITOP - in 2 cases. It arrived at the conclusion that under conditions of hospital

the offtake gypsum bandage is the basic method of treatment. Cross and oblique breaks with the shift, in his opinion, are subject to treatment with the use/application of an abducent splint.

V. G. Baynshteyn (1940) according to the experiment/experience of the treatment of 283 casualties with the bullet break of shoulder arrived at the conclusion that the best method of immobilization is the gypsum bandage under the condition of changing the bearing/angle of removal/diversion according to the special features/peculiarities of each case. He proposed the lightened gypsum bandage, after replacing large corset with small with the additional stop/emphasis by the iliac bone.

According to literature data, within the time of the Great Patriotic War the preceding experiment/experience of the treatment of the bullet breaks of shoulder was considerably supplemented and deepened.

F. R. Bogdanov (1942), in detail dismantling a question about the use/application of a deaf gypsum bandage with all bullet breaks, considered that with the breaks of shoulder the application of the deaf offtake gypsum dressing must be produced as a rule, and skeletal/skeleton traction/extension - as exclusion. In this case he indicated that the reposition of broken ends via skeletal/skeleton

traction/extension was possible not only in the early period, but also 1 1/2-2 months after wound; in the appropriate cases was possible also stage correction. To avoid the protrusion of tissues from the wound when it cannot be managed without fenestrated or bridge bandage, it is necessary to use "gypsum covers/tegmina". F. R. Bogdanov noted also that with the application of deaf gypsum dressing with the bullet break of shoulder is necessary the early release of elbow joint - is not later than the 30th day, but sometimes - 45th day, and march/passage to longette demountable bandage only with the offensive of consolidation, i.e., to earlier than the 50th day.

The author focused attention on the vast value of the skillful combination of a strict immobilization with the early functional treatment and underscored that prolonged presence of casualty in the transport splint, which impedes the use/application of therapeutic gymnastics, is inadmissible.

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F. R. Bogdanov recommended the following position/situation of upper extremity in the gypsum bandage: depending on the level of the break the extremity must be diverted from the body to the side on 45-75°, and toward the front from the front line - on 30°; elbow joint must be located at an angle of 90°, and forearm - on the



average between supination and pronation position; hand must be raised above the level of elbow joint, fingers/pins were free; so that it would be possible to lead the thumb, the edge of hand with respect to the I mesopodial bone; also it must be free.

Ye. V. Smirnov (1942), observing casualties under conditions of the stable defense of Sevastopol, noted that of 90 cases of the bullet break of shoulder early application of deaf gypsum dressing gave a significant descent in the temperature, up to the normal, through the days - in 2 cases, through 5 days - into 13, through 10 days - in one and through 15 days - in 6 cases.

Under the same conditions with the deaf chlorogypsum bandage the temperature was lowered in two of 14 casualties through days, in 12 casualties - through 5 days.

I. Ye. Kazakevich (82 cases), Ye. V. Usol'tseva (64 cases) and other surgeons of Leningrad (1943) on the basis of their experiment/experience arrived at the conclusion that with the bullet breaks of shoulder use/application of the deaf offtake gypsum bandage in the majority of the cases gave good results. Contraindications to the application of dressing was the significant shift of broken ends and early periods after wound.

D. P. Fedorovich (1944) after the secondary surgical processing of 122 casualties, who entered with the transport splints, replaced splints by the deaf offtake hypc-cwl by bandage.

M. I. Panov (1945) it presented the compound annual report of the group of evacuation hospitals, from which it is evident that in essence during the treatment of the bullet breaks of shoulder was used offtake gypsum bandage (80.4c/c); gypsum cast was applied into 7.80/o, and the offtake splint with adhesive traction/extension - into 1.80/o. Indication to the latter served the shift of broken ends along the length; with the angular displacement was necessary preliminary reposition by hand; in the heavy general condition it was conducted into several performances, by the so-called stage order/formation. Extremity was not fixed/recorded in 10.00/o of casualties. The complications of osteomyelitis are noted into 52.00/o of cases, dummy joints - into 8.60/o. Clinically into 13.00/o is established/installed full/total/complete recovery.

Almost all authors arrived at the conclusion that during the treatment of the breaks of shoulder in the rear it is necessary to extensively use offtake deaf gypsum bandage. With the significant shift of broken ends should be used the traction/extension, while with some lighter means of damage to shoulder bone - gypsum casts.

The large material of the deepened development of the histories of disease/illness makes it possible to in detail illuminate all sides of a question about the treatment of casualties with the bullet break of shoulder during the period of the Great Patriotic War on the basis of worthy statistical data.

From a number of those treated of deep gypsum bandage the deep rear reached 88.60/o; in the front line area finished treatment 9.50/o, also, in the preceding early stages - 1.90/o.

Of all casualties with the bullet break of shoulder finished treatment in the evacuation hospitals of deep rear 84.30/o, i.e., from every 7 casualties with the break of shoulder 6 they finished treatment in the rear, and one in the preceding stage.

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Table 103 gives the data about the distribution of the casualties, who finished treatment in different stages of evacuation, depending on the form/species of the break of shoulder bone.

From given data it follows that in casualties with the break of shoulder bone, that finished treatment in the preceding stages, considerably predominated the simple forms/species of breaks, which

do not require prolonged treatment; in this case should be considered the fact that also among these casualties were encountered serious complications and lethal outcomes.

Is given below the information about the casualties, who finished treatment in the rear evacuation hospitals. If we compare these information with the materials, which concern all casualties with the break of the shoulder (they are given, on pg. 73, 218, 239, 250, etc.), then the essential difference between these groups of casualties it is not noticeable.

Wounds according to the type of the wounding weaponry were distributed as follows: 57.00/o of bullet wounds and 43.00/o of fragmentation ones, moreover among the fragmentation ones the first place occupied wounds by the fragments of mines.

According to the character/nature of the wound: blind were 18.20/o, through - 74.80/o, disengagements and crushings - 5.20/o, tangential wounds - 1.80/o; the wounds, which penetrated the joint, it was 9.60/o, and wounds with the foreign bodies - 28.00/o. Consequently, with the bullet breaks of shoulder predominated bullet and perforating wounds. In 37.00/o breaks of shoulder they were combined with other wounds, including into 0.30/o - with the penetrating wounds of skull, into 0.90/o - with the wounds of breast,

into 0.10/o - with the wounds of stomach.

Casualties with the break of shoulder, that finished treatment in the rear, were distributed on the years of war as follows: the first year - 20.20/o, the second year - 23.60/o, the third year - 30.10/o and the fourth year - 26.10/o, 71.50/o of casualties with the break of shoulder, that finished treatment in the rear, they underwent in the preceding stages primary surgical processing.

The data about the distribution of casualties according to the periods of production in the primary surgical processing in the preceding stages are given in Table 104.

Table 103. Distribution of the casualties, who finished treatment in the rear and in other stages, depending on the form/species of the break of shoulder bone (in the percentages).

(2) Группа раненых	(1) Вид перелома	(3) Дырчатый и краевой	(4) Поперечный, продольный и косой	(5) Крупный и мелкооскольчатый	(6) Раздробленный	(7) Всего
(8) Окончившие лечение в тылу . . . . .		10,0	17,9	52,3	19,8	100,0
(9) Окончившие лечение на предыдущих этапах . . . . .		26,2	15,0	39,9	18,9	100,0

Key: (1). Form/species of break. (2). Group of casualties. (3). Perforated and edge/boundary. (4). Cross, longitudinal and by sand bar. (5). Major (small-splintered). (6). Crushed. (7). In all. (8). ended treatment in rear. (9). Finishing treatment in preceding stages.

Table 104. Distribution of casualties with the the bullet fracture of shoulder according to the periods of production in the primary surgical processing (in the percentages).

(2) до 6 часов	(1) Первые сутки			(5) Позже 24 часа	(6) Всего
	(3) от 7 до 12 часов	(4) от 13 до 24 часов	(7) без уточнения часа		
20,5	22,7	18,2	15,3	25,3	100,0

Key: (1). First day. (2). to 6 hours. (3). from to hours. (4). without refinement of hour. (5). It is later than 24 hours (6). In all.

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According to the character/nature surgical interventions were distributed as follows: splitting up of soft tissues - 46.0o/o, splitting up and carving - 13.2o/o, splitting up and carving with the removal/distance of bone broken ends - 21.2o/o, with the removal/distance of foreign bodies - 5.7o/o, with the dressing of vessels - 2.0o/o, with processing of bone fragments - 0.9o/o, amputation - 9.0o/o and other - 2.0o/o.

On the specific gravity/weight of rear hospitals in the setting of accurate diagnosis in the process of treatment of casualties it is possible to judge according to the data of the X-ray diagnostics: for the first time X-ray examination was carried out in the rear evacuation hospitals into 44.3o/o, in the front line evacuation hospitals - into 39.8o/o, on DMF and in the army evacuation hospitals - into 15.9o/o. Thus, the X-ray examination of the bullet breaks of shoulder in the rear evacuation hospitals was used considerably more frequently than in all preceding stages.

The frequency of complications with the bullet breaks of shoulder bone in casualties, who finished treatment in the rear or in the preceding stages, is represented in Table 105, moreover one casualty could have, and in actuality it was, more than one

complication.

Thus, among the complications in the casualties whose further treatment was conducted in the rear, the frequency of shock, anaerobic infection and sepsis in 2, 2 1/2 is and of 4 times less than in casualties, who were being treated in the preceding stages. This is explained by the fact that the unit of these casualties with extra-heavy clinical course died in the early stages.

All remaining complications in casualties, who continued treatment in the rear, are encountered more frequently, since casualties with such complications the majority of the cases needed prolonged treatment, for which then they directed into the rear. Even suppurative arthrites with the breaks of shoulder rarely flowed/occurred/lasted severely, and the majority of casualties with this complication achieved the deep rear.

The high frequency of pneumonia in casualties, who finished treatment in the rear, can be explained by the fact that in the unit of the casualties with the protracted suppurative process the resistivity of organism was lowered, which could contribute to the development of this complication.



Table 105. Frequency of the complications of the bullet breaks of shoulder bone in casualties, who finished treatment in the rear and in other stages (in the percentages).

(2) Осложнения	(1) Закончили лечение	(3) В войсковом, армейском и фронтовом районе	(4) В тыловом районе
(5) Шок		4,3	2,3
(6) Обильное гноеобразование в ране		5,1	20,8
(7) Анаэробная инфекция		10,4	4,1
(8) Гнойный артрит		0,1	0,6
(9) Сепсис		2,4	0,6
(10) Острый остеомиелит		1,0	7,2
(11) Вяло текущий остеомиелит		18,7	35,5
(12) Флегмона и гнойные затеки		1,7	8,8
(13) Контрактура и ограничение движений		48,9	71,3
(14) Воспаление легких		0,2	0,6
		19,7	42,7

Key: (1). They finished treatment. (2). Complication. (3). In army, army and front line area. (4). In service area. (5). Shock. (6). Abundant festering in wound. (7). Anaerobic infection. (8). Suppurative arthritis. (9). Sepsis. (10). Acute osteomyelitis. (11). Limply flowing osteomyelitis. (12). Phlegmon and suppurative flows. (13). Contracture and limitation of movements. (14) Pneumonia.

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The treatment of the bullet breaks in the rear in essence pursued the following purposes: 1) the general/common/total strengthening of the forces of organism and the elevation of its resistivity; 2) the fixation of broken ends in the correct position

before the education of the callus, and in the case of necessity and before the repeated reposition; 3) struggle with the onset of infection and its consequences; 4) the fast reduction of functions, prophylaxis of the limitations of movements and contractures and their treatment.

The first three purposes were the same as and in all preceding stages, the struggle with osteomyelitis as with the most frequent complication in the rear coming forward to the foreground. However, last goal could be achieved mainly in the rear.

Therapeutic process with bullet breaks of shoulder on the stages of the deep rear consisted of the immobilization of extremity, surgical interventions, conservative treatment - medicinal/medicamentous, physical therapy, the transfusion of blood and complex of measures for the functional therapy, massage and labor therapy. The forms/species of the immobilization, which was being used with the breaks of shoulder in the rear evacuation hospitals, are represented in Table 106.

The form/species of immobilization was not established/installed or the immobilization of extremity was not conducted in 8.60/o of all casualties with the break of shoulder, who finished treatment in the rear. The basic method of therapeutic immobilization with the breaks

of shoulder in the rear was the deaf gypsum bandage which was applied in 2, all cases. If we to this add even and fenestrated gypsum bandage, then circular gypsum bandage on the whole was applied into 69.20/o. Almost in third of all cases of immobilization was used gypsum splint. To the remaining forms/species of immobilization, including to the traction/extension, falls very insignificant fraction/portion. In contrast to the closed breaks the bullet breaks of shoulder were more rarely escorted/tracked by the shift of broken ends; these it is explained an insignificant number of readings/indications to the traction/extension.

Based on materials of deepened development of the histories of disease/illness it is evident that the gypsum bandage in the rear evacuation hospitals almost always was laid in the form of the offtake bandage, which ensures the reliable fixation of broken ends with average-physiological position of extremity.

Is of significant interest a change in the character/nature of therapeutic immobilization with the breaks of shoulder during the Great Patriotic War (Table 107), independent of the stage of the end of treatment.

If we summarize all varieties/subspecies of deaf gypsum bandage, then it will seem that during the first year of war the deaf gypsum bandage was applied into 43.50/o, in the second year - into 61.50/o, in the third year - into 70.10/o and in the fourth year - into 82.40/o.

Table 106. Distribution of casualties with the bullet break of shoulder, that finished treatment in rear evacuation hospitals, according to the form/species of immobilization (in the percentages).

(1) Гипсовая или другая шина	(2) Глухая гипсовая повязка..			(4) Окончатая гипсовая повязка	(7) Вытяже- ние	(8) Прочие виды иммо- билизации	(9) Всего
	(3) с про- кладкой	(4) без про- кладки	(5) неизвест- но				
29,1	10,0	13,3	44,3	1,6	0,7	1,0	100,0

Key: (1). Gypsum or other splint. (2). Deaf gypsum bandage. (3). with gasket. (4). without gasket. (5). unknown. (6). Fenestrated gypsum bandage. (7). Traction/extension. (8). Other forms/species of immobilization. (9). In all.

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But if we here add the data, that concern fenestrated gypsum bandage, and to speak about the circular gypsum bandage in the broad sense, then its use/application will be expressed with respect to the years of war in the percentages: 47.1, 63.8, 70.9 and 83.0. Thus, the method of deaf gypsum bandage, being prevailing, in the treatment of the bullet breaks of shoulder gradually was used increasingly wider and it is wider, after achieving maximum in last year of war; whereas skeletal/skeleton traction/extension played in the treatment of the bullet breaks of shoulder insignificant role.

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Bond between the form/species of the break and the character/nature of the use/application of therapeutic immobilization is reflected in Table 108.

Table 107. Distribution of casualties with the bullet break of shoulder according to the years of war and the character/nature of therapeutic immobilization (in the percentages).

(4) Год войны	(1) Характер иммобилизации	(2) Гипсовый или др. гипс шиня	(3) Глухая гипсовая повязка			(8) Окончатая гипсовая повязка	(9) Прочие виды фиксации	(10) Скелетное вытяжение	(11) Среднее вытяжение в сочетании с гипсовой повязкой	(12) Всего
			(5) с прокладкой	(6) без прокладки	(7) не указано с прокладкой или без нее					
(13) Первый		47,7	9,7	6,0	27,8	3,6	2,9	1,2	1,1	100,0
(14) Второй		34,9	11,0	9,8	40,7	2,3	1,0	0,1	0,2	100,0
(15) Третий		28,2	9,0	15,0	46,1	0,8	0,9	—	—	100,0
(16) Четвертый		16,2	9,1	20,0	53,3	0,6	0,7	—	0,1	100,0
(17) В среднем		30,9	9,6	13,1	42,8	1,6	1,3	0,3	0,4	100,0

Key: (1). Character/nature of immobilization. (2). Gypsum or scolding splint. (3). Deaf gypsum bandage. (4). Year of war. (5). with lining. (6). without gasket. (7). it is not indicated, with gasket or without it. (8). Fenestrated gypsum bandage. (9). Other forms/species of fixation. (10). Skeletal/skeleton traction/extension. (11). Skeletal/skeleton traction/extension in combination with gypsum bandages. (12). In all. (13). The first. (14). The second. (15). The third. (16). The fourth. (17). On the average.

Table 108. Distribution of casualties with the bullet break of shoulder according to the form/species of break and the character/nature of therapeutic immobilization (in the percentages).

(2) Вид перелома	(1) Характер ле- чебной иммо- билизации	(3) Гип- совая или дру- гая лента	(4) Глухая и окон- чатая гипсовая повязка	(5) Вытя- же- ние	(6) Вытяже- ние в со- четании гипсо- вой по- вязкой	(7) Прочие виды иммо- билиза- ции	(8) Всего	(9) Вид им- моби- зации не указан
(10) Дырчатый . . . . .		44,7	51,3	—	—	4,0	100,0	17,4
(11) Поперечный и про- дольный . . . . .		16,1	82,3	0,5	0,5	0,6	100,0	1,1
(12) Косой . . . . .		27,9	69,5	0,2	0,2	2,2	100,0	1,2
(13) Раздробленный . . . . .		31,5	64,5	—	—	4,0	100,0	27,9
(14) Крупно-, мелкоско- льчатый и вколо- ченный . . . . .		23,7	74,2	0,4	0,5	1,2	100,0	0,9
(15) Краевой . . . . .		56,6	39,9	—	—	3,5	100,0	14,3
(16) В среднем . . . . .		30,9	67,1	0,3	0,4	1,3	100,0	8,6

Key: (1). Character/nature of therapeutic immobilization. (2). Form/species of break. (3). Gypsum or other splint. (4). Deaf and fenestrated gypsum bandage. (5). Traction/extension. (6). Traction in combination with gypsum bandage. (7). Other forms/species of immobilization. (8). In all. (9). Form/species of immobilization is not indicated. (10). Perforated. (11). Cross and longitudinal. (12). By sand bar. (13). Crushed. (14). Large/coarse, small-splintered and packed in. (15). Edge/boundary. (16). On the average.

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If we accept the strength of group "Deaf and fenestrated gypsum bandage" for one hundred, then this group will be distributed as follows; deaf gypsum bandage with the gasket - 14.4; deaf gypsum bandage without the gasket - 19.6; are not indicated, with the gasket

or without it - 63.6; fenestrated gypsum bandage - 2.4.

Data of Table 108 relate to the bullet breaks of shoulder without taking into account the latter/last stage of treatment. However, taking into account the fact that 84.30/o of all casualties with the break of shoulder finished treatment in the rear evacuation hospitals, it is possible with the known correction to consider data of table as illustration to the studied question. From them it follows that:

1) in all forms of breaks, except edge/boundary ones, predominates deaf gypsum bandage, especially with the cross and longitudinal breaks, and then by way of gradual decrease with the large/coarse and small-splintered and packed in, oblique, crushed and perforated breaks;

2) the use/application of a deaf gypsum bandage with the simple forms/species of break without the shift of broken ends is explained by the fact that with the localization of the break of shoulder into 30.80/o in upper third and on 37.90/o in average third application of the offtake dressing was preventive measure against the education of the bringing contracture in the shoulder joint;

3) the use/application of a gypsum splint with the crushed



breaks is explained by the fact that with these breaks in a number of cases was noted the very heavy clinical course, which required continuous observation of the wound;

4) traction/extension and traction/extension in combination with the gypsum bandage was used in all into 0.70/o of all established/installed forms/species of immobilization, mainly with the cross ones and the longitudinal ones, and also with comminuted fractures.

Gypsum bandage they relieved one time in 19.20/o of cases, two times - in 6.50/o, three times - in 2.10/o, four times - into 0.90/o, more than four time - into 25.30/o and did not relieve at all - into 44.00/o; furthermore, into 0.70/o wound it was controlled through the window, but into 1.30/o wound it was treated through the window. Consequently, deaf gypsum bandage was changed more than in half of the cases.

The shift/relief of gypsum bandage was produced during weakening of its fixing properties or with its soaking as a result of abundant suppurative discharge; with the high temperature and the suspicion to the suppurative flows of the bandage were cut out the windows. The basic reason for the shift/relief of gypsum bandage were the frequent complications of osteomyelitis and the need for surgical intervention

in regard to this.

One should add that with entrance into the rear evacuation hospitals simultaneously with the additional processing of wound sometimes it was necessary to relieve gypsum bandage for the health and hygiene reasons.

Volume and character/nature of surgical interventions with the bullet breaks of shoulder are given in Table 109.

It is operated casualties in the therapeutic installations of army and army area 11.50/o, in the front line hospitals - 10.50/o and in the rear ones - 37.20/o.

The character/nature of surgical interventions in the deep rear substantially was changed: more than 2 times it was increased a number of sequestrectomies, achieving 70.90/o, while in the front line area they they composed only 33.10/o.

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On the frequency of use/application in the rear evacuation hospitals of the surgical treatment of the bullet breaks of shoulder, complicated by osteomyelitis, it is possible indirectly to judge

according to the data of the author's development of the histories of the disease/illness of the breaks of shoulder, treated by deaf gypsum bandage, independent of the latter/last stage of treatment. According to these materials, 71.0c/o, all casualties with osteomyelitis of shoulder it underwent surgical treatment.

In the rear hospitals considerably was increased the group of other operations/processes and re-amputations and sharply was decreased the group of the amputations which, naturally, predominated in the preceding stages in connection with the priority development of severe complications. Together with this, such means of operation/process as processing bone fragments, comprising 8.2o/o of all operations/processes in the front line area, in the rear it occupied more modest place - only 1.8o/o, and the autopsy of suppurative flows and phlegmons and in the rear composes 4.1 against 21.1o/o in the front line area.

One should consider that latter/last interventions were produced in the unit of the cases together with the operations/processes with osteomyelitis and therefore separately were not recorded.

It is necessary to emphasize that late interventions in these cases were further Rubtsovs' reason changes in the soft tissues and development on this basis of contractures. Summing up the results, it

is possible to say that a quantity of the repeatedly operated casualties in the rear was 3 1/2 times more than in the front line area.

Among the therapeutic measures, which were being used in casualties, who finished treatment in the rear, the conservative methods of treatment occupied very significant place.

Table 109. Distribution of casualties with the bullet break of the shoulder of finished treatment in the deep rear, according to the means surgical interventions (eliminating primary surgical treatment) and the area of their production (in percent).

(2) Оперативное вмешатель- ство	(1) Этап эвакуации	(3) Войско- вой и армян- ской район	(4) Фронтно- вой район	(5) Тыловое район
(6) Ревизия раны . . . . .		17,9	5,3	0,7
(7) Удаление костных осколков и ино- родных тел . . . . .		16,4	17,1	5,2
(8) Обработка фрагментов кости . . . . .		5,8	8,2	1,8
(9) Открытие гнойных затеков и флег- монов . . . . .		24,2	21,1	4,1
(10) Перевязка кровоточащих сосу- дов . . . . .		3,6	2,6	0,1
(11) Ампутация или экзартикуля- ция . . . . .		25,6	6,0	0,5
(12) Реампутация . . . . .		—	0,8	1,9
(13) Секвестрэктомия . . . . .		1,9	27,1	58,7
(14) Секвестрэктомия в сочетании с дру- гими операциями . . . . .		0,7	6,0	12,2
(15) Прочие операции . . . . .		3,9	5,8	14,8
	(16) Итого . . . . .	100,0	100,0	100,0
	(17) Операций произведено не было	88,5	89,5	62,8

Key: (1). Stage of evacuation. (3). Army and army area. (4). Front line area. (5). Service area. (6). Examination of wound. (7). Removal/distance of bone fragments and foreign bodies. (8). Processing fragments bone. (9). Autopsy of suppurative flows and phlegmons. (10). Dressing of bleeding vessels. (11). Amputation or exarticulation. (12). Re-amputation. (13). Sequestrectomy. (14). Sequestrectomy in combination with others to operations/processes. (15). Other operations/processes. (16). Altogether. (17).

(m).

Operations/processes it was not produced.

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Thus, one medicinal/medicamentous treatment alone - into 12.00/o, medicinal/medicamentous treatment and therapeutic gymnastics - into 28.00/o, medicinal/medicamentous treatment, therapeutic gymnastics and physiotherapy - into 51.30/c, other combinations of medicinal/medicamentous treatment and physical methods - into 5.60/o, only physiotherapy and therapeutic gymnastics - into 3.10/o.

With the treatment of casualties with the severe infectious complication, and also the casualties with a sharp reduction in the tone and with the delayed consolidation high value had a blood transfusion, and into the unit of the cases and intravenous transfusion of blood-replacement solutions.

By casualty, who finished treatment in the rear, the blood transfusion was produced into 22.00/o. One was produced in the following stages: on DMP - into 14.80/o, in PFG - 14.80/o, in the evacuation hospitals of army - 11.00/o, in the evacuation hospitals of front - 12.60/o, in GLB - 1.00/o, in the evacuation hospitals of the rear - 25.40/o, in several stages - 20.40/o.

Averting limitation of movements and contractures to a considerable degree depended on the promptness of functional therapy, and with the superimposed deaf gypsum bandage - from the period of its removal/taking. In the rear evacuation hospitals with the offensive of consolidation the joints were freed/released gradually, first of all elbow joint with the fixation by its additional splint for the earliest possible start in it. This procedure leans on the observations, which showed that with the prolonged deaf gypsum bandage significant difficulty of movement is developed in the elbow joint faster than in other large/coarse joints of upper extremity.

The immobilization of shoulder joint in the offtake gypsum bandage in an average-physiological position/situation of extremity completely satisfactorily is transferred more prolonged period. Its subsequent contracture is nonpersistent and is easily inferior to treatment.

To the fastest reduction of function with the breaks of shoulder, besides the enumerated methods of physiotherapy, contributed mud cure, peat cure, balneotherapy and insolation. In this respect was widely developed the initiative of rear evacuation hospitals on the utilization of local resources/lifetimes and is widely set therapeutic exercise (82.40/0).

Ergotherapy as the powerful/thick factor, which facilitates the general/common/total strengthening of the organism of casualty and the fastest development of the voluse of movements and force in the wounded hand, equal with other forms/species of the therapeutic exercise, was appointed in the form of the different forms/species of the metered work in workshop hospitals, in the vegetable-gardens and the fields, in the scaffolding/forest and i.e. This form/species of treatment casualties used especially willingly, since the very process of treatment was very interesting.

On the results of the treatment of the breaks of shoulder in the rear evacuation hospitals it is possible to judge by the periods of the education of the callus, the complications and the clinical outcomes.

	Срок консолидации (1)	%
(а) До 1 1/2 месяцев . . . . .		16.3
2 месяца (2) . . . . .		27.2
2 1/2 " . . . . .		22.2
3 " . . . . .		13.9
4 " . . . . .		11.0
5 месяцев (4) . . . . .		4.6
(б) 6 месяцев и позднее . . . . .		2.7
(в) Срок неизвестен . . . . .		2.1

(7) Итого . . . 100.0

(8) В 5.9% костная мозоль не образовалась.

Key: (1). Period of consolidation. (2). To 1 1/2 months. (3). month. (4). months. (5). months and late. (6). Period is unknown. (7). Altogether. (8). In 5.9% callus was not formed.



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Consequently, within the optimal periods, not later than 2 months, the callus was formed into 43.50/o of cases, i.e., almost in half of casualties. If we recall that it is more than in 40.00/o of all casualties with the bullet break of shoulder, who finished treatment in the rear, there was a complication of osteomyelitis, then becomes clear the reason for the delayed consolidation in casualties with the periods of the education of corn of later than 2 months, namely a reduction in the regenerative capability of bone tissue as a result of the infection.

If we consider the preponderance of the heavy forms of the break of the shoulder of the casualties, who were being treated in the rear (large/coarse, fine(ly)-fragmented and crushed breaks on the whole composed 72.1% and to elongate the optimal periods of consolidation to 2 1/2 months, then the education of the callus within the optimal periods will be noted into 65.7c/o of cases.

In what measure the therapeutic measures contributed to the

success of reduction processes with the bullet breaks of the arm, it is possible to judge according to the final results, independent of the latter/last stage of treatment (table 110).

Thus, with the breaks, treated in the gypsum splint, it is obtained good outcomes almost two times more than during the treatment in by deaf hypo-cwltc bandage, but amputations and lethal outcomes with the deaf gypsum bandage it was noted less than with the gypsum splint (amputation almost 20 times, and lethality 6 times). This, however, it is explained by the fact that the gypsum splint was used both with the simpler breaks, which logically give the best results, and with the very compound heavy fractures, fraught with the most serious complications with which often they avoided to lay deaf gypsum bandage, giving for the purpose of the best observation of the wound and the inflammatory process preference to splint.

Thus, the bond of clinical outcomes with the form/species of therapeutic immobilization was only indirect, since outcomes depended on the form/species of break and severity of the advanced complications.

The character/nature of the used immobilization in the dependence on the form/species of the break is shown in table 111, from which evident that among the casualties for treatment of whom it

was used splint, was almost three times more than the incomplete breaks (perforated and edge/boundary) and more than 1 1/2 times of more than the breaks whose character/nature, apparently in connection with the heavy damages, which served as the reason for rapid death of casualty or amputation of extremity, even was not noted in the history of disease/illness; at the same time, among the cases which were noted as breaks, there was a significant number of light damages to bones apropos of which was not produced even x-ray examinations and the wide operational of intervention.

Table 110. Distribution of casualties with the bullet break of shoulder according to the clinical outcomes in connection with the character/nature of therapeutic immobilization (in the percentages).

Лечебная (13) иммобилизация	Клинические исходы										
	(2) Хороши	(3) Деформация	(4) Повреждение нервов	(5) Контрактура	(6) Анкилоз	(7) Ломный сустав	(8) Культи	(9) Прочие и неизвестные исходы	(10) Остеомиелит	(11) Комбинация исходов	(12) Всего
(14) Гипсовая или другая шина	21,8	0,3	15,2	32,1	3,0	2,0	9,8	2,9	7,7	5,2	100,0
(15) Глухая гипсовая и окончатая повязка	13,6	0,4	15,9	41,5	4,5	6,0	0,5	1,8	9,0	6,8	100,0

Key: (1). Clinical outcomes. (2). Good. (3). Deformation. (4). Damage of nerves. (5). Contracture. (6). Ankylosis. (7). Dummy joint. (8). Stump. (9). Other and unknown outcomes. (10). Osteomyelitis. (11). Combination of outcomes. (12). In all. (13). Therapeutic immobilization. (14). Gypsum or other splint. (15). Deaf gypsum and fenestrated bandage.

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Among the casualties, treated by deaf gypsum bandage, were observed in essence the comminuted and linear fractures, which were being less frequently escorted/tracked by severe complications.

On clinical course undoubtedly had an effect the series/number

of the facts, connected with the special features/peculiarities of wound, with the shown/rendered first aid and the subsequent treatment. Very high value took the character/nature and the form of wound, form/species and level of break, period and the character/nature of rendering to first aid and use/application of transport immobilization, period and the volume of the primary surgical processing of bullet wound, the procedure of the subsequent treatment, the general condition before the wound, age, the reaction of casualty it is direct to the damage and for the subsequent treatment.

The special feature/peculiarity of the bullet breaks of shoulder was the retention/preservation/maintaining statics, which allowed for many of these casualties, in spite of extensive sometimes damage, independently to be moved. In terms of this the obtained wounds upper extremities sharply differed from casualties into the lower extremity, that lost capability for locomotion even during the less serious damages. The retention/preservation/maintaining the capability to walk had a positive effect on the psyche/psychics of casualties, sharply secreting them among the horizontal/lying ones, is frequently morally suppressed by its helplessness.

In a number of cases the clinical course of the bullet breaks of shoulder in principle differed little from the fact that was observed

in the cases of the closed break: the small, little contaminated wound, the uncomplicated form of break and insignificant blood loss were not escorted/tracked by shock. The general condition of casualty little suffered: temperature remained subfebrile for several days, and then came to the norm; pains with a good immobilization disappeared; the process of the healing of wound and intergrowth of break proceeded smoothly, and in 2 1/2-3 months attacked/advanced full/total/complete recovery.

Table 112. Distribution of casualties according to the form/species of the bullet break of shoulder in the dependence on the therapeutic immobilization (in the percentages).

(10) Вид перелома Характер иммобилизации	(2) Дырчатый	(3) Продольный и поперечный	(4) Косой	(5) Раздробленный	(6) Оскольчатый	(7) Краевой	(8) Легкие непрон- зненные переломы, от- меченные как переломы	(9) Всего
(11) Гипсовая (или дру- гая) шина . . . . .	2,5	2,3	10,2	13,1	34,6	12,1	25,2	100,0
(12) Глухая гипсовая по- вязка . . . . .	1,3	5,2	11,7	12,4	50,0	1,0	15,4	100,0

Key: (1). Form/species of break. (2). Perforated. (3). Longitudinal and cross. (4). By sand bar. (5). Crushed. (6). Fragmented. (7). Edge/boundary. (8). Light damages bones, noted as breaks. (9). In all. (10). Character/nature of immobilization. (11). Gypsum (or other) splint. (12). Deaf gypsum bandage.

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By the example, which clearly illustrates the smooth clinical course of the bullet break of shoulder, cured in the limits of front, can serve the following observation.

P., 24 years, obtained the perforating bullet wound of left shoulder on the middle third with damage of bone. First aid is

shown/rendered by aidman for the first hour after wound.

At PMP 2 hours after wound is superimposed the splint. On DMP is produced the operation/process - splitting up of entrance and exit hole. Is superimposed for the purpose of immobilizations wire splint, and casualty is evacuated.

In KhPPG of interarmy base PEP the casualty arrived on the 3rd day after wound in good of conditions, with the normal temperature and the smooth course of wound. In the X-ray photograph is discovered the full/total/complete crushing of the diaphysis of shoulder bone in its middle third to the multiple fragments, arranged/located by series/number with each other in the form of spindle.

Upon the inspection/examination the shoulder is moderately increased, painfully during the palpation; pathological mobility in middle third, on the anteroexternal and posterior surface pure/clean, with the even edges of wound by the size/dimension 5x6 cm. Is superimposed the deaf offtake gypsum bandage. Good course with the normal temperature. Casualty was not evacuated from the hospital beyond the limits of PEP.

3 1/2 Weeks after the application of the gypsum immobilizing dressing the casualty itself requested to remove/take it, declaring,



that it is healthy. Patient produced with left hand free motion fully. Upon the inspection/examination is established/installed the full/total/complete consolidation of break. 5 Weeks after wound the casualty was discharged into the unit.

To characteristic and account for the work experience of front line and rear evacuation hospitals on the treatment of casualties with the bullet break of shoulder is of interest the study of the procedure of the treatment of the wounds, which flowed/occurred/lasted without the complications and the associated diseases. These group composed with respect to all casualties with the break of shoulder 4.20/o. Casualties with the breaks of shoulder without the complications finished treatment in rear evacuation hospitals in 2/3 of cases, in the front line evacuation hospitals - into 1/5 and in a small number of cases - in the preceding stages. In the rear the uncomplicated breaks composed 3.20/o of all breaks of shoulder.

The bullet perforating wounds of arm in this group were encountered into 75.00/o. According to the forms/species of break they were distributed as follows: perforated - 8.10/o, edge/boundary - 21.40/o, cross and longitudinal - 2.70/o, by sand bar - 18.10/o, crushed - 6.80/o and fragmented - 42.90/o.

First aid into 56.20/o was shown/rendered to the discharge of hour into 71.40/o - to the discharge of 6 hours, into 77.70/o - during the first day.

In 48.80/o was produced primary surgical processing moreover in the first twenty-four hours 83.6c/c (to 6 hours - 13.20/o, from 7 to 24 hours - 70.40/o), into the second day it is later - 16.40/o.

During the primary surgical processing splitting up was produced into 55.10/o, carving - into 9.20/o, splitting up and carving with the removal/distance of foreign bodies - into 12.20/o, with the removal/distance of bone broken ends - into 15.30/o, the character/nature of processing was not indicated into 8.20/o.

The shortages of primary surgical processing can be judged from the cases, that required of subsequent surgical interventions which were undertaken into 11.3c/o and it consisted of the examination of wound - into 21.70/o, the removal/distance of bone broken ends and foreign bodies - into 43.50/o (of them half in the deep rear) and other operations/processes - into 34.80/o (everyone in the deep rear). X-ray examination was carried out in 75.0%.

Hence it is possible to make following conclusions.

1. First aid to this group of casualties, who finished treatment in deep rear, predominantly proved to be within early periods that it contributed to favorable further course.

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2. Significant quantity (50.30/o) of simple forms/species of breaks (perforated, edge/boundary, cross, longitudinal and oblique), and also preponderance of perforating bullet wounds allowed it will apply primary surgical processing only into 48.80/o of all cases, and subsequent operations/prcesses - into 11.30/c.

The callus was formed in the majority of casualties (77.00/o) within the optimal periods - to 2 months. With the uncomplicated breaks of shoulder there were the following clinical outcomes: a good functional and anatomical result was noted into 85.60/o, deformation - into 2.10/o of contracture and the significant limitations of movements - into 7.20/o other pathological phenomena, not connected with the break of shoulder, into 5.10/o.

The high percentage of good results (85.6) during the uncomplicated course is explained by a comparatively rare development of infection in these cases, which is conditioned on the smaller severity of damage, on prophylaxis and procedure of treatment in the

stages of evacuation.

The course of the bullet breaks of shoulder characterize also the data, which concern the complications, which appear in casualties, independent of the latter/last stage of treatment.

Most frequent of the complications were festering, osteomyelitis, contracture.

As the illustration of this course of the bullet break of shoulder can serve the following observation.

K., 30 years, was wounded 14.1 1943. At PMP is set the diagnosis: the fragmentation blind-end wound of upper third of left shoulder; is superimposed bandage and wire splint and is introduced antitetanus serum.

After 8 hours at DMP was set the diagnosis of the bullet break of shoulder and under the local anesthesia is produced splitting up of wound. Wound is powdered by streptocide. Is superimposed bandage and wire splint. In the satisfactory general condition the casualty is evacuated to GLR, where he arrived 15/I. The general condition of casualty was satisfactory, temperature normal. Pulse of 76 strikes/shocks per minute. From the side of the thoracic and

abdominal area of deflections from the norm it was not noted. On the external surface in upper third of left shoulder is a split wound by the size/dimension 10x5 cm, pure/clean with the even edges. In the muscles wound canal goes towards bone. Are determined the crepitation of bone during the palpation, sickliness with the palpation and the load along the axis of shoulder.

25/I 1943 casualty was evacuated into army EG, where during the x-ray examination were discovered bone fragments and metallic foreign bodies by the size/dimension 2x1.5 cm and 1x0.5 cm.

Research of the blood: Hb 71c/o, eras. 4390000, Z 9200; e. 10/o, p. 80/o, s. 610/o, lymph. 220/o, mon. 80/o, colored indicator 0.8; ROE 20 mm an hour.

31/I 1943 is produced secondary surgical processing. After the intravenous introduction 2 cm<sup>3</sup> 10/o of solution of morphine of edge the wounds are diluted by small hooks, and of its depth they are removed two metallic and one bone fragment. To the wound is superimposed the bandage with the fish oil; extremity is fixed/recorded with drain closed gypsum thoracobrachial bandage.

2/II casualty is converted into another evacuation hospital. No complaints were produced, from the side of the internal

organs/controls of no deflections from the norm it is discovered. On roentgenogram is discovered a comminuted fracture of upper third of shoulder with a good standing of broken ends and several fine/small metallic fragments in the wound area.

22/III casualty arrived in the rear hospital in the offtake bandage after removal/taking of which was discovered the wound by the size/dimension 3x1.2 cm; in the center of wound is determined the fistula with suppurative discharge. Movements in the elbow and radiocarpal joint full/total/complete: in the shoulder joint the removal/diversion of shoulder to the bearing/angle in 50°. The intergrowth of break is full/total/complete.

6/IV under the local anesthesia is produced scraping out by the sharp/acute spoon of fistula course and the removal/distance of several fine/small bone sequestrations.

25/V, in view of the presence of the unhealing fistula, is produced repeated operation/process apropos of osteomyelitis. Under the local anesthesia is removed large sequestration and several fine/small ones.

19/VII casualty is directed toward the commission with the diagnosis: chronic osteomyelitis after the bullet break of shoulder bone, fistula with moderate suppurative discharge, moderate limitation of movements in the shoulder joint.

In the given case 8 hours after wound at DMP was produced primary processing in the form of splitting up of wound. This processing, undertaken for the purpose of preventing the development of anaerobic infection, 17 days after wound was produced reworking of wound - removal/distance under the morphine of two metallic ones and one bone fragment; however, this intervention it was insufficient, since, in spite of smooth course, wounds continued to be festered.

Produced through 3 and 4 1/2 months after wound two surgical interventions in the form of scraping out and removal/distance of the sequestrations also not of the distance of result, since the scraping out of fistulas, as showed the experiment/experience of the Great Patriotic War, with chronic bullet osteomyelitis did not give effect and usually was required more expanded surgical intervention.

The periods of the education of the callus in connection with the complications were the following: in casualties with the festering the callus on the average was formed in 2.6 months, in casualties with osteomyelitis - in 2.7 months, in casualties with the

contracture or the significant limitation of movements - in 2.2 months.

Clinical outcomes with the same complications are represented in table 112.

From given data we see that infection and especially osteomyelitis they decreased the percentage of good functional and anatomical results.

Infection in the significant majority of the cases contributed to the development of ankylosis, dummy joint, osteomyelitis and to the loss of extremity.

By the illustration of the ordinary course of the bullet break of shoulder during the treatment as its gypsum bandage can serve the following observation.

B. is wounded 14/I 1944. After 5 hours at PMP is set the diagnosis: the perforating bullet wound of middle third of left shoulder with the damage of bone; is superimposed aseptic bandage, is produced immobilization by the splint of Cramer and are introduced 3000 units of antitetanus serum.



15/I 2 hours 30 minutes at DFF diagnosis was confirmed; is produced splitting up of entrance and outlet, was superimposed aseptic bandage and splint.

16/I casualty entered KhPPG, where there was the confirmed good condition of bandage and position/situation of splint. Casualty in a good condition. From the side of the internal organs/controls of there are no deflections from the norm.

Table 112. Clinical outcomes of the bullet breaks of arm, which flowed/occurred/lasted with the complications (in the percentages).

(10) Осложнения	(1) Клинические исходы	(2) Хороший функциональ- ный и анатомиче- ский резуль- тат	(3) Кон- трак- тура	(4) Анки- лоз	(5) Лож- ный сустав	(6) Куль- тя	(7) Остео- миелит	(8) Про- чие	(9) Итого
(11) Нагноение в мягких тка- нях . . . . .	10,2	35,8	7,7	6,3	3,4	11,9	24,7	100,0	
(12) Остеомиелит . . . . .	7,8	33,2	6,0	6,3	0,9	19,4	26,4	100,0	
(13) Контрактура . . . . .	12,0	50,0	3,5	2,3	0,1	8,7	23,4	100,0	

Key: (1). Clinical outcomes. (2). Good functional and anatomical result. (3). Contracture. (4). Ankylosis. (5). Dummy joint. (6). Stump. (7). Osteomyelitis. (8). Other. (9). Altogether. (10). Complications. (11). Festering in soft tissues. (12). Osteomyelitis. (13). Contracture.

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18/I casualty arrived in SEG, where it was established/installed the swelling of left shoulder and forearm, two split wounds in middle and lower third of shoulder by the size/dimension 10x3 cm by suppurative separated and the break in lower third of shoulder. Is superimposed bandage with the hypertonic solution and gypsum cast to entire upper extremity.

25/I casualty in a good condition and with the normal temperature entered into the evacuation hospital where was superimposed the deaf offtake gypsum bandage.

31/I casualty is delivered into the rear evacuation hospital in the satisfactory condition, with the well superimposed offtake deaf gypsum bandage. Are noted pains in the wound and absence of extensor movements in the fingers of left hand. To patient is assigned the therapeutic exercise of the first period for the left hand.

C 8/11 on 12/II temperature was increased to 38.6-39°, which made it necessary to remove/take bandage and to inspect wound. It is covered with succulent granulation. Separable abundant, suppurative character/nature. The flows of pus is not discovered. Is again superimposed deaf gypsum bandage.

Subsequently followed smooth course, and 28/III casualty was converted into the evacuation hospital on the place of residence. After the removal/taking of gypsum bandage is discovered: the consolidation of break, on the external and internal surface of shoulder two granulating wounds by the size/dimension 8x2 cm each. From the fistula aperture in the center of external wound is secreted pus. In the X-ray photograph is discovered a comminuted fracture in lower third of left shoulder bone with the correct standing of broken

ends. Internal organs/controls without the deflections from the norm.

The research of neuropathologist confirmed the damage of left radiation/radial nerve. To casualty are assigned physiotherapy, active and passive gymnastics.

20/IV 1944 casualty is represented to the commission with the healed wounds, the completely gotten stronger callus, full/total/complete paralysis of the extensors of left hand and limitation of movements in the elbow joint in the limits: flexing - to 90° and straightening - by 125°.

During the analyses of the urine and blood for the time of the treatment of pathological changes never it is discovered.

In the given observation of the bullet break of shoulder from middle third was an associated damage of radiation/radial nerve, which subsequently determined the outcome of wound, after causing the violation of the extensor movements of hand. The damage of radiation/radial nerve, however, was not reflected in the process of educating the callus, which was formed within the common for the breaks of shoulder period - 2 1/2 months, since the violation of the integrity of nerve usually is observed at the level of break, but bone in the region of break obtains innervation from undamaged/uninjured that arranged/located above the sector of nerve.

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Chapter II.

BULLET BREAKS OF THE BONES OF FOREARM.

Characteristic of anatomical changes with the bullet breaks of the bones of forearm.

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General/common/total characteristic.

The bullet breaks of the bones of forearm composed 54.20/o of all wounds of forearm and they are distributed following by mode (table 113).

According to the character of the wounding shell all wounds of forearm with the damage of bones are divided into two groups: bullet and fragmentation; the first composed 68.30/o, the second - 31.70/o.

Somewhat different relationships/ratios were observed with the

wound of the individual bones of forearm and both together. Thus, the bullet bullet breaks of radiaticn/radial bone composed 72.50/o, and fragmentation - 27.50/o, the ulna: bullet - 71.10/o, and fragmentation - 28.90/o. Simultaneous break of both bones as a result of the wound by bullet was observed into 50.80/o, and as a result of wound by fragment - into 49.20/c.

Thus, the breaks of the individual bones of forearm were most frequently the result of bullet wounds, and simultaneous breaks of both bones - equally frequently both bullet and fragmentation. The data about the distribution of the individual forms/species of break with the bullet and fragmentation wounds are given in table 114, from which it is evident that with the bullet wounds more frequently were observed the large-splintered breaks, and those crushed - are more frequent with the fragmentation ones.

Table 113. Distribution of the bullet breaks of the bones of forearm according to the form/species of break (in the percentages).

(12) Наименова- ние кости	(11) Вид перелома	(2) Круп- ноос- коль- чатый	(3) Мел- ноос- коль- чатый	(4) Крае- вой	(5) Кос- вой	(6) Раз- дроб- лен- ный	(7) Дыр- чатый	(8) Попе- реч- ный	(9) Про- доль- ный	(10) Вмо- щен- ный	(11) Всего
(13) Лучевая (42,1%)		43,8	13,2	13,7	11,6	9,6	3,9	3,0	1,1	0,1	100,0
(14) Локтевая (39,8%)		45,0	15,3	11,1	10,6	11,1	2,9	3,2	0,6	0,2	100,0
(15) Осекости (18,1%)		40,9	12,9	2,1	5,4	34,2	1,3	2,8	0,2	0,2	100,0
(16) В среднем		43,6	14,0	10,9	10,0	14,8	2,7	3,1	0,7	0,2	100,0

Key: (1). Form/species of break. (2). Large-splintered. (3). Small-splintered. (4). Edge/boundary. (5). By sand bar. (6). Comminuted. (7). Perforated. (8). Cross. (9). Longitudinal. (10). Impacted. (11). In all. (12). Designation of bone. (13). Radiation/radial. (14). Cubital. (15). Both bones. (16). On the average.

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The frequency of the break of the bones of forearm and the form/species of break were found in direct dependence on the character of wound. The bullet breaks of the bones of forearm in the overwhelming majority of the cases were the result of perforating wounds.

The individual forms/species of the breaks of the bones of forearms were observed dissimilarly frequently in the groups of blind-end, perforating and tangential wounds (table 115).

Thus, independent of the character/nature of wound, most frequently were observed large-splintered breaks and most rarely - those packed in.

The distribution of the breaks of the bones of forearms according to the level of wound was following: upper third - 19.70/o, average - 35.90/o, lower - 41.50/o, two thirds - 2.90/o; whereas the frequency of the wounds, which penetrate into the joint, was the following: upper third - 11.40/o, average - 0.20/o, lower - 13.00/o two thirds - 8.30/o, on the average - 7.90/o.

Before passing to the characteristic of the surgical anatomy of the individual forms/species of the bullet breaks of the bones of forearms, is necessary briefly to be stopped at some anatomical data, that are of practical use.



Table 114. Distribution of the bullet and fragmentation wounds of forearm according to the form/species of the breaks of its bones (in the percentages).

(1) Вид ранения (4) Вид перелома	(2) Пулевой (68,3%)	(3) Осколочный (31,7%)
(5) Крупнооскольчатый	46,0	38,4
(6) Мелкооскольчатый	15,1	11,5
(7) Краевой . . . . .	11,4	9,9
(8) Косой . . . . .	10,2	9,6
(9) Раздробленный . . . . .	9,9	24,4
(10) Дырчатый . . . . .	3,3	2,5
(11) Поперечный . . . . .	3,2	2,8
(12) Продольный . . . . .	0,8	0,6
(13) Вколоченный . . . . .	0,1	0,3
(14) Всего . . . . .	100,0	100,0

Key: (1). Means of wound. (2). Bullet. (3). Fragmentation. (4). Form/species of break. (5). Large-splintered. (6). Small-splintered. (7). Edge/boundary. (8). Oblique. (9). Crushed. (10). Perforating. (11). Cross. (12). Longitudinal. (13). Packed in. (14). In all.

Table 115. Distribution of casualties with the bullet break of the bones of forearm according to the character/nature of wound in the form/species of break (in the percentages).

(1) Вид перелома (12) Характер ранения	(2) Крупнооскольчатый	(3) Мелкооскольчатый	(4) Краевой	(5) Косой	(6) Раздробленный	(7) Дырчатый	(8) Поперечный	(9) Продольный	(10) Вмороженный	(11) Всего
(13) Сквозное (84,4%)	45,6	14,7	10,4	10,0	12,5	2,8	3,2	0,7	0,1	100,0
(14) Слепое (10,6%)	41,3	11,4	15,7	11,7	9,5	6,4	2,6	1,1	0,3	100,0
(15) Касательное (2,3%)	32,4	15,2	18,6	12,4	17,9	1,4	2,1	—	—	100,0

Key: (1). Form/species of break. (2). Large-splintered. (3). Small-splintered. (4). Edge/boundary. (5). Oblique. (6). Comminuted. (7). Perforated. (8). Cross. (9). Longitudinal. (10). Packed in. (11). In all. (12). Character of wound. (13). Through. (14). Blind. (15). Tangent.

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Building/structure of forearm is different depending on the level of segment. Thus, in upper third of bone of forearm, besides the posterior department of the ulna, they are surrounded almost from all sides usually by the well developed muscles whose volume in middle third is decreased, and in lower third of muscle they change into the tendons. Basic nerves and vessels in upper third are

arranged/located in the thickness of soft tissues, and at lower third they lie/rest between the individual tendons more superficially and it is nearer to the bones of forearm. Muscles and passing here vessels and nerves are included in the individual bone-fascial spaces (Fig. 97).

On the forearm are distinguished three basic fascial beds - are front/more leading, external and posterior. The form of each of them corresponds to the general configuration of forearm. Front/leading fascial space is divided by a deep dense fascial plate and deep. In the surface department are included the surface flexors of hand and fingers/pins. Furthermore, here passes the radiation/radial artery, which to the limits of middle third is escorted/tracked by radiation/radial nerve. A deep department of fascial space in which are included deep flexors of fingers/pins, m. pronator teres and below m. pronator quadratus, is isolated from the posterior bed by the interosseal membrane/diaphragm on which pass front/leading interosseal vessels. In the same bed is found median nerve, ulnar nerve, ulnar artery and its escorting/tracking veins.

External bed includes mainly m. brachioradialis i. m. extensor carpi radialis longus et brevis.

In the posterior muscular bed are arranged/located the extensors

of hand and fingers/pins.

The described fascial spaces define as topography of hematomas as well as the localization of purulent flows.

Most important in a practical sense is the musculofascial slit which

is arranged/located in the deep section of front/leading fascial space between the interosseal membrane/diaphragm and deep flexors.

The second muscular-fascial slit is located between deep flexors of fingers/pins and deep plate of its own fascia, which divides front/leading fascial space into two departments.

On the basis of given data, it is possible to establish/install the following places of the possible accumulations of the blood and pus: 1) external fascial bed; 2) the surface department of the bed of the flexors: a) between a deep plate of fascia and deep flexors and b) between deep flexors and interosseal membrane/diaphragm; 3) within the limits of posterior muscular bed.

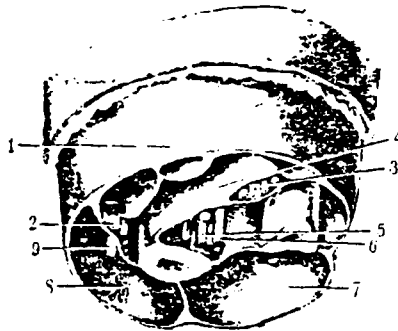


Fig. 97. Fascial spaces of middle third of right forearm. 1 - surface department of front/leading fascial space; 2 - radiation/radial artery and its escorting/tracking veins; 3 - ulnar artery, nerve and vein; 4 - deep department of front/leading fascial space; 5 - interosseal vessels; 6 - median nerve; 7 - fascial space of the rear of forearm, posterior to gunstock; 8 - external bed of forearm; 9 - radiation/radial nerve; surface branch.

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Large-splintered, small-splintered and crushed breaks.

From given in table 113 data it is evident that the large-splintered, small-splintered and crushed breaks of radiation/radial bone comprised among other forms/species of the break of this bone 66.60/o, ulna - 71.40/o and breaks of both bones -

88.00/o.

If we in this case consider that most frequently the wounds, which were being escorted/tracked by the multifragment break of the bones of forearm, it was through and bullet, then it is possible to visualize the important practical value of this group of breaks.

If we examine the described forms/species of the breaks in the dependence on the level of the damage of forearm, then it appears that in the different departments they were encountered not equally not frequently. Thus, the large-splintered breaks in middle third were observed into 48.30/o, in lower third - into 38.30/o, in upper third - into 45.30/o and with the break two third - into 48.30/o; the crushed breaks in middle third were observed into 13.30/o, in lower third they composed 13.90/o, in upper third - 17.00/o with the wound of two thirds by 23.30/o; small-splintered breaks were observed in middle third into 14.80/o, composing in lower third 15.20/o, in upper third - 10.60/o, with the wound two third - 8.50/o.

Thus, of the described forms/species of break only small-splintered more rarely were observed in upper third of forearm, but such breaks more frequently were observed in lower third, which depended on the special features/peculiarities of the anatomical building/structure of the bones of forearm.

Wound canals. The given above topographic relationships/ratios of the individual forms/species of the tissues of forearm determined the character/nature of wound canal and the degree of the damage of bones and their surrounding soft tissues.

The complexity of structuring the wound canals, defined both by the decomposition of bone, and by the degree of the damage of soft tissues, was closely related to the level of the damage of forearm.

With the wounds in upper third to a considerable extent suffered muscles, somewhat less in middle third; in lower third muscular tissue in building/structure of wound canal did not have great practical value.

Perforating wounds. Among the perforating wounds the breaks of the bones of forearm were encountered very frequently, the large-splintered breaks composing 45.60/o, small-splintered - 14.70/o and those crushed - 12.50/o.

Thus, 72.80/o of all breaks with the perforating wounds they were escorted/tracked by the more or less significant decomposition of bones and, consequently, also soft tissues.

But if we consider that the wounds of forearm in the overwhelming majority were through and it is more frequent bullet, then it is possible to visualize and the degree of the decomposition of soft tissues, which was different depending on damage level.

The topography of the wound of the individual elements/cells of the tissues of forearm is determined by the direction of the wounding shell and by the plane, in which occurred the wound. It is possible to distinguish wounds sagittal and frontal. The picture of wound canals with the sagittal wounds is distinguished depending on whether does pierce the wounding shell the forearm from the front back or from back to front and it does damage it one or both bones.

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With posterior-front sagittal wounds (Fig. 98) the unit of the wound canal to the place of break during the damages to radiation/radial bone occurs through the insignificant layer of the soft tissues the degree of decomposition of which is determined mainly by size/dimension and form of shells.

In the zone of wound canal after the place of break strike



interosseal vessels and, depending on damage level, radiation/radial, ulnar and median nerve.

During the damages to the ulna into the zone of wound canal after the place of break strikes ulnar artery, its veins and ulnar nerve.

With front-posterior sagittal wounds in upper third of forearm the damages of soft tissues in the department of wound canal to the place of break can be insignificant, but nevertheless is very probable the damage of individual nerves and vessels. However, in the zone of wound canal after the place of break are destroyed mainly the muscles, fascias and skin, the degree of their decomposition depending on the degree of the violation of the integrity of bone (bones).

With the frontal wounds in upper third both in outward-internal and with internal-external usually suffer mainly only interosseal arteries and interosseal nerves, since the basic nerves and the vessels, which supply forearm and hand, pass usually out of the zone of decomposition (Fig. 98).

Topography the wounds of the individual forms/species of soft tissues, that is determining general/common/total structure and form

of wound canal, in middle third of forearm is shown in Fig. 99.

With the sagittal posterior-front wounds with the damage to the ulna strikes into the zone of wound canal after the place of break entire ulnar neurovascular bundle, while with the wound of radiation/radial bone - interosseal vessels and median nerve.

In front-posterior direction of the wounding shell the probability of damage of individual basic vessels and nerves it is insignificant, since they are within the limits of wound canal to the place of the break where the decomposition of soft tissues is usually small.

In the unit of the wound canal after the place of break strike mainly the muscles of posterior bed. With the frontal wounds both external-internal and inward-external in middle third of forearm (Fig. 99), into the zone of wound canal after the place of break strikes radiation/radial nerve, the artery and vein; with these means of wounds, as a rule, suffer also interosseal vessels and nerves.

With the sagittal and frontal wounds in the region of lower third of forearm, as a result of the surface and relatively close to the bones disposition of basic vessels and nerves, the possibility of their damage to a considerable degree increases/grows.

With the sagittal posterior-front wounds of the ulna into the zone of wound canal after the place of break strike cubital vessels, while with sagittal wounds of radiation/radial bone - radiation/radial artery and its escorting/tracking veins.

In front-posterior direction of the wounding shell cubital and radiation/radial vessels are located in the department of wound canal to the place of break. That unit of the wound canal, which is located beyond the place of break, is extremely short, and into its zone strike mainly the tendons of extensors.

With the frontal wounds when are damaged both bones, in outward-internal and inward- external direction of wound canal suffer mainly tendons. The section of wound canal to the place of break and after it is very short; into the zone of decomposition strikes median nerve, interosseal vessels, and also a ulnaris and a radialis (Fig. 100).

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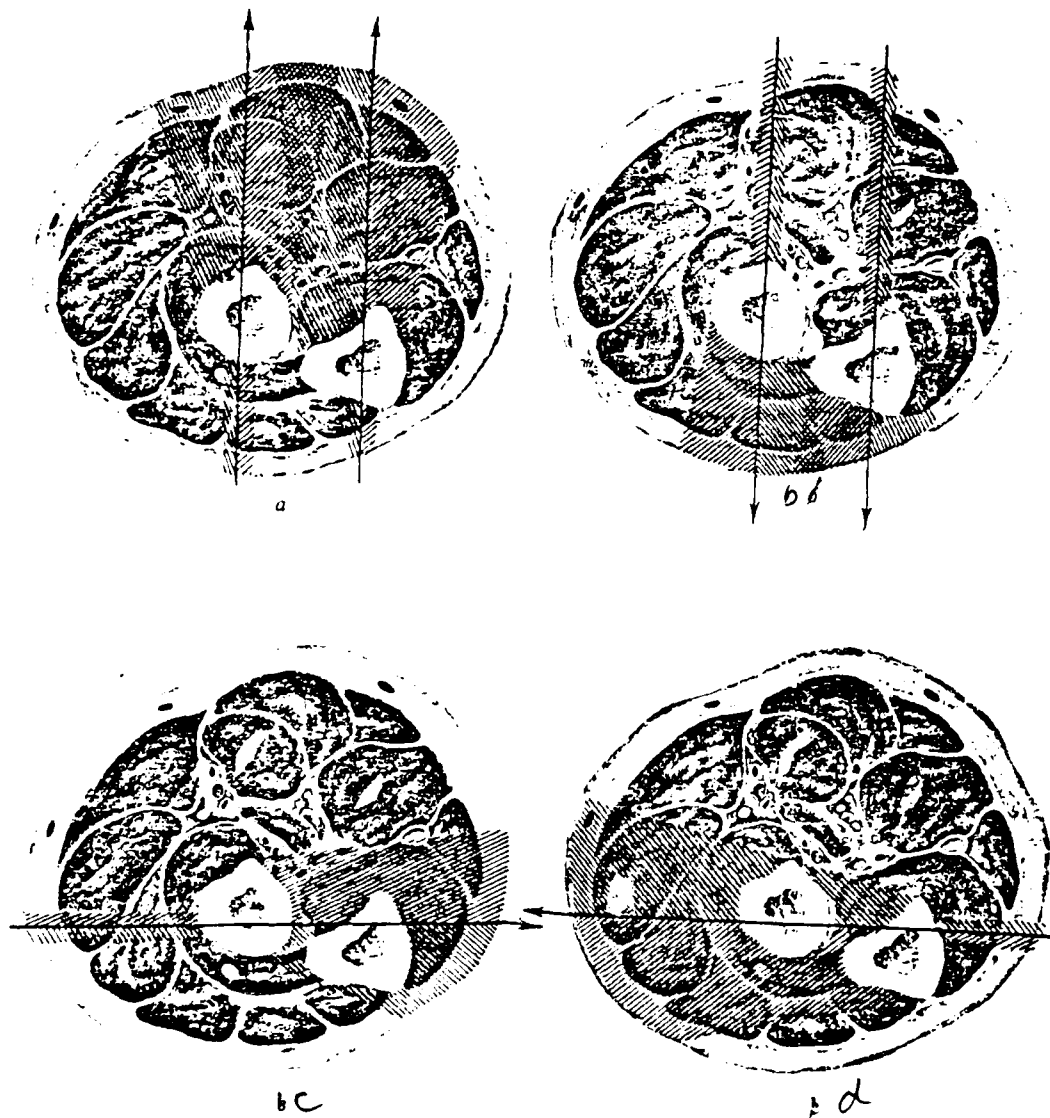


Fig. 98. Topography of damages of soft tissues of forearm with perforating frontal and sagittal wounds of upper third of forearm. a)

the zone of the damage of soft tissues with the sagittal posterior-front wounds of radiation/radial and ulna; b) the zone of the damage of soft tissues with the sagittal front- posterior wounds of radiation/radial and ulna; c) to the zone of the damage of soft tissues with the frontal outward-internal wounds; d) the zone of the damage of soft tissues with the frontal internal-external wounds.

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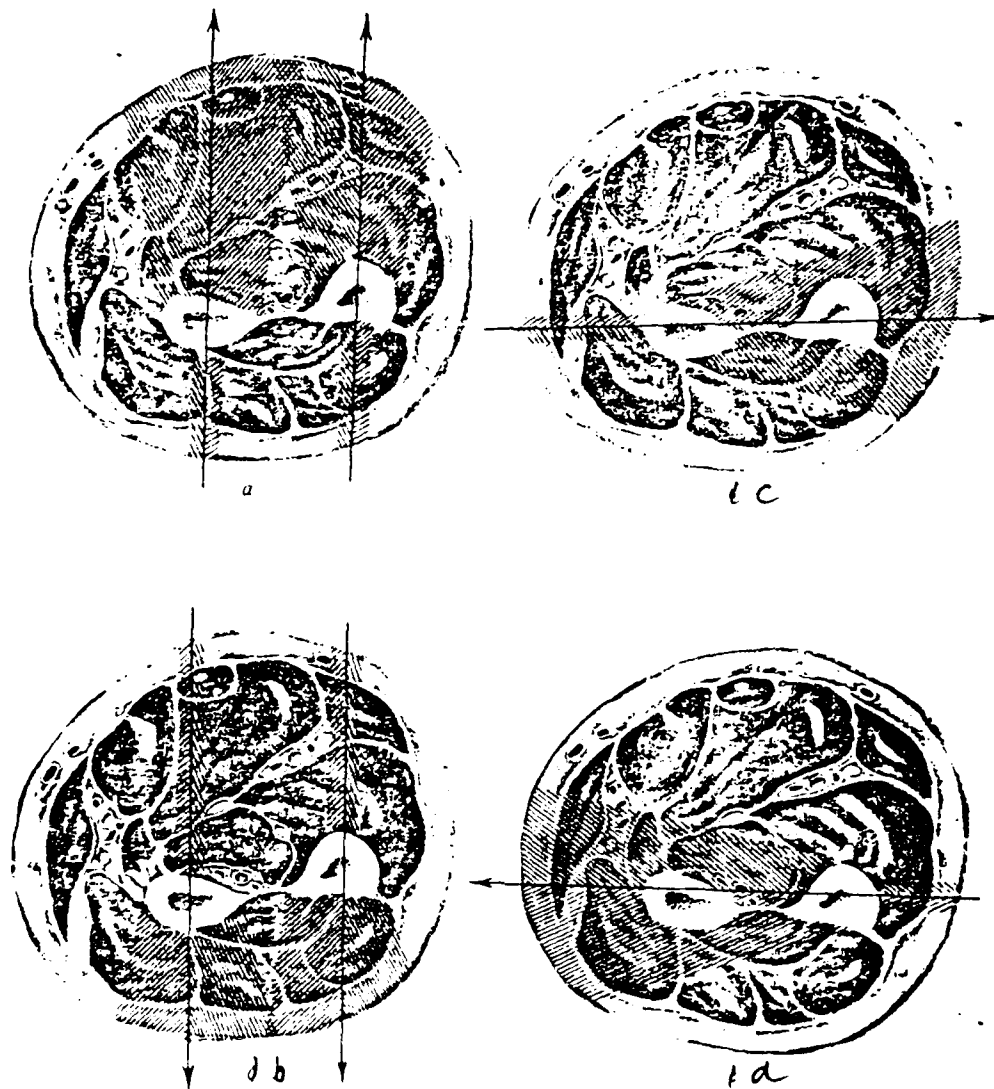


Fig. 99. Topography of damages of soft tissues of forearm with its perforating frontal and sagittal wounds on middle third. a) the zone

of the damage of soft tissues with the perforating sagittal posterior-front wounds; b) the zone of the damage of soft tissues with the perforating sagittal front-posterior wounds; c) the zone of the damage of soft tissues with the frontal outward-internal wounds; d) the zone of the damage of soft tissues with the frontal internal-external wounds.

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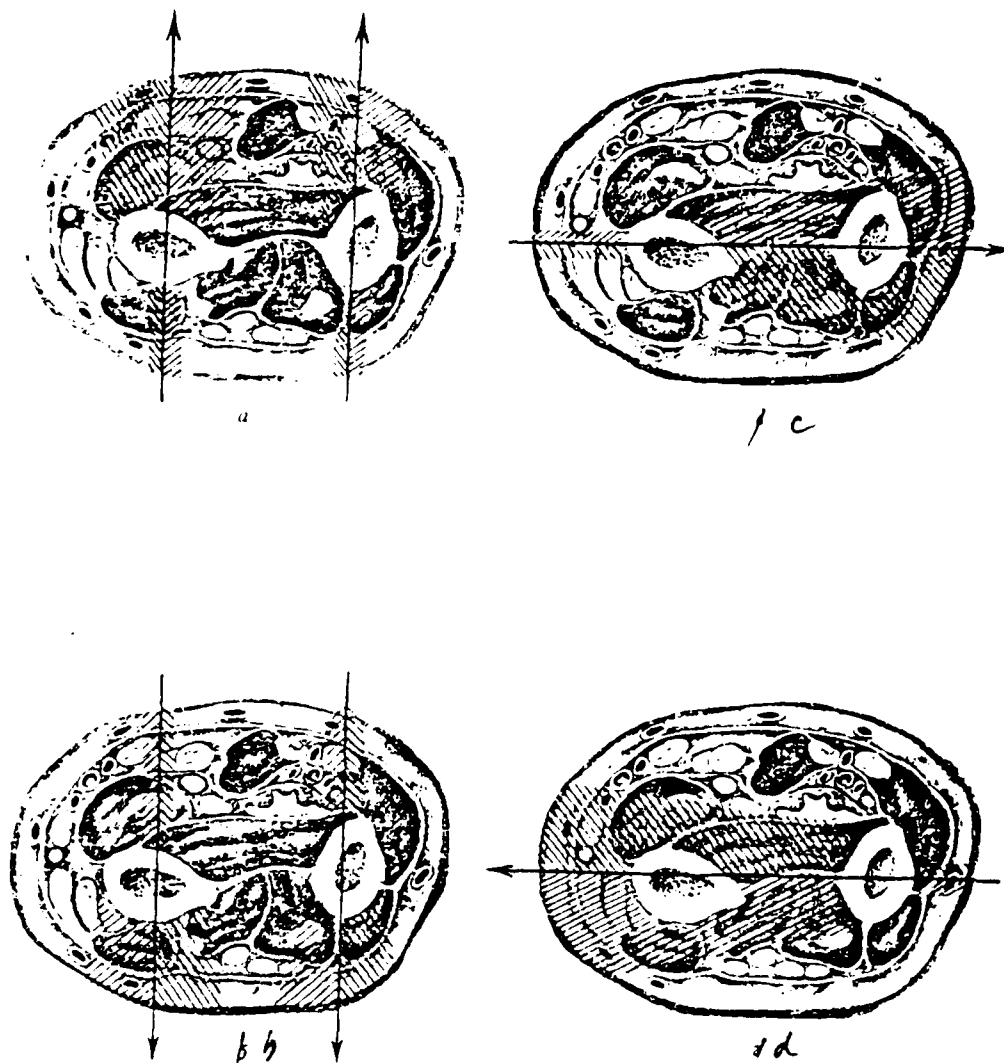


Fig. 100. Topography of damages of soft tissues of forearm with its perforating frontal and sagittal wounds in lower third.

- a) zone of damage to soft tissues with perforating postero anterior wounds of the ulna and radius; b) zone of damage to soft tissues with perforating sagittal postero anterior wounds; c) zone of damage to soft tissues with frontal external-internal wounds; d) zone of damage to soft tissues with frontal internal-external wounds.



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Fig. 101. Crushed break of radius/ulna bone in lower third  
(X-ray photograph from preparation No 1409/248).

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The given above topographic-anatomical characteristic of wound canals is initial scheme, because the degree of the decomposition of bone and the value of the wounding shell, especially with the fragmentation wounds, and also simultaneous bullet breaks of both bones of forearm and multiple wounds considerably complicate the common picture of anatomical changes in the described above typical frontal and sagittal wounds.

With the wounds in lower third of forearm the more proximally passes the wounding shell, all the more probable the damage of synovial vaginas which leads to the severe complications, which sharply change clinical picture and subsequent outcomes.

Among the large-splintered breaks of the individual bones of forearm perforating wounds were encountered very frequently.

Thus, from all large-splintered breaks of radius/radial bone perforating wounds composed 88.80%, from the small-splintered breaks of the same bone - 49.10%, and from those crushed - 33.10%. Of all

large-splintered breaks of ulna 86.50/o they were the result of perforating wounds, from the small-splintered ones - 87.90/o, while from those crushed - 90.50/o. From large-fragment breaks of both bones forearms 87.20/o were the result of perforating wounds, from the small-splintered breaks - 87.70/o, and from those crushed - only 49.70/o.

Thus, among crushed breaks of both bones of forearm perforating wounds were encountered considerably less frequent than among other forms/species of breaks.

It is above, with the presentation of the topographic-anatomic possibilities of the wounds of the individual elements/cells of the tissues of forearm, were given the data, which concern building/structure of bullet wound canals.

With the fragmentation perforating wounds the departments of wound canal to the place of break differ from bullet ones in terms of the significant decomposition of soft tissues. In a number of cases the departments of wound canal to the place of break and after it with the fragmentation wounds by the degree of the damage of soft tissues differ little from each other.

As the example of the bullet wound of forearm it is possible to

give the following observation.

Wound 12/VIII 1942. Death 14/VIII 1942. Preparation No 1409/246. Perforating bullet wound of forearm with the break of radiation/radial bone. On the back surface of lower third of forearm of oval form the surgical processed wound by the size/dimension 10x6 cm. The projecting muscles of dark brown color, by places are covered with the thin layer of greyish suppurative raid. From the wound will stand the mass of the bone broken ends of radiation/radial bone. On the internal surface are arranged/located two wounds, also surgical processed. Muscles are bared. Size/dimension of wound 6x4 cm. The surface of wounds by places is covered with greyish suppurative raid. In the X-ray photograph on the course of wound canal are visible the fine/small fragments of bone (Fig. 101).  
Diagnosis: the perforating bullet wound of lower third of forearm with the large-splintered break of radiation/radial bone.

With the fragmentation perforating wounds the degree of the damage of bones to a certain extent depends on that, which of the bones of the first strikes on the route/path of the wounding shell.

In such cases the degree of the crushing of one bone does not correspond to the degree of the crushing of another. As the example it is possible to give the following observation.

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Wound 10/VII 1942. Amputation 12/VII 1942. Preparation No 986/4412.

Perforating fragmentation wound of right forearm with the break of bones. Ischemic gangrene.

Preparation (Fig. 102): on the boundary of middle and lower third of right ulna passes the skew line of break with the uneven edges. The surface of bone in the place of break is covered with fine/small tubercles with the small depressions.

In the region of middle and lower third of diaphysis of right radiation/radial bone is visible extensive defect with 10 free bone fragments. From the place of break will withdraw the longitudinal cracks over the external surface of the proximal and extremal broken ends of the diaphysis of radiation/radial bone. The surface of the latter in the place of break is covered with fine/small tubercles.

The degree of the decomposition of soft tissues, as it was

indicated above, with the fragmentation wounds can achieve significant sizes/dimensions, moreover on the course of wound canal is noted the formation of pockets. Muscles and intermuscular gaps/intervals are stratified. As illustrations we give the following observation.

Wound 13/I 1945. Amputation 1/II 1945. Preparation no 184/1510. Perforating fragmentation wound of left forearm on the boundary of middle and upper third with break of both bones.

On the frontal cut of left forearm is visible break of both its bones; the broken ends of the ulna settle from each other on 1 cm (Fig. 103). Their ends are notched. The broken ends of radiation/radial bone are located one from another at a distance of 2-2.5 cm. Their ends are also notched. Between the ends of the broken ends of bones is visible the defect of the tissues with the size/dimension 6x1 of cm. Defect begins at a distance of 3 cm from the posterior outer surface of forearm. Bone marrow of radiation/radial bone is impregnated with the blood dark red color. Are visible the cracks of the radiation/radial bone which go from the place of break. The muscular tissue, which surrounds the region of break, is pierced by fine/small sockets, poriferous. On an outward-lateral surface there is a wound by the size/dimension 6x1 cm, oval form, with the edges, closely fitted to the muscular

tissue.

In the depth of wound is visible the defect of the soft tissues with the size/dimension 5x1 cm. In the X-ray photograph (Fig. 104) is determined the large-splintered break of radiation/radial and ulna, moreover lower than place of the break of radiation/radial bone is visible its second break at a distance of 5-6 cm from the first.

With the crushed breaks in lower third of forearm, depending on the degree of crushing, was observed the decomposition of radiocarpal joint.

As the example of a similar wound it is possible to give the following observation.

Wound 10/II 1942. Amputation 22/II 1942. Preparation No 679/3066. Perforating bullet wound of lower third of left forearm with the break of radiation/radial bone.

On the surface of the frontal cut of left forearm (Fig. 105) is visible the break of its bones. The proximal broken end of radiation/radial bone has sharp/acute ones of edge. Extremital broken end is completely destroyed. Bone marrow of the broken ends of brown color. On the course of wound canal is visible the defect of soft

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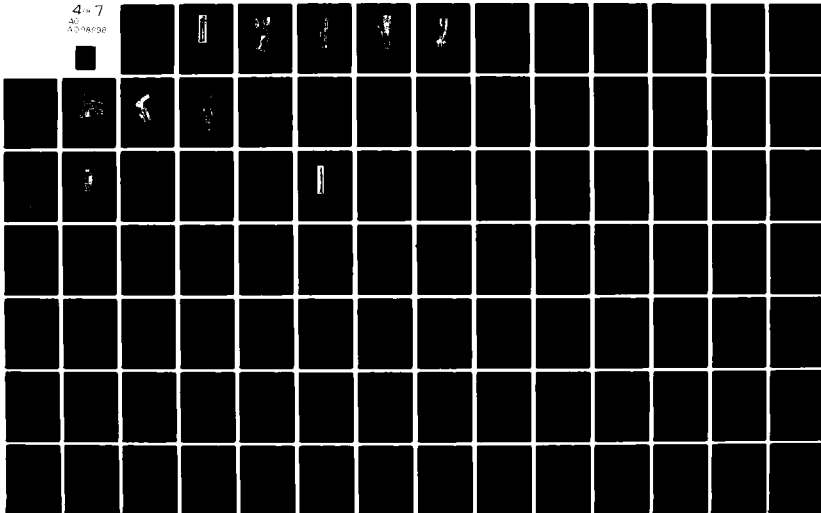
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tissues, on its wall there are sectors of festering and necrosis.

In the X-ray photograph (Fig. 106) is determined the crushing of the extremital department of radiation/radial bone with the violation of the integrity of joint.

The large/coarse and small-splintered breaks in upper third were frequently escorted/tracked by the violation of the integrity of elbow joint.



Fig. 102. Large-splintered break of radiation/radial bone with the oblique break of cubital (preparation No 986/4412).

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Fig. 103. Perforating fragmentation wound of left forearm. Frontal cut. Preparation of VMM No 184/1510. (Artist of V. S. Chumancv).

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Fig. 10<sup>4</sup>. Large-splintered break of bones of left forearm (X-ray photograph from preparation No 184/1510 - is posterior - front/leading projection).

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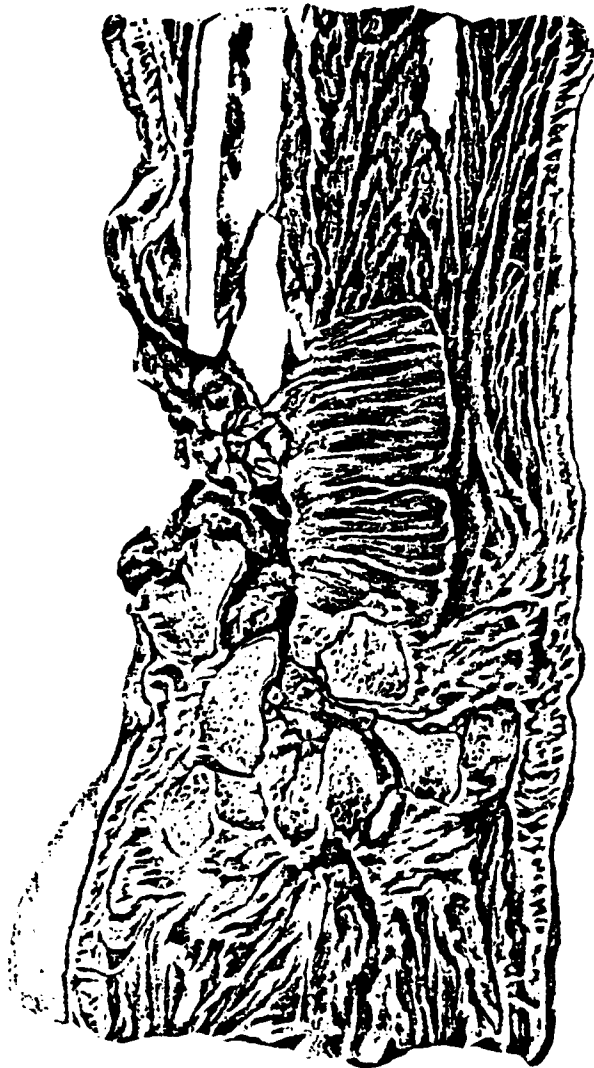


Fig. 105. Frontal cut of left forearm. Crushed break of radius/radial bone. Preparation of VMH No 679/3066. (Artist of V. S. Chumanov).

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Fig. 106. Crushed break of extremity of radius/ulna and bones of wrist (X-ray photograph from preparation No 679/3066).

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Wound 9/II 1942. Death 20/II 1942. Preparation No 674/2391.

Fragmentation wound of right forearm in upper third with break of both bones. Fragmentation wound of shoulder. Perforating bullet wound of right thigh. Comminuted fracture of femoral bone. Fragmentation wound of left shin.

On the sagittal cut in upper third of forearm and right elbow joint (Fig. 107) in this area are visible blood-containing-suppurative masses. The region of pineal systems of both bones of forearm is crushed. Evidently large quantity of fine/small bone broken ends. Wound area on the spot of break by the size/dimension 5x3 cm is satisfied by the fine/small fragments of bones and by suppurative masses. In the X-ray photograph (Fig. 108) crushed break of both bones of forearm.

Blind-end wounds. Among all blind-end wounds the large-splintered breaks of the bones of forearm composed 41.3c/o, small-splintered - 11.4c/o, crushed - 9.5c/o. Thus, more than 60.0c/o of blind-end wounds occupied the described group.

The large-splintered breaks of radius/radial bone with the blind-end wounds composed 40.6c/o, small-splintered breaks - 10.2c/o and those crushed - 9.8c/o.

The large-splintered breaks of the ulna with the blind-end wounds were observed into 39.7c/o, small-splintered - into 11.4o/o and those crushed - into 5.4c/o. Somewhat more frequent with the blind-end wounds were observed large-splintered breaks of both bones (49.4c/o). To the blind-end wounds it fell among all large-splintered breaks of the bones of forearm 10.4o/o, among the small-splintered ones - 8.9c/o and among those crushed - 7.0c/o.

The degree of the decomposition of soft tissues with the blind-end wounds both bullet, and fragmentation, with the wounds in upper third is expressed to the greater degree than in the lower, which depends on the anatomical special features/peculiarities of building/structure of forearm.

However, the decomposition of soft tissues by the fragments of bones is closely related to the degree of their dispersion and, therefore, from the length of wound canal beyond the place of break.

In the overwhelming majority of the cases with the blind-end wounds the wounding shell stopped in the place of the break of bone.

Tangential wounds. With the tangential wounds large-splintered



breaks were observed into 32.40/o, small-splintered - into 15.20/o and crushed - into 17.90/o, therefore, and in this group of wounds the dismantled forms/species of breaks in the frequency comprised more than 60.00/o all breaks. The large-splintered breaks of individual bones with the tangential wounds were encountered more rarely.

Thus, the crushed breaks of radiation/radial bone with these wounds were encountered into 18.70/o, large-splintered - into 23.40/o, and small-splintered - into 14.10/o of cases.

Approximately/exemplarily the same relationships/ratios were observed also with the isolated/insulated breaks of the ulna, only large-splintered breaks was one and a half times more.

The heavy decomposition of the bones of forearm with these forms/species of breaks was escorted/tracked by the formation of the cracks which, penetrating the joint, caused associating wounds arthrites. It is logical that the nearer the wound to the region of joint, the more frequent the joint was drawn in into the process.

With the bullet breaks of forearm in the upper third arthrites were observed into 14.00/o, in lower third - into 7.00/o and in middle third - only into 1.00/o. The frequency of arthrites was also

caused by the form/species of break (table 116).

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The heavy decomposition of soft tissues, which were being observed both with the bullet ones and with the fragmentation wounds of forearm, determined the frequency of the damage of vessels. Thus, with the crushed breaks of the bones of forearm vessels were damaged into 22.80/o, with the large-splintered ones - into 4.60/o and with the small-splintered ones - into 5.30/o.

The damages of nerves were encountered considerably more frequently than the damage of vessels, namely: with the crushed breaks into 44.00/o, with the large-splintered ones - into 30.90/o and with the small-splintered ones - into 32.30/o.

The described above special features/peculiarities of the topography of the nerves of forearm determine the distribution of the cases of their damage depending on the level of break. If we accept all damages of nerves for 100, then to the bullet breaks lower third it is necessary for 39.9 middle thirds - 38.6 upper third - 21.5.

Thus, most of all of the damages of nerves falls to lower third.

The education of hematomas and the lamination of soft tissues contribute to development subsequently of suppurative flows. Thus, with the large-splintered breaks of the ulna suppurative flows were observed into 4.7o/o, and radial - into 4.5o/o.

With the crushed breaks suppurative flows were encountered almost equally frequently during the isolated/insulated damage both to radiation/radial (5.4o/o) and ulna (5.6o/o).

Suppurative flows were observed with the small-splintered breaks of radiation/radial bone into 5.1o/o, and of cubital - into 6.1o/o.

During damage of both bores the frequency of flows with the dismantled forms/species of breaks somewhat was raised, and nominal with large-splintered breaks both bones suppurative flows were observed into 7.3o/o, with the small-splintered ones - into 7.9o/o and with those crushed - into 5.5o/o.

As the example of rotting deep hematoma with the large-splintered break of radiation/radial bone it is possible to give the following observation.

Wound 8/II 1942. Amputation 16/II 1942. Preparation No 185/3244.

Perforating fragmentation wound of left forearm with the break of radiation/radial bone.

On the sagittal cut of left forearm (Fig. 109) is visible the break of radiation/radial bone in middle third. On the spot of the break of 5 bone fragments with the toothed edges.

Adjacent muscles of light brown color, fuzzy, alveolar/cellular building/structure. Over the external surface of forearm extensive torn wound by the size/dimension 22x9 of cm. In the center of wound evidently slit-shaped aperture. Between the broken ends of bones rotting hematoma.

Table 116. Frequency of arthrites with the breaks of the bones of forearm (in the percentages).

(1) Локализация перелома	(2) Вид перелома	(3) Продоль- ный	(4) Косой	(5) Раздроб- ленный	(6) Крупно- осколь- чатый	(7) Мелко- осколь- чатый	(8) Крае- вой
(9) Лучевая кость . . . . .		3,6	—	0,8	0,4	—	0,3
Локтевая » . . . . .		—	0,4	2,4	0,4	0,3	0,4
(10) Обе кости . . . . .		—	—	0,6	0,9	2,2	—
(11) В среднем . . . . .		2,3	0,2	1,1	0,5	0,5	0,3

Key: (1). Localization of break. (2). Form/species of break. (3). Longitudinal. (4). By sand bar. (5). Crushed. (6). Large-splintered. (7). Small-splintered. (8). Edge/boundary. (9). Radiation/radial bone. (10). Both bones. (11). On the average.

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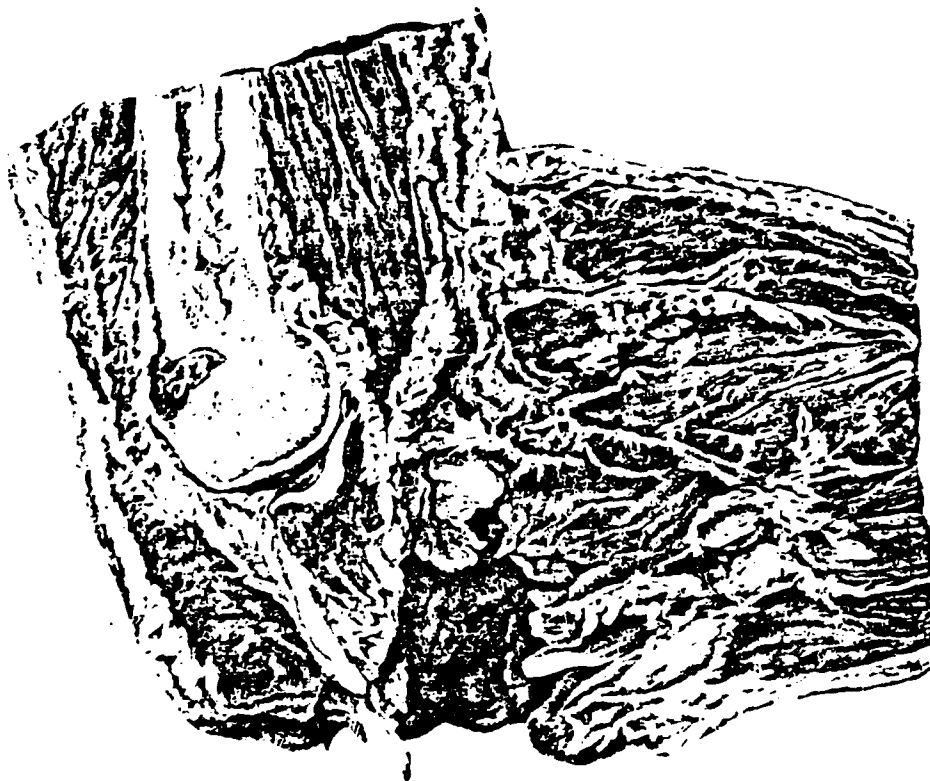


Fig. 107. Crushed break of upper third of forearm. Sagittal cut.  
Preparation VMM No 674/2391. (Artist of V. S. Chumanov).

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Fig. 108. Crushed break of bones of upper third of forearm (X-ray photograph from preparation No 674/2391).

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Fig. 109. Sagittal cut of left forearm. Preparation VMM No 185/3244.  
(Artist of V. S. Chumanov).



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Edge/boundary, cross and perforated breaks.

General/common/total for these forms/species of the break of the bones of forearm is the fact that with them, as a rule, the soft tissues suffered very insignificantly (table 117).

Given data tell about the fact that the breaks of the dismantled group with the bullet wounds were encountered comparatively rarely.

With the bullet ones and with the fragmentation wounds they were encountered with almost same frequency, namely: edge/boundary breaks among the bullet wounds were observed into 11.40/o, and among the fragmentation ones - into 9.90/c, perforated among the bullet ones were observed into 3.3c/c, and among the fragmentation ones - into 2.50/c, cross composed 3.20/o of bullet ones and 2.80/o of fragmentation ones.

In the relation to damage level between the cross and edge/boundary breaks also is much in common (table 118).

In such a manner both cross and edge/boundary breaks they were distributed on third almost equally, moreover to lower third arrived approximately/exemplarily half of all breaks.

Perforated breaks were distributed on third differently from cross and edge/boundary; here, as in other tubular bones, the perforated breaks it was necessary more to those units of the bone where there was a spongy substance.

The picture of wound canals and the relationship/ratio of the individual forms/species of break are changed depending on the character/nature of the wound of fcrears.

Table 117. The specific gravity/weight of the edge/boundary, cross and perforated breaks of the bones of forearm among other forms/species of break (in the percentages).

(1) Локализация перелома	(2) Вид перелома	(3) Крайевой	(4) Поперечный	(5) Дырчатый
(6) Лучевая кость . . . . .		13,7	3,0	3,9
Локтевая . . . . .		11,1	3,2	2,9
(7) Обе кости . . . . .		2,1	2,8	1,3
(8) В среднем . . . . .		10,9	3,1	2,7

Key: (1). Localization of break. (2). Form/species of break. (3). Edge/boundary. (4). Cross. (5). Perforated. (6). Radiation/radial bone. (7). Both bones. (8). On the average.

Table 118. Distribution of some forms/species of the break of the bones of forearm on the level of break (in the percentages).

(1) Уровень перелома по третям	(2) Вид перелома	(3) Поперечный	(4) Крайевой	(5) Дырчатый
(6) Верхняя . . . . .		17,3	19,3	18,5
(7) Средняя . . . . .		35,8	28,8	18,9
(8) Нижняя . . . . .		43,6	50,8	63,5
(9) Две трети . . . . .		3,3	1,1	1,1
(10) Итого . . . . .		100,0	100,0	100,0

Key: (1). Level of break on third. (2). Form/species of break. (3). Cross. (4). Edge/boundary. (5). Perforated. (6). Upper. (7). Average/mean. (8). Lower. (9). Two thirds. (10). Altogether.

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Perforating wounds. Among the perforating wounds of forearm edge/boundary breaks composed 10.4c/o, perforated - 2.8o/o and cross - 3.2c/o. Consequently, the practical value of perforated breaks is small. However, edge wounds in the frequency will cost in the fourth place. Wound canals with the perforating wounds of forearm, which were being escorted/tracked by the described forms/species of breaks, were not characterized by the large complexity of building/structure. The degree of the decomposition of soft tissues depended not on the fragments of bones, which damaged tissue, but it is exclusive from the form and the sizes/dimensions of the wounding shell.

Of all edge/boundary breaks in the fraction/portion of perforating wounds it was necessary to 82.9o/c, from the perforated ones - 80.8o/o, while from the cross ones - 92.1o/o. Such a relationship/ratio were observed also during the damage to the ulna and both together, only during the damage to the ulna numerals were less.

Tangential wounds. Among all tangential wounds edge/boundary breaks stood in the second place and composed 18.6o/o, whereas perforated breaks were observed only into 1.4o/o. Cross breaks were encountered somewhat more frequent than perforated ones, but also

rarely and they were only 2.1c/c.

The described types of the breaks of the individual bones of forearm with the tangential wounds were encountered very rarely, and their percentage did not exceed 3.0.

Wound canals with the tangential wounds had much in common with wound canals with the perforating wounds.

In connection with the fact that the breaks of group indicated, kA rule/handspike, rarely were escorted/tracked by crack formation, arthrites were observed rarely, for example, with the edge/boundary breaks into 0.30/o. With the perforated isolated/insulated breaks of radiation/radial bone arthrites not at all were encountered, <sup>as</sup> ~~in~~, also, with the cross breaks. With the edge/boundary breaks of radiation/radial bone arthrites were observed into 0.30/o, and the ulna - into 0.40/o.

Since soft tissues with the edge/boundary breaks suffer very insignificantly, then the damage of vessels with them was observed more rarely than with the cross breaks. Thus, for instance, based on materials of author's development, with the cross breaks the integrity of vessels was disturbed into 6.10/c, with the perforated ones - into 5.40/o and with the edge/boundary ones - into 3.90/o. The

relatively high frequency of the damage of vessels in the group of the dismantled breaks is explained by the topographic nearness of artery to the bones in the region of the pineal systems where most frequently are observed perforated and edge/boundary breaks.

The damages of nerves with the perforated breaks composed 29.20/o, with the cross ones - 38.50/o and with the edge/boundary ones - 27.60/o.

The relatively high percentage of the damage of nerves is also explained by their close topographic relations to the lower pineal systems of the bones of forearm. Suppurative flows most frequently were encountered with perforated and cross breaks of both bones of forearm (table 119).

Table 119. Frequency of suppurative flows with the perforated, edge/boundary and cross breaks of the bones of forearm (in the percentages).

(1) Локализация перелома	(2) Вид перелома	(3) Дырчатый	(4) Краевой	(5) Попереч- ный
(6) Лучевая кость . . . . .		5,1	3,5	3,9
(7) Локтевая . . . . .		3,1	6,8	4,1
(8) Обе кости . . . . .		14,3	4,5	10,0

Key: (1). Localization of break. (2). Form/species of break. (3). Perforated. (4). Edge/boundary. (5). Cross. (6). Radiation/radial bone. (7). Ulna. (8). Both bones.

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Oblique, longitudinal and packed in breaks.

The specific gravity/weight of the oblique, longitudinal and packed in breaks of the bones of forearm among other breaks of the bones of forearm is given in table 120.

Thus, in the examination of this group of breaks the practical value have the oblique breaks which considerably differed from remaining two forms/species in terms of the degree of the decomposition of soft tissues and in terms of the frequency of

different complications.

The breaks indicated were encountered almost equally frequently both with the bullet ones and with the fragmentation wounds, namely: among the bullet ones oblique were observed into 10.20/o, and among the fragmentation ones - into 9.60/o, longitudinal among the bullet ones composed 0.80/o, and among the fragmentation ones - 0.60/o; those packed in composed 0.10/o of bullet wounds and 0.30/o of fragmentation ones.

Wound canals with the oblique breaks were characterized by the inaccuracy of form, considerable range in the proximal and extremal direction, which depended mainly on the extent of break and decomposition of soft tissues, which, as a rule, was more sharply pronounced with simultaneous oblique break of both bones of forearm.

With the packed in breaks soft tissues suffered considerably less. With the longitudinal breaks was noted the considerable range of wound canal in the proximal and extremal direction (on the course of break).

Consequently, wound canals in this group of the breaks never were rectilinear, since the going along the crack breaks and the displacement of soft tissues unavoidably strain the axis of wound



canal.

Soft tissues can be displaced lengthwise, the degree of their displacement depending on the degree of driving in of bone broken ends.

Perforating wounds. Among the bullet breaks with the perforating wounds oblique were observed into 10.00/o of cases, longitudinal composed 0.70/o those packed in - 0.10/o.

With the bullet and fragmentation wounds, especially with the oblique breaks, on the course of wound canal was noted the greater or smaller decomposition of soft tissues, which depended on form and size/dimension of the wounding shell; whereas in other respects the structure of wound canal in no way differed from that described above.

Table 120. The specific gravity/weight of the oblique, longitudinal and packed in breaks of the bones of forearm among other breaks of the bones of forearm (in the percentages).

(1) Локализация перелома	(2) Вид перелома	(3) Косой	(4) Продоль- ный	(5) Включен- ный
(6) Лучевая кость		11,6	1,1	0,1
(7) Локтевая		10,6	0,6	0,2
(8) Обе кости		5,4	0,2	0,2

Key: (1). Localization of break. (2). Form/species of break. (3). By sand bar. (4). Longitudinal. (5). Packed in. (6). Radiation/radial bone. (7). Ulna. (8). Both bones.

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Fig. 110. Sagittal cut of right fcreara. Preparation VMH No 756/2400.  
(Artist V. S. Chumanova).

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Fig. 111. Oblique break of both bones in upper third of right forearm (X-ray photograph from preparation No 756/2400).

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If the formation of oblique break was escorted/tracked by the education of fragments, then they, as a rule, remained in the region of the violation of the integrity of bone and, therefore, they

brought in on tissues insignificant damage, but this relates to the breaks of any one bone; whereas with simultaneous break of both bones soft tissues as a result of the shift can undergo significant trauma.

As the example of oblique break with the insignificant shift of broken ends and crack formation it is possible to give the following observation.

Wound 17/I 1942. Death 19/II 1942. Preparation No 756/2400. Fragmentation wound in upper third of forearm. On the sagittal cut of right forearm and elbow joint (Fig. 110) is visible break of both bones in upper third.

Kray broken ends sharp/acute. The place of the break of the ulna has bone fragment. Between the broken ends it is visible a pinkish-gray connective tissue, and also scraps of overcoat. Muscles of brown color. On the external surface of forearm wound surface by the size/dimension 3x4 cm.

In the X-ray photograph (Fig. 111) is determined oblique break of both bones of forearm in upper third.

The described preparation is interesting to those that in the tissue of forearm were involved the foreign bodies (scraps of

overcoat). This frequently was observed with the through ones and with the blind bullet ones, and also with the fragmentation wounds.

As the example of cross-longitudinal break of radiation/radial bone it is possible to give the following observation.

Wound 14/IV 1942. Death 3/V 1942. Preparation No 900/2284. Perforating bullet wound of lower third of left forearm with the damage of bones. Freezing of the III degree of extremal departments of both feet. Right pneumonia. Phlegmon of left shin. Tetanus.

The preparation: in middle third of left radiation/radial bone is a cross line of the break, which changes into the longitudinal, which achieves the region of radiccarpal joint (Fig. 112).

Blind-end wounds. Among the blind-end wounds of forearm the oblique breaks of radiation/radial bone were observed into 14.30/o, the ulna - in 11.10/o and both bones - into 6.60/o. The longitudinal breaks of radiation/radial bone were observed into 1.60/o, cubital - into 1.10/o.

The isolated/insulated packed in breaks with the wound of the individual bones of forearm were encountered rarely.

Wound canals both with the bullet ones and with the fragmentation blind-end wounds, which are escorted/tracked by the described forms/species of the breaks of bones, are not especially complex, since the very frequently wounding shell stops in the place of break and, therefore, presently is only a unit of the wound canal to the place of break; the degree of the decomposition of soft tissues depends only on the character/nature of the wounding shell.

In certain unit of the cases with the blind-end wounds, even if wounding shell remained in the place of the break, as a result of the significant shift of broken ends sometimes was formed large wound area, which especially frequently was observed with simultaneous break of both bones.



Fig. 112. Cross and longitudinal break of left radiation/radial bone (preparation No 900/2284).

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Tangential wounds. Among the tangential wounds of forearms the oblique breaks of all bones comprised in average/mean 12.40/o, but packed in and longitudinal, as a rule, were not observed. With the



tangential wounds the oblique breaks of radiation/radial bone composed 12.50/o, the ulna - 14.50/o and both bones together - only 6.00/o.

The aforesaid above relative to wound canals with the tangential wounds, which were being escorted/tracked by other forms/species of breaks, wholly relates also to the given forms/species of breaks, with the only the special feature/peculiarity, that with the oblique breaks the degree of the decomposition of soft tissues is always more than with those packed in and longitudinal ones.

From the group of breaks which are dismantled here, longitudinal were most frequently penetrating into the joint. Therefore in the frequency of arthrites longitudinal breaks among others will cost in the first place.

Arthrites were observed with them into 2.30/o of cases.

The damage of vessels with the oblique breaks of forearms was observed into 3.70/o, with the longitudinal ones and packed in, as a rule, the vessels did not suffer. The latter is the indirect confirmation of the fact that the soft tissues with the packed in and longitudinal breaks suffer to the very insignificant degree.

The damage of nerves with the oblique breaks was observed into 30.00/o of cases, with those packed in - into 11.10/o, and with the longitudinal ones - into 21.00/o.

The relatively high percentage of the damage of nerves among the longitudinal breaks was the result of the direct damage of the nerve trunks by the wounding shell. The packed in, oblique and longitudinal breaks were encountered mainly in lower third (Table 121).

The education of suppurative phlegmons and flows was observed predominantly with the longitudinal breaks.

Thus, the longitudinal breaks of radiation/radial bone were complicated by suppurative flows into 7.10/o, cubital - into 7.70/o, the oblique breaks of the ulna - into 5.00/o, and radiation/radial - into 2.70/o.

Suppurative flows to forearm most frequently were observed with the longitudinal breaks which in this respect occupy the first place among all other forms/species of break.

The frequency of suppurative flows on the forearm with the longitudinal breaks is explained in essence by the spread of hematomas in the proximal and distal direction, hematomas can be

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both subperiosteal and paraossal.

Furthermore, with the longitudinal breaks can be damaged adjacent fascial spaces, which to a certain extent also contributes to the education of suppurative flows.

Table 121. Frequency of the oblique, longitudinal and packed in breaks of the bones of forearm in connection with the level of wound (in the percentages).

(1) Вид перелома	(2) Уровень перелома по третям		
	(3) верхняя	(4) средняя	(5) нижняя
(6) Косой . . . . .	10,5	9,9	9,8
(7) Пролольный . . . . .	0,6	0,4	1,1
(8) Вколоченный . . . . .	—	0,1	0,3

Key: (1). Form/species of break. (2). Level of break on third. (3). upper. (4). average/mean. (5). lower. (6). By sand bar. (7). Longitudinal. (8). Packed in.

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Symptoms diagnosis of the bullet breaks of the bones of forearm.

Major of medical service I. B. Fedoprigor.

In the Great Patriotic War timely and correct diagnosis was the basis of correct classification and treatment of casualties with the bullet break of the bones of forearm.

The special works, dedicated to the diagnosis of the bullet breaks of the bones of forearm, there is not.

In his leadership/manual on the military field surgery M. M. Diterikhs is limited to the instruction that the diagnosis of the bullet breaks of the bones of forearm is light, and the receptions/procedures of the identification of these breaks ordinary. Meanwhile V. Ya. Ven'kovetskiy notes that in the army area the breaks of one bone of forearm even by experienced surgeons are not always distinguished, and imperatively he recommends to maximally draw nearer x-ray examination the forecast stages. I. M. Shelko indicates that in 5.00/o of the casualties, who entered into the hospital of front rear with diagnosis of the break of the bones of forearm, with roentgenological study of break it was not discovered. The analysis of the materials of the Great Patriotic War showed that the erroneous and inaccurate diagnosis of the bullet breaks of the bones of forearm occurred in all stages of evacuation.

Erroneous diagnosis was expressed in the fact that either the break was not identified, or the diagnosis of break was placed in such cases where were damaged only soft tissues. The inaccurate diagnosis of the bullet breaks of the bones of forearm consisted in the fact that the break was identified, but was not indicated the damaged bone or even if it was indicated, then it is incorrect,

namely: with the break of radiation/radial bone diagnosed itself of the break of the ulna and vice versa. Less frequently with breaks of both bones diagnosed itself of the break of one bone or vice versa.

The main symptoms on which was based the diagnosis of the bullet breaks of the bones of the forearms, which follow: 1) localization of wounds and the direction of wound canal, 2) deformation, 3) pathological mobility, 4) bone crepitation, 5) the presence of bone fragments in the wound, 6) a change in the ratio of the line of styloid processes to the axis of forearm, 7) the localized sickliness, 8) sickliness with the load along the axis of forearm, 9) pain during the active and passive movements, in particular during the attempt to make a pronation and supination, 10) pain in the wound during compression of both bones of forearm out of the place of wound. These are - the same symptoms, as with the closed breaks, with exception of the presence of wound canal and bone fragments in the wound which with the closed breaks there is not.

The diagnostic value of painful symptoms (points/posts 7, 8, 9 and 10) with the bullet breaks descends, since pains can be explained by the presence of wounds with greater than with the closed breaks, damage of soft tissues. With the closed breaks of one bone of forearm the traumatizing force usually causes the shift of fragments in the corresponding to its activity direction; the shift of fragments is

increased by the contraction/abbreviation of the corresponding muscles. This leads to the shortening of bone and a change in the ratio of the line of styloid processes to the axis of forearm. With the bullet breaks of one bone the ratio of this line to the axis of forearm can remain the same as on the healthy/sound hand, in view of the fact that shift and shortening now and then can and not be, since the damaged muscles lose the capability to be decreased, but the undamaged/uninjured bone serves as the splint, which impedes shift even when the significant defect of another bone is present,.

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With the incomplete breaks, such as sulcus and perforated, are absent such signs as bending, crepitation, pathological mobility. In these cases the diagnosis can be set on the basis of the direction of wound canal and presence in wound of bone fragments.

The additional difficulties of the diagnosis of the breaks of the bones of forearm in comparison with the diagnosis of the breaks of the single-bone segments of extremities consist in the fact that with the established/installed break it is necessary to refine, is damaged one or both bones, and if only one, then namely what.

During the systematic research almost always it is possible to

find a sufficient quantity of signs, which make it possible to solve a question about the break of radiation/radial or ulna or both bones.

From the data, represented in Table 122 it is apparent that the objective symptoms (deformation, pathological mobility, bone crepitation, bone fragments in the wound) composed 73.00/o, and subjective symptoms (localized sickliness, sickliness with the load, morbid movements) were indicated into 27.00/o.

Most frequently it was indicated the presence of the bone fragments in the wound which were revealed/detected in the stages where was performed primary surgical processing, and namely: at DMP and in KhPPG. Deformation is noted into 21.30/o of cases. Small percentage is pathological mobility and bone crepitation.

It is necessary to assume that the phobia to cause to casualty pain limited the utilization of these signs for purposes of diagnosis. Indications of a change in the ratio of the line of styloid processes to the axis of forearm in the histories of disease/illness it was not encountered.

Insufficient repulsing in the histories diseases/illnesses of the symptoms of break (38.80/o) and large quantity of identified breaks to roentgenological inspection/examination (92.40/o) tell



faster not about the defects of diagnosis, but about the brevity of medical documentation. Evidently, for the detailed basis of diagnosis by the description of symptoms in the histories of disease/illness it frequently fell short neither time nor possibilities.

Table 122. Distribution of casualties with the break of the bones of forearm according to the symptoms of break, for the first time indicated in the different stages of evacuation (in the percentages to a number of casualties).

(1) Этап	(2) Симптом	(3) Дефор- мация	(4) Патоло- гическая подвиж- ность	(5) Костная крепита- ция	(6) Костные осколки в ране	(7) Локализован- ная болезнен- ность, болез- ненная на- грузка, бо- лезненные движения	(8) Всего
ПМП		—	—	—	0,3	—	0,3
ДМП		2,5	—	—	27,0	0,3	29,8
ХМПГ		8,7	3,0	1,3	10,5	13,9	37,4
(9) Армейский эвакуационный госпиталь		8,2	3,0	2,0	4,0	11,5	28,7
(10) Фронтальной		1,1	0,3	—	—	1,3	2,7
(11) Тыловой		0,8	0,3	—	—	—	1,1
(12) Всего		21,3	6,6	3,3	41,8	27,0	100,0

Key: (1). Stage. (2). Symptom. (3). Deformation. (4). Pathological mobility. (5). Bone crepitation. (6). Bone fragments in wound. (7). Localized sickness, morbid load, morbid movements. (8). In all. (9). Army evacuation hospital. (10). Front line. (11). Rear. (12). In all.

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Nevertheless in the group of casualties with the indicated in the histories of disease/illness systems the percentage of the undiagnosed breaks almost is six times lower than in the group

without the instruction of symptoms (Table 123).

Based on materials of author's development, 92.40% of breaks of the bones of forearm were identified without the roentgenological inspection/examination, and, as can be seen from Table 123, the damaged bone into 2/3 cases was almost correctly identified.

Further analysis of data, given in Table 124, shows, to what extent affected the form/species of break the results of the correctness of clinical diagnosis. It is logical that more easily in all it was recognize breaks with the shift of broken ends. Full/total/complete breaks without the shift it was with more difficulty diagnose, and most difficult for the identification were the incomplete breaks: they did not distinguish doubly more frequent than full/total/complete ones without the shift and four times of more frequent than the breaks with the shift.

Even more sharply comes forward the difference in the correct setting of diagnosis with breaks of one and both bones. As shown in Table 125, the break of one bone was not distinguished 7-8 times more frequently than break of both bones.

Table 123. Diagnosis of the bullet breaks of the bones of forearm in the groups of casualties with the instruction of the symptoms of break and without their instruction (in the percentages).

(1) Группа раненых	(2) Характер диагноза	(3) Точный диагноз	(4) (5) Неточ- ный! диагноз	(5) Переломы не распо- знаны до рентгено- логическо- го обследо- вания	(6) Всего
(7) С указанием симптомов переломов		63,0	35,0	2,0	100,0
(8) Без указания		58,3	30,4	11,3	100,0
(9) В среднем . . .		60,2	32,2	7,6	100,0

Key: (1). Group of casualties. (2). Character/nature of diagnosis.  
(3). Accurate diagnosis. (4). Inaccurate diagnosis.

FOOTNOTE 1. The graph "Inaccurate diagnosis" includes the cases, in which the damaged bone either is not indicated entirely or it is indicated incorrectly. ENDFOOTNOTE.

(5). Breaks are not identified to roentgenological inspection/examination. (6). In all. (7). With instruction of symptoms of breaks. (8). without instruction of symptoms of breaks. (9). On the average.

Table 124. Diagnosis of the bullet breaks of the bones of forearm to the roentgenological inspection/examination (in the percentages).

(1) Вид перелома	(2) Характер диагноза	(3) Точный диагноз	(4) Неточный диагноз	(5) Перелом не распо- знан	(6) Всего
(7) Переломы со смещением . . .		67,5	28,3	4,2	100,0
, полные без смещения		57,2	34,0	8,8	100,0
(8) Неполные переломы . . . . .		41,8	40,9	17,3	100,0
(10) В среднем . . .		60,2	32,2	7,6	100,0

Key: (1). Form/species of break. (2). Character/nature of diagnosis. (3). Accurate diagnosis. (4). Inaccurate diagnosis. (5). Break is not identified. (6). In all. (7). Breaks with mixing. (8). Breaks (full/total/complete without shift). (9). Incomplete breaks. (10). On the average.

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With the breaks of one bone the diagnoses with the erroneous identification of the damaged bone and without the instruction of the damaged bone were encountered 4 times more frequently than inaccurate diagnoses with breaks of both bones.

The noted facts are explained by the fact that with the more compound fractures with the large decomposition of bone tissue more greatly there is the explicit, straight/direct signs of break.

As the example of the correct setting of the diagnosis of the break of one bone of forearm can serve the following observation.

D., 32 years, is wounded 14/XII 1941. He entered PMP with the diagnosis: the perforating bullet wound of upper third of left forearm with the damage to radiaticn/radial bone, who was confirmed in the subsequent stages by rcentgenological supervision. At PMP to casualty was made the dressing. More detailed entries on the card of foremost stage it was not.

Primary surgical processing was produced in KhPPG 16/XII 1941, moreover there was given following description of the wound: in upper third of left forearm from the extensor side is a bullet inlet in diameter in 1 cm, and on the bending side outlet is somewhat greater size/dimension. Forearm swelled also with the feeling painfully.

After splitting up of wound was superimposed the bandage, moistened in the solution of Bivancl, and wire splint.

Table 125. Diagnosis of the bullet breaks of the individual bones of forearm to the roentgenological inspection/examination (in the percentages).

(1) Название кости	(2) Характер диагноза	(3) Точный диагноз	(4) Неточный диагноз	(5) Перелом не рас- познан	(6) Всего
(7) Лучевая	.....	55,0	36,3	8,7	100,0
(8) Локтевая	.....	53,1	37,6	9,3	100,0
(9) Обе кости	.....	89,6	9,2	1,2	100,0
(10) В среднем	...	60,2	32,2	7,6	100,0

Key: (1). Name of bone. (2). Character/nature of diagnosis. (3). Accurate diagnosis. (4). Inaccurate diagnosis. (5). Break is not identified. (6). In all. (7). Radiation/radial. (8). Cubital. (9). Both bones. (10). On the average.

Table 126. Diagnosis to the roentgenological inspection/examination of the bullet breaks of the individual bones of forearm at the different levels (in the percentages on each level).

(1) Название кости	(2) Треть кости и характер диагноза			(3) Верхняя			(4) Средняя			(5) Нижняя		
	⑥ точный диагноз	⑦ неточный диагноз	⑧ перелом не рас- познан	⑥ точный диагноз	⑦ неточный диагноз	⑧ перелом не рас- познан	⑥ точный диагноз	⑦ неточный диагноз	⑧ перелом не рас- познан	⑥ точный диагноз	⑦ неточный диагноз	⑧ перелом не рас- познан
(9) Лучевая . . . . .	58,4	38,3	3,3	56,1	37,2	6,7	52,9	35,0	12,1			
(10) Локтевая . . . . .	47,0	41,8	11,2	58,3	34,0	7,7	51,3	39,0	9,7			
(11) Обе кости . . . . .	85,4	14,6	—	89,3	10,7	—	93,2	3,4	3,4			
(12) В среднем . . . . .	59,2	34,5	6,3	62,9	31,0	6,1	59,0	31,0	10,0			

Key: (1). Name of bone. (2). Third of bone and characters/natures of diagnosis. (3). Upper. (4). Average/mean. (5). Lower. (6). accurate diagnosis. (7). inaccurate diagnosis. (8). break is not identified. (9). Radiation/radial. (10). Cubital. (11). Both bones. (12). On the average.

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In the X-ray photograph of 23/XII 1941 is discovered comminuted break of upper third of radiation/radial bone. Recovery advanced after 81 days.

As show data of Table 126, fractures of radiation/radial bone in lower third they were not distinguished almost two times of more frequent than the breaks in middle third and almost four times more



frequent than the breaks in upper third. The breaks of the ulna, on the contrary, were not identified in upper third more frequent than in the average and the lower. A small number of breaks of both bones was not identified without the roentgenological inspection/examination only in lower third.

These facts are explained to a certain degree of different by the frequency of more difficult than the undistinguishable incomplete breaks radiation/radial and ulna on third (Table 127).

The incomplete breaks of individual bones and both bones of forearm simultaneously were encountered in middle third from one-and-a-half and almost to three times less frequent than in the lower and the upper.

The symptoms of break of both bones are usually such explicit that the diagnosis did not present difficulties.

As frequently was not distinguished break in the different stages of evacuation to the roentgenological inspection/examination, evidently from Table 128.

At PMP the break was not distinguished almost in half of the cases.

Table 127. Frequency of the incomplete bullet breaks of the bones of forearm on third (in the percentages).

(1) Название кости	(2) Уровень перелома по трети	(3) Верхняя	(4) Средняя	(5) Нижняя
(6) Лучевая		14,8	11,6	23,8
(7) Кубитовая		17,6	11,0	15,6
(8) Обе кости		3,4	2,0	4,6
(9) В среднем		13,4	10,2	18,2

Key: (1). Name of bone. (2). Level of break on third. (3). Upper. (4). Average/mean. (5). Lower. (6). Radiation/radial. (7). Cubital. (8). Both bones. (9). On the average.

Table 128. Diagnosis of the bullet breaks of the bones of forearm in the different stages to the roentgenological inspection/examination (in the percentages).

(1) Этап эвакуации	(2) Характер диагноза	(3) Точный диагноз	(4) Неточный диагноз	(5) Переломы не распознаны	(6) Всего
НМП		10,2	46,2	43,6	100,0
ДМП		28,0	44,8	27,2	100,0
ЛМПГ		41,3	39,7	19,0	100,0
(7) Армейский эвакуогоспиталь		56,6	34,5	8,9	100,0
(8) Фронтальной		62,9	29,9	7,2	100,0
(9) Эвакуогоспиталь глубокого тыла		65,0	24,1	10,9	100,0

Key: (1). Stage of evacuation. (2). Character/nature of diagnosis. (3). Accurate diagnosis. (4). Inaccurate diagnosis. (5). Breaks are not identified. (6). In all. (7). Army evacuation hospital. (8). Front line. (9). Evacuation hospital of deep rear.

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In order to correctly evaluate this fact, it is necessary to clarify the conditions of diagnosis in this stage. This was the first stage where was documented diagnosis. The aim of stage consisted of the rendering to the necessary aid and the rapid evacuation of casualty on DMP. Diagnosis was placed on the basis of anamnesis and examination/inspection without the undressing of casualty. Recognized break was to be mainly in order to establish/install the need for immobilization. The general condition of this contingent of casualties, as a rule, to the sharp degree was not disturbed; casualties even could independently follow on foot to the nearest stages of evacuation. If the primarily superimposed bandage lay/rested well, complaints on the part of casualty were absent, the explicit signs of the break in the form of the expressed deformation it was not revealed, then at PMP it was not readings/indications, also, to the shift/relief of bandage.

A good reception/procedure, which makes it possible to place the diagnosis of break without the removal/taking of bandage, although which were being rarely used at PMP, is load, along the axis and pressure on both bones out of the place of wound, as a result of

which occurs the approach of radiation/radial and ulna, which calls in the presence of the break pain in the place of wound, but not in the place of pressure.

As can be seen from Table 128, at DMP of 4 cases of the break of the bones of forearm was not identified already only one. Conditions for the diagnosis in this stage were better than at PMP. Here there were qualified surgeons; casualties upon the inspection/examination they undressed and they produced with it primary surgical processing, which raised the possibility of correct diagnosis, since in this case cut the soft tissues, examined/scanned entire wound canal and it was possible to more accurately determine the degree of the damage of different tissues. In a word, at DMP were conditions not only for the identification of the break of the bones of forearm, but also for refining the associating break damages of joints, vessels, nerves, etc.

However, at DMP there was not possibility to apply x-ray examination, in consequence of which they occurred for inaccuracy in the diagnosis. But if we consider that at DMP rarely was used the gypsum immobilization and, without holding up casualties for a prolonged time, were sent them into the rear therapeutic installations, then it becomes clear that also in this stage it was important to only recognize the very fact of break for further

evacuation of casualty according to the designation/purpose; whereas the identification of the details of break was not decisive.

In further stages, as shown in Tables 128, the percentage of accurate diagnoses without the x-ray examination regularly increased/grew also in the hospitals of the deep rear it achieved already 65.0. With the same regularity, but with the less expressed jumps, descended the percentage of the inaccurate diagnoses of the break which in the deep rear was equal to 24.1. So steadily descended the percentage of the undiagnosed breaks of the bones of forearm. In the hospitals of the deep rear it comprised in the absence of roentgenological inspection/examination by 10.9, i.e., there was somewhat higher than in the army and front line evacuation hospitals. This is explained by the fact that here reached the most difficult for the diagnosis breaks, not identified in the preceding stages and which were not undergoing x-ray examination.

Given data show that the accurate diagnosis of the bullet breaks of the bones of forearm without the x-ray examination frequently presented significant difficulties. But at the same time it should be noted that erroneous diagnoses, as is evident from Table 124, they occurred also when correct diagnosis could be placed without the special work (4.20/o of casualties with the break of the bones of forearm with the shift).

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The errors first of all appeared after the mass entry of casualties into the hospitals. Under such conditions, naturally, heavy to casualties gave more attention, than to casualties with the break of bones forearms, which negatively affected the quality of the diagnosis of the latter. This evidently already from the fact that with the breaks of the bones of forearm only into 38.80/o of histories of disease/illness were indicated the symptoms on the basis of which was set the diagnosis of break.

There is no doubt that as one of the reasons for the inaccurate clinical diagnoses of the bullet breaks of the bones of forearm served the absence of the possibility to produce x-ray examination not only in the army, but frequently and in the army area, but sometimes also in the front line.

On the data of the deepened development of the histories of disease/illness, the roentgenological inspection/examination it underwent by 73.20/o of all casualties with the bullet break of the bones of forearm.

The stage of the first roentgenological inspection/examination with these wounds of forearm they were: 0.10/o - DMP, 1.10/o - KhPPG, 9.20/o - army evacuation hospital, into 43.40/o - front line evacuation hospital and into 46.20/o - rear evacuation hospital. Consequently, casualties with the bullet break of the bones of forearm into 10.40/o were only inspected roentgenologically in the limits of army and army area.

Of 100 subjects during the first 3 days were roentgenologically inspected 3.9, on the 4-5th day - 5.4, on 6-10th day - 12.7, to the 11-15th tribute - 10.9, on 16-30th day - 22.1, it is later than the 30th day - 40.8; the period of inspection/examination was not known in 4.2.

Thus, to 15 days roentgenological inspection/examination was produced almost in third of all cases.

The diagnosis of the bullet breaks of the bones of forearm could not be limited only to the decision/solution of a question about the damage of bones. The belated identification of those substantially influencing the course and the functional prognosis of the associated damages of joints, vessels and nerves was also gross diagnostic error.

The damage of vessels, eliminating the cases of the wounds, which were being escorted/tracked by disengagement and crushing of extremity, it is noted altogether only into 4.60/o of breaks; 68.60/o of damages of vessels are diagnosed in the army area on the basis of primary hemorrhage; the remaining cases are diagnosed in the army and front line area on the basis of secondary hemorrhage.

The associating the bullet breaks of the bones of forearm the damage of nerves is noted into 30.50/o; of them more than 3/4 were diagnosed in the rear.

This late diagnosis of the damage of nerves, very which frequently associates the break of the bones of forearm, is explained by the difficulty of its identification, although the most characteristic symptoms of the damage of the nerves: the violation of skin painful sensitivity, paralyses, the characteristic positions/situations of hand and fingers/pins, they attacked/advanced immediately after wound a \* is well known to the doctors of all of specialities. However, these symptoms were not always caught and therefore in the foremost stages evacuations comparatively rarely were indicated in the histories of disease/illness. Moreover, some of them could be quickly passing as the result of trauma, without the violation of the anatomical integrity of nerves.



Thus, in spite of unfavorable conditions for the diagnosis and its difficulties sometimes, already in the army area of 3/4 bullet breaks of bones forearms were identified (Table 128).

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In further stages, in spite of the insufficient sometimes repulsing of symptoms in the histories of disease/illness, clinical diagnosis was explained and was more precisely formulated as a result of roentgenological inspection/examination, and this provided the correctness of the activity of surgeon during the treatment of this contingent of casualties.

First, premedical and first medical aid transport immobilization with the bullet breaks of the bones of forearms.

Major of medical service I. Ya. Podoprigor.

In the Great Patriotic War the treatment of the bullet breaks of the bones of forearm was determined by the frames/scopes of the general/common/total system of the stage treatment of casualties. In the foremost stages of army area this contingent of casualties was rendered aid, which had as a goal in essence the protection of wounds from the secondary contamination, struggle with the hemorrhage and

the shock and preparation/training for the evacuation into the rear.

First aid in the company in the overwhelming majority of the cases consisted in the application of dressing with the aid of the first aid kit, in this case, as a rule, the hemorrhage was stopped. With the wound of large vessels on the field of battle was laid the tourniquet. With the bullet breaks of the bones of forearm the use/application of a tourniquet is generally noted into 4.20/o, whereas the wound of vessels was observed into 7.40/o, therefore, during the damage of the vessels of forearm did not always appear the need in the use/application of a tourniquet. Hemorrhage was stopped after the application of dressing and subsequently was not repeated, whereas in the unit of the cases it was opened/disclosed in the route/path or in further stages, which caused the need for the imposition of tourniquet. Tourniquet was applied in the following stages: in the company - into 26.20/o, at BMP - in 6.50/o, at PMP - in 29.00/o, at DMP - in 8.40/o, in KhPPG - in 2.80/o, in the army evacuation hospital - into 1.90/o, in the front and rear evacuation hospital - into 6.50/o, in the route/path - into 4.70/o, in other stages - into 8.40/o, the place of the imposition of tourniquet is not established/installed into 5.60/o. Are here given all cases of the imposition of tourniquet, including those, where it was possible to think about its insufficiently substantiated use/application (see also that 16).

Given data show that for the stop of primary hemorrhage into 51.7o/o tourniquet it was applied in the company, on BMP and PMP; into 48.3o/o it was applied in further stages apropos of repeated or secondary hemorrhage. On PMP tourniquet was used more frequently than in the company, since in the company after the application of dressing hemorrhage, naturally, was decreased and did not present special danger, but already at PMP was explained the threat of the blood loss for preventing which was laid the tourniquet. Almost in half of casualties by which was laid tourniquet (43.9o/o), no operations/processes in connection with the hemorrhage it was produced, and hemorrhage was not repeated.

All this confirms the fact that during the damage even large vessels on the forearm the hemorrhage frequently spontaneously was stopped, why the dressing of vessels and it was not required.

The first medical aid casualties with the bullet break of the bones of forearm obtained at PMP. In essence it expressed itself in the supervision of condition previously the superimposed bandages, while if necessary - and in their shift/relief, in the struggle with the hemorrhage, by shock, in the preventive introduction of antitetanus and antigangrenous serum and immobilization.

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All produced manipulations were reflected in the card of forward area - first medical document, which followed together with the casualty to further stages. As stated below (Table 134), 8.50/o of casualties arrived at PMP, without having obtained first aid. At PMP was laid aseptic dressing, having preliminarily greased skin around the wound by iodine liquid. In the presence of large wounds were used the antiseptics (Rivanol, chlcramine). Sulfanilamides in this stage were used rarely. Hemorrhage was stopped with the aid of the tourniquet, less frequently with the aid of the styptic clamp (a demeur). For dealing with the shock they introduced subcutaneously morphine, cardiac substances, gave to fault or vodka. In the heavier cases transfused the blood and blood-substitute fluids/liquids. The blood transfusion with the breaks of the bones of forearms was produced at PMP in 0.90/o of all cases of the blood transfusions, mainly for dealing with the shock and the blood loss.

Besides the mentioned substances, for preventing the shock with the bullet breaks of the bones of forearms at PMP in 1.20/o of cases was used the novocaine blockade, which consisted of subperiosteal anesthesia of the region of break.

Important moment/torque in the work of PMP was the introduction of preventive sera (Table 129).

From the preceding information it is evident that the preventive introduction of antitetanus serum was produced in all stages, but to the overwhelming majority of casualties it was introduced in the army area. 36.20/o of casualties with the bullet break of forearm antitetanus serum was introduced at PMP. The introduction of antitetanus serum and surgical processing in the army area reduced to minimum the disease by tetanus (with the breaks of forearm to 0.070/o).

The introduction of antigangrenous serum for the preventive target with the bullet breaks of the bones of forearm is noted in all into 7.10/o. It was introduced in the presence of the large contaminated wounds with crushing of tissues.

The effectiveness of first aid depended on that how and where it was shown/rendered (Table 130).

First aid with the bullet breaks of the bones of forearm in the company sector was shown/rendered into 88.60/c, at BMP - in 2.90/o

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and at PMP - in 8.50/o.

Focuses attention the low percentage of rendering of first aid  
in BMP.

Table 129. The distribution of casualties with the break of the bones of forearm in the stages of evacuations, in which were introduced preventive sera (in the percentages).

(1) Сыворотка	(2) Этап	ПМП	ДМП	ХППГ	(3) Эвакогоспиталь			ГЛР	(4) Про- чие	(5) Многократное введение на разных этапах	(6) Всево
					(7) армия	(8) Фронт	(9) тыл				
(10) Противостолбняч- ная . . . . .		36,2	29,9	9,0	6,0	5,3	1,3	0,7	4,9	6,7	100,0
(11) Противогангрен- озная . . . . .		5,1	36,1	23,7	12,9	8,8	1,1	1,0	4,1	7,2	100,0

Key: (1). Serum. (2). Stage. (3). Evacuation hospital. (4). Other. (5). Repeated introduction in different stages. (6). In all. (7). army. (8). front. (9). rear. (10). Antitetanus. (11). Antigangrenous.

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In order to correctly evaluate this fact, it is necessary to take into consideration, that the feldsher of BMP led by the work of company link, were fulfilled complex duties, controlling the superimposed bandages in the company, and was rendered aid only by the fact, who it did not have time to obtain in the company.

The high percentage of rendering of first aid by way of self-help and mutual assistance is explained by the ease/lightness of

the application of dressing with the aid of the first aid kit on the wound of forearm. Wounded itself or with the aid of the comrade without the special difficulties could put uncomplicated bandage, using a first aid kit.

In the course of war were accelerated the periods of rendering of first aid with the bullet breaks of the bones of forearm (pg. 141): so during the first year of war for the first hour it was shown/rendered 72.20/o of casualties, while in the fourth year - 84.60/o. This was established even more during the study of the individual combat operations/prcesses of first and last year of war (pg. 142).

The most important problem of medical aid with the bullet breaks of the bones of forearm in the army area was the imposition of transport splint, since the primary immobilization of extremity with the aid of the bandage or the knee plate yet did not create the necessary rest.

Under conditions of war it was difficult to ensure that transport immobilization would not lag on the periods of its imposition behind the periods of rendering of first aid. Obstacle was the fact that under the fire/light of enemy the imposition of splints was more complex manipulation than the imposition of bandage and knee



plate, and therefore always it could not be carried out. For the imposition of splint was required more than skill and training; the badly/poorly made immobilization could prove to be not only useless, but also harmful.

Had a value and the fact that in the foremost stages of army area, as about this it is said above, break frequently was not distinguished.

The delay of the periods of the imposition of primary transport immobilization from the periods of rendering of first aid clearly comes forward during the comparison of the distribution of these means of aid in the stages of evacuation (Table 131).

Table 130. Distribution of casualties with the bullet break of the bones of forearms in the stages of rendering of first aid (in the percentages).

(1) Рота	БМП	ПМП	(2) Итого	(3) Другие этапы не установлены	
(4) само- и взаимопомощь	(5) санитар	(6) фельдшер	(7) врач		
37,0	51,8	2,9	8,5	100,0	3,5

Key: (1). Company. (2). Altogether. (3). Other stages are not established/installed. (4). auto- and mutual assistance. (5). aidman. (6). feldsher. (7). doctor.

Table 131. Rendering of first aid and the imposition of primary transport immobilization in the stages of evacuation with the bullet breaks of the bones of forearms (in the percentages).

(1) Вид первой помощи	(2) Этап	(3) Рота	БМП	ПМП	(4) ДМП и другие этапы	(5) Итого	(6) Не установлено
(7) Первая повязка		88,6	2,9	8,5	—	100,0	3,5
(8) Первая транспортная иммобилизация		0,4	2,4	27,3	69,9	100,0	19,1

Key: (1). Means of first aid. (2). Stage. (3). Company. (4). DMP and other stages. (5). Altogether. (6). is not established/installed. (7). First bandage. (8). First transport immobilization.

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From the preceding information it is evident that the first aid in the overwhelming majority of the cases was shown/rendered in the company sector and the latter/last point/post where could be encountered casualties, who need first aid, there was PMP, and the imposition of the first transport splint actually only began with PMP.

Transport immobilization beyond the limits of army area was for the first time superseded third of casualties. This could depend, first of all, on the unexplained diagnosis of the bullet breaks in the army area. In chapter about the diagnosis it is indicated, that in the latter/last stage of army area, at DMP, the breaks of forearm were not identified into 27.20/c (Table 128). Nonconformity between a number of those not diagnosed and a number nonimmobilized breaks is smoothed, if one takes into account, that the produced on the medical aid stations of army area immobilization was not always documented. Frequently in the card of forward area mark about the immobilization was absent, and from the history of the disease/illness of the following stage it was explained, that the casualty arrived there in the splint. Thus, the percentage of the nonimmobilized breaks of the

bones of forearms can be considerably lowered due to the cases, in which it was the information neither about the stage of the first immobilization nor about the form/species of immobilization itself, but such cases, as show given data, composed 19.10/o of all bullet breaks of bones forearms.

The periods of rendering of first aid and imposition of primary transport immobilization are represented in Table 132.

More than 90.00/o casualties with the break of the bones of forearms obtained first aid for the first 6 hours, the overwhelming majority of casualties obtaining it for the first hour from the moment/torque of wound.

For the first hour from the moment/torque the wounds of splint were laid to each twentieth, and in time from 2 to 6 hours - to almost each fourth with the break of the bones of forearms. During the first day transport immobilization was obtained 3/5 casualties, during the second day are later - 2/5 casualties with the break of the bones of forearms.

Thus, if for the first hour from the moment/torque of wound first aid was shown/rendered to the overwhelming majority of casualties, then immobilization within this period was obtained only

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5.00/o of casualties. If during the second day rendering of first aid was exclusion and was expressed in the fracticns/portions of percentage, then transport immobilization during the second day later was superimposed 2/5 casualties.

Table 132. Periods of rendering of first aid and imposition of the first transport immobilization with the bullet breaks of the bones of forearm (in the percentages).

(1) Вид помощи	(2) Срок	(3) В течение 1 часа	(4) От 2 до 6 часов	(5) От 7 часов и позже	(6) Итого
(7) Первая помощь (первая повязка)		79,3	11,2	9,5	100,0
(8) Первая транспортная иммобилизация . . . . .		5,0	23,9	71,1	100,0

Key: (1). Means of aid. (2). Period. (3). For 1 hour. (4). From 2 to 6 hours. (5). From 7 hours it is later. (6). Altogether. (7). First aid (first bandage). (8). First transport immobilization.

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The first transport immobilization of the bullet breaks of the bones of forearm was realized by the following splints: Cramer - 20.00/o, plywood (splint/pulp publications) - 14.40/o, cross-linked - 2.00/o, gypsum - 20.30/o, improvised by other splints - 2.80/o, without the instruction of the type of splint - 40.50/o.

The simplest forms/species of fixation, which were being noted only in the company sector, they were: the fortification of the sleeve of overcoat, in which was located the damaged extremity, on

opposite side of breast, the use/application of a knee plate and the imposition of splints from improvised material in the form of fir branches, plates and other. The explicit deficiency of the fixation of break by the improvised splints was the main reason for their rare use/application. Casualty in the route/path to PMP preferred to support the damaged forearm with healthy/sound hand in such position/situation in which the pain from the unexpected jerks/impulses was smallest. Knee plate and carton on the same reason were used rarely and therefore they were insignificant percentage. In 16.60/o of all cases about the form/species of immobilization in no way it was mentioned.

The frequency of the use/application of different splints in the different stages was dissimilar.

Given data show that on BMP the most frequent form/species of immobilization was the plywood splint and less frequent the splint of Cramer. However, at PMP more frequently was used the splint of Cramer, plywood it was used almost two times less frequent.

At DMP for the immobilization they put to use almost in the identical measure the splint of Cramer and plywood splint. Furthermore, to the greater degree than on PMP, was used gypsum fixation.

In KhPPG the fixation with the aid of the gypsum bandage was used almost so frequently as by the splint of Cramer, and plywood splint was used extremely rarely. In further stages the prevailing form/species of transport immobilization was gypsum immobilization, since in these stages transport immobilization greatly frequently was therapeutic.

Turns to itself attention the high percentage of immobilization by splint without the instruction of view of all stages of army area. It is possible to assume that from the being commonly used themselves in these stages splints they most frequently put to use the splint of Cramer and less frequent - by plywood splint. Under this assumption the specific gravity/weight of the splints indicated considerably is increased.

One cannot fail to note that in BMP and in front evacuation hospitals in no way was used for the immobilization of the breaks of the bones of forearm the cross-linked splint; in PMP and other stages it was rarity.



Table 133. Form/species of the first transport immobilization of the bullet breaks of the bones of forearm in the stages of evacuation (in the percentages).

(1) Вид иммобилизации	(2) Этап					(3)	(4)
		БМП	ПМП	ЛМП	ХППГ	Армейский эвакуационный госпиталь	Фронтальный эвакуационный госпиталь
(5) Шина Крамера . . . . .		11,1	27,0	25,6	26,6	7,7	20,8
(6) Шина фанерная . . . . .		33,3	15,0	23,1	6,3	3,8	8,3
(7) Шина сетчатая . . . . .		—	1,6	4,4	1,3	1,9	—
(8) Прочие шины . . . . .		55,6	54,8	43,1	41,7	13,5	4,2
(9) Гипсовая фиксация . . . . .		—	1,6	3,8	24,1	73,1	66,7
(10) Итого . . . . .		100,0	100,0	100,0	100,0	100,0	100,0

Key: (1). Form/species of immobilization. (2). Stage. (3). Army evacuation hospital. (4). Front evacuation hospital. (5). Splint of Cramer. (6). Splint plywood. (7). Splint cross-linked. (8). Other splints. (9). Gypsum fixation. (10). Altogether.

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In the war with the White Finns 1939-1940 G. Ya. Epstein stated/established in one quarters of bullet breaks of the bones of forearm unsatisfactory transport immobilization and he considered that the method of selection with these breaks is the wire splint or gypsum splint. It is necessary, however, to say that to lay the splint of Cramer on the forearm is far not simply, and, furthermore, it has a number of deficiencies. To model it on the forearm is difficult.

Besides bend at angle with respect to elbow joint, it is necessary to bend it still with respect to radiocarpal joint in order to set hand in the position/situation of light rear inflexion and to model splint along the length for the envelopment of forearm. The turns of bandage, holding the splint, in the route/path were weakened, splints it was shot down, forearm accepted the position/situation of pronation and the rest of extremity it was not provided. In view of these reasons wire splint for the immobilization with the bullet breaks of forearm must be recognized as inadequate.

The cross-linked splint, about which positively answered some authors (M. N. Akhutin) and which so rarely was used in the Great Patriotic War for the immobilization of bullet fractures of the bones of forearm, he is modeled well on the forearm, however, as a result of the insufficient elasticity, does not hold extremity and for the prolonged trans-perspiration it is not suitable. Its correct imposition in the company sector, frequently under the fire/light of enemy, proved to be too complex, by which is explained the fact that in the company and at BNP its use/application is in no way noted.

The frequently used in the army area plywood splint retains the axis of forearm, it is extremely simple for the imposition, it is light. Although it does not fix/reccrd elbow joint, badly/poorly it fits closely to the forearm, is not created back flexing in the radiocarpal joint, it does not rescve the rotary motions of forearm, nevertheless to forego it in the foremost stages of army area was difficult.

Its use/application at DNP was conditioned on the fact that it protected well from the secondary trauma.

For eliminating the deficiencies in the plywood splint indicated

was proposed the series/number of refinements. Thus, for the purpose of the fixation of elbow joint to the plywood splint was added the suspension/mounting forearms on the knee plate. For eliminating the rotary motions of forearms they previously fastened to the single plywood splint at right angle the wooden pin which was captured by hand, which added to forearms position/situation, average between the pronation and supination.

However, these splints did not have extensive application, and the data about them in the histories of disease/illness is not found.

Did not win acceptance for the transport immobilization of the bullet breaks of the bones of forearms and the prefabricated short gypsum splints.

Thus in the Great Patriotic War by first aid and the first medical by aid with the bullet breaks of the bones of forearms both in the total quantity of victims and on place and time of its rendering from the moment/torque of wound stood at the high level.

Transport immobilization in the near after wound time was used in a greater quantity of cases of wounds with the breaks, it is sufficiently close to a total number of casualties.

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Primary surgical processing treatment of the bullet breaks of the bones of forearm in an army area.

Major of medical service I. Ya. Fedoprigror.

The primary surgical processing of the bullet breaks of the bones of forearm has its of special feature/peculiarity and difficulties, which escape/ensue from the complexity of the anatomical building/structure of this department of the extremity: narrow interosseal space impedes the wide examination of wound and manipulation at the depth, and the insufficiently sharp knowledge of the complex topography of this region and the too daring activities of surgeon can do irreparable damage. The at the same time small size of the organ/control gives the possibility to trace entire course of wound canal, and because of a comparatively small muscular layer with the breaks of the bones of forearm less frequent than with the breaks of other tubular bones are encountered the large turned wounds, and, on the contrary, predominate the wounds of small diameter, with the small zone of damage, with which surgical processing is not always shown. With the perforating bullet wounds with the entrance and outlet, which does not exceed the diameter of bullet, without hematoma, voltage of tissues and signs of the significant

contamination of wounds primary surgical processing, as a rule, was not performed.

By drive the corresponding observation.

L. 5/VI 1942 obtained the perforating bullet wound of left forearm. Was immediately superimposed bandage with the aid of the first aid kit. At DMP is produced dress/lavatory of wound, is superimposed bandage. On the volar side, on the boundary of middle and lower third, is discovered the inlet with a diameter 1x1 cm, on the back side at the same level also of the same sizes/dimensions - the outlet. Roentgenoscopy from 10/VI 1942 showed the presence of the large-splintered break of radiation/radial bone on the boundary of middle and lower third. Is superimposed gypsum cast. 15/VI is initiated the therapeutic exercise, and 7/VII wound healed. Immobilization is taken/removed 18/VII. During the inspection/check is discovered difficulty of movement in the radiocarpal joint and the joints of fingers/pins. Is assigned mud cure. the X-ray photograph of 1/VIII is discovered the presence of a good callus. 12/VIII it is discharged into the unit during the full/total/complete reduction of the function of extremity. Duration of treatment - 68 days.

The bullet breaks of the bones of the forearms, which were not undergoing primary surgical processing, together with the light

course, frequently were complicated by heavy pyogenic and especially risky anaerobic infection. As illustration can serve the following observation.

It was equal to 7/IV 1942 by the explosive bullet into the right forearm. In the company after 10 minutes is superimposed the bandage. After 30 minutes at PHP are carried out antishock measures and is superimposed bandage. After 3 hours 30 minutes at DMP is produced dress/lavatory of wound, and is newly superimposed bandage with chloramine. During the same day the casualty is delivered to the evacuation point. Condition is heavy. Temperature of 38.5°. From the amputation proposed it refused. Next day in KhPPG is suspected anaerobic infection. On the cubital side of lower and middle third of right forearm extensive torn is equal with the large defect of soft tissues, the gap of tendons of extensors, ulnar nerve, crushing of both bones and autopsy of radiocarpal joint. Pulse on the radiation/radial artery is not probed. Hand and forearm are edematous. From the wound is secreted turbid blood-containing fluid with the unpleasant odor. From the for a second time proposed amputation it refused. Wound is washed below peroxide of hydrogen, is superimposed bandage with the ointment of A. V. Vinyovskiy and splint of Cramer. 9/IV dully moved apart muscles and are removed free bone fragments. The wound of dirty-gray color, issues malodorous odor. Is newly superimposed bandage with chlcravine and splint of Cramer. 13/VI -

surprise hemorrhage from the wound. Is superimposed tourniquet. Under local anesthetic novocaine bandaged ulnar artery. Are poured 500 cm<sup>3</sup> of the blood. 15/IV is noted burning in the forearm, cold, bluish-purple color fingers/pins; the forearm of the same color, it is edematous, epidermis is scaled, from the wound are secreted the follicles of malodorous gas. Under ether anesthesia without the tourniquet is produced the amputation in lower third of shoulder. Post-operation course is smooth. It is discharged with a good stump 30/VI 1942.

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So heavy clinical a picture is caused by the extensive damage of soft tissues, by crushing of both bones, by damage of radiocarpal joint and by absence of primary surgical processing. The rapid development of heavy infection and secondary hemorrhage led to the loss of extremity.

The experiment/experience of the Great Patriotic War showed that the insufficient processing can serve as a reason for the heaviest complications of infection:

As illustration can serve the following observation.



To it is wounded by the fragments of the mine 8/IV 1942 on the volar side in middle third of left forearm evidently inlet, at the same level from the back side - exit. In the cubital bend - blind wound. 23 Hours after wound is produced splitting up of wounds. Subsequently was observed festering wounds and withdrawal of bone fragments. The general condition deteriorated, and 3/V, on the 25th day after wound, was produced as a result of the development of sepsis the amputation of lower third of shoulder. During the research of the amputated extremity is established/installed crushing of both bones of forearm, break of lower third of shoulder, osteomyelitis. It is discharged on the 93rd day after wound with the formed stump of left shoulder.

In this case, obviously, was insufficient one splitting up alone of wounds, and it was necessary to remove free bone fragments and to cut all over nonvital tissues. Furthermore, processing the wound after 23 hours with the ascent/torque of wound was already late.

The basic condition of the success of primary surgical processing are correct reading/indication to it promptness and its high quality.

Primary surgical processing underwent more than half of all casualties with the break of the bones of forearm (55.50/o). Are

processed bullet breaks 48.80/o, and fragmentation - 62.20/o, moreover perforating wounds are processed 52.20/o, blind - 71.70/o, tangents 55.70/o, crushed - 91.80/o.

Consequently, casualties with the heavy damages underwent primary surgical processing more frequently than with the lung, and with the blind ones - it is more frequently than with the through ones, with the fragmentation ones - it is more frequently than with the bullet ones. Thus, during the disengagements and the crushings primary surgical processing was performed almost in all cases, with the blind-end wounds almost in 3/4 cases, and with the through ones and the tangents - only a little larger half.

The degree of the decomposition of bone also affected the readings/indications to the primary surgical processing, which can be judged from its frequency with the different types of breaks, namely: incomplete breaks were treated in 49.30/o, cross and oblique - into 52.80/o, large/coarse and small-splintered - into 57.40/o and those crushed - into 70.50/o.

Incomplete breaks underwent primary surgical processing only in half of the cases; with the build-up/growth of the severity of break the frequency of processing was increased also with those crushed it achieved 70.50/o.

With the breaks of radiation/radial bone the processing is produced into 51.90/o, the ulna - in 54.20/o and both bones into 68.50/o.

The tendency to perform as early as possible primary surgical processing was expressed in whereas the fact that in the overwhelming majority of the cases it was produced in the first stage, in which there was a corresponding surgical circumstances. In the stages of evacuations, in which was produced primary surgical processing, casualties were distributed as follows: at DMF - 74.30/o, in KhPPG - 15.00/o, in the army evacuation hospital - 2.60/o, in the front line evacuation hospital - 1.00/o, in GIB - 0.80/o, in other therapeutic installations - 6.30/o.

By others by words, almost 3/4 primary surgical processings with the bullet breaks of the bones of forearm was produced at DMF and more than 1/6 - in KhPPG. In further stages primary surgical processing was rare phenomenon.

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The period of primary surgical processing from the moment/torque

of wound was determined by the time of the entry of casualties to the stages, moreover the delay of processing in these stages it was not observed (Table 134).

According to these data, during the first day were primarily processed more than 3/5 bullet breaks of the bones of forearms, and for the first 6 hours after wound almost 1/5 all breaks.

The most important condition of the success of primary surgical processing is its quality and character/nature.

About the character/nature of primary surgical processing it is possible to compose presentation/concept according to following data:

① Первичная обработка	② Про-цент	③ Первичная обработка	④ Про-цент
(а) Рассечение мягких тканей раны . . . . .	51,9	(8) Обработка фрагментов кости . . . . .	0,6
(б) Иссечение мягких тканей раны . . . . .	11,8	(9) Ампутация . . . . .	5,0
(в) Рассечение и иссечение с перевязкой сосудов . . . . .	4,5	(10) Комбинация (кроме рассечения, иссечения и ампутации) . . . . .	1,0
(г) Рассечение и иссечение с удалением инородных тел . . . . .	4,4	(11) Характер не указан . . . . .	4,8
(д) Рассечение и иссечение с удалением костных осколков . . . . .	16,0		

Key: (1). Primary processing. (2). Percentage. (3). Splitting up of soft tissues of wound. (4). Carving of soft tissues of wound. (5). Splitting up and carving with dressing of vessels. (6). Splitting up and carving with removal of foreign bodies. (7). Splitting up and carving with removal/distance of bone fragments. (8). Processing fragments of bone. (9). Amputation. (10). Combination (besides

splitting up, carving and amputation). (11). Character/nature is not indicated.

Generalizing these data, it is possible to determine that stoppage splitting up of wounds composed somewhat more than half, and carving - is somewhat more than 1/9 all primary surgical processings. The amputation of forearms during the primary surgical processing was produced by greater unit apropos of disengagement and its crushing.

As illustration can serve the following observation.

B., 27 years, was wounded by the grenade 12/X 1942, moreover were detached lower third of left forearm. First aid it is shown/rendered by comrade. At PEP was introduced antitetanus serum and was superimposed tourniquet. During the same day at DMP is produced the amputation of forearm in middle third.

Casualty was discharged with the completely healed stump of the forearm in 4 months of 12 days.

So prolonged a treatment after amputation is explained by the fact that it was produced at the level of the zone of wound canal. After amputation was observed prolonged festering and rejection/separation of necrotic tissues.

It is necessary to note that the primary surgical processing as powerful/thick preventive substance against the complications of infection on the different reasons always could not be used in the sufficient measure. Thus, for instance, primary surgical processing was absent into 32.00/o of breaks, which were complicated by anaerobic infection, and into 33.3c/o of breaks, which were complicated by osteomyelitis.

Table 134. Period of primary surgical processing from the moment/torque of wound (in percentage)

(3) в часов	(1) Первые сутки			(2) Вторые сутки и позже	(3) Срок не установлен	(4) Всего
	(5) от 7 до 12 ча- сов	(6) от 13 до 24 часов	(7) час не указан			
19,1	17,8	15,2	12,7	24,7	10,5	100,0

Key: (1). First day. (2). Second day are later. (3). Period is not established/installed. (4). In all. (5). hours. (6). from to hours. (7). hour did not indicate.

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In other words, in the complicated by heavy infection groups almost third of casualties with the break of the bones of forearm to primary surgical processing it did not throw downplunge. Surgical processing in the group of casualties with the complication of anaerobic infection was reduced to simple splitting up of wounds into 39.60/o of cases, and in the group with the complication of osteomyelitis - in 48.2 0/o. This percentage of splitting up, simplest means of primary surgical processing, must be recognized for these groups as too high. Simple splitting up of wounds is not always sufficient for preventing the heavy infection, especially with the breaks with the large damage of tissues and the presence in wound of foreign bodies,

it is more frequent than complicated by anaerobic infection and osteomyelitis (Table 151).

Technology and character/nature of primary surgical processing during the Great Patriotic War underwent the change: with each year the number of casualties which proved to be this means of surgical aid, it increased/grew, was increased a number of interventions on the damaged bones, and with them and a number of wide examinations of wounds (Table 135).

The given numerals show that in the beginning of war (1941) the primary surgical processing was produced a little larger  $1/4$  casualties with the break of the bones of forearm, and at the end of war (1945) - it is more than  $3/4$  all casualties. In 1941-1943 the percentage of interventions on the bones did not exceed 15.3, while in 1945 this means of intervention underwent the almost each fourth of that processed.

In the overwhelming majority of the cases the primary surgical processing of the bullet breaks of bones of forearm was performed under local anesthesia. Anesthesia/narcosis was used predominantly during processing of breaks with the large decomposition of bones. The details of the character/nature of anesthetization are represented in Table 136, from which it is evident that with the



incomplete ones, and also with the cross and longitudinal breaks the local anesthetization was used almost into 3/4 cases. Noticeably more rarely was used with comminuted fractures, and with those crushed prevailed the general/common/total anesthetization, but several different character/nature, than with other forms/species of break.

The ordinary method of general/common/total anesthetization during the surgical processing of the uncomplicated bullet breaks of the bones of forearm was short-time chloroethyl anesthesia and it is comparatively rare - ether/ester. However, during processing of the crushed breaks ether anesthesia was used four times more frequently than with other forms/species the breaks of the bones of forearm.

Table 135. Frequency of primary surgical processing with the bullet breaks of bones of forearm and the frequency of processing bone wound on the years of war (in the percentages).

(1) Характер вмешательства	(2) Год войны				
	1941	1942	1943	1944	1945
(3) Первичная хирургическая обработка	26,1	42,1	60,3	72,6	78,8
(4) Рассечение и иссечение с удалением костных осколков и обработкой фрагментов кости . . . . .	15,3	11,8	12,0	20,3	22,6

Key: (1). Character/nature of intervention. (2). Year of war. (3). Primary surgical processing. (4). Splitting up and carving with removal/distance of bone fragments and treatment of fragments of bone.

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Intravenous hexobarbital anesthesia during the primary processing of the bullet breaks of the bones of forearm was used extremely rarely, i.e., in fractions of a percent. The same relates also to the chloroform. Local anesthetization proved to be insufficient very rarely, and then processing was finished under the general/common/total anesthetization.

In a significant number of cases during the surgical processing

the method of anesthetization in the documents was not designated; however, it is possible to assume, then here prevailed local anesthetization, since when in the card of forward area there are no indications of the form/species of anesthetization, frequently in anamnesis, assembled in further stages, this gap/spacing was completed with the indication of local anesthetization.

The primary surgical processing of the bullet breaks of the bones of forearms in the Great Patriotic War in the overwhelming majority of cases (74.30/c) was performed at DMP and within the sufficiently early periods (in the first twenty-four hours 72.40/o).

The total quantity of the casualties, subjected to primary surgical processing in connection with this means of wound, was raised with each year of war and in 1945 achieved 78.80/o.

Quality and character/nature of primary surgical processing were improved from year to year. A number of the wider examinations of wounds and manipulations on the damaged bones was increased.

Treatment of the bullet breaks of the bones of forearm in army therapeutic installations.

Essential moment/torque after primary surgical processing in the treatment of casualties with the bullet break of the bones of forearm is the reposition of the displaced broken ends and the therapeutic immobilization, which holds broken ends in the attached by it position/situation to the offensive of intergrowth. Without this condition unthinkably correct treatment of bullet fractures is difficult to rely on a good outcome. From this point of view the role of army area in the system of stage treatment was especially great, since in essence here temporary/tense transport immobilization was replaced by the constant, therapeutic. According to the data of the deepened development of the histories of disease/illness, the first therapeutic immobilization with the bullet breaks of the bones of forearm was produced at DMP in 4.20/o; in army KhPPG and evacuation hospitals - in 50.90/o; in the front line evacuation hospitals - in 38.60/o; in the evacuation hospitals of the deep rear - in 6.30/o.

Table 136. Form/species of anesthetization during the primary surgical processing in accordance with the form/species of the break of the bones of forearm (in the percentages).

(1) Вид обезбо- ливания	(2) Мест- ное	(3) Общее обезболивание					(9) Мест- ное + общее	(10) Всего
		(4) хлор- этил	(5) хлор- этил- эфир	(6) эфир	(7) гексе- нал	(8) хлоро- форм		
(12) Дырчатый в краевой . . . . .	73,8	18,7	2,8	2,4	—	—	2,3	100,0
(13) Поперечный, косой, продоль- ный . . . . .	74,2	19,8	2,3	3,2	—	0,5	—	100,0
(14) Крупно- и мелкооскольчатый . . . . .	67,3	26,0	2,0	3,8	0,4	0,3	0,2	100,0
(15) Раздробленный . . . . .	48,9	30,1	4,7	15,0	0,5	0,5	0,3	100,0
(16) В среднем . . . . .	66,3	25,1	2,6	4,8	0,3	0,3	0,6	100,0

Key: (1). Form/species of anesthetization. (2). Local. (3). General/common/total anesthetization. (4). ethyl chloride. (5). chloroethylether/ester. (6). ether/ester. (7). hexenal. (8). chloroform. (9). Local + general/common/total. (10). In all. (11). Form/species of break. (12). Perforated and edge/boundary. (13). Cross, by sand bar, longitudinal. (14). Large/coarse and small-splintered. (15). Crushed. (16). On the average.

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The presented data show that in the army area, at DMP, the first therapeutic immobilization was insignificant percentage; in the stages of army area it was produced in half of all cases and a little

less than 2/5 - in the installations of front line area. To the deep rear without the therapeutic immobilization reached about 1/16 casualties with the break of the bones of forearm. This were the predominantly difficultly diagnosed breaks, not identified in the preceding stages. In 8.00/o stage of the use/application of the first therapeutic immobilization set could not be.

A question about the therapeutic immobilization is inseparably connected with a question about the reposition. It is irrational to lay constant immobilization, without having attached to the broken ends of the bone of mooring position/situation, just as irrational to produce reposition, without having finished by its reliable immobilization. By this by measures, as is known, is finished the primary surgical processing of the open breaks in peacetime. Under conditions of the war between the primary surgical processing of the bullet breaks of the bones of forearm and the constant immobilization with the preliminary reposition there was a gap in the time and on the place of their production. At DMP the reposition with the therapeutic immobilization usually was not used. Primary surgical processing was finished with transport immobilization, predominantly standard splints (Table 137).

Gypsum splint and plaster bandage, which can be considered therapeutic immobilization, composed only 11.00/o. The most frequent

form/species of immobilization after primary surgical processing was the splint of Cramer. This gap in the time between the primary surgical processing and the constant immobilization with the preliminary reposition of broken ends is explained, in the first place, by the fact that for the execution of therapeutic immobilization with the preliminary reposition in the first therapeutic installations where was performed primary surgical processing, it was not the necessary conditions; in the second place, in the literature it was frequently indicated that in the army area the one-time reposition and therapeutic immobilization must not be produced and that these manipulations should be produced in the more distant stages. Thus, for instance, in the leadership/manual on the military field surgery M. N. Akhutina is said that in the army area attempts at the reposition of broken ends must be completely left, since to remove shifts within the later periods considerably more easily with the open breaks, than with those closed; therefore reposition can be plotted to further stages.

However, delay in the production of reposition and therapeutic immobilization had a series/number of unfavorable sides. First, casualty deprived himself during the first days of this powerful preventive substance against the infection as therapeutic immobilization; in the second place, already during the first days frequently it was developed the infection which, in the opinion of authors' majority, served contraindication to the one-time reposition.

Table 137. Distribution of casualties with the bullet break of the bones of forearm according to the character of immobilization, applied after the primary surgical processing (in the percentages).

(1) Шина Крамера	(2) Фанерная, сетчатая, картонная шина	(3) Гипсовая шина	(4) Глухая гипсовая повязка	(5) Неизвестная шина	(6) Всего
35,8	17,3	7,7	3,3	35,9	100,0

Key: (1). Splint of Cramer. (2). Plywood, cross-linked, carton splint. (3). Gypsum splint. (4). Leaf gypsum bandage. (5). Unknown what splint. (6). In all.

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In such cases the periods for the one-time early reposition could be missed, and the unreponated infected breaks of forearm flowed/occurred/lasted heavier than reponated. In the soft tissues were created the pockets near the unreponated broken ends whose edge they pressed to the adjacent tissues, which contributed to the onset of prolongedly not disappeared wound edema. This confirm literature data. I. M. Shelko noted that the swelling, which accompanied the unreponated bullet breaks of forearm, could not be by nothing eliminated, after reposition it disappeared. Late repositions gave



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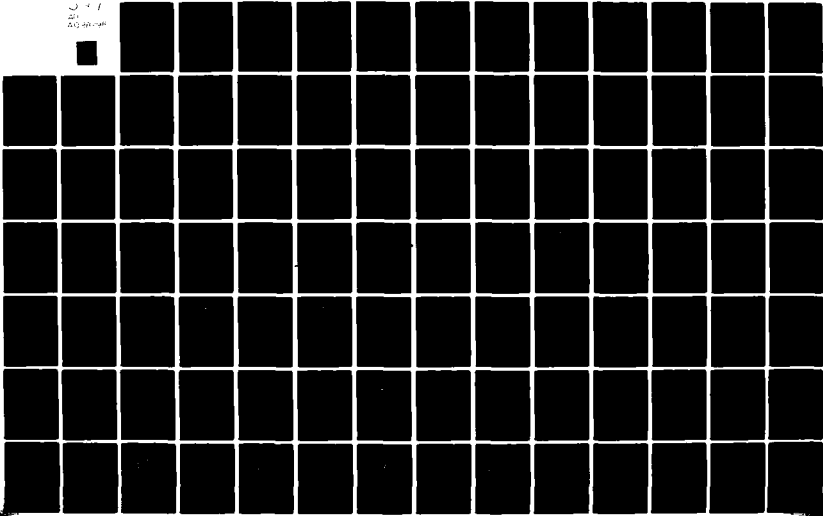
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the high percentage of failures. According to I. M. Shelko, already with repositioning in time from 10 to 15 days from the moment/torque of wound the percentage of failures composed 18.4, and in time from 30 to 35 days - 77.0.

In the documents of the stages of army area it is indicated the imposition of therapeutic immobilization, but it is not mentioned about the reposition, although the shifts, which was subject to reposition, as this can be judged from X-ray photograph, they were frequent phenomenon. This can be explained by the following: frequently with the bullet breaks of bones forearms shift tried to remove without the anesthetization by pulling for the fingers/pins with the counterthrust for the shoulder at the moment of the imposition of immobilization by gypsum. In the history the diseases/illnesses in this case fixed/recorded only latter/last moment/torque, namely the application of gypsum dressing. The insufficiently active tactics of the surgeons of army area in the relation to the reposition of the bullet breaks of the bones of forearm is explained by the danger to sharpen infection. Authors' majority indicates the need for observing extreme care with the correction of shift. However, M. B. Akhutin recommended in evacuation hospitals GBA from the first dressings to approach the correct installation of broken ends, striving in this case not so much the accurate reduction of anatomical relations, as provision of function

of extremity. However, not all adhered to this especially cautious tactics. Thus, for instance, I. M. Shelko produced one-time reposition under the local infiltration anesthetization with 20/o solution of novocaine or cover anesthesia according to A. V. Vivnyovskiy and underscored the beneficial influence of early reposition on the course of break.

The gap between the moment/torque of primary surgical processing and the therapeutic immobilization with the reposition of broken ends under the X-ray test affected negatively the elimination of shifts. According to the data of the outcomes of the bullet breaks of the bones of forearm, into 1.10/o main reason for the unsatisfactory results of treatment was the deformation. However, in the combination with other consequences of the breaks the deformation is noted considerably more frequent - into 16.40/o; with the breaks of radiation/radial bone - into 17.40/o, cubital - in 6.00/o and both bones - into 36.80/o.

Deformation occurred most rarely with the isolated/insulated bullet breaks of the ulna. With the isolated/insulated breaks of radiation/radial bone it is noted almost three times more frequently, while with breaks of both bones - into six and the more of times more frequently than with the breaks of the ulna.

One ought not, however, to forget the general severe conditions of march combat situation, which forced to develop/extend the treatment of the bullet breaks of the bones of forearm in the stages of evacuation, i.e., to conduct stage treatment according to the general/common/total principles.

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High value in the onset of deformation had the level of break (Table 138).

The fact calls attention to itself that the deformation with the isolated/insulated breaks of lower third of radius/radial bone was noted with the extraction into 90.00/o of cases. With the breaks in middle third of this bone the deformation is noted into 33.30/o of cases, while with the breaks in upper third - only into 3.30/o.

The frequency of the deformations of the ulna and both bones, depending on the level of break, little was distinguished.

In the overwhelming majority of the cases the first therapeutic immobilization was laid during the period up to 10 days (70.20/o), from 11 to 20 days - into 20.50/o it is more than 20 days - into 9.30/o. Late immobilization is explained by the late identification

of the break in the difficult for the diagnosis cases.

The character/nature of therapeutic immobilization is represented in Table 139. Deep gypsum bandage, as show the presented data, was applied more than in half of the cases of the bullet breaks of bones of forearm; gypsum or other splint (in the majority of the cases the splint of Craser), used as the first therapeutic immobilization, by a little was inferior in the frequency of use/application to circular gypsum bandage.

Table 138. Frequency of deformations with the bullet breaks of the bones of forearm at different levels (in the percentages).

(1) Название кости	(2) Уровень перелома по третям		
	(3) верхняя	(4) средняя	(5) нижняя
(6) Лучевая . . . . .	3,3	33,3	90,0
(7) Локтевая . . . . .	7,0	5,5	5,8
(8) Обе кости . . . . .	42,9	39,9	33,3
(9) В среднем . . . . .	17,8	13,8	19,7

Key: (1). Name of bone. (2). Level of break on third. (3). upper. (4). average/mean. (5). lower. (6). Radiation/radial. (7). Cubital. (8). Both bones. (9). On the average.

Table 139. Character/nature of therapeutic immobilization with the bullet breaks of the individual bones of forearm (in the percentages).

(1) Название кости	(2) Гипсовая или другая шина	(3) Глухая и окончатая гипсовая повязка	(4) Скелетное вытяжение	(5) Прочие виды	(6) Всего	(7) Неизвестно
(8) Лучевая . . . . .	47,0	51,5	0,1	1,4	100,0	4,0
(9) Локтевая . . . . .	45,3	53,0	0,1	1,6	100,0	4,2
(10) Обе кости . . . . .	35,5	62,7	0,4	1,4	100,0	11,9
(11) В среднем (учитывая в тех равных, у которых вид сломанной кости не установлен)	45,8	53,5	0,2	0,5	100,0	7,1

Key: (1). Name of bone. (2). Gypsum or other splint. (3). Deaf and

fenestrated gypsum bandage. (4). Skeletal/skeleton traction/extension. (5). Other forms/species. (6). In all. (7). It is unknown. (8). Radiation/radial. (9). Cubital. (10). Both bones. (11). On the average (taking into account those casualties, whose form/species of broken bone is not established/installed).

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The application of fenestrated gypsum dressing occupied insignificant place among other methods (1.80/o), used for the first therapeutic immobilization of the bullet breaks of the bones of forearm. In no way was noted bridge-like bandages, or the gypsum bandages with the corset, which recommended G. Ya. Yapshteyn with infected breaks of both bones of forearm. Skeletal/skeleton traction/extension was rarity and it comprised the fractions/portions of percentage.

With the isolated/insulated breaks of one bone deaf and fenestrated gypsum bandage was used a little more frequent than the immobilization by gypsum or any another splint. With breaks of both bones of the forearm closed and fenestrated bandage laid almost doubly more frequently than splint.

Gypsum bandage was laid from the level of the

metacarpophalangeal joints to upper third of shoulder in the position/situation of the extremity, bent at the right angle in the elbow joint, and light extension in the radiocarpal joint. Forearm was set in the mid-position between the pronation and the supination.

M. N. Akhutin with the breaks of the bones of forearm in lower third recommended to add to forearm and hand the position/situation of pronation. With the breaks on the same level in the "Instructions in accordance with the 4th Ukrainian front" is recommended the fixation in the position/situation of incomplete pronation. However, the majority of the surgeons (M. Z. Yavorskiy, S. Ye. Kashkarov, G. Ya. Epstein and et al.) considers that the immobilization of forearm in the position/situation of pronation is shown neither with one form/species of the break of the bones of forearm, at whatever level it nor occurred, and are recognized themselves advantageous the position/situation of supination with the breaks in upper third and the mid-position with the breaks in middle and lower third.

The frequency of the use/application as the therapeutic immobilization of a deaf gypsum bandage with the bullet breaks of the bones of forearm was increased with each year of war, namely (in the percentages to a number of breaks of the bones of forearm in each year): during the first year of war - 26.1,

in the second year of war - 47.6, in the third year -



58.6 and in the fourth year - 77.0.

If during the first year of war the immobilization of closed plaster bandage comprised a little larger  $1/4$ , then in the fourth year - is already more than  $3/4$ , with each year of war all more displacing gypsum and other splints.

It is necessary to indicate also reduction of the use/application of the fenestrated gypsum bandages: the first year of war - 3.7o/o, the second - 2.3o/o, the third - 0.7o/o, the fourth - 0.5o/o.

With the bullet breaks of bones the forearms soon after wound and primary surgical processing appeared the various kinds of complication, in connection with which was the need in repeated surgical interventions which were distributed as follows: in the army area - 17.2o/o, in the front line - 23.7o/o and in the deep rear - 59.1o/o.

The distribution of repeated operations/processes in stages is given in Table 154, from which it is evident that the most frequent operations/processes in the army area they were: the autopsy of suppurative flows (28.7o/o), the examination of wounds (20.6o/o) and amputation (18.2o/o).

From a total quantity of different means of the repeated operations/processes, produced in all areas, in the fraction/portion of army area it is necessary 65.80/o of examinations of wounds, 62.40/o of amputations, 45.00/o of dressings of vessels, 38.00/o of autopsies of flows and phlegmon, 29.00/o of removals/distances of bone fragments, 23.30/o of processings of fragments, 0.90/o of sequestrectomies, 5.50/o of reamputations. In other words, specific gravity/weight of repeated surgical interventions apropos of the sharp/acute complications of the bullet breaks of the bones of forearm, produced in the army area, was sufficiently great.

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This distribution of surgical interventions indicates that the struggle with the early complications was conducted mainly in the stages of army area, and confirms the high value of the latter in the system of the stage treatment of the bullet breaks of the bones of forearm.

For the local treatment of wounds with the bullet breaks of the bones of forearm from the medicinal substances in the army area extensively were used sulfineylamide, Rivanol, hypertonic solution of

sodium chloride, ointment of A. V. Vivnyovskiy, chloramine and rarely phages.

Almost all medicinal substances were used in combination one with another.

In the army area into 20.0c/o of cases is noted the combination of the use/application of medicinal substances with the therapeutic exercise, whereas in the front line area and in the hospitals of the rear in half of the cases medicinal substances were matched with the physiotherapy and the therapeutic gymnastics. This is understandable - in cases when immobilization was already superimposed, in the army area could be early assigned only therapeutic gymnastics, since physiotherapy was possible only after the removal/taking of immobilization in the rear hospitals. Thus, the conservative treatment of the bullet breaks of the bones of forearms in the army area in essence consisted of the imposition of therapeutic immobilization (50.9c/o). The shift of broken ends was amended under the local anesthetization by traction/extension for the fingers/pins and counterthrust for the shoulder at the moment of the application of gypsum dressing.

Struggle with the early complications of infection was conducted by repeated surgical interventions and applying the antiseptic

substances.

Most frequent of the operations/processes, produced in the army area, was the autopsy of flows and phlegmons (27.80/o). Such serious surgical interventions, as amputations (62.40/o), dressing of vessels apropos of secondary hemorrhages (45.00/o), examination of wounds (65.80/o), autopsy of flows and phlegmons (38.00/o), were produced predominantly in the army therapeutic installations.

In army region began functional treatment in the form of therapeutic gymnastics.

Therapeutic immobilization in the majority of the cases was realized by the circular gypsum bandage which, beginning from the third year of war, prevailed. Fenestrated gypsum bandage as the first therapeutic immobilization was used rarely (1.80/o).

Course treatment of the bullet breaks of the bones of forearms in front line and rear evacuation hospitals.

Major of medical service I. Ya. Podoprigror.

The clinical course of the bullet breaks of the bones of forearms in the Great Patriotic War was very different and it depended on many interacting factors, the main things of which were the degree of the anatomical damage of bones and soft tissues, infection the associated damages of vessels, nerves and joints.

The degree of the damage of bones and soft tissues was the inherent factor, which influenced one way or another the course of the bullet breaks of the bones of forearm. Nevertheless remaining factors were not constant; however, their specific gravity/weight in the clinical course was frequently so great that the anatomical damages withdrew to the second plan/layout. Thus, for instance, comminuted fractures of both bones flowed/occurred/lasted heavier than the comminuted fracture of one bone, but if the latter was complicated by anaerobic infection, then its course was incomparably heavier than the uncomplicated break of both bones. Therefore it is difficult to give such common clinical picture of the bullet breaks

of the bones of forearm, which would reflect/represent the effect of each of the mentioned interacting factors on the course of break.

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Is considered by advisable to secrete the group of the bullet breaks of forearm, which flowed/occurred/lasted without the complication of infection and without the associated damages of the vessels of nerves and joints. This group of casualties with the bullet break of the bones of forearm is characterized by the not disturbed by attendant moments/torques clinical course. In view of the small number of the wounds of this group, which composed altogether only 15.00/o of all bullet breaks of the bones of forearm, it is not typical for the majority of the bullet breaks of the bones of forearm; however, it can serve as the example of the uncomplicated course and line of conduct and tactics of surgeon with respect to this contingent of casualties.

Furthermore, the characteristic of this uncomplicated group shows, what forms/species of the bullet breaks of the bones of forearm and with what character/nature of damages more frequently flowed/occurred/lasted smoothly.

In the group of the uncomplicated breaks overwhelming majority

(93.00/o) composed the breaks of one bone, whereas the breaks of both bones composed altogether only 7.00/o.

As it is said above, the simple fractures composed 15.00/o of all breaks of the bones of forearm; with the breaks of radius/ulna bone they were encountered in 15.3%, cubital - in 18.30/o and both bones - into 5.60/o of cases.

Thus, smooth course with breaks of both bones was observed more rarely than with the breaks of one bone. By this is confirmed known position/situation that breaks of both bones on the whole flowed/occurred/lasted more heavily in comparison with the breaks of one bone.

The smooth course of the bullet breaks of the bones of forearm more frequently was observed during the smaller damage to the bone tissue (Table 140).

In the group of casualties without the complications were encountered more frequently the incomplete breaks and the breaks, which differ little from those closed, and three times less frequent the heaviest form/species of break - crushed.

According to the form/species of the wounding shell and the character/nature casualty it was also few basis for the development of infection in the group (Table 141) in question.

Table 140. Distribution of all casualties with the bullet break of the bones of forearm according to the form/species of break and separately for the group without the complications (in the percentages).

(6) Группа раненых	(1) Вид перелома	(2) Дырчатый, краевой, про- дольный, поперечный, косой	(3) Осколь- чатый включен- ный	(4) Раздроб- ленный	(5) Всего
(7) Все раненые . . . . .		27,4	57,8	14,8	100,0
(8) Раненые без осложнений . . . . .		38,2	57,2	4,6	100,0

Key: (1). Form/species of break. (2). Perforated, edge/boundary, longitudinal, cross, by sand bar. (3). Fragmented packed in. (4). Crushed (5). In all. (6). Group of casualties. (7). All casualties. (8). Casualties without complications.

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From the preceding information it is evident that in casualties without the complications the fragmentation wounds were observed almost 2 1/2 times less frequent, and blind almost is 1 1/2 times less frequent, than in all casualties with the bullet break of the bones of forearm; tangential wounds and crushings in this group in no way were observed.



Thus, the bullet breaks of the bones of the forearm of the uncomplicated group according to all signs were more the lungs.

In this group in the overwhelming majority of the cases were observed bullet wounds with small damages and breaks of one bone. By this is explained their smooth clinical course, which has by nature much in common with coursing of closed breaks of bones forearm.

The general condition of the casualties of this group suffered little: they could independently be moved and from an evacuation point of view they were easily wounded. Increases in the temperature, and also the changes in the composition of the blood and urine in them was not observed. After the therapeutic immobilization of break the pains calmed down. Primary surgical processing in the dismantled group of casualties was necessary only into 38.40/o instead of 55.50/o with all bullet breaks of the bones of forearm. The consolidation of break attacked/advanced into the earlier periods, than in all casualties with the break of the bones of the forearm (see that 16).

In the group of casualties without the complications the consolidation of break attacked/advanced during the period up to 45 days in 69.50/o, from 46 to 60 days - in 19.30/o, from 61 to 75 days - in 6.70/o, during 76 days it is later - in 3.7% and consolidation

it did not advance in 0.8c/o.

On the basis of data of the author's development of the histories of disease/illness the healing of wounds occurred on the average after 42.2 days from the ascent/torque of wound; the earliest period of the healing of wounds was 26 days, the latest - 69 days from the moment/torque of wound.

After the removal/taking of immobilization remained muscular weakness and difficulty of movement in the joints. The use/application of physiotherapy and therapeutic exercise on the average for a period of 3 weeks usually contributed to the full/total/complete reduction of function.

The data about the duration of treatment are represented in Table 142.

During the comparison of the duration of the treatment of casualties without the complications with the duration of the treatment of casualties without the complications with the duration of the treatment of all casualties with the bullet break of the bones of forearm it proves to be that during the period up to 3 months in the first group finished treatment more than 3/4 casualties, and secondly - it is considerably less than half; the average duration of hospital treatment in the first group of 72.2 days, and secondly - 108 days, i.e., 1 1/2 times it is more.

Table 141. Form/species and the character/nature of wound with the bullet breaks of the bones of icreams in the different groups of casualties (in the percentages).

(1) Группа раненых	(2) Вид ранения			(3) Характер ранения				(11) Всего
	(4) пулевое	(5) осколоч- ное	(6) всего	(7) сшибное	(8) скашивное	(9) кас- тельное	(10) размо- лнение	
(12) Все раненые . . . . .	68,3	31,7	100,0	84,4	10,6	2,3	2,7	100,0
(13) Раненые без осложнений . . . . .	86,3	13,7	100,0	92,4	7,6	—	—	100,0

Key: (1). Group of casualties. (2). Means of wound. (3). Character of wound. (4). bullet. (5). fragmentation. (6). in all. (7). through. (8). nonperforating. (9). tangent. (10). crushing. (11). in all. (12). All casualties. (13). They are wounded without complications.

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In the absence of complications more than 2/5 casualties with the break of the bones of forearms (42.20/o) finished treatment in the army and front line area, without reaching on the hospitals of the deep rear, whereas from a number of all casualties with the bullet break of the bones of forearms in the army and front rear it finished the treatment only of the 1/5 casualties (20.90/o).

The comparison of the clinical outcomes of all bullet breaks with the outcomes of the breaks, which flowed/occurred/lasted without the complications (Table 143), shows that good clinical outcomes in the first group occurred 2 1/2 times less frequent than in the second group.

As the example of cursing of break without the complications can serve the following observation.

Ch., 46 years, is wounded 17/VIII 1943. At PMP is set the diagnosis: the perforating bullet wound of left forearm on the

boundary of upper and middle third with the damage to bone. Is superimposed bandage and plywood splint. 18/VIII in GLR plywood splint is substituted by hypo-owl by cast. 1/IX is initiated the use/application of therapeutic gymnastics. 16/IX immobilization is taken/removed. Was noted the light limitation of supination and pronation and the violation of sensitivity at the ends of the fingers/pins. X-ray photograph - multifragment break of the ulna on the boundary of upper and middle third. 20/IX wounds healed. Under the effect of the baths and the therapeutic gymnastics the function of extremity was reduced completely. 30/IX 1943 it is discharged healthy/sound.

With each year of war was decreased a number of smoothly flowed/occurred/lasted bullet breaks of the bones of forearm and was increased a quantity of breaks, which flowed/occurred/lasted with the complications (Table 144).

Table 142. Distribution of wounded with gunshot fracture of the forearm bones by duration of treatment (in days) in various groups, (in . . . percent).

(1) Группа раненых	(2) Длительность лечения (в днях)	60	61-90	(3) 91 и более	(4) Всего	(5) На уста- новлено	(6) Средняя дли- тельность госпи- тального лечения
(1) Все раненые . . . . .		15,7	26,6	57,7	100,0	2,0	178,0
(2) Раненые без осложнений		40,1	38,8	23,1	100,0	5,5	72,2

Key: (1). Group of wounded. (2). Duration of treatment (in days). (3). 91 or more. (4). Altogether. (5). Not established. (6). Mean duration of hospital treatment. (7). All wounded. (8). Wounded without complications.

Table 143. Clinical outcomes of all bullet breaks of the bones of forearm and separately flowed/occurred/lasted without the complications (in the percentages).

(1) Группа раненых	(2) Исход	(3) Хороший анатомический и функциональный результат	(4) Последствия повреждения нервов	(5) Контрактура	(6) Анкилоз	(7) Ложный сустав	(8) Культи	(9) Проние и деформация	(10) Остеомиелит	(11) Комбинант	(12) Итого
(13) Все огнестрельные переломы предплечья . . .		36.6	14.4	27.7	3.4	2.7	4.4	4.1	3.3	3.4	100.0
(14) Без осложнений . . . .		90.9	—	3.4	—	0.8	—	4.9	—	—	100.0

Key: (1). Group of casualties. (2). Outcome. (3). Good anatomical and functional result. (4). Consequences of damage of nerves. (5). Contracture. (6). Ankylosis. (7). Dummy joint. (8). Stump. (9). other and deformation. (10). Osteomyelitis. (11). Combination. (12). Altogether. (13). All bullet breaks of forearm. (14). Without complications.

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If in 1941 for each of 100 bullet breaks of the bones of forearm it fell not complicated by infection and associated wounds of other regions 20.6, then in 1945 they were only 12.8; the percentage of the complications of osteomyelitis was increased with 11.9 in 1941 to 32.9 in 1945; the complications of anaerobic infection were increased with 1.60/o in 1941 to 3.20/o in 1945.

Presented facts are explained the changing in the course of war military and tactical circumstances, which entailed an increase in the quantity of multiple wounds, which accompanied the break of the bones of forearm. Such breaks with the associated wounds of other regions did not enter into the uncomplicated group. In the course of war increased also a number of breaks, caused by the fragmentation wounds (Table 145).

Within the time of war the frequency of the breaks of the bones of forearm with associated and continued wounds increased by 7.50/o, and the frequency of the breaks, caused by fragments, to 10o/c.

This testifies about the greater severity of the wounds of forearm in last year of war.

The relationship/ratio of the forms/species of the bullet breaks of the bones of forearm on the years of war little was changed (Table 146).

During the first year of war the lightest forms/species of the break, by nature which were approaching those closed and which flowed/occurred/lasted, as a rule, it is smooth, they were

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encountered more rarely, and fragmented - are more frequently than during the subsequent years. The frequency of the crushed breaks on the years of war was changed little.



Table 144. Frequency of the bullet breaks of the bones of forearm, which flowed/occurred/lasted without the complications and complicated by osteomyelitis and by anaerobic infection, during the war (in the percentages).

(1) Переломы	(2) Год				
	1941	1942	1943	1944	1945
(3) Не осложненные инфекцией и сопутствующими ранениями . . . . .	20,6	14,1	15,2	13,3	12,8
(4) Осложненные остеомиелитом . . . . .	11,9	23,7	27,3	28,5	32,9
(5) Осложненные анаэробной инфекцией	1,6	2,0	2,3	2,0	3,2

Key: (1). Breaks. (2). Year. (3). Not complicated by infection and associated wounds. (4). Complicated by osteomyelitis. (5). Complicated by anaerobic infection.

Table 145. Frequency of the bullet breaks of the bones of forearm with the associated wounds and caused by fragmentation wound on the years of war (in the percentages).

(1) Переломы	(2) Год войны			
	(3) первая	(4) второй	(5) третий	(6) четвертый
(7) Переломы с сопутствующими ранениями . . . . .	16,3	21,2	23,1	23,8
(8) Переломы, вызванные осколочными ранениями . . . . .	28,7	30,6	33,2	36,7

Key: (1). Breaks. (2). Year of war. (3). the first. (4). the second. (5). the third. (6). the fourth. (7). Breaks with associated wounds.

(8). Breaks, caused by fragmentation wounds.

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Given data attest to the fact that the degree of damage to bone, determined by the form/species of break, was not always the main decisive moment/torque clinical coursing of bullet breaks of the bones of forearm. An increase in the number of fragmentation and associating break wounds, and also number of crushed breaks created favorable conditions for the different genus of complications. Evidently, coursing of bullet breaks of the bones of forearm affected also the effect of general/common/total factors - nerve exhaustion and general/common/total fatigue, caused by prolonged war.

Thus, clinical coursing of not complicated by accompanying damages and infection of breaks according to all signs was incomparably more the lung, than coursing of all bullet breaks of the bones of forearm. This is explained by lighter damage of tissue, absence of the associated damages and complications of infection.

Clinical coursing of bullet breaks of the bones of forearm, complicated by infection, and also by associated damages of vessels and nerves, is set forth in vcluse 16. Here are given only the characteristic features of coursing with these complications and the

value of each of the mentioned factors.

The degree of anatomical damages had straight/direct and indirect effect on coursing of bullet breaks of the bones of forearm. Straight/direct effect was expressed in the fact that the breaks with the large damages more frequently caused the heavy condition of casualties, they flowed/occurred/lasted they more prolongedly and gave the worse prognosis, than breaks with the small damages.

M. Z. Yavorskiy considered that the direct dependence between the degree of anatomical damages and clinical coursing of bullet breaks of the bones of forearm there does not exist.

However, data of the deepened development of the histories of disease/illness show that with the light forms/species of break the shock either in no way was encountered or it was noted only in the very rare cases. With such heavy breaks as crushed, it is noted into 3.90/o; the break of one bone it was escorted/tracked by shock only into 0.4-0.30/o, whereas with breaks of both bones it was 3.30/o, i.e., 8-11 times more frequent. The frequency of dummy joints with an increase in the severity of break increased/grew (that 16).

The indirect effect of the degree of anatomical damages on clinical coursing was expressed in the fact that the breaks with the

large damage of tissues were more frequently complicated by infection. As illustration can serve the data about such heavy infections as anaerobic, sepsis, osteomyelitis (Table 147).

Table 146. Form/species of the bullet break of the bones of forearms during the different years of war (in the percentages).

(1) Год войны	(2) Вид перелома	(3) Раздробленный	(4) Оскольчатый	(5) Прочие	(6) Всего
(7) Первый		13,3	58,2	28,5	100,0
(8) Второй		15,9	56,1	28,0	100,0
(9) Третий		15,5	55,5	29,0	100,0
(10) Четвертый		13,7	57,5	28,8	100,0

Key: (1). Year of war. (2). Form/species of break. (3). Crushed. (4). Fragmented. (5). Other. (6). In all. (7). The first. (8). The second. (9). The third. (10). The fourth.

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Thus, anaerobic infection with the light forms/species of break either in no way was encountered or it was noted more rarely than with heavier cross and comminuted fractures, with the crushed breaks it achieved 4.20/o.

On the effect of the degree of damage to bone on the development of anaerobic infection it is possible to judge also by the fact that it much more frequently was observed with breaks of both bones of the forearm: whereas with the breaks of radiation/radial bone into 1.10/o of cases, with the breaks of cubital - into 1.10/o, with the breaks

of both bones into 5.40/o of cases, i.e., with breaks of both bones anaerobic infection was encountered five times more frequently than with the breaks of one bone.

The same dependence on the degree of damage to bone and, consequently, also soft tissues, it was noted in the development of sepsis and osteomyelitis.

Consequently, the heavy condition of casualties with the break of the bones of forearm and unsatisfactory functional prognosis were frequently the direct consequence of heavy anatomical damages. Appeared in this case infection perverted the process of healing, burdened and lengthened coursing, it made functional prognosis worse and it led to the loss of extremity, and sometimes even to death.

With the bullet breaks of bones the forearms of the damage of vessels were observed into 7.40/o, nerves - into 30.50/o and joints - into 7.90/o.

The special feature/peculiarity clinical coursing of bullet breaks of the bones of forearm with the associated damages of vessels consisted in the fact that frequently right after wound in casualties was noted the heavy condition as a result of the primary anemia and the shock.

With the breaks with the damage of vessels the shock is noted 6.50/o, i.e., 13 times more frequently than with the breaks of the bones of forearm without the wound of vessels (0.50/o).

According to the data of the deepened development of the histories of disease/illness, aprcpc of anemia and shock 28/80/o of these casualties was produced the blood transfusion.

This direct effect had the damages of vessels to coursing of bullet breaks of the bones of forearm. Still greater there was the indirect effect of this factor, which was expressed in the development of complications on the soil of the violation of blood circulation and reduction in the general/common/total resistivity of organism.

Table 147. Frequency of the complications of the infection of the bullet breaks of the bones of forearm (in the percentages).

(1) Вид перелома	(2) Осложнения		
	(3) анаэробная инфекция	(4) сепсис	(5) остеомиелит
(6) Краевой . . . . .	—	—	13,1
(7) Дырчатый . . . . .	0,6	—	21,9
(8) Продольный . . . . .	—	—	14,0
(9) Косой . . . . .	0,7	0,2	20,1
(10) Поперечный . . . . .	2,2	—	25,7
(11) Крупнооскольчатый	1,6	0,03	34,0
(12) Мелкооскольчатый	1,3	0,3	38,1
(13) Раздробленный . . .	4,2	0,9	39,7

Key: (1). Form/species of break. (2). Complications. (3). anaerobic infection. (4). sepsis. (5). osteomyelitis. (6). Edge/boundary. (7). Perforated. (8). Longitudinal. (9). By sand bar. (10). Cross. (11). Large-splintered. (12). Small-splintered. (13). Crushed.

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The special feature/peculiarity clinical coursing of bullet breaks of the bones of forearm with the associated damage of nerves was the presence of paralyzes, paresis, neurogenic contractures which involved/tightened coursing and were usually the reason for unsatisfactory functional prognosis depending on the character/nature of the damage of nerves - full/total/complete or partial gap, contusion and so forth, etc.



Prolonged difficulty of movement of joints and frequent outcomes into the ankylosis were the special feature/peculiarity clinical coursing of bullet breaks of the bones of forearm, which penetrated the joint. According to the data of the deepened development of histories the diseases/illnesses, which penetrate into the joints of crack were observed into 7.90/o, and ankylosis in the outcomes in those recovered - into 3.40/o. According to the data of the author's development of the histories of disease/illness, with the breaks, complicated by the penetrating into the joint wound, there were the following outcomes: good outcomes were into 13.70/o, contracture - into 53.00/o, ankylosis - into 30.30/o, dummy joint - into 1.50/o, amputating stump - into 1.50/o of cases. In other words about a third of breaks, which penetrate into the joint, were finished with ankylosis and it is more than half - by contracture.

Foreign bodies in the bones and the soft tissues with the bullet breaks of the bones of forearm, according to the data of the deepened development of the histories of disease/illness, were observed into 18.70/o.

Data of the author's development of the histories of disease/illness (K. P. Ivan'kevich) regarding the complications in casualties with the foreign bodies and in the absence of the latter are represented in Table 148.

Given data show that all forms/species of heavy infection in the group of the bullet breaks of the bones of forearm with the foreign bodies were observed considerably more frequently than in the group without the foreign bodies. By this is explained the high frequency of repeated surgical interventions, the large duration of coursing and high frequency of poor outcomes in the group with the foreign bodies.

Operations/processes, besides the primary surgical processing, in the group with the foreign bodies were produced into 64.5c/o, and in the group without the foreign bodies - into 27.0o/o.

To each wound in the group with the foreign bodies fall 1.5 repeated operations/processes, whereas in the group without foreign bodies - 1.3, i.e., in the group of casualties with the foreign bodies not only a larger number of casualties underwent repeated operations/processes, but also a number of repeated operations/processes on the average in the casualty of this group was more than in the casualty of group without the foreign bodies.

The average duration of the hospital treatment of casualties in the group with the foreign bodies was 127 days, and in the group

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without the foreign bodies - 108 days. The distribution of casualties with the bullet break of the bones of forearm according to the duration of hospital treatment is represented in Table 149.

Table 148. Complications of the bullet breaks of the bones of forearms with the foreign bodies and without them (in the percentages).

(1) Группа раненых	(2) Осложнения			
	(3) анаэробная инфекция	(4) сепсис	(5) остеомиелит	(6) флегмона, абсцесс
(7) С инородными телами	2,8	0,4	41,7	34,6
(8) Без инородных тел	1,0	0,1	23,5	18,0

Key: (1). Group of casualties. (2). Complications. (3). anaerobic infection. (4). sepsis. (5). osteomyelitis. (6). phlegmon, abscess. (7). With foreign bodies. (8). Without foreign bodies.

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Good clinical outcomes in the group with the foreign bodies composed 29.20/o, and in the group without the foreign bodies - 35.60/o.

Thus, the bullet breaks of the bones of forearms with the foreign bodies on the whole flowed/occurred/lasted more heavily, more prolongedly and gave the worse outcomes, than breaks without the foreign bodies.

The complication of the bullet breaks of the bones of forearms of pyogenic infection in the Great Patriotic War was frequent phenomenon. The festering in the wounds, which flowed/occurred/lasted

without the education of flows and phlegmons and without subsequent osteomyelitis, it is noted into 15.30/o of all bullet breaks of the bones of foreara. This festering little was reflected in the general condition of the casualties: temperature remained normal or it was slightly increased (to 37.5°), changes in the composition of the blood and urine it was not observed. Repeated surgical interventions in such cases it was not required.

The heavier manifestation of pyogenic infection with the education of flows and phlegmons was escorted/tracked by reinforcing of pains in the wound, by increase in the temperature to 38-39°, and also quantity of leukocytes in the blood and accelerated ROE.

With respect to a number of all bullet breaks of the bones of foreara this form/species of complication composed 4.40/o. Frequently this form/species of complication was the first manifestation of osteomyelitis. According to the data of the author's development of the histories of disease/illness, osteomyelitis in further coursing of these cases was noted into 61.3c/o.

Uniquely flowed/occurred/lasted the disengagements and the crushings, which composed 2.7c/c all of the bullet breaks of the bones of foreara. According to the data of the author's development of the histories of disease/illness, into 15.80/o of cases of

crushing forearm was noted heavy condition and shock. If during the crushing immediately was not produced amputation, but were undertaken the attempts to maintain extremity, then frequently the complication of the heavy infection, predominantly anaerobic, forced to produce amputation under less advantageous conditions, than during the primary surgical processing. lethality in this group composed 15.50/o of general/common/total lethality with the breaks of the bones of forearm.

After removal from the condition of shock and amputation the condition of casualties after 2-3 days after became satisfactory, toward the end of the second or third month was finished shaping of stump, and the majority of casualties was discharged with a good stump.

Clinical outcomes in the group of disengagements and crushings were such: a good stump was obtained into 78.60/o, stump poor - into 13.60/o, ankylosis - into 1.40/o, dummy joint - into 0.90/o and other outcomes - into 5.50/o.

Table 149. Duration of the hospital treatment of the bullet breaks of the bones of forearm in the group with the foreign bodies and in the group without them (in the percentages).

(1) Группа раненых	(2) Длительность в месяцах			(4) Всего
	2	3	(3) 4 и более	
(5) С инородными телами	6,5	19,9	73,6	100,0
(6) Без инородных тел	14,2	28,3	59,5	100,0

Key: (1). Group of casualties. (2). Duration in months. (3). and more. (4). In all. (5). With foreign bodies. (6). Without foreign bodies.

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Therapeutic measures also influenced clinical coursing of bullet breaks of the bones of forearm. Such moments/torques as the periods of rendering of first aid, transport immobilization, primary surgical processing, were the important substances of prophylaxis of complications. Surgical intervertions, medicinal/medicamentous treatment with the advanced complications, it is doubtless, improved the condition of casualties. The reposition of broken ends, therapeutic exercise also beneficially affected outcomes. However, it is difficult to secrete these measures from the general/общий/total complex of the factors, which influenced coursing of bullet breaks of the bones of forearm, and to descstrate their value in the accurate

digital expressions.

On the whole in the Great Patriotic War with the bullet breaks of the bones of forearm such severe complications as anaerobic infection (2.10/o), sepsis (0.2c/o), were rare phenomenon. Osteomyelitis, which sharply made coursing and prognosis worse, was most frequent severe complication (25.20/o). Frequently the unsatisfactory functional prognosis was caused by the damage of nerves (30.50/o). But even without the complications indicated and without the associated damages of nerves, vessels and joints coursing of bullet breaks of the bones of forearm was more prolonged than closed ones, moreover into 9.10/o were observed unsatisfactory outcomes. The average duration of the treatment of the breaks of the bones of forearm was 3.6 months. Amputations composed 4.40/o of all clinical outcomes.

In the hospitals of the deep rear the stage treatment of the bullet breaks of the bones of forearm in essence consisted in the struggle with the late complications and in overcoming of the aftereffects of both break and associated damages of nerves, vessels, joints and so forth, etc.

In each stage the treatment of the bullet breaks of the bones of forearm had its special features/peculiarities which were determined



by the condition of casualties and by the revealed/detected here complications. In proportion to the removal/distance of casualties from the front line it was possible to note an increase in the quantity of complications and a change in the character/nature of the wound process coursing of which, besides entire other, influenced the period, which passed from the moment/torque of wound.

In casualties, who finished treatment in the rear, early complications were recorded in 53.20/o, moreover in the army area - into 2.40/o, in the army area - into 11.80/o, in the front line area - into 15.60/o and in the deep rear - into 23.40/o.

The distribution of casualties with the bullet break of the bones of forearms, which finished treatment in the rear, according to the character/nature of the complications, which were being observed in the different areas, is represented in Table 150.

Table 150. Distribution of early complications and associated diseases with the bullet breaks of the bones of forearm the casualties have according to the areas of their treatment (in the percentages).

(1) Район	Осложнение (2) (3)	Шок (3)	Анаэробная инфекция (4)	Гнойные вытеки (5)	Гнойный артрит (6)	Остро теку- щий сепсис (7)	Остеомиелит остро теку- щий (8)	Сопутствующе е заболевания (9)	Отморозки (10)	Итого (11)	Не было осложнения (12)
(13) Войсковой . . .		35,6	15,3	8,0	—	—	—	31,9	9,2	100,0	97,6
(14) Армейский . . .		0,8	12,8	60,2	0,7	0,7	0,5	21,6	2,7	100,0	88,2
(15) Фронтальной . . .		—	2,4	58,2	1,0	1,0	9,1	26,5	1,8	100,0	84,4
(16) Тыловой . . .		—	0,2	26,4	1,1	0,1	14,2	57,6	0,4	100,0	76,6

Key: (1). Area. (2). Complication. (3). Shock. (4). Anaerobic infection. (5). Suppurative flows. (6). Suppurative arthritis. (7). Sharply flowing sepsis. (8). Osteomyelitis sharply flowing. (9). Associated diseases. (10). Freezing. (11). Altogether. (12). It was not complications. (13). ~~Army~~ <sup>Зона</sup>. (14). Army. (15). Front ~~zone~~. (16). Rear.

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The analysis of given data shows that in the army area the shock and anaerobic infection comprised more than half of all complications. Therefore struggle with the direct danger, connected with the wound, and prophylaxis of complications were primary task of army area.

In the army area the festering, flows, phlegmons composed 3/5, and anaerobic infection of approximately all 1/8 observed here complications with the breaks of the bones of forearm; therefore struggle with the sharp/acute complications of pyogenic infection and imposition of therapeutic immobilization were the basic problems of the therapeutic installations of this area.

In the hospitals of front line area the festering, flows and phlegmons also comprised more than half of all complications with the bullet breaks of the bones of forearm. In this stage has already been revealed/detected sharply elapsing osteomyelitis, sepsis, suppurative arthrites. Primary task of front line hospitals consisted of the completion of struggle with the early sharp/acute complications and of the imposition of therapeutic immobilization, since only under these conditions casualties with the break of the bones of forearm could be directed for the deep rear without further deterioration of general condition in the route/path and without the special damage for coursing the break. In the rear of festering, the flows and phlegmons comprised more than all quarter noted here sharp/acute complications of the bullet breaks of forearm, whereas in the majority of the cases these complications were the first manifestations of late complications.

The late ones included such complications which were revealed/detected in the rear and flowed/occurred/lasted chronically. They included osteomyelitis, limply flowed/occurred/lasted sepsis, suppurative arthrites, delayed consolidation, limply healing wounds, contractures and so forth, etc.

Table 151. Form/species and the character/nature of wound, the form/species of the break and the presence of other wounds in the group of the casualties, who were being treated in the rear, and in the total group of all casualties with the bullet break of the bones of forearm (in the percentages).

(1) Группа раненых	(2) Вид ранения			(3) Характер ранения				
	(6) пулевое	(7) осколочное	(8) всего	(9) сгибное	(10) сгибное	(11) насательное	(12) размозженое	(13) всего
(15) Лечившиеся в эвакуогоспиталях глубокого тыла . . . . .	66,2	33,8	100,0	83,7	10,8	2,4	3,1	100,0
(16) Все раненые с переломом костей предплечья . . . . .	68,3	31,7	100,0	84,4	10,6	2,3	2,7	100,0

(4) Вид перелома				(5) Другие ранения, кроме перелома костей предплечья		
(3) оскольчатый	(14) раздробленый	(15) прочие	(8) всего	(16) были	(17) не были	(9) всего
58,4	16,0	25,6	100,0	22,5	77,5	100,0
57,8	14,8	27,4	100,0	18,6	81,4	100,0

Key: (1). Group of casualties. (2). Means of wound. (3).

Character/nature of wound. (4). Form/species of break. (5). Other wounds, except break of bones of forearm. (6). zero. (7).

fragmentation. (8). in all. (9). through. (10). blind. (11). tangent. (12). crushing. (13). fragmented. (14). crushed. (15). other. (16). they were. (17). they were not. (18). treated in evacuation hospitals of deep rear. (19). All wounded with break of bones forearms.

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A little larger than in third (35.7c/o) of those treating in the rear were late complications, among which the contractures composed 59.5o/o, contractures in combination with osteomyelitis - 27.5o/o, osteomyelitis - 7.9o/o, pathological stump - 2.8o/o, other - 2.3o/o.

As show given data, among the late complications most frequently were encountered contracture (87.0o/o) and osteomyelitis (35.4o/o).

More than 1/5 casualties with the break of the bones of forearm finished treatment in the front line and army rear.

The group of the casualties, who were being treated in the deep rear, according to all signs was heavier than the total group of all casualties with the bullet break of the bones of forearm; in it there was above percentage of the fragmentation wounds, blind, crushings and the associated multiple wounds (Table 151).

The ratio of a number of treated in the deep rear to entire number casualties with the break of the bones of forearm on the years of war oscillated from 75.7 to 79.90/o (first year - 79.60/o, the second year - 78.80/o, the third year - 75.70/o, the fourth year - 79/90/o).

The basic methods of the treatment of the bullet breaks of the bones of forearm in the deep rear were immobilization and surgical interventions. Medicinal therapy, physiotherapy, therapeutic gymnastics were auxiliary methods and acquired frequently great value in the final stages of treatment. Thus, for instance, if in the army and front line area reposition and therapeutic immobilization were carried out successfully, infection was avoided or suppressed, and

the heavy associated damages it was not observed, then in the deep rear it was necessary to only in time remove/take the immobilizing bandage, to attain the healing of wounds, if they did not heal under the bandage by this time, and to try to eliminate muscular weakness and difficulty of movement in the joints, which was the consequence of break and prolonged inactivity of extremity in the fixing bandage. In such cases physical methods of treatment in the hospitals of the deep rear acquired the value of fair methods.

In the deep rear the bullet breaks of the bones of the forearms, which flowed/occurred/lasted without the complications, composed only 11.10/o; in the remaining cases were observed the complications whose development is noted in the preceding stages into 53.20/o and in the rear into 35.70/o. In the presence of the unliquidated pyogenic infection the plaster bandages, superimposed in the preceding stages, got wet, they issued unpleasant odor, lost durability and did not provide must fixation. It was necessary to change them sometimes repeatedly, which unfavorably was reflected in the consolidation of break.

In 66.10/o of cases deaf gypsum bandages in the process of treatment were not changed, into 25.20/o they were changed one time, into 6.60/o were changed two times and in 2.10/o of cases were changed three and more than once, moreover shift/relief was produced



both in the stages of the deep rear and in the preceding stages. The reason for shift/relief was predominantly soaking and contamination, brought bandages into the unsuitability.

According to the data of the deepened development of the histories of disease/illness, during the treatment of the bullet breaks of the bones of fcrears in the hospitals of the deep rear as the therapeutic immobilization they were used: gypsum or other splint into 43.10/o of cases, deaf gypsum bandage - into 54.50/o, fenestrated gypsum bandage - into 1.90/o, skeletal/skeleton traction/extension - into 0.10/c and other forms/species of immobilization - into 0.4c/o of cases.

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Given data show that in the rear the therapeutic immobilization was realized by the almost exclusively deaf gypsum bandages and gypsum or other splints. Fenestrated gypsum bandage was used rarely, and skeletal/skeleton traction/extension and other forms/species comprised a fraction of a percent.

The need for the supervision of wound during the treatment caused the use/application of fenestrated gypsum bandages. They, however, did not win acceptance on the following reasons: 1) large window in the bandage in the small by the volume organ/control disadvantageously was reflected in its durability, and small window

did not provide sufficient access to the wound; 2) edematous soft tissues were stuck out into the window whose edge squeezed tissues and they led to an even greater violation of lympho- and blood circulation; 3) gypsum bandage did not fulfill its important function - it did not suck in suppurative discharge of wound; 4) were lost autobacteriophages, which develop under the deaf gypsum bandage; 5) was disturbed rest and were created the possibilities of the secondary infection of wound.

The duration of immobilization depended on the time of the offensive of the consolidation of break, and the latter in turn, was determined by many conditions among which the complications, by especially pyogenic infection, played important role.

Table 152 shows the period of the education of strong/durable callus in casualties without the complications and in those treating in the deep rear.

To 11/2 months in the casualties of the uncomplicated group the education of the callus was observed into two and the more of times more frequently than among all casualties, who were being treated in the hospitals of the deep rear. The average period of the education of the callus for those treating in the deep rear was 2 months, and in the group without the complications - 11/2 months.

The duration of immobilization with the bullet breaks of the bones of forearm is represented by data of Table 153.

Table 152. Period of the education of strong/durable callus in the group of casualties with the bullet break of the bones of forearm, which did not have complications, and in the group of all casualties, who were being treated in the rear (in the percentages).

(1) Группа раненых	(2) Срок, прошедший с момента ранения (в днях)				(4) Срок не установлен	(5) Всего
	45	46-60	63-90	91 и позже		
(6) Раненые без осложнений . . . . .	69,5	19,3	9,2	1,2	0,8	100,0
(7) Все раненые, лечившиеся в тылу . . . . .	33,5	27,1	27,2	10,1	2,1	100,0

Key: (1). Group of casualties. (2). Period, which passed from moment/torque of wound (in days). (3). and it is later. (4). Period is not established/installed. (5). In all. (6). Casualties without complications. (7). All casualties, who were being treated in rear.

Table 153. Average duration (in the days) of therapeutic immobilization with the bullet breaks of the individual bones of forearm.

(1) Название кости	(2) Характер иммобилизации		(5) Всего
	(3) шпала	(4) глухая гипсовая повязка	
(6) Лучевая . . . . .	14	25	39
(7) Локтевая . . . . .	13	24	37
(8) Обе кости . . . . .	28	41	69

Key: (1). Name of bone. (2). Character/nature of immobilization. (3). splint. (4). deaf gypsum bandage. (5). In all. (6). Radiation/radial. (7). Cubital. (8). Both bones.

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Thus, with the isolated/insulated breaks of one bone immobilization for splints to the extent/torque of the application of deaf gypsum dressing was continued on the average of 2 weeks, and with breaks of both bones two times longer. This is explained by the fact that with breaks of both bones more frequently were encountered the more severe complications of pyogenic infection, which served as contraindication to the application of deaf gypsum dressing.

The fixation of the isolated/insulated breaks of one bone for deaf gypsum bandage was continued 3-4 weeks, while that of breaks of both bones - 6 weeks.

The average duration of the immobilization of the isolated/insulated breaks of one bone of forearm was 5-6 weeks, while those of breaks of both bones - 9-10 weeks. Average duration of the immobilization of all bones of forearm - 6-7 weeks.

After the removal/taking of deaf gypsum bandage frequently the immobilization was realized by a demountable gypsum splint during 7-10 days; consequently, the average duration of immobilization was

increased approximately/exeaplarly to the week.

A. M. Landa considered as the average period of fixation for the bullet breaks of the bones of the forearm of 6-8 weeks.

Shorter periods (3-4 weeks) are insufficient and are exclusion. According to M. Z. Yavorskiy, the average period of fixation is equal to 60-80 days.

In the rear finally were revealed/detected the complications and the consequences of breaks, which caused need in surgical interventions. Casualties, who were being treated in the rear hospitals, underwent surgical interventions in the different stages of evacuation. From a number of made by him operations/processes 17.10/o they fell to the army area, 19.30/o - on the front line and 63.60/o - to the service area.

The character/nature of surgical interventions in the different areas of evacuation is represented in Table 154.

In the rear most frequent operation/process was sequestrectomy, that composed almost 2/3 all produced in this area operations/processes with the bullet breaks of the bones of forearm, more than 1/6 composed "other operations/processes", into number of which entered secondary sutures, transplantation of skin, reposition, redressment, etc.

Table 154. Character/nature of surgical interventions, produced in the different areas in casualties with the bullet break of the bones of forearm (in the percentages).

(1) Район эвакуации	(2) Название операции	(3) Ремизил раны	(4) Удаление костных осколков и инородных тел	(5) Обработка костных фрагментов	(6) Искрытие загноев и фистул	(7) Перевязка сосудов	(8) Ампутация	(9) Ремпугация	(10) Секвестрэктомия	(11) Прочие операции	(12) Всего
(13) Армейский		20.6	15.7	3.0	27.8	8.2	18.2	0.2	1.2	5.1	100.0
(14) Фронтной		6.5	15.6	3.0	25.9	6.8	7.9	0.6	23.4	10.3	100.0
(15) Тыловой		0.6	5.6	1.7	5.1	0.6	0.5	1.0	66.2	18.7	100.0
(16) В среднем		5.4	9.8	2.2	12.9	2.8	4.5	0.7	40.7	14.7	100.0

Key: (1). Area of evacuation. (2). Name of operation/process. (3). Examination of wound. (4). Removal/distance of bone fragments and foreign bodies. (5). Processing bone fragments. (6). Autopsy of flows and phlegmons. (7). Dressing of vessels. (8). Amputation. (9). Reamputation. (10). Sequestrectomy. (11). Other operations/processes. (12). In all. (13). Army. (14). Front line. (15). Rear. (16). On the average.

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From every 100 produced in the rear operations/processes on forearm 85.9 they fall on sequestrectomy, reamputation and "other" and only 14.1 - to the remaining means of surgical interventions, whereas in the army area, on the contrary, 93.5 fall for the autopsy

phlegmons and flows, the examination of wounds, amputation, the removal/distance of bone fragments and of foreign bodies, the dressing of vessels, processing of bone fragments and only 6.5 - on sequestrectomy, "other" and reamputation.

Intermediate place occupied front line area. Here operations/processes apropos of early complications were produced more rarely, in the army area, but nevertheless were approximately all 2/3 operations/processes, and the operations/processes apropos of late complications - sequestrectomy, reamputation, "other" - it is more than 1/3 all produced in this area operations/processes on the forearm.

The characteristic of operations/processes with the bullet breaks of the bones of forearm in connection with the areas of evacuations, on which they were produced, was represented in Table 155.

From the preceding information it is evident that sequestrectomies, reamputations and "other" operations/processes in the overwhelming majority were produced in the rear. In the army and front line area are produced sequestrectomy altogether only 16.00/o, reamputations - 16.70/o, "other" - 27.20/o. The overwhelming majority of the examinations of wounds, amputations, dressings of vessels fell

to the army and front line area.

The autopsy of flows and phlegmons, the removal/distance of bone fragments and foreign bodies were distributed by the areas more evenly. From a number of all processings of bone fragments of approximately 50.00/o fell to the deep rear where this operation/process was not the measure for warning/prevention, but by the combat means with the already available complication (osteomyelitis).

From a number of casualties with the break of the bones of forearm, which were being treated in the hospitals of the deep rear and which were undergoing surgical interventions, overwhelming majority (74.30/o) it was produced on one operation/process, 20.20/o transferred on two operations/processes and 5.50/o - on three and more than operations/processes.

According to the data of the author's development of the histories of disease/illness, the periods of the first operation/process after the primary surgical processing (or from the moment/torque of wound) were following: to 6 days - 11.60/o, 7-10 days - 11.80/o, 11-30 days - 13.30/o, 30 days more - 63.30/o.



Table 155. The distribution of operations/processes with the bullet breaks of the bones of forearm by the areas where they were produced (in the percentages).

(1) Район	(2) Название операции	(3) Результаты раны	(4) Удаление костных осколков и инородных тел	(5) Обработка костных фрагментов	(6) Вскрытие затеков и флегмон	(7) Перевязка сосудов	(8) Ампутация	(9) Реампутация	(10) Секвестрэктомия	(11) Прочие
(12) Армейский	.....	65,8	29,0	23,3	38,0	45,0	62,4	5,5	0,9	6,1
(13) Фронтальной	.....	28,2	36,0	28,3	39,6	43,5	32,0	11,2	15,1	21,7
(14) Тыловой	.....	6,0	35,0	48,4	22,4	11,5	5,6	83,3	84,0	72,8
(15) Всего	.....	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0	100,0

Key: (1). Area. (2). Name of operation/process. (3). Examination of wound. (4). Removal/distance of bone fragments and foreign bodies. (5). Processing bone fragments. (6). Autopsy of flows and phlegmons. (7). Dressing of vessels. (8). Amputation. (9). Reamputation. (10). Sequestrectomy. (11). Other. (12). Army. (13). Front line. (14). Rear. (15). In all.

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As is evident, a number of operations/processes, produced in the later month, comprise more than 3/5 all operations/processes on the forearm. This corresponds to a number of operations/processes, produced in the hospitals of the deep rear, and confirms the known fact that apropos of late complications the operations/processes were

produced almost exclusively in the deep rear.

Both the immobilization and surgical intervention they were used in combination with other auxiliary methods of treatment (medicinal therapy, physiotherapy and therapeutic gymnastics).

According to the data of the deepened development of the histories of disease/illness, medicinal therapy and physical methods of treatment were not used during the treatment of altogether only in 0.80% of casualties, in all remaining cases were matched these or other the methods of treatment.

More than in half of casualties were used medicinal agents in combination with the physiotherapy and the therapeutic gymnastics; during the treatment of 1/4 casualties were used the medicines in combination with the therapeutic gymnastics. Only some physical methods or only medicines, as other combinations of methods, were encountered considerably less frequent.

From the medicinal agents locally to the wounds were used sulfanilamides, Rivanol, peroxide of hydrogen, potassium permanganate, preparations of chlorine, hypertonic solution of sodium chloride, ointment of A. V. Vishnevskiy et al.

The treatment of wounds with the breaks of the bones of forearms rarely was limited to the use/application of one antiseptic; were commonly used consecutively/serially many of them. Sulfanilamides in the hospitals of the deep rear more frequently were used to the wounds in the form of streptocide emulsions, whereas in the army and especially in the army area the powder of streptocide they usually filled into the wound or wound powdered by the powder of streptocide. Rarely (into 0.30/o) were used phages in combination with the vitamins. Greatly rarely were used the preparations of silver nitrate for the cauterization of excess granulation.

In the hospitals of the rear in the treatment of the bullet breaks of the bones of forearms significant place occupied the physiotherapy and therapeutic gymnastics. This is evident from the materials of the deepened development of the histories of disease/illness, which show that the therapeutic gymnastics was applied in 86, and physiotherapy in 60 casualties from every 100 those treating in the deep rear. The significant part of the casualties with the break of the bones of forearms entered the hospitals of the rear with good, subject to the shift/relief by immobilization and even with the advanced already consolidation of break. The treatment of break as such was in essence completed and it remained to remove/take the immobilizing bandage and to eliminate the consequences of the break, damages of soft tissues and prolonged

inactivity of extremity in the fixing bandage. These consequences were expressed in the muscular weakness and muscular atrophy, difficulty of movement in the joints, in the presence of Rubtsovs of contractures and so forth, etc. The best combat means with similar complications were the different types of physiotherapy and movement, mainly active. Operational methods were used only when the violation of function was the result of the compression of the nerve trunk by Rubtsovs by tissues, the gap of tendons, incorrect intergrowth of break, presence of the foreign bodies, which mix the healing of wounds, the presence of osteomyelitis and so forth, etc. In such cases the complex therapy in which the leading role played operational methods, was singularly rational.

From the physical therapy methods were used applications of mud/contamination, clay and paraffin, bath, the diathermy, ultraviolet lighting, UVCh, scllux, iontophoresis.

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The use/application of physiotherapy began from the moment/torque of stopping immobilization and only in the unit of the cases with the immobilization with demountable gypsum splint.

The duration of physiotherapy depended on the staying

power/persistency of the violation of function. During the light violations of function the physiotherapy was limited to the use/application of sollux or baths during 1-2 weeks. In the heavier cases treatment was continued many weeks, moreover physical therapy methods were combined or they were conducted in the specific sequence.

Therapeutic gymnastics they began to use already in the army or front line area through several days after the imposition of therapeutic immobilization; it consisted of the active movements of fingers/pins. In the deep rear after the removal/taking of immobilization therapeutic gymnastics most frequently was matched with the physiotherapy and consisted of the active movements of all joints of extremity; frequently it was matched with the massage and the physiotherapy. The duration of the use/application of therapeutic gymnastics depended on the staying power/persistency of the violation of function. Usually therapeutic gymnastics was continued to the extraction of casualty from the hospital, changing gradually to the over-all strengthening form/species of the therapeutic exercise.

Together with the treatment of the breaks as such, in the hospitals of the deep rear was given much attention to the over-all strengthening methods of treatment. In particular, by anemic and that exhausted as a result of wound infection, and by casualty with the

limply healing wounds was also produced the blood transfusion. On the sizes/dimensions of the use/application of this substance in the deep rear it is possible to judge already by the fact that the transfusions composed here 31.3c/o of all blood transfusions with the bullet breaks of the bones of forearm despite the fact that in the rear was not observed such complications as shock, sharp/acute anemias in connection with the hemorrhage when the blood transfusion was necessary.

Extensively was used vitamin therapy (vitamins C and D), regularly was conducted fortifying physical culture, were organized entertainments for the target act on the psyche/psychics of casualties. Entire complex of measures had in mind more rapid and full/total/complete recovery.

As the example of the treatment of the bullet break of the bones of forearm in the rear it is possible to give the following observation.

N. V., 21 year, is wounded 21/IX 1943. 6 Hours after wound at DMP under chloroethyl stupefaction is produced splitting up of the through fragmentation wound of right forearm with the damage to bone and amputation of the crushed V finger of right hand, after which is superimposed the bandage with Rivanc1 and the splint of Cramer.

Further coursing smooth, with moderate festering of the split wounds. 13/X 1943 in SEG in the X-ray photograph confirmed the presence of a comminuted fracture in lower third of the ulna is superimposed closed plaster bandage. In view of the fact that the wound was not occluded, 27/XI 1943 under local anesthesia is produced the removal/distance of three sequestrations, after which was superimposed gypsum cast. Wound healed only to 7/II 1944. In view of the fact that during the treatment the casualty systematically conducted therapeutic gymnastics, in it up to the moment/torque of extraction was noted only the insignificant limitation of the flexing of fingers/pins in the interphalangeal joints.

The treatment of complications and associated damages of the bullet breaks of the bones of forearms in detail is set forth in the appropriate works, dedicated to this question (that 16). It is here necessary to note only the special features/peculiarities of the most frequent complication - contractures. Contractures are noted in 62.60/o of casualties with the break of the bones of forearms, which were being treated in the deep rear. With the bullet breaks of other tubular bones this complication did not achieve this significant frequency.

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The special features/peculiarities of the anatomical building/structure of forearm and multifeature complexity of the motor function of hand, connected with the neuromuscular apparatus of forearm, conditioned the frequency of contractures with the bullet breaks of the bones of this segment of upper extremity. Even during the slight deformations of the bones of forearm frequently were disturbed movement in the radiocarpal joint and in the joints of fingers/pins and were limited pronation and supination.

A large quantity of muscles and tendons on which depends the complex and thin motor function of fingers/pins and hand, is concentrated in this small by the volume organ/control, such as it is forearm. Muscles and tendons inevitably suffered to a greater or lesser extent with the bullet breaks of the bones of forearm. The formed after the healing of fracture intergrowth between the fascias, the tendons and the callus were reflected in the movements of hand and especially fingers/pins. If healing occurred with the festering, especially prolonged, then the development of scar tissue achieved large sizes/dimensions. Into the scars were drawn in the frequently



and unaffected tendons, muscles, nerve trunks. Cicatrical changes in the interosseal ligament disturbed its elasticity. All this was reflected in the function of hand and fingers/pins and in the rotary motions of forearm.

Even the small changes in the musculotendinous apparatus, which on the lower extremity or the shoulder did not cause the noticeable violations of function, on the forearm frequently was accompanied by contracture.

A large quantity of joints, complex on their building/structure whose ligamentous/connecting apparatus frequently suffered even in the absence of the penetrating into the joint damages, was the second reason for the frequency of contractures with the bullet breaks of the bones of forearm. Cicatrical changes in the para-articular tissues led sometimes to the stable ones contracture, that caused the need for surgical interventions.

Of pains and developed and that propagating is not hand and fingers/pins wound edema rapidly disturbed movements in the joints of the fingers/pins in which prolongedly remained difficulty of movement.

By the special features/peculiarities indicated is explained the

frequency of contractures with the bullet breaks of the bones of forearms. The timely removal/taking of immobilization and early movements were the measures for warning/prevention of their education.

With the formed contractures the struggle was difficult, which can be judged from the outcomes which show that in 29.80/o discharged from the hospitals of the deep rear casualties by basic outcome were the contractures; actually then it was more, if we consider those cases, in which the contracture was combined with other outcomes.

One should, however, consider that here have in mind the nearest results which subsequently progressively were improved under the effect of the therapeutic measures in the system of hospitals for additional healing of the invalids of the Great Patriotic War, and also the civil/civilian therapeutic installations.

Thus, the treatment of the bullet breaks of bones forearms finished almost 4/5 casualties in the hospitals of the deep rear; several of more than 1/5 finished treatment in the army and front line area.

Treatment in the deep rear in essence was directed toward the struggle with the complications from which most frequent were

contractures (87.0c/o) and osteomyelitis (35.4c/o).

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By the basic methods of treatment were immobilization predominantly deaf gypsum bandage (53.5o/o) and surgical interventions by which underwent about 1/3 casualties with the break of the bones of forearm. Most frequent operation/process in the hospitals of the deep rear it was sequesterectomy (66.2o/o).

At the final stages of treatment particularly important value acquired physical methods in the form of therapeutic gymnastics (86.0o/o) and different types of physiotherapy (60.0o/c).

The average period of the education of the callus was equal to 2 months, while the average period of the immobilization of isolated breaks of one bone 5-6 to weeks and both bones - 9-10 to weeks.

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Chapter III.

Bullet breaks of thigh.

Characteristic of anatomical changes with the bullet breaks of thigh.

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General/common/total characteristic.

Apropos of the bullet breaks of thigh N. I. Pirogov wrote: "the bullet damages of diaphysis to femoral bone require both with respect to the hazard level and with respect to the treatment of a strict position finding of damage for bone from thirds of thigh (lower, average/mean and upper). Over that, it is necessary to still determine position/situation, length, direction of bullet canal and, particularly, degree of the crushing of bone".

N. I. Pirogov's opinion at present cannot be betrayed to oblivion, on the contrary, it must become the basis of the formation

of the rational classification where the main role play: a) the degree of damage to bone (forms/species of breaks), b) the level of break, c) the character/nature of wound (blind, through, tangential types of wound canals).

The analysis of the enumerated signs gives the possibility to be dismantled/selected at the multifeature clinical picture of the bullet breaks of femoral bone.

The wounds of thigh are separated into two groups, different in every respect: the wound of thigh with the damage to bone (16.5o/o) and the wound of thigh without the violation of the integrity of bone (83.5o/o).

Among the wounds of thigh with the break of bone most frequently were observed perforating wounds (63.6o/o); in the second place stood blind (33.3o/o), on the third - tangential wounds (0.9o/o); on the fourth - disengagements and crushings (2.2o/o).

Thus, about all 2/3 bullet breaks of thigh were through. It should be noted that with the wounds of this form/species, together with the damage to bone, were significant, and sometimes also very heavy damage of the integrity of soft tissues.

The individual means of the wounds of thigh indicated were different both in the anatomical and in clinical sense.

The wounds of thigh with the break of bone were most frequently bullet and through, in this case among the perforating wounds bullet were encountered almost four times as more frequent than blind ones. Among the fragmentation wounds of thigh the breaks of bone most frequently were encountered with blind-end wounds (51.90/o); the blind-end wounds of thigh with the damage to bone were encountered with the fragmentation wounds almost three times more frequently than with the bullet ones.

On the character/nature of break with described above means of the wounds of thigh it is possible to judge by tables 156.

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From the preceding information it is evident that most frequently was encountered one of the heaviest forms/species of break - large-splintered, and most rarely - longitudinal and packed in. The individual forms/species of the breaks of thigh in different relationships/ratios were observed both with the bullet ones and with the fragmentation wounds.

Attention is drawn to the fact that the large-splintered breaks among the bullet wounds composed almost half and considerably more rarely they were encountered with the fragmentation ones; the at the same time crushed and edge/boundary breaks with the fragmentation wounds were encountered more frequently than with the bullet ones. The latter can be explained by form of the wounding shell and by its kinetic energy.

The distribution of the bullet breaks of thigh according to the level of wound was the following: upper third 32.40/o, average - 32.60/o, lower - 31.50/o, two thirds 3.50/o.

The frequency of the bullet breaks of thigh, which penetrate into the joint, was the following: upper third 8.60/o, average - 1.00/o, lower - 17.70/o, two thirds 6.30/o, in average/mean 8.90/o.

Given above data only in general terms characterize the wounds of thigh with the break of bone. More detailed analysis can be made only in the examination of each form/species of break separately, taking into account its level, the character/nature of the damage of soft tissues, vessels and nerves.

Before passing to the description of the surgical anatomy of the individual forms/species of the break of thigh, is necessary at least

brief to dwell on some special features/peculiarities of the anatomical building/structure of thigh.

Thigh is characterized by the very complex building/structure of fascial leaflets and their mutual arrangement. A large quantity of powerful/thick muscles, which have independent fascial beds, between which are arranged/located interfascial spaces satisfied by cellulose, contributes to the education of hematomas and to the development of the isolated/insulated phlegmons, different in the topography and the extent.

Despite the fact that among the authors there is no sufficient coordination in the description of individual fascial leaflets, the overall diagram of building/structure of the fascial spaces of thigh is given by almost all equally.

Thus, they distinguish: 1) the front/leading fascial bed in which are included the extensors, 2) the posterior fascial bed in which are included the flexors, and 3) the medial fascial bed, which contains the group of the muscles, which give thigh (Fig. 113).



Table 156. Means of the wound of thigh and the form/species of break (in the percentages).

Вид перелома (1)	Крупино-оскольчатая (5)	Кусок (4)	Раздробленный (9)	Краевой (6)	Дырчатый (7)	Поперечный (8)	Мелко-оскольчатый (9)	Вколоченный (10)	Продольный (11)	Всего (12)
(13) Пулевое (55,9%)	44,7	16,8	12,8	10,8	4,9	4,6	3,4	1,2	0,8	100,0
(14) Оскольчатое (44,1%)	31,5	15,7	17,4	17,3	7,7	5,7	3,1	0,6	1,0	100,0
(15) В среднем . . .	39,1	16,3	14,8	13,6	6,1	5,0	3,3	0,9	0,9	100,0

Key: (1). Means of wound. (2). Form/species of break. (3).

large-splintered. (4). By sand bar. (5). Crushed. (6). Edge/boundary. (7). Perforated. (8). Cross. (9). small-splintered. (10). Packed in. (11). Longitudinal. (12). In all. (13). Bullet. (14). Fragmentation. (15). average.

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The density of the fascial leaflets, which generate both the basic osteofascial beds of thigh, and the fascial vaginas of individual muscles, it is not constant and is found in the known dependence on the degree of the development of musculature, in consequence of which the individual fascial beds not always isolated from each other, but this in a number of cases determines the routes/paths of dissemination and the topography of hematomas and accumulations of pus.

The front/leading fascial bed of thigh, to the gunstock of the flexors, is formed by from the front wide fascia of thigh; from its medial and lateral side will withdraw two different densities connective partitions/septa, from which laterally is fastened to the external jaw of the rough line of thigh, and medial, less dense, is fastened to the internal jaw.

In the front/leading fascial bed is included the quadriceps muscle of thigh and almost entire/all femoral bone, with exception of its small sector, turned toward the rear and towards the inside.

The extent of front/leading bed almost wholly corresponds to the front/leading region of thigh.

In the thickness of wide fascia in the diagonal direction passes the tailoring muscle whose vagina is usually closed for entire elongation/extent. When individual fascial leaflets are loose, on the posterior wall of front/leading bed (in the region of Scarpa's triangle) and in the lower department are encountered the communications/reports with the adjacent spaces of thigh, satisfied by cellulose.

The individual heads of the quadriceps muscle of thigh are surrounded by the fascial leaflets whose density is different, in consequence of which the bed of individual muscles they can in a number of cases communicate.

Between the muscles of front/leading bed are slits, satisfied by loose connective tissue on which usually are propagated pyoinflammatory processes. Great practical value have spaces between m rectus and m vastus intermedius, and also between m vastus intermedius and periosteum. In this paraossial space frequently are arranged/located deep front/leading suppurative flows.

In the lower third similar space are located between m vastus lateralis and periosteum, on one hand, and m vastus medialis and pericosteum - on the other hand. In upper third of thigh, in the front/leading fascial bed, is arranged/located the closed fascial space in which is included m iliopsoas. The intermuscular spaces of front/leading department are communicated with the connective gaps/intervals of the region of knee and hip joint, satisfied by cellulose.

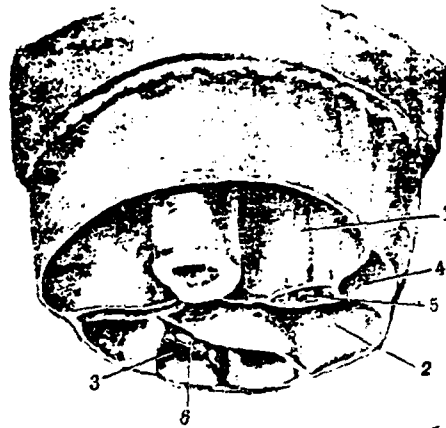


Fig. 113. fascial spaces of thigh in the region middle third. 1 - front/leading fascial bed - gunstock extensor; 2 - medial fascial bed - gunstock of the bringing muscles; 3 - posterior fascial bed - gunstock of flexors; 4 - vagina of tailoring muscle; 5 - femoral vessels; 6 - ischiatic nerve.

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The medial bed of thigh contains the group of the muscles, which give thigh, including m gracilis. This bed does not have sharp front/leading fascial wall, that as from the front face group of these muscles is covered with loose connective tissue which sometimes is converted into the relatively dense plate.

If fascias of thigh are expressed sufficiently well, the

individual muscles, included in this bed, have seemingly independent sheath. However, this is comparatively rarely.

Experiments/experiences on the twigs/rods showed that the mass, introduced in the bed of long and large adductor, not only propagated within the limits of the named muscles, but also penetrates through the walls of their sheath into the adjacent spaces, in particular, in the posterior bed of thigh, into the popliteal pit, and also it is propagated in the proximal and extremal direction on the course of vessels and nerves.

Between the fascial spaces of the front/leading and medial group of muscles of thigh are disposed of the femoral vessels, surrounded cellulose which below changes into cellulose of popliteal pit, and above into cellulose of pelvis. In the limits of the medial group of muscles branches n obturatorius, while in the limits of front/leading - mainly n femoralis.

Posterior fascial space is outside limited by dense intermuscular fascial plate, it from behind consists fascia lata, and from the group of the bringing muscles it by separately medial muscular fascial plate.

This space contains the two-headed, semimembranosus,

semitendinous muscles and sciatic nerve with its surrounding cellulose. The boundaries of posterior fascial space almost wholly correspond to the boundaries of the posterior surface of thigh.

The enumerated muscles, as all remaining muscles of thigh, in a number of cases can have the isolated/insulated fascial spaces. In such cases there is distinctly it is expressed the interfascial slit, which is located along the center line and satisfied by loose cellulose, which surrounds sciatic nerve.

Experiments/experiences showed that the mass, introduced in the vagina of the biceps of thigh in the region of long head, as a rule, is extended beyond the limits of its fascial case, penetrating the vaginas of other muscles of posterior bed or exceeding the limits its.

In the posterior fascial bed is found the important in the practical sense interfascial slit in cellulose of which is passed sciatic nerve. On the course of nerve pyoinflammatory processes can be propagated as into the region of popliteal pit and further to the shin, that, also, into the buttock region, and from there into the area of a small pelvis.

The described above fascial and interfascial slits in the

various forms of the bullet breaks of thigh in essence determine the severity of the subsequent complications from the side of soft tissues. Complications from the side of bone are the result of the violation of nourishment, which attacks as a result of the damage of vessels.

Therefore it is necessary to consider that the diaphysis of thigh has the independent sources of blood supply and is supplied with the blood independent of metaphysis and pineal system (M. G. Prives). The special feature/peculiarity of the arterial blood supply of diaphysis is the fact that basic a nutritia is separated in it into two branches - ascending and downcoming, in consequence of which during the damage of basic trunk/stem is disturbed the nourishment of entire diaphysis. True, external layer of the diaphysis of femoral bone is additionally supplied with the fine/small arteries, which penetrate from the periosteum. All this in the equal measure relates also to the veins.

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Thus, the compact substance of the diaphysis of femoral bone has two power supplies: internal - from the side of bone marrow and external - from the side of pericosteum. If feeding of one of these sources is disturbed, then are formed surface central or external

necroses; if ceases feeding of both, then entire/all thickness of the unit of the diaphysis in the sector, deprived of feed, undergoes numbness.

Large/coarse and small-splintered breaks of femoral bone.

The surgical anatomy of the wounds of thigh with the large/coarse and small-splintered breaks of bone has the great similarity; therefore these two groups of breaks can be examined together.

The large-splintered breaks of thigh composed 39.10/o of all bullet violations of the integrity of bone, and small-splintered - 3.30/o.

If is considered the crushed breaks, then with all wounds of thigh with the damage to bone more than in half of cases (57.20/o) were observed the heavy damage of the integrity of bone and soft tissues. By this to a considerable degree was determined the heavy course of the complications of the majority of the bullet breaks of thigh.

Differences in the anatomical building/structure of diaphysis, metaphyses and epiphyses of thigh bone (relationship/ratio of compact



and spongy substance), nearness of large/coarse joints, different relationship/ratio of soft tissues in the proximal and extremal department of thigh make it necessary to focus special attention on the level of break.

According to the data of the deepened development of the histories of disease/illness, the large-splintered breaks of femoral bone in its middle third were encountered into 46.50/o of all breaks this third, in upper third - into 36.50/o, in lower third - into 33.3c/o and simultaneously in several thirds - into 45.60/o. Approximately/exemplarily the same relationships/ratics were observed also with the small-splintered breaks. The small-splintered breaks of femoral bone among all breaks of diaphysis were encountered into 2.90/o, in the region of upper poreal system and metaphysis - into 4.00/o, in the region of lower - into 3.00/o and in the region of several levels - into 2.5c/c.

From comparison of given data it is evident that of large-fragment breaks were encountered more frequently in the region of the diaphysis of femoral bone, than at other levels.

The large difference in the relationships/ratios of levels with the large/coarse and small-splintered breaks it is not established/installed.

Although the large/coarse and small-splintered breaks of femoral bone were encountered almost equally frequently in each third its, nevertheless surgical anatomy of wounds, complexity of the decomposition of soft tissues, the severity of the subsequent complications they were different and they were closely related to the place of the violation of the integrity of bone. The latter was determined by the complexity of the configuration of the upper and lower pineal system of thigh, by the nearness of large/coarse joints and by different topography of soft tissues.

All these facts have more an effect on the structure of the wound canals, which are distinguished depending on the level of the wound of thigh.

Wound canals. The complexity of the structure of wound canals with the bullet wounds of thigh was found in the intimate dependence not only on the mentioned moments/torques, but also on the anatomical building/structure of region as a whole.

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Above in the short lines were described the relationships/ratios

of muscular-fascial education. Femoral bone on the periphery is almost evenly surrounded by the powerful/thick mass of muscular tissue. Individual muscles are fastened at the different levels and possess different force, in consequence of which during the displacement of broken ends at the moment of wound, caused by muscular thrust, is strained the axis of wound canal.

Different position/situation extremities into moment/torque of wound and connected with this subsequent displacement of muscular beds contribute so that the axis of wound canal almost never was rectilinear. In addition to this in the formation of wound canals the significant role played also the character/nature of the wound of thigh (through, blind, tangent).

The special features/peculiarities of building/structure of wound canals depending on the character/nature of wound will be examined below.

Perforating wounds of thigh.

Among all perforating wounds of thigh, which were being escorted/tracked by the break of bone, large-splintered breaks composed 44.2c/o, and small-splintered occupied only 3.50/c.

Thus, almost in half of the cases of all perforating wounds, which were being escorted/tracked by the violation of the integrity of femoral bone, were noted large/coarse and small-splintered breaks, i.e., those forms/species of the break, with which it is more frequent and stronger than with other forms/species of break, except those crushed, suffered soft tissues.

As noted above, with the perforating wounds of thigh, which were being escorted/tracked by the large/coarse and small-splintered break of bone, bone broken ends at the moment of wound, obtaining the unit of the kinetic energy of the wounding shell and after being scattered on the course of wound canal, increased the zone of the damage of soft tissues.

In the wound canal both on the thigh and on other departments of extremities distinguish two departments - to the place of break and after the place of break the bones.

If building/structure of the second department of wound canal (after the place of break) depended not so much on the form/species of the wounding shell, as from the degree of the crushing of bone, then structure of the first department of wound canal depended almost exclusively on the form/species of the wounding shell.

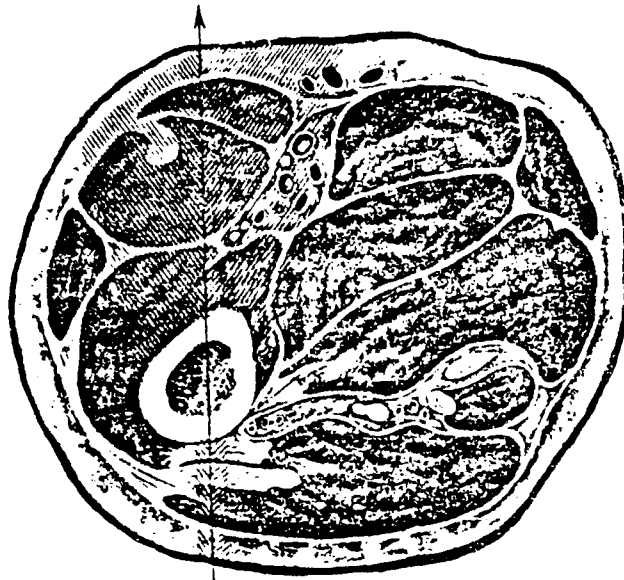
The severity of the damage of soft tissues, the wound of their individual elements/cells (nerves and vessels) depended both on the direction of the wounding shell and on the topography of wound canal.

Will be examined below the surgical anatomy of bullet and fragmentation perforating wounds, depending on the direction of the wounding shell and level of the wound of thigh.

Bullet wounds. With the bullet wounds the department of wound canal to the place of break had relatively simple structure and if at the moment/torque the wounds of the soft ones of tissue and muscle were not displaced, then its axis was rectilinear. The degree of the damage of soft tissues in this department depended mainly on the direct effect on them of the wounding shell.

As a rule, in such cases inlet was small, and the damage of subcutaneous cellular tissue to insignificant, especially if bullet penetrated the soft tissues perpendicular to the surface of thigh; wound aperture in the fascia was also small, and the violations of the integrity of muscles were insignificant.

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a



b

Fig. 114. Topography of the damages of the soft tissues of thigh with its perforating sagittal and frontal wounds in upper third. a) the zone of the damage of soft tissues with posterior-front/leading sagittal wounds; b) the zone of the damage of soft tissues with front- posterior sagittal wounds.

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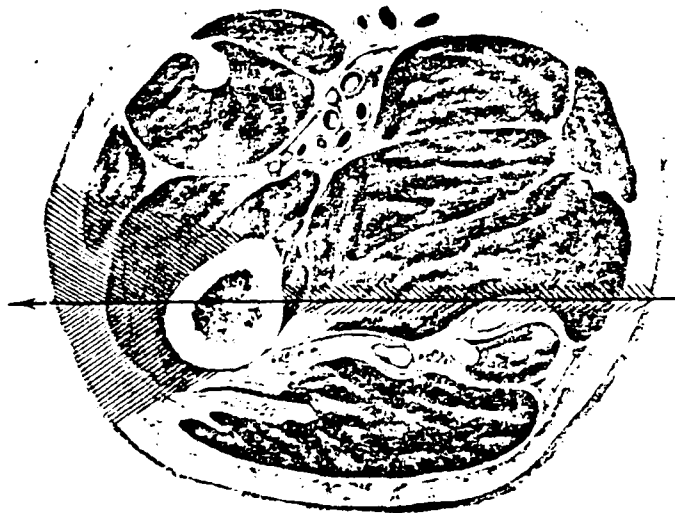
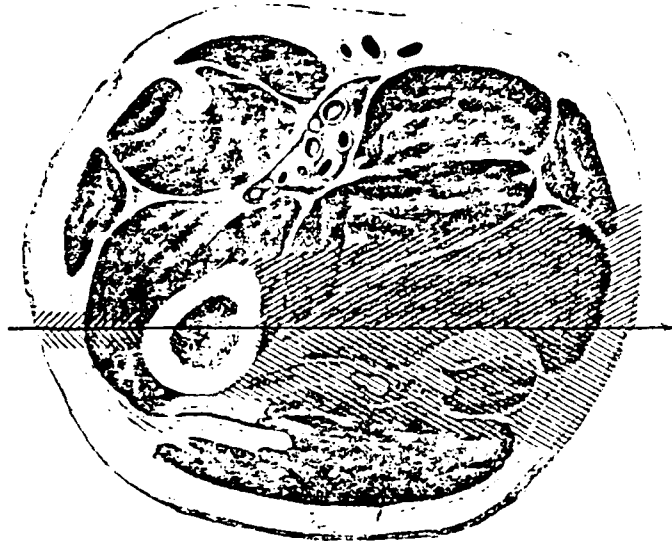
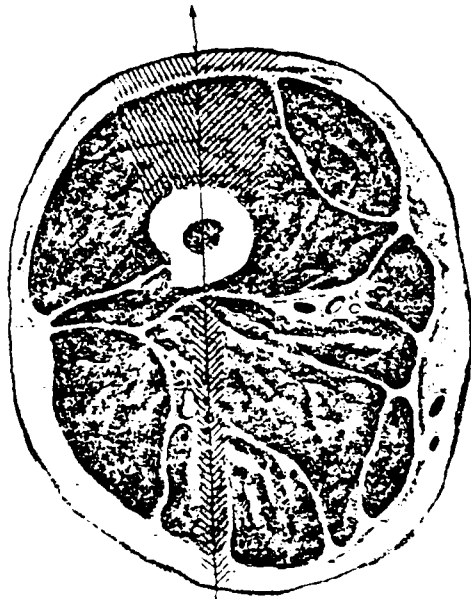


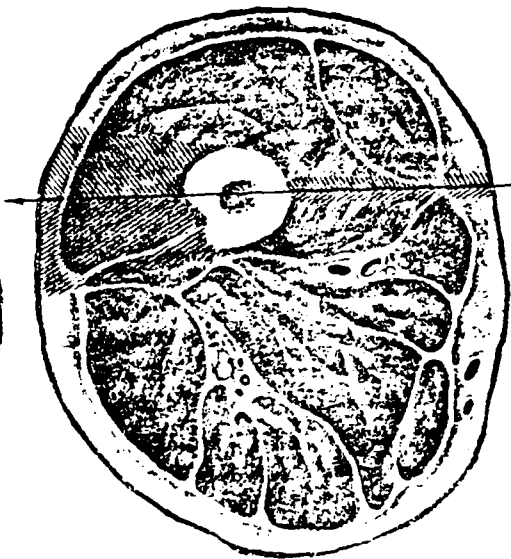


Fig. 114. Topography of damage of the soft tissues of thigh with its perforating sagittal and frontal wounds in upper third. c) the zone of the damage of soft tissues with cutward-internal frontal wounds: d) the zone of the damage of soft tissues with inward- external frontal wounds.

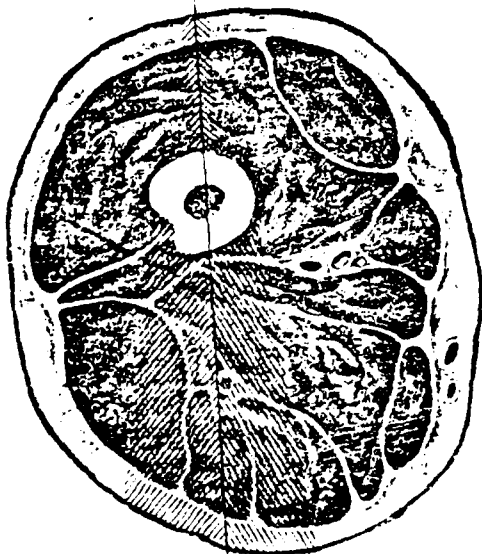
Page 336c.



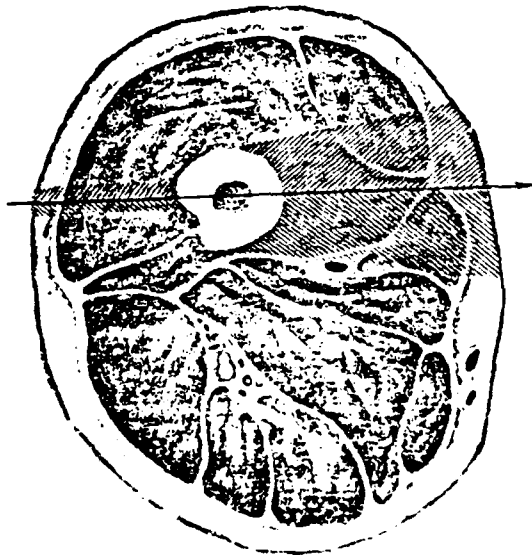
a



c



b



d

Fig. of 115. Topography of the damages of the soft tissues of thigh with its perforating frontal and sagittal wounds in middle third. a) the zone of the damage of soft tissues with the perforating posterior-front/leading sagittal wounds; b) the zone of the damage of soft tissues with the perforating front- posterior sagittal wounds; c) the zone of the damage of soft tissues with the perforating inward- external frontal wounds; d) the zone of the damage of soft tissues with the perforating outward-internal frontal wounds.

Page 336d.

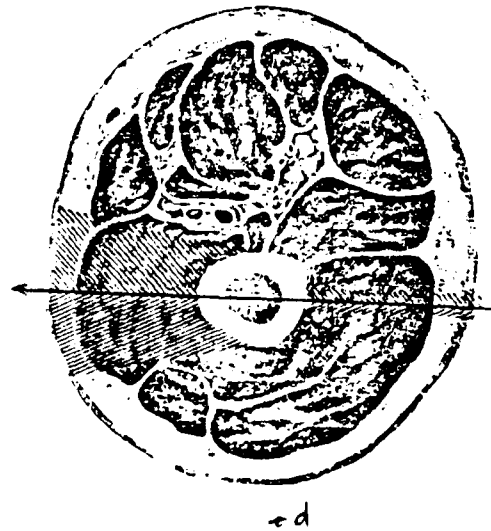
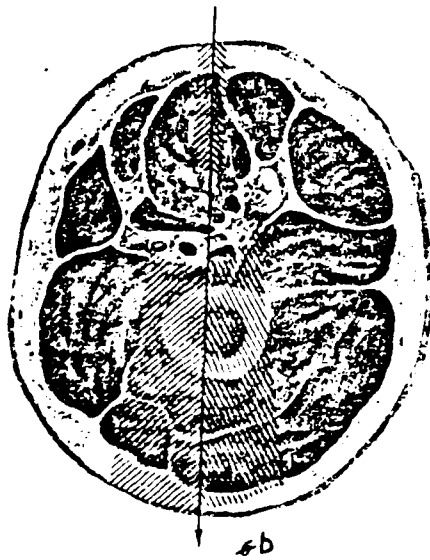
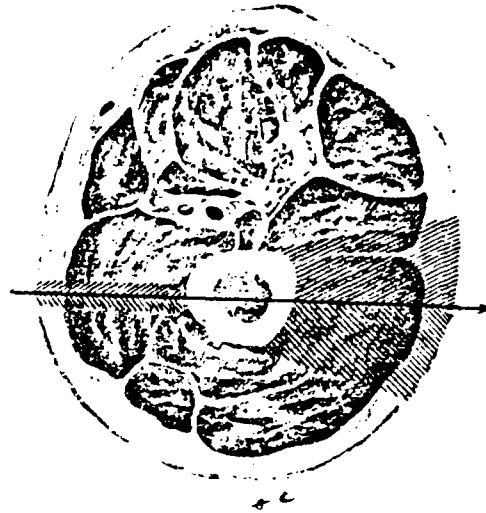
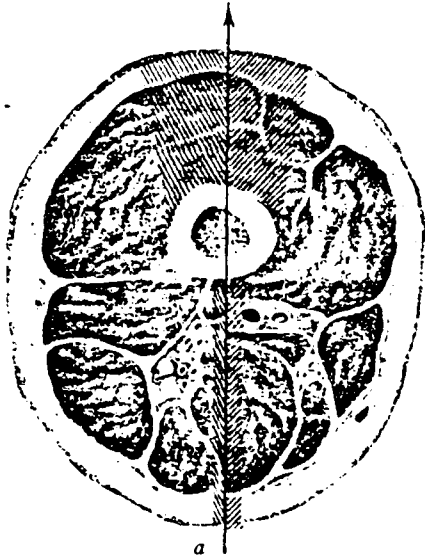


Fig. 116. Topography of the damages of the soft tissues of thigh with its perforating sagittal and frontal wounds in lower third. a) the zone of the damage of soft tissues with the perforating posterior-front/leading sagittal wounds; b) the zone of the damage of soft tissues with the perforating front- posterior sagittal wounds; c) the zone of the damage of soft tissues with the perforating inward- external frontal wounds; d) the zone of the damage of soft tissues with the perforating outward-internal frontal wounds.

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The noted here special features/peculiarities of wound canal depend mainly on direction and topographic possibilities of the wounds of individual nerves and vessels.

With the bullet wounds distinguish: sagittal wounds (front-posterior and posterior-front/leading) and frontal (outward-internal and inward- external).

The possibility of the violation of the integrity of vessels and nerves, and by the equal mode also of the fascial spaces of thigh is different in the dependence on the level of break.

As can be seen from Fig. 114, with the sagittal wounds of upper third of thigh when bullet pierces the tissues of thigh from the front back/ago, in the first department of wound canal, to the place of damage for bone, on its route/path are encountered the basic vessels of thigh (femoral artery or a deep artery of thigh), femoral vein and femoral nerve.

In the direction of bullet from behind in advance (posterior-front/leading sagittal wound) on the route/path of the passing bullet to the place of break are encountered muscle, cellulose and sciatic nerve, included in the fascial bed of flexors thighs.

With the frontal outward-internal and inward- external wounds wound canal to the place of break is passed exclusively through muscular-fascial education, passing nerves and basic vessels, which feed lower extremity.

In connection with the fact that the second department of wound canal after the place of break with the perforating wounds has a character/nature of the infunditulum, which was being formed as a result of the decomposition of soft tissues by the wounding shell and by the fragments of the damaged bone, the zone of the direct damage of soft tissues is increased and in parallel with this

increases/grows the danger of the wound of basic vessels and nerves.

From the same figure it is evident that with the perforating sagittal wounds in upper third of thigh in a front-posterior direction of bullet the probability of damaging the nerve considerably is increased.

Equally in a posterior-front/leading direction into the zone of direct destruction enters neurovascular bundle of the front face of thigh.

With the frontal wounds of upper third of thigh the danger of the damage of vessels and nerves in significant degree descends. It is logical that in middle third of thigh where the femoral nerve as individual trunk/stem is absent, and basic vessels depart to the medial surface, relationships/ratics must be others.

As can be seen from Fig. 115, with the sagittal wounds in middle third of thigh, which are escorted/tracked by large/coarse and small-splintered by break of femoral bone, the entrance department of wound canal to the place of the break of femoral bone, the entrance department of wound canal to the place of break occurs exclusively through the muscles of front/leading bed ( front- posterior direction of bullet) or through the muscles of posterior bed

(posterior-front/leading direction of bullet).

However, in the zone of the second (exit) department of wound canal (after the place of break) in front-posterior direction of bullet strikes sciatic nerve, and with posterior-the front/leading - partially femoral vessels. Both in that and in other case to a considerable degree suffer muscle- flexors or respectively the extensor muscles of thigh. The bed of the muscles, which give thigh, and most included in it muscles remain intact.

Perforating wounds in lower third of thigh, the characterized by the clinical picture of the damage of individual forms/species soft tissues, differ from the same with the wounds of thigh by other levels.

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In the region of the lower pineal system of thigh (Fig. 16) the vessels depart to the posterior surface of the femoral bone where they are arranged/located near the sciatic nerve.

Therefore sagittal perforating wounds, as front- posterior, that and posterior-front/leading, in the identical degree conceal the threat of damage of basic vessels and nerves of lower extremity. In



this case the wounding shell, in this case bullet, passes through the muscles of front/loading fascial bed and through the musculature of the posterior bed, in intermuscular cellulose of which is included sciatic nerve.

With the perforating frontal wounds in the region lower third both in outward-internal direction of bullet and with the inside-outside are damaged mainly the muscles and the fascial spaces of the medial and anteroexternal group of muscles.

However, sometimes the frontal wounds of lower third of thigh with the break of bone are escorted/tracked by the violation of vessels and nerves. The nearer with the frontal wounds the wound canal passes to the boundary between lower and middle third, the more increases/grows the danger of the damage of femoral vessels (Fig. 116).

With the bullet perforating wounds of thigh with the break of bone soft tissues suffer mainly in the exit department of wound canal after the place of break, moreover degree and the zone of their violation directly proportional of the degree of the violation of the integrity of bone, to a quantity and to the value of the formed fragments and to the zone of their dispersion in the soft tissues.

As the example of the large-splintered break of thigh in middle third it is possible to give the following observation.



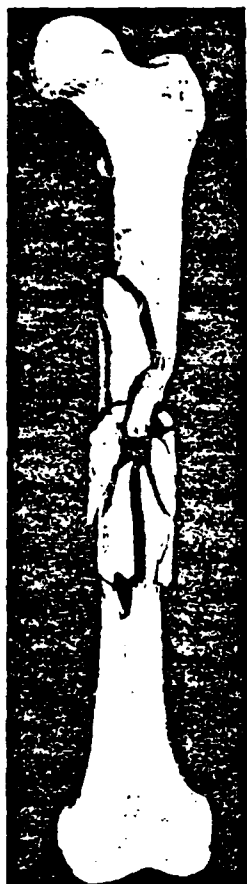


Fig. 117.



Fig. 118.

Fig. 117. Large fracture break of diaphysis of femoral bone. Front view (preparation No 936).

Fig. 118. Large-splintered break of diaphysis of femoral bone. Back elevation (preparation No 936).

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Fig. 119. Frontal cut of left thigh. Preparation VMM No 221/2321.  
(Artist of T. V. Belyayev).

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Fig. 120. Large-splintered break of left thigh (X-ray photograph from preparation No 221/2321).

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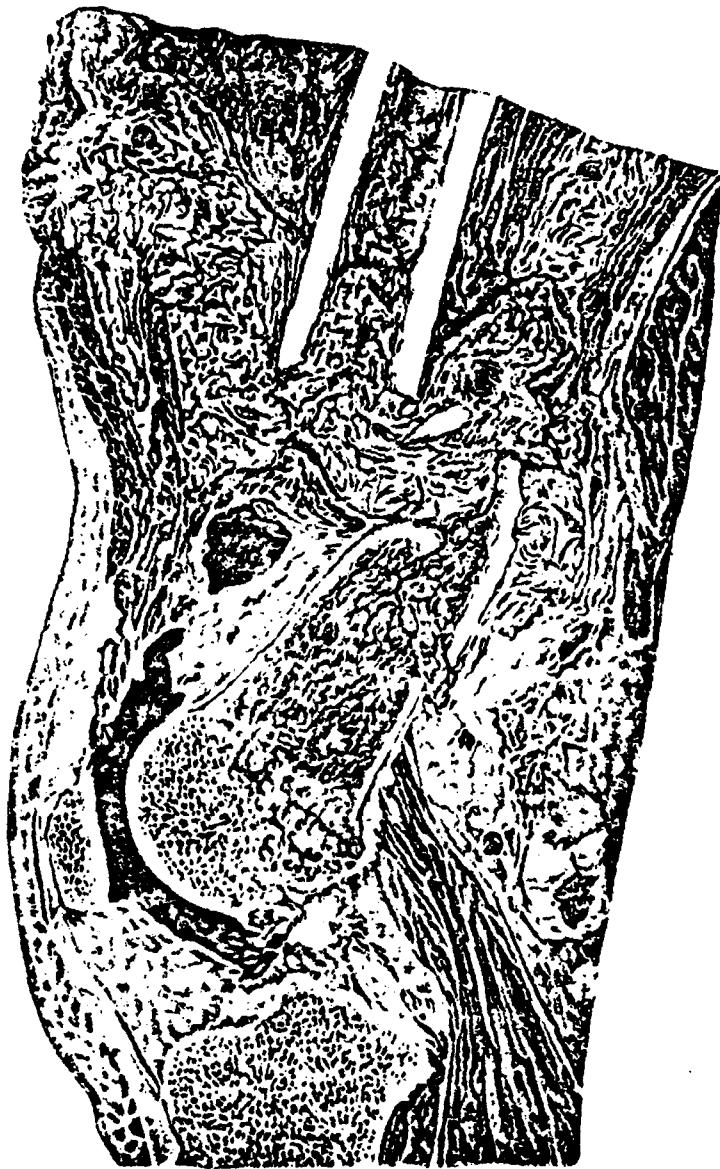


Fig. 121. Sagittal cut of thigh. Preparation VMM No 751/155707.  
(Artist of T. V. Belyayev).

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Wound 7/IV 1942 death 9/V 1942. Preparation No 936.

Fragmentation wound of middle third of left thigh with the break of bone. In middle third of left femoral bone is a multifragment break with 12 fragments. Above and below break over the surface of diaphysis pass to bias the sequestral flutes, which delimit the region of break. On the edges of the isolated/insulated fragments of bones also are sequestral flutes. Edges of break are uneven (Fig. 117 and 118).

Of that presented above it is possible to see that with the perforating bullet wounds in the general/common/total structure of wound canal distinctly they are secreted two different in their complexity of department. With the fragmentation wounds in a number of cases these differences are laudered.

Fragmentation wounds. The perforating fragmentation wounds, which were being escorted/tracked by the large-splintered break of femoral bone, were encountered more rarely than bullet ones. Among

all large-splintered breaks of thigh in the fraction/portion of bullet wounds it was 65.4c/o, and in the fraction/portion of fragmentation ones - 34.6c/o.

Approximately/exemplarily the same relationships/ratios were observed also in the group of small-splintered breaks with the only difference that the the wounds by bullet were observed into 59.7o/o, and wounds by fragment - into 40.3c/o. Everything said higher relative to the topography of the wounds of the soft tissues of thigh at different levels with the sagittal and frontal wounds, in the different direction of the wounding shell relates in the equal measure and for fragmentation wounds. However, among the fragmentation wounds, depending on the size/dimension of fragment and its kinetic energy, the degree of the damage of soft tissues in the department of wound canal to the place of break and after it was directly proportional to the value of the wounding shell and complexity of its form.

In a number of cases with the fragmentation wounds in the first department of wound canal was revealed the heavy decomposition of muscular tissue with crushing of the unit of the muscles and formation of pockets. The walls of wound canal in these cases were extremely uneven. On the course of fragment soft tissues were exfoliated, the loose connective tissue, which fulfills muscular



gaps/intervals, was destroyed, was damaged a significant quantity of fine/small vessels, as a result of which frequently it was possible to see, especially on the cuts, intermuscular, subfascial, paraossal and other hematomas.

The extent of the zone of the damage of soft tissues with the fragmentation wounds in the exit department of wound canal after the place of break, especially with the large/coarse fragment, is considerably more than with the bullet wounds. As the example it is possible to give the following observation.

Wound 15/II 1942 the amputation 25/II 1942. Preparation No 221/2321. Clinical diagnosis: the fragmentation wound of left thigh with the break of bone. On the frontal cut (Fig. 119), carried out through the region of wound, it is possible to see the displacement of broken ends and the lamination of muscles. In the region of break is visible festering hematoma.

In the muscles of flexors and in the group of adductors are noted intermuscular and interfascial hematomas. In the region of inlet is evident the hemorrhage into subcutaneous cellular tissue. On the posterior surface of thigh is noted hemorrhage into cellulose, surrounding the sciatic nerve, and also insignificant hemorrhage into the spongy substance of the lower broken end of femoral bone.

In the X-ray photograph is visible large-comminuted fracture in middle third of thigh. Is noted the lamination of individual muscular groups (Fig. 120).

When with the perforating fragmentation wounds were damaged relatively large vessels, hematoma was propagated for the significant elongation/extent from the wound canal in the proximal and extremital direction.

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The issuing from blood fulfilled not only pockets and bays between the scraps of the muscles through which passed the fragment, but it went out far beyond the limits of canal on different opened intermuscular and interfascial gaps/intervals.

If we in this case consider that as a result of the thrust of muscles the scraps of bones are displaced, then it is possible to visualize entire complexity of surgical anatomy of perforating fragmentation wounds.

As the example it is possible to give the following observation.

Wound 20/II 1942 the amputation 21/II 1942. Preparation No 751/1557. Perforating fragmentation wound of right thigh on the boundary of middle and lower third.

On the sagittal cut, carried out through the region of wound (Fig. 121), it is possible to see extensive hematoma, which fulfills directly wound area toward the front and toward the rear from the place of break.

The blood fulfills slits in the destroyed muscles of the front/leading department of thigh (quadriceps muscle), it penetrates the narrow area and on cellulose of the posterior surface of thigh, which surrounds sciatic nerve, is propagated in the proximal and extremal direction.

In the X-ray photograph is visible a comminuted fracture of thigh on the boundary of lower and middle third. Fine/small bone broken ends are scattered in the zone of wound canal. Among the stratified soft tissues are visible hematomas.

Thus, the perforating bullet and fragmentation wounds of thigh, which are escorted/tracked by the large/coarse and small-splintered

break of femoral bone, as a rule, were characterized by the significant damage of the integrity of soft tissues, which not only determined the severity of damage at the moment of wound, but also the severity of the subsequent complications.

#### Blind-end wounds.

The blind-end wounds of thigh, which were being escorted/tracked by large/coarse and small-splintered break, were different in the anatomical picture and in the severity of course. If we take the blind-end wounds, which were being escorted/tracked by the break of femoral bone, as 100, then in the fraction/portion of the large-comminuted fractures it is 32.5, and in the fraction/portion of small-splintered ones - 3.1. Thus, in the group of the blind-end wounds of thigh about a third of all breaks comprised large/coarse and small-splintered breaks. Extent and structure of wound canals with the blind-end wounds are different.

If the first (entrance) department of wound canal to the place of break with the blind-end wounds both bullet, and fragmentation, almost in no way differs from the group of through ones, then the second (exit) department after the place of break sharply differs from the appropriate department with the perforating wounds and is various in each individual case of blind-end wound. The latter

depends mainly on the extent of the second department of wound canal, from the degree of the crushing of bone, the zone of the dispersion of its broken ends, on the degree of the strain of bullet and possibility of its rebounding in the soft tissues, and with the fragmentation wounds, furthermore, from value and form of fragment. The aforesaid above relative to the topographic-anatomic damages of the individual forms/species of the soft tissues of thigh with the perforating wounds in the equal measure relates also to the blind ones.

In this group also it is necessary to turn special attention to the level of break and direction of the wounding shell. Contents of wound canal with the blind-end wounds differs from contents with the through ones. If with the latter soft tissues are partially taken away by the wounding shell, in consequence of which is formed their defect, then with the blind-end wounds the scraps of clothing, bone fragments, as most wounding shell, are within the limits of wound canal beyond the place of the break or in its region. Wound discharge does not have output/yield.

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The issuing from in the tissue blood, without having a drain outside (broken line of wound canal, the displacement of muscular beds), is

propagated on the loose connective tissue, on the intermuscular and interfascial gaps/intervals in the proximal and extremital direction to the significant distance.

Developing following the wound edema of the soft tissues, included in the relatively little pliable fascial spaces, contributes to the disorder of lymph drainage, squeezing of veins, which leads, to the end of the ends, to the violation of the drain of the venous blood.

During the full/total/complete stopping of the drain of the venous blood the preserved arterial influx even more greatly increases edema, until finally comes such moment when, as a result of the compression of arteries, is disturbed the influx and the arterial blood.

The tissues, deprived of oxygen, are necrotized, and this creates favorable conditions for the development of anaerobic flora.

With the blind-end wounds more frequently are created the conditions, which facilitate the education of intermuscular phlegmons and suppurative flows which can apply to significant from the place of wound distance. From this point of view it is necessary to have in mind different topographic relationships/ratics of muscular-fascial

education and vessels, and of nerves, available in different departments thighs, and also different disposition of basic muscular masses.

Is most complex in topographic sense the medial surface of thigh, especially in its upper and middle third. Is here arranged/located a large quantity of muscles, between which there are complex intermuscular and interfascial spaces.

With the blind-end frontal wounds, especially in outward-internal direction of the wounding shell, the wounding fragment or bullet, and also the broken ends of bone, jamming in the muscular tissue of the bringing muscles of thigh, in a number of cases can condition the development of intermuscular phlegmons and flows.

Are somewhat simpler topographic relations on the external surface of the thigh where the soft tissues it is relatively less. Finally, the blind-end wounds, especially sagittal with front-posterior direction of the wounding shell in upper third of thigh, in view of the complexity of the topographic relations, which are observed in the frontier department between the thigh and the buttock region, are characterized from the anatomical side by special complexity, and with the clinical - by severity of developing

complications.

Deep intermuscular gaps/intervals of the posterior surface of thigh are communicated with cellulose of the buttock region, connected in turn, with the connective spaces of pelvis.

With the blind-end wounds when foreign body is arranged/located in this region, pyoinflammatory processes can be propagated on the course of sciatic nerve in the proximal direction up to retroperitoneal space.

Tangential wounds.

The surgical anatomy of the tangential wounds of thigh, which are escorted/tracked by the large/coarse and small-splintered break of femoral bone, differs little from the same with the perforating wounds.

Among all tangential wounds of thigh large-splintered breaks were observed in 23.7o/c, and small-splintered - in 2.6o/c.

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Thus, in quarter of all tangential wounds of thigh with the break of



bone were encountered large/coarse and small-splintered breaks. In this group just as in two those described above, is retained the general regularity, which is developed in the fact that comminuted fractures of thigh are encountered more frequent than other means of the violations of the integrity of femoral bone.

Bullet wounds. With the bullet wounds everything said relative to perforating wounds must be in the equal measure referred also to the tangents.

It is difficult in a number of cases to differentiate, are large-splintered breaks the result of tangential or perforating bullet wound. As one of the signs can serve the degree of the dispersion of bone fragments on the course of wound canal after the place of break. With the perforating bullet wounds bullet, being hit directly into the substance of bone, communicates to fragments the unit of its kinetic energy, and the latter acquire the character/nature of the secondary wounding shells, whereas with the tangential wounds the fragments of bone, as a rule, remain within the limits of damage to bone.

Since with this means of wounds the scraps of bone more frequently remain within the limits of break, the second department of wound canal after the place of break is not so complex, as it

spoke above, and here it is not observed the described above degree of the decomposition of soft tissues.

The inaccuracy of the configurations of wound canal, the brokenness of its axis in this group of breaks are the result of the displacement of broken ends by the thrust of muscles.

Fragmentation wounds. The degree of the decomposition of soft tissues and their displacement depend in these cases as with the through ones, mainly on form and value of the wounding fragment.

With the tangential fragmentation wounds the fragments of bone just as with the bullet ones, more frequently they remain in the region of break. A quantity of fragments is always less than with the through ones, but their size/diversion is greater. As the example it is possible to give the following observation.

Wound 13/II 1942 death 21/II 1942. Preparation No 285/1558.

Diagnosis: the tangential wound of lower third of right thigh by the fragment of mine with the damage to bone. Anaerobic infection.

On the frontal cut, carried cut through the region of wound (Fig. 122), is visible large-comminuted break of femoral bone.

Extremital broken end is displaced towards the outside, and proximal - towards the inside. Soft tissues are stratified. Hematoma fulfills the region of wound and it is propagated in the proximal and extremital direction mainly on paracssal cellulose. In the X-ray photograph (Fig. 123) is visible a comminuted fracture in lower third of femoral bone. Are visible the expanded intermuscular slits.

Crack formation. With all described above means of the perforating, blind-end and tangential wounds of thigh, which are escorted/tracked by the large/coarse and small-splintered breaks of femoral bone, one of the essential moments/torques, which are determining the severity of wound and subsequent complications, is the formation of the cracks, which are propagated into the adjacent joints which in a number of cases are drawn in in the inflammatory process and considerably weight the clinical picture of wound.

It is logical that the nearer the place of break to the region of knee or hip joint, the more frequently is drawn in into the process one or another the joint.

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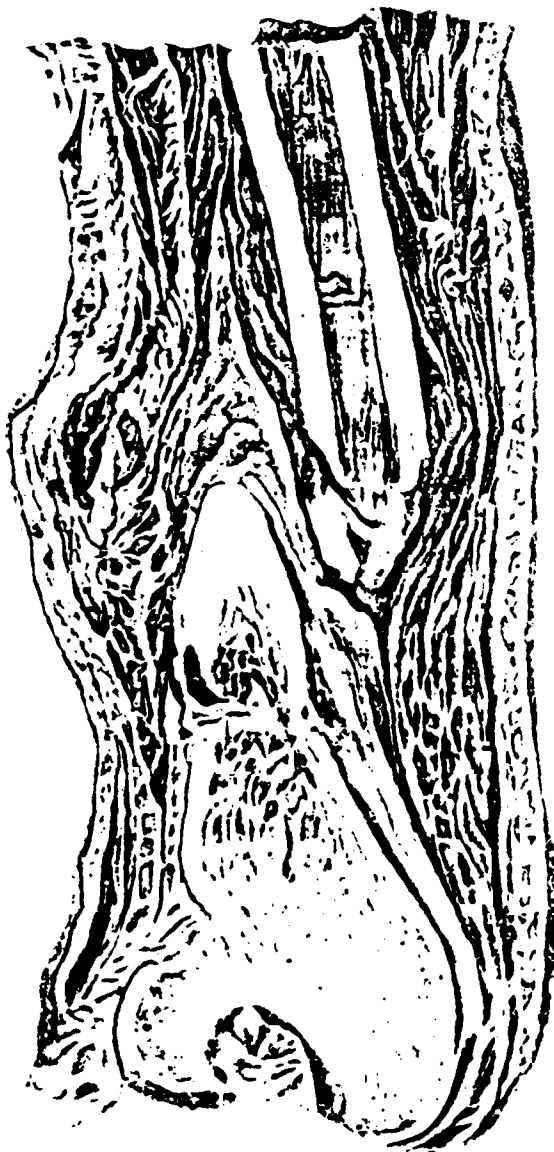


Fig. 122. Frontal cut of thigh. Preparation VMM No 285/1558. (Artist V. S. Chumanova)

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Fig. 123. Large-splintered break of lower third of right thigh (X-ray photograph from preparation No 285/1558).

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The analysis of the histories of the disease/illness of casualties with the bullet break of thigh showed that the breaks lower third in 6.60/o were complicated by suppurative gonitis, and upper third in 3.70/o were complicated by suppurative coxitis, whereas the bullet breaks in middle third of thigh into 1.60/c were only complicated by implication in the process of knee or hip joint.

The frequency of arthrites in the various forms of break was different. Thus, large-splintered breaks were complicated by arthritis in 2.70/o of cases and small-splintered - in 3.70/c.

The given statistical indicators tell about the fact that crack formation considerably complicated the clinical picture of wound, weighted it and, therefore, unavoidably affected outcomes.

Cracks with the bullet breaks of thigh were different. Sometimes they are longitudinal; however, more frequent they encircle the femoral bore like of spire. As the illustration it is possible to give the following observation.

Wound 15/IV 1942. Death 3/VI 1942. Preparation No 935/1957.

Blind-end fragmentation wound of middle third of left thigh with the damage to bone. On the boundary of middle and upper third of left femoral bone is a skew line of break with the defect on the external surface of thigh by the size/dimension 3.5x3 cm. Over the front face of upper third of femoral bone (Fig. 124) passes the crack from the line of break to the basis of large trochanter. Another crack passes over the internal surface of the peripheral broken end of bone. The internal surface of diaphysis is uneven, covered with periosteal layerings and fine/small depressions. On the internal surface of bone above and below break is determined a deep demarcation line of sequestration, which delimits the sequestration of the sizes/dimensions 8x2 cm (Fig. 125).

Spiral cracks rarely were observed with the large/coarse and small-splintered breaks, more frequently being encountered with the oblique breaks (see below). Crack formation contributed to the onset both of intrasosseous/intraosteal/endoosteal and sub-periosteal hematomas.

If the decomposition of bone was escorted/tracked by the scaling of periosteum both from the bone and from the surrounding soft tissues, which frequently was observed with the fragmentation wounds, crack formation led to the violation of the integrity of the Haversian canals, in which passed the vessels and the nerves, as a

result of which the unit of the bone, deprived of nourishment from the side of periosteum and from the side of bone marrow (its decomposition, hematoma), especially into the region of diaphysis, inevitably underwent necrosis.

Wound of vessels and the education of hematomas. In all cases of the large/coarse and small-splintered breaks of thigh was noted the presence of hematomas whose sizes/dimensions were closely related to the value of the damaged vessel and, consequently, also on quantity of blood, which issued from in the tissue.

In topographic sense should be distinguished hematomas subcutaneous, intermuscular, interfascial, intraosseous/intraosteal/endoosteal, sub-pericosteal, paraosseal, paravasal and paraneural.

Above, in the description of topographic-anatomic possibilities with the wounds at the discrete levels, it was indicated the degree of the probability of damaging the individual vessels, depending on the level of wound.

If we accept all wounds of the large vessels of thigh with its bullet breaks for 100, then in the fraction/portion of femoral artery it is necessary to 43.6 all cases, deep artery of thigh - 5.9;



popliteal - 6.1; the wounds of several vessels - 11.0; other - 3.6  
the vessels whose type is not refined, 24.8.

The analysis of the histories of disease/illness, which more precisely formulates the frequency of the damage of vessels with the large/coarse and small-splintered breaks, showed that 7.7o/o of all large-splintered and 5.2c/o small-splintered breaks were escorted/tracked by the damage of large vessels.

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The given numerals show that the damage of large vessels with the large-splintered and small-splintered breaks of femoral bone did not present large rarity, and consequently, to this question must be given significant attention. As the example of the large-splintered break of thigh with the damage of large vessel it is possible to give the following observation.

Wound 19/II 1942 the amputation 24/II 1942. Preparation No 160/2436.

Fragmentation wound. Large-splintered break in the region of lower third of left thigh.

On the frontal cut (Fig. 126), carried out in the region of lower third of left thigh, is visible the large-splintered break of femoral bone.

Edge broken end sharp/acute, toothed. Bone marrow in the place of the break of yellow-gray color, is impregnated with pus; further goes the sector, impregnated with the blood. Higher than place of the break of femoral bone the large sector of hemorrhage by the size/dimension 11x4.5 cm, dark brown, almost black color with the red hue. Muscles of the dark brown color, impregnated with the blood, fuzzy, alveolar/cellular building/structure. On the posterior surface of the cut of the thigh of the muscle of dark brown color.



Fig. 1.24.



Fig. 125.

Fig. 124. Comminuted fracture of femoral bone with crack formation.  
Front view (preparation Nc 935/1957).

Fig. 125. Comminuted fracture of femoral bone with crack formation.  
Back elevation (preparation Nc 935/1957).

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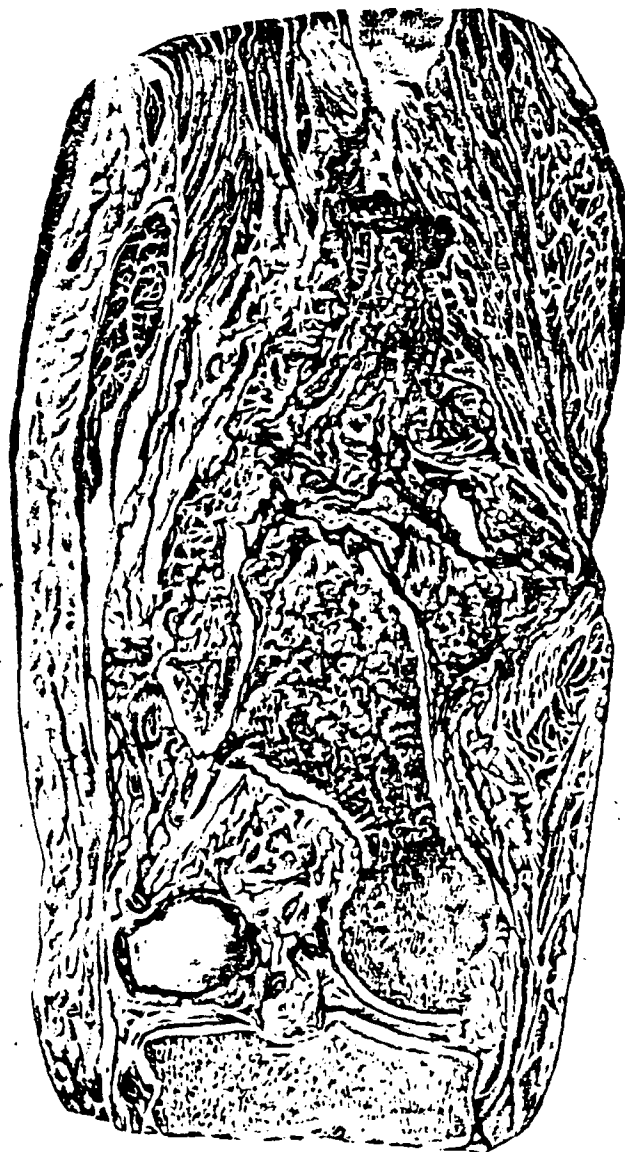


Fig. 126. Frontal cut of thigh. Preparation VMM No 160/2436. (Artist T. V. Belyayeva)

Page 344b.

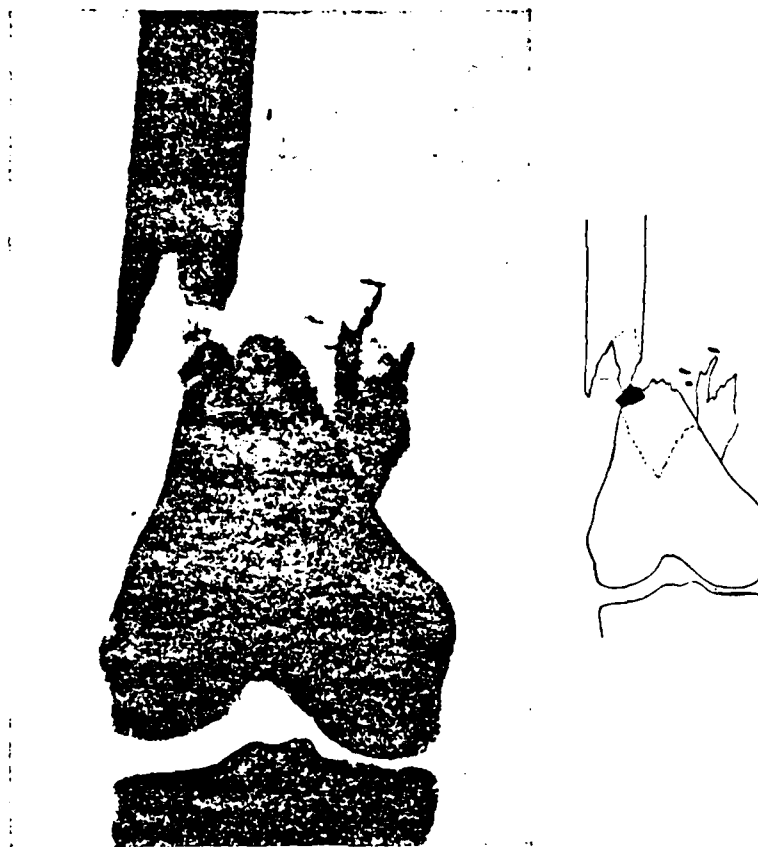


Fig. 127. Large-splintered break in region of lower third of right thigh (X-ray photograph from preparation No 160/2436).

Page 344c.

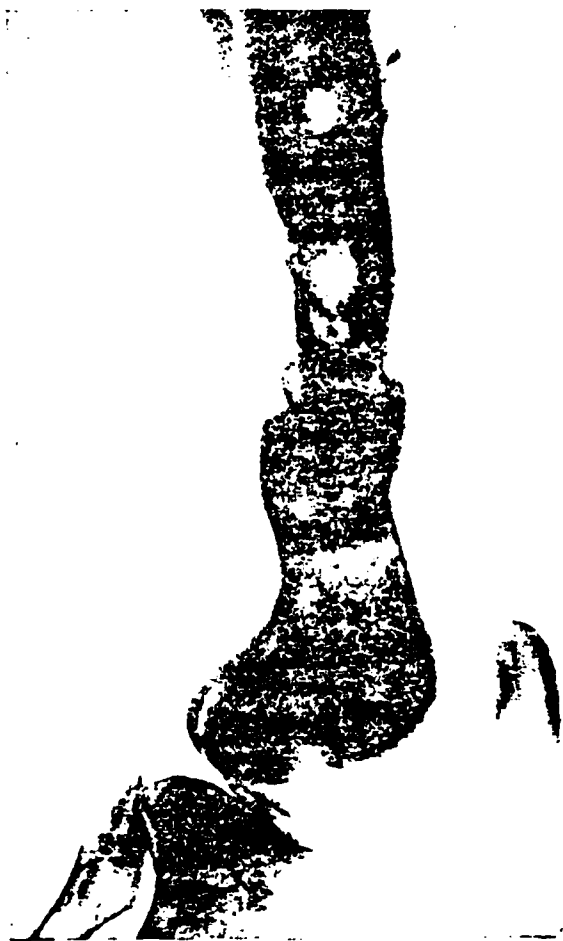


Fig. 128. Wound osteomyelitis in lower third of left thigh (X-ray photograph) from amputated extremity wounded E.

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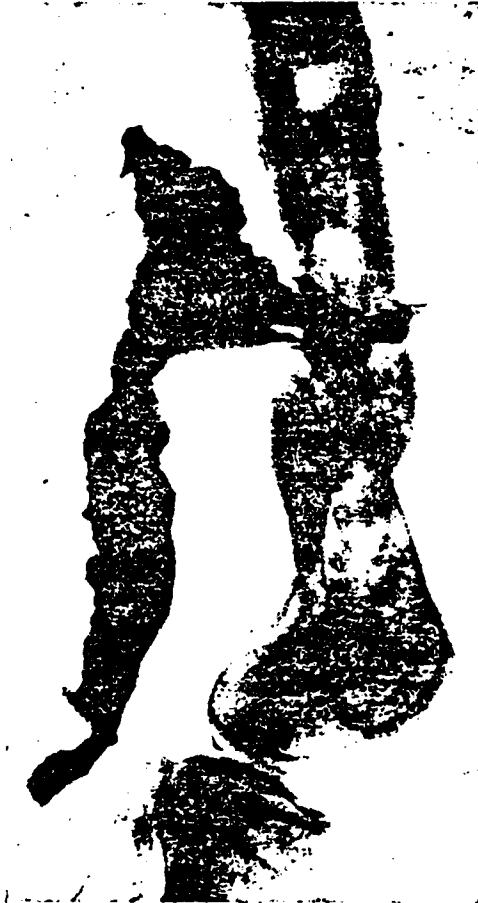


Fig. 129.



Fig. 130.

Fig. 129. Posterior flow with osteomyelitis after large-splintered break of thigh in lower third. Side view.

DOC = 80116028

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Fig. 130. Posterior flow with osteomyelitis after large-splintered break of thigh in lower third. Back elevation.



Page 344e.

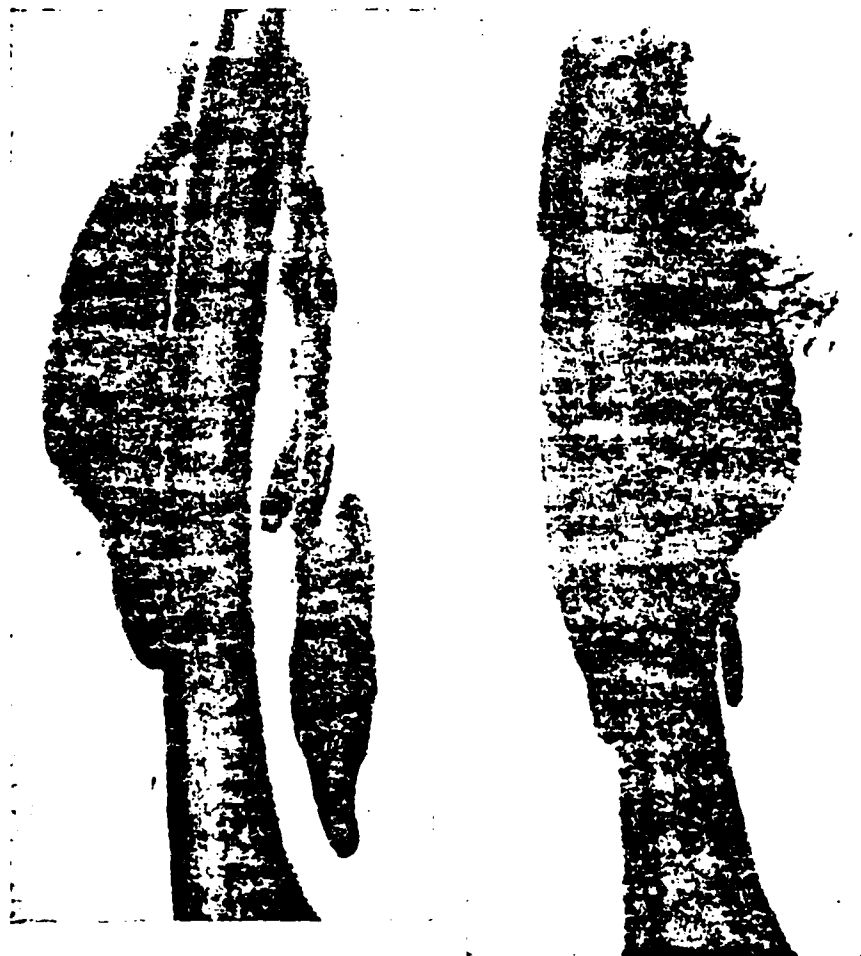


Fig. 135.

Fig. 136.

Fig. 135. Front/leading and posterior flows with bullet osteomyelitis of upper third of thigh. Side view.

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Fig. 136. The front/leading and posterior flows (see Fig. 135). Front view.

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In the X-ray photograph (Fig. 127) is visible the large-splintered break in lower third of femoral bone with the displacement of broken ends inward and toward the rear. Bone fragments uneven and unclear. Knee cap is absent.

Suppurative flows and the route/path of their dissemination. Described above cracks and hematomas to a considerable extent contribute to development subsequently of suppurative flows and phlegmons. The large-splintered breaks into 11.70/o of cases were escorted/tracked by the development of suppurative flows. Approximately/exemplarily the same numerals (11.90/o) were encountered also with the small-splintered breaks.

From the given numerals it is evident that each tenth casualty with a comminuted fracture of femoral bone among other complications had suppurative flow. The topography of suppurative flows and phlegmons was different and was located in accordance with differences indicated above in the degree of the damage of soft tissues in the various forms of wound, wounding shell and level of break.

Routes/paths of the dissemination of suppurative flows. Above were described the individual fascial spaces and the communications/reports between them, which in essence determine the routes/paths of the dissemination of pus.

In spite of entire diversity of those observing with the large/coarse and small-splintered breaks of the thigh of flows, it is possible, depending on damage level, to note the more or less typical places of the accumulation of pus.

With the breaks of femoral here in the region lower third, as a rule, the flows were propagated in the limits of front/leading muscular bed both in the extremal and in the proximal direction mainly on loose connective tissues, which surrounds femoral bone.

In connection with the fact that cellulose of popliteal pit and paraneural cellulose, which surrounds sciatic nerve, are actually unit, with the breaks at this level suppurative flows applied to the posterior surface of thigh, mainly in the downward direction.

As the example it is possible to give the following observation.

D. is wounded 21/VII 1943 the diagnosis: the perforating bullet wound of lower third of left thigh with the large-splintered break of

bone.

On the fifth day after wound is produced splitting up of wound. Are removed free bone fragments. 2/XI 1943 as a result of the incorrect intergrowth of the broken ends of bone is produced the osteotomy through the section/cut on the external surface of thigh.

1/II 1944 as a result of developing osteomyelitis and absence of consolidation there is produced sequestrectomy.

After wound (22/VII 1944) to patient was produced fistulography with sulfate barium, which showed that the contrast substance freely penetrated in the marrow canal and filled it for entire elongation/extent of thigh to the neck/journal.

As a result of deterioration in the general condition of sick 16/VIII 1944 is produced the amputation of thigh in upper third, which ended with exarticulation.

In the X-ray photograph (Fig. 128) of the amputated extremity is visible large/coarse bone sequestration and destruction of broken ends in the region of break.

Through the fistula was introduced the contrast mass, which was

disseminated from the region of fracture into the posterior department of thigh and on the course of flow went down to the level of upper third of shin (Fig. 129 and 130).

The given observation is interesting as the typical example of the posterior, mainly descending suppurative flow.

With the breaks of thigh in middle third in connection with the fact that femoral bone almost wholly enters into the limits of front/leading muscular bed, in which is included quadriceps muscle, suppurative flows, as a rule, were propagated over the front face of thigh.

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As the illustration it is possible to give the following observation.

N. is wounded 29/VIII 1943 the diagnosis: the perforating bullet wound of left thigh with the large-splintered break.

On the third day after wound is produced splitting up of wound. Extremity is immobilized. In further course was noted progressive deterioration in the general condition of casualty, the development

of wound exhaustion.

4/I 1944 is produced the amputation of thigh in upper third by guillotine method.

During the research of the amputated extremity is established/installed osteomyelitis in the region of break. The incorrect intergrowth of the broken ends which form the bone area with a diameter of 3.5 cm, that is communicated with the area of the flow under the quadriceps muscle of thigh, which diagnosed was not (Fig. 131).

Through the second bone window between the broken ends the place of break was communicated with the flow in subcutaneous cellular tissue on the external surface of thigh which was opened 14/XII 1943. On the spot of flow subsequently was formed the fistula with the constant suppurative discharge.

In the amputated extremity through the fistula was introduced the contrast mass, which filled the area of suppurative flow, which was being arranged/located paracssally under the quadriceps muscle of thigh.

Through the aperture in the upper turn contrast mass penetrated

in the area of knee joint (Fig. 132 and 133).

With the bullet breaks of femoral bone in upper third, especially with the through ones, when the wounding shell and the broken ends of bone opened several fascial spaces, the routes/paths of the dissemination of pus were multifeature. As the example it is possible to give the following observation.

Ya. Wounded 16/I 1944 the diagnosis: the perforating bullet wound of right thigh in upper third with the large-splintered break of femoral bone and the wound of urethra (Fig. 134).

11 Hours after wound is produced processing wound and is superimposed superpubic fistula. Extremity is immobilized.

8/II 1944 with the dressing it was noted, that from the wounds of which one by size/dimension 12x3 of cm was located on the external surface of thigh, in the region of large trochanter, and another with size/dimension 6x3 cm - on the internal surface, was secreted a significant quantity of pus. During the subsequent days the condition of patient deteriorated.

14/III was produced sequestrectomy; however, improvements did not advance, and 1/IV patient died.



On the autopsy was established/installed the perforating bullet wound of upper third of thigh with the damage to bone and the wound of urinating canal. Osteomyelitis of right femoral bone. Suppurative flows on the thigh. Catarrhal-fibrinogenous cystitis and other inflammatory phenomena in the region of the urinary tracts.

On the thigh is discovered the not identified with the life suppurative flow, which was being arranged/located along the anterolateral surfaces of femoral bone and which was being launched to lower third of it. The second flow was propagated on cellulose toward the front from the sciatic nerve. The areas of flows were filled with the contrast mass (Fig. 135 and 136).

Frequently with the blind ones and the through ones, especially with the frontal ones, the wounds it was possible to see the medial flows which were arranged/located between the muscles of medial group (to gunstock of the bringing muscles of thigh).

Finally, with the wound of upper third of thigh, especially in the region of large trochanter, neck/journal thighs, were encountered both posterior and front/leading flows, moreover the first were propagated mainly in the buttock region under the large and small

buttock muscle, being sometimes launched in the extremital direction on paraneural cellulose (posterior flow).

Toward the front pus was propagated usually on m iliopsoas, through its vagina into the iliac pit it is further in the proximal direction to the lumbar region, and in the extremital - under the quadriceps muscle of thigh and on the course of vessels.

Sometimes it was possible to observe the accumulation of pus in the intermuscular slit between r rectus and m vastus intermedius.

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Thus, on the thigh in topographic sense it is possible to distinguish the following means of flows:

1) front/leading: a) between m rectus and m vastus intermedius:  
b) between the quadriceps muscle and the femoral bone (paravasal

flows):

2) front-upper ascending flows on the course of vagina m iliopsoas:

3) paravasal flows - on cellulose, which surrounds femoral

vessels;

4) the posterior flows: a) downcoming, that are propagated on cellulose between the muscles by flexors to the shin, and b) ascending, that penetrate on paraneural cellulose into the buttock region;

5) the medial flows, arranged/located in the medial group of the muscles of thigh.

Damage of nerves. With the large/coarse and small-splintered breaks in accordance with the damage of soft tissues as this was described above, unavoidably were damaged the corresponding nerves. Taking into account that the topographic relations of nerves are different depending on the level of thigh, it is possible to visualize that also the frequency of their damage with the bullet breaks of femoral bone was different.

If we take all damages of nerves as 100, then in the fraction/portion upper third it is necessary to 37.6, average/mean - 32.0, lower - 28.8, also, to the wounds several third simultaneously - 1.6. In upper third femoral and obturator nerve yet they were not decomposed into their branches; their basic nerve trunks pass on the front/leading and anterointernal than the surface; therefore in all

directions of the wounding shell is very probable their damage.

With the large-splintered breaks, as can be seen from that presented above, soft tissues suffered to a considerable extent. It is possible to expect that also the damage of nerves with this form/species of breaks will be encountered more frequently than with others.

The analysis of statistical data from this point of view showed that the damages of nerves with large-splintered fractures breaks were observed into 9.30/o of cases, and with the small-splintered ones - into 8.20/o.

From given data it is possible to see that almost each tenth that wounded the thigh with its large-splintered break had the damage of one or the other nerve.

Crushed breaks.

General/common/total data. The crushed bullet breaks of femoral bone relate to the heaviest damages of extremities.

In contrast to comminuted fractures those crushed were characterized by so strong a dispersion of bone fragments, that was

obtained the defect of bone, and the fragments of contact between themselves did not have; therefore with the crushed breaks it was possible to note changes in the tissues, which are located on the significant distance from the place of the direct effect of the wounding shell.

The jolt of extremity as a whole contributed to the education of intramuscular, intraosseous/intraosteal/endoosteal hematomas, especially in the spongy substance. Among all bullet breaks of femoral bone the crushed breaks composed 14.8c/o.

The given numerals attest to the fact that this form/species of break was encountered so not already rarely: in each seventh among those wounded the thigh with the violation of the integrity of bone was noted the crushing.

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The crushed breaks of thigh with the fragmentation wounds were encountered to 4.60/o more frequently than with the bullet ones, which indirectly reflects the degree of the decomposition of soft tissues. If one considers that almost in half of all wounds of thigh, which were being escorted/tracked by the crushing of bone, which wounds by shell there was the fragment, then it is possible to visualize the degree of the decomposition of soft tissues to the place of break and after it.

The severity of these wounds and the complexity of the developing complications were found in the known dependence on the level of break.

In the fraction of the crushed breaks of all breaks of middle third of thigh it was necessary to 14.40/o, upper third - 13.60/o, lower third - 15.00/o, of the number of breaks several third - 22.20/o.

Wound canals. In the description of large/coarse and small-splintered breaks were in detail presented the special features/peculiarities of wound canals.

With the crushed breaks in the overwhelming majority of the cases it is difficult to speak about the wound canal, especially if one considers that into 50.6% crushing of bone it was the result of wound by fragment.

The axis of wound canal with the crushed breaks was not straight line as a result of the significant decomposition of soft tissues, displacement of muscular beds, but mainly as a result of the crushing of bone for the significant elongation/extent.

The aforesaid above of relatively sagittal and frontal wounds in different directions of the wounding shell and value of these factors in the determination of the surgical anatomy of wounds by rear sight is added to the crushed breaks. It is logical that depending on the character/nature of the wound of thigh the wound canals were distinguished not only by extent, but also by the configuration.

Perforating wounds. Among all perforating wounds of thigh, which were being escorted/tracked by the violation of the integrity of bone, the crushing of thigh was encountered into 13.0%, which

indicates the relative frequency of this form/species of break.

With the perforating sagittal wounds both front-posterior and posterior-front, and also through frontal in cutward-internal and inward- external direction of the wounding shell soft tissues suffered to the identical degree.

However, with the crushed breaks the described above two departments of wound canals (to the place of break and after it) in general terms differ little from similar wound canals with the large-splintered breaks. The section of wound canal to the place of break with the bullet and fragmentation wounds was described above, whereas the department of wound canal after the place of break with the crushing of thigh was characterized by large extent and significant decomposition of soft tissues.

The exit section of wound canal after the place of break did not have sharp boundaries and actually even it was not canal, since the region of outlet often was significant sizes/dimensions of the wound on bottom of which were visible the broken ends of bone both freely lain/rested, and connected with the periosteum.

With the perforating wounds with the crushing of thigh the sizes/dimensions of outlet were closely related to degree and extent



of the crushing of femoral bone. It is logical that, depending on the level of break and topography of outlet, in different measure, but nevertheless relatively frequently suffered the vessels and nerves.

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With the described means of wound were destroyed all fascial partitions/septa, which separate/liberate one muscular bed from another, as a result of which during the development of suppurative complications of phlegmon and suppurative flows could be localized in any fascial bed.

Latter/last circumstance greatly impeded the diagnosis of suppurative flows with this form/species of break.

The latter fact greatly impeded the diagnosis of suppurative flows with this form/species of break.

Blind-end wounds. Among the blind-end wounds, which were being escorted/tracked by the violation of the integrity of bone, the crushed breaks of thigh composed 12.10%, i.e., in the frequency almost they coincided with the perforating wounds.

The surgical anatomy of blind-end wounds with the crushing of

thigh in contrast to the blind-end wounds with another form/species of break was characterized by constancy, since with the crushed break in the majority of the cases the wounding shell passed further the place of break, and bone fragments flew away in different directions, forming defect in the bone; in this case there were two units of the wound canal: to the place of break and after it. The more deeply penetrated the shell, the longer there was the second department of wound canal (after the place of break) and it the more approached in its general/common/total structure the wound canals, which were being observed with the perforating wounds, with the only the difference, that skin, and sometimes also fascias remained undamaged/uninjured.

Soft tissues in the zone of the second department of wound canal after the place of break underwent significant decomposition, the reason for what were the multiple bone broken ends of different sizes/dimensions, which penetrate and, therefore, the destructive soft tissues for the significant elongation/extent.

With the blind-end wounds was especially difficultly comprise on the basis of the appearance of inlet the presentation/concept about the real degree of damage.

Tangential wounds. Among all tangential wounds of thigh, which were being escorted/tracked by break, the crushed breaks composed

15.80/o, i.e., their percentage was somewhat higher than with the through ones and the blind ones. Here perhaps pronounced the activity of the lateral impact of the wounding shell.

The common picture of wound canal with the tangential wounds was described above. Certain special feature/peculiarity of the structure of wound canal with the tangential wounds, which are escorted/tracked by the crushing of bone, was an increase of its extent in the proximal and extremal direction with respect to the extent of the decomposition of bone. Wound canal was not rectilinear, and the degree of the decomposition of soft tissues both in the department of wound canal to the place of break and after the place of break it differed little, if we do not take into consideration of the cases when the wounding shell is uncovered in the region of outlet the unit of the soft tissues.

Crack formation. The crushing of femoral bone in a number of cases was unavoidably escorted/tracked by the formation of the cracks which even more greatly increased the zone of wound. Cracks penetrated the adjacent joints, opening/disclosing thus the route/path of infection into their area.

Obtained as a result of the deepened development of the histories of disease/illness data show that suppurative arthrites

were observed into 3.3c/o of all crushed breaks.

Wound of vessels and nerves. The decomposition of soft tissues for the significant elongation/extent involved the violation of the integrity of large/coarse arteries and veins, which was observed into 22.2o/o of all crushed breaks.

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Consequently, in each fifth casualty with the crushed break of femoral bone it was possible to expect the education of extensive hematomas. Issuing from as a result of decomposition and lamination of soft tissues the blood fulfilled the area of wound canal (especially with the blind-end wounds), and also it was propagated for the significant elongation/extent on the intermuscular and interfascial slits.

With the crushed breaks it was possible to observe all described above forms/species of hematomas. The blood, which issued from in the tissue, caused the compression of the latter, which led to the sharp violation of the nourishment of extremity.

Hematomas contributed to the development of pyoinflammatory processes. In 10.3o/o of all crushed breaks were noted different

topography the flows and phlegmons.

As a result of the fact that with the crushed breaks greatly frequently are opened almost all fascial spaces and connective gaps/intervals, were observed all forms/species of flows and phlegmons: intracosseous/intracosteal/endosteal, sub-periosteal, paraossal, paravasal, paraneural, intermuscular and subcutaneous.

The severity of clinical course was determined still and by that fact that with this form/species of the break into 11.40/o were damaged the large/coarse nerve trunks. The violation of the integrity of nerves led to the vasomotor and trophic disorders, which, after all, unavoidably affected outcomes.

Edge/boundary breaks.

The edge/boundary breaks of femoral bone during its bullet damages did not comprise, as this it was possible to assume, large rarity. Among all other forms/species of break they were observed into 13.60/o and in the frequency stood in the fourth place. Difference in building/structure of diaphysis, metaphysis and pineal systems of thigh to a considerable extent affected the frequency of the observed edge/boundary breaks. The complexity of the configuration of the pineal systems of thigh to a considerable extent

determined the frequency of this form/species of break.

Edge/boundary breaks were observed both with the fragmentation ones and with the bullet wounds; however, their frequency with those and others was different. Among all bullet breaks of edge/boundary ones it was 10.80/o, while among the fragmentation ones considerably greater - 17.30/o.

The analysis of statistical data, obtained as a result of the deepened development of the histories of disease/illness, showed that most frequently the edge/boundary breaks were observed in upper third of thigh (19.20/o), less frequent - in lower third (14.30/o) and still less frequent - on the average (9.10/o).

Thus, the edge/boundary breaks of pineal systems and metaphysis of thigh were observed more frequently than the edge/boundary breaks of diaphysis.

As the example of the edge/boundary break of the upper pineal system of thigh it is possible to give the following observation.

Wound by the fragment of the mine 9/VIII 1943. Death 18/IX 1943. Preparation No 545/2214. Blind-end fragmentation wound of right half of pelvis with the damage to iliac bone. Osteomyelitis of right iliac

bone. Phlegmon of right half of pelvis. Perforating fragmentation wound of upper third of right thigh with the edge/boundary break of femoral bone.

Preparation (Fig. 137): on the posterior surface of right femoral bone, in the region of a small trochanter and metaphysis, there is an edge/boundary defect with the size/dimension 7.5x3 cm with rough edges, a small trochanter is absent.

In the X-ray photograph is visible the edge/boundary break of the posterior edge of upper third of right femoral bone with the defect of the bone substance with the size/dimension 6x2 cm, the depth is 1 cm. A small trochanter is absent, the outlines of defect uneven, with the sharp edges.

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The given observation once more underscores that the complexity of the configuration of the upper pineal system of thigh (large trochanter, a small trochanter) contributes to an increase in the partly edge/boundary breaks in this department (almost half of all cases of edge/boundary break).

Wound canals with the edge/boundary breaks as with other

forms/species of break, did not have rectilinear form. Their distinctive features was the considerably smaller decomposition of soft tissues, than with other forms/species of break, the decomposition depending not so much on the fragments of bone, as is direct from the most wounding shell, its form and kinetic energy.

Perforating, blind-end and tangential wounds. Among all perforating wounds edge/boundary breaks were observed into 11.10/o. Consequently, they did not compose large rarity. With the perforating bullet wounds, and also with the fragmentation ones the sizes/dimensions of edge/boundary breaks were different. Depending on the value of the broken end of bone, carried off by the wounding shell with the perforating wound, the department of wound canal after the place of break sometimes acquired more complex forms than this it would be possible to assure.

The fragments of bone, taken away by bullet or fragment of shell, with the perforating wounds led to the fact that the structure of wound canal with the edge/boundary breaks actually in no way differed from the wound canals, which are observed with the perforating wounds with the large-splintered break of femoral bone.

Among all blind-end wounds, which were being escorted/tracked by the break of the femoral bone, edge/boundary they composed 18.80/o.



Thus, almost in each fifth case of blind-end wound with the violation of the integrity of bone it is possible to expect the education of edge/boundary break.

The aforesaid above relative to the character/nature of wound canals with the bullet and fragmentation blind-end wounds with the damage to bone is wholly added to the edge/boundary breaks.

Among all tangential wounds of thigh, which were being escorted/tracked by the breaks of femoral bone, in the fraction/portion of edge/boundary ones it is 29.00%. Consequently, almost in third of all cases of the breaks with the tangential wounds were observed edge/boundary damages to bone, which is completely explained by the mechanism of tangential wounds. The structure of wound canal with the tangential wounds has much in common with structure wound canal with the perforating wounds. In that and in other case the cross sizes/dimensions of wound canal are determined by the value of bone defect.



Fig. 137. Edge/boundary break of upper third of femoral bone. Back elevation (preparation No 595/2214).

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Intraosseous/intraosteal/endosteal ulcers and suppurative arthrites. With the edge/boundary breaks frequently was revealed marrow canal and, therefore, at certain distance was damaged bone marrow. The presence of the opened marrow canal, made by necrotized bone marrow, in the presence of intraosseous/intraosteal/endosteal

hematomas contributed to the development of complications from the side of bone marrow (intracosseous/intraosteal/endoosteal ulcers).

With the pyoinflammatory processes, especially with small aperture, which leads into the marrow canal, which is accumulated here pus did not always have free drain, which unavoidably affected both the clinical picture and the subsequent outcomes.

Since edge/boundary breaks more frequently were observed in the region of pineal systems and in a number of cases were escorted/tracked by cracks, was possibly implication in the process of the adjacent joints. In this case it is necessary to consider that in a number of cases of infection it can hit the joint on the lymphatic and venous vessels, but not only on the cracks.

Suppurative arthrites with the edge/boundary breaks were encountered into 3.10/o of all cases of the break of this form/species.

Wound of vessels. With this form/species of break soft tissues suffered to the considerably smaller degree, than with crushed, why more rarely was observed the damage of large vessels. With respect to all the edge/boundary breaks only into 4.20/o were observed the violations of the integrity of basic arteries.

The relatively high percentage of the wounds of vessels is explained by localization of the break predominantly in the region upper and lower third, i.e., in those places where was most probable the damage of basic arteries, especially with the sagittal front-posterior and posterior-front, and also with the frontal both outward-internal and internal-outward wounds.

Suppurative flows. Above it was indicated, that the edge/boundary breaks comparatively frequently were observed with the blind-end wounds and very frequently with the tangents. In the first group of the wounds when foreign body and absorbed it the unit of the clothing and the broken ends of bone remained in tissue, were created conditions for educating of intermuscular phlegmons and suppurative flows. With the edge/boundary breaks suppurative flows were observed into 12.7% of all cases and on the frequent stood in the second place.

Wound of nerves. Since edge/boundary breaks more frequently were observed in the limits of pineal system, i.e., in those places where the nerves approached nearer anything the bone, violation their integrities were encountered relatively frequently and they comprised with respect to all edge/boundary breaks 13.8%. In this respect the

edge/boundary breaks stood at the following place after cross breaks.

Perforated breaks.

The media of all other forms/species of the bullet breaks of thigh perforated were encountered relatively rarely and they composed only 6.10/o. In the frequency they occupied the fifth place.

The perforated breaks of femoral bone, as other tubular bones, most frequently they were observed in those departments of the bone whereas where is sufficiently developed spongy substance; therefore in the region of the diaphysis of thigh they were encountered rarely (2.40/o), in the region of lower epi-metaphysis they comprised 10.30/o. Middle place in the frequency occupied the breaks in upper third of thigh (6.40/o).

Almost 90.00/o of perforated breaks of thigh fall to its upper and lower third. This can be explained by the physical properties of the spongy substance of bone tissue, which is characterized by significant elasticity and elasticity.

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As the example of perforated break it is possible to give the

following observation.

Wound 26/VII 1943. Death 2/IX 1943. Preparation No 605/2213.

On the posterior surface of left femoral bone on 2 cm of lower than the small trochanter is a perforated defect by the size/dimension 1.5x0.5 cm, with the longitudinal cracks, which go upwards and down from the defect; down will withdraw multiple cracks and two long cracks, of which one goes to the sawn end of the bone, and the second crosses/intersects its external edge on 1 cm it overdrank below (Fig. 138).

On the front face of the diaphysis of bone is visible the longitudinal crack, which goes down from the basis of large trochanter. The second crack goes for the insignificant elongation/extent towards a small trochanter. In the X-ray photograph is visible the perforated break of upper third of femoral bone.

The described preparation is interesting in that sense, that the break is located on the boundary of the march/passage of spongy substance into the compact. By this perhaps and is explained a significant quantity of cracks, which go in the different directions.

Perforated breaks were the result of the bullet wounds less

frequent (4.90/o) than fragmentation ones (7.7c/o).

Wound canals. With the perforated breaks wound canals were not characterized by the special complexity of structure, with exception of those cases when they were escorted/tracked by the cracks which applied to significant elongation/extent. Sometimes with the perforated breaks is possible the formation of the large/coarse broken ends of bone which frequently was encountered in the limits of lower pineal system. Such perforated breaks occupy the middle place between the large-splintered ones and the oblique ones.

As the example it is possible to give the following observation.

Wound 17/II 1942. Amputation 3/IV 1942. Preparation No 4619/2085. Bullet wound of lower third of left thigh. On the front face of lower third of left femoral bone is a perforated defect by the size/dimension 2x1 cm (Fig. 139), which penetrates to opposite side of the bone where it has a size/dimension 5x2.5 cm, with the uneven notched edges (Fig. 140).

Over the front/leading and posterior surface of lower metaphysis the bones pass deep cracks, which exit from the edges of the defects indicated. From the upper edge goes the skew line of the break of the diaphysis of thigh.

Along the line of break over the surface of broken ends is visible edge/boundary sequestral flute. On the surface of broken ends outside the zone of demarcation are visible fine/small depressions.

The described form/species of the perforated break is interesting, as was already noted above, from that point of view that it according to general form of fracture of bone can be related both to the oblique ones and to large-splintered breaks.

The structure of wound canals with the perforated breaks just as with other forms/species of break, it is closely related to the character/nature of wound.

Perforating wounds. Among all perforating wounds, which were being escorted/tracked by the violation of the integrity of bone, perforated fractures were observed relatively rarely and they composed only 4.20/o.





Fig. 138. Perforated break in upper third of left thigh (preparation No 605/2213).

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With the perforating wounds the general/common/total building/structure of wound canal is similar to that described with the large/coarse and small-splintered break with the only the difference, which in the department of wound canal after the place of break, as a rule, is not observed the large decomposition of soft tissues.

The special difference between the bullet and fragmentation wounds here to establish/install, because the value of the wounding

shell, in particular, fragment, with the perforated breaks in terms of a little differed from the sizes/dimensions of bullet.

Blind-end wounds. With the blind-end wounds perforated breaks composed 10.30/o of all breaks, which were being observed with this means of wounds. From the comparison of numerals it is possible to see that the perforated breaks with the nonperforating wounds were encountered doubly more frequently than with the through ones.

The latter testifies from that that in a number of cases with the blind-end wounds the wounding shell either jams in the bone or it is arranged/located very closely after it. Therefore wound canals with the blind perforated breaks have very simple structure, and the violation of the straightness of the axis of canal is the result of the displacement of muscular beds depending on the position/situation of extremity at the moment of wound.

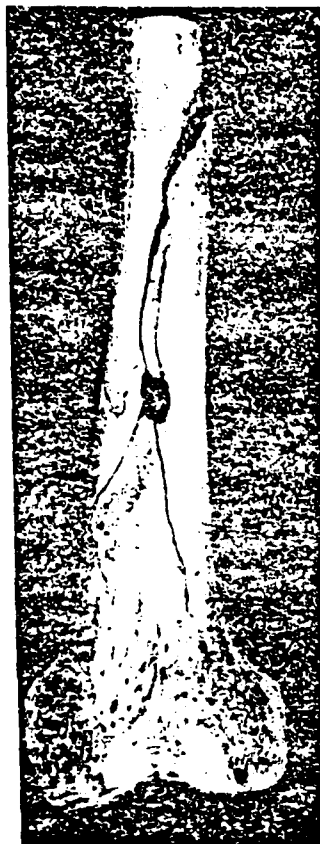


Fig. 139.



Fig. 140.

Fig. 139. Perforated break of femoral bone. Front view (preparation No 4619/2085).

Fig. 140. Perforated break of femoral bone. Back elevation (preparation No 4619/2085).

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The special difference in building/structure of wound canals with the blind-end bullet and fragmentation wounds was impossible to establish.

Tangential wounds. Among all tangential wounds, which were being escorted/tracked by the break of thigh, perforated breaks composed 2.60/o. The decomposition of soft tissues with this means of wounds was extremely insignificant and it depended mainly on the wounding shell, but not from the degree of damage to bone, since almost 90.00/o of perforated breaks were localized in epimetaphyses.

The fact that the perforated breaks were observed predominantly in the region of pineal systems, moreover frequently were observed cracks, is found its reflection in the frequency of arthrites of hip and knee joint. The perforated breaks into 3.60/o were escorted/tracked by arthritis.

As the example of crack formation it is possible to give the following observation.

Wound 21/II 1942. Death 4/V 1942. Preparation No 931/1990.

Perforating fragmentation wound of buttock region with the damage of thigh.

In the region of the neck/journal of left femoral bone is a perforated defect with size/dimension 2x1.5 cm with cracks, which apply to head. In addition to this, is visible bone defect on the spot of the disengagement of a small and large trochanter (Fig. 141). The outlines of defect are unclear and uneven. From the region of break goes the crack through entire head (Fig. 142).



Fig. 141.

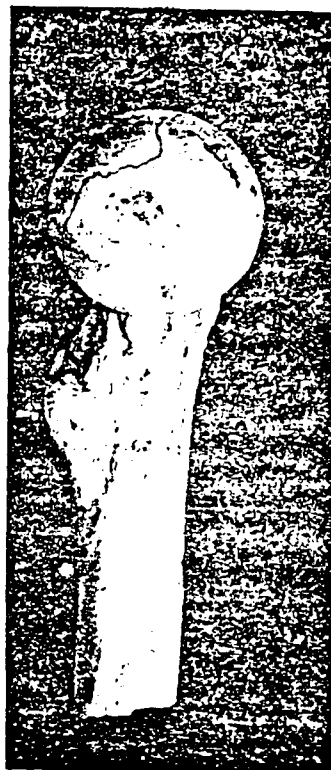


Fig. 142.

Fig. 141. Perforated break of neck/journal of left femoral bone.  
Front view (preparation Nc 931/1990).

Fig. 142. Perforated break of neck/journal of left femoral bone.  
Crack of head (preparation Nc 931/1999).

Wound of vessels and nerves. In connection with the fact that the perforated breaks were observed mainly in the region of the pineal systems where the basic large/coarse arteries almost directly adjoin to the bone, their damage was encountered so not rarely, namely in 5.20/o of all perforated breaks. In the frequency of the wound of vessels perforated breaks will stand at one place with small-splintered.

The damage of nerves was observed into 12.50/o of all perforated breaks. The relative frequency of the damage of nerves is explained by preferred localization of the perforated breaks in the region of pineal system.

Soft tissues with the perforated breaks were damaged, in comparison with other forms/species of breaks, to the considerably smaller degree, due to which flows were encountered comparatively rarely and they were observed only into 7.70/o.

Among all violations of the integrity of the break of femoral bone the flows were encountered most rarely with the perforated breaks.

Oblique breaks.

With respect to all bullet breaks of femoral bone the oblique breaks comprised 16.30/o and in the frequency occupied the second place.

Somewhat more frequent than oblique fractures were encountered with bullet wounds (16.80/o), than among the fragmentation ones (15.70/o).

The frequency of oblique breaks little depended on the level of wound; with the breaks of upper third of thigh oblique breaks composed 13.20/o, with the breaks middle third - 16.70/o, lower third - 18.50/o and with the breaks several third - 21.50/o.

Relative to frequently were encountered bone fractures, which capture both any thirds (21.50/o), and sometimes also entire femoral bone. In such cases of crack they went spirally, encircling thigh for entire its elongation/extent.

As the illustration it is possible to give the following example of oblique break.

Wound 11/X 1944. Death 11/X 1944. Preparation No 2415/2244. Multiple blind-end mine-fragmentation wounds of breast, stomach with the wound of the liver, lumbar region, with the open break of left



thigh. Blind-end wound of right radiocarpal joint. Multiple wounds of soft tissues of right thigh and shin. Shock.

The preparation: in middle third of left femoral bone is a spiral break. The line of break passes over outward-posterior surface middle third of bone (Fig. 143) and it changes from the front into the longitudinal. From the lower edge of break on anterointernal than the surface goes the spiral crack, which changes to external condyle in the region of the front face of the lower pineal system of thigh (Fig. 144). Edge/boundary defect in deep to 2 cm and by the size/dimension 2.5x1.5 cm.

From its upper edge over the front face of middle third of thigh will withdraw for the elongation/extent 7 cm the crack.

Wound canals with the oblique breaks are different in their structure and it is closely related to the character/nature of the break of bone and its extent.

With the oblique breaks, as a rule, the broken ends sharp/acute; during the displacement they easily pierce soft tissues, which considerably increases the region of damage.

It is logical that extent, the form and the sizes/dimensions of

wound canals will be different depending on the means of the wound of thigh, direction of the wounding shell and level of damage.

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Perforating wounds. With the perforating wounds oblique breaks were encountered relatively frequently (16.80/o) and in the frequency occupied the second place.

The aforesaid above relative to the structure of wound canals with large small-splintered breaks can be by rear sight referred also to the perforating wounds, which are escorted/tracked by oblique break. Here also canal does not have straight axle. Its sections to the place of fracture and after it sharply differ from each other. On the form of wound canal great effect exerts the displacement of broken ends. As the example it is possible to give the following observation.

Wound 14/II 1942. Amputation 21/II 1942 apropos of anaerobic infection. Preparation No 310/2475.

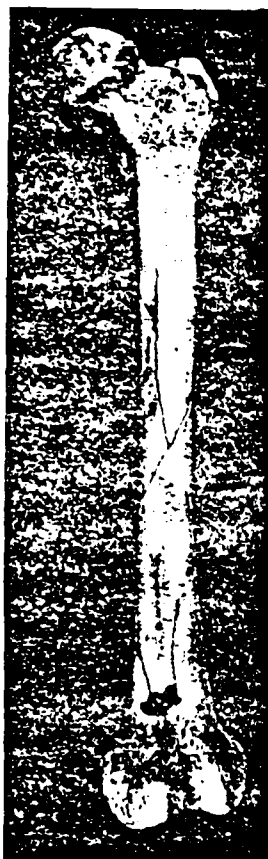


Fig. 143.

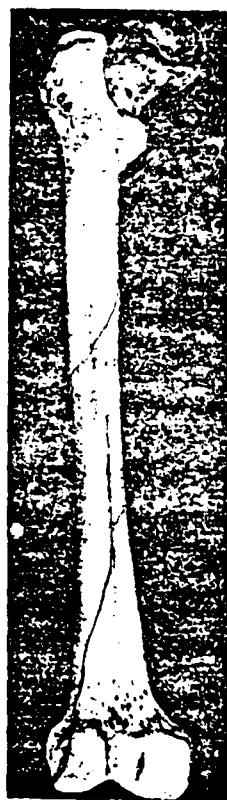


Fig. 144.

Fig. 143. Oblique fracture of left femoral bone. Front view  
(preparation No 2415/2244).

Fig. 144. Oblique break of left femoral bone. Back elevation  
(preparation No 2415/2244).

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On the frontal cut of left thigh (Fig. 145) is visible the oblique break of femoral bone with the displacement of broken ends along the length. Kray broken ends they are smoothed. Bone marrow of the proximal broken end of yellow-gray color with the sectors of festering and necrosis. In the soft tissues also many foci the festerings and hemorrhages into the muscles; the latter are fuzzy, have alveolar/cellular structure.

In the X-ray photograph (Fig. 146) is visible the oblique break in middle third of femoral bone with the displacement to the face and along the length on 12 cm. The outlines of broken ends are unclear.

Blind-end wounds. With the blind-end wounds of thigh oblique breaks occupy among all others the second place and compose 16.70/o. Consequently, oblique breaks equally frequently are encountered both with the blind ones and with the perforating wounds.

With the blind-end bullet wounds the general/common/total structure of wound canal the same as with other breaks. Special feature/peculiarity is the rebounding of bullet in the tissues of thigh, in consequence of which wound canal can obtain especially complex form. During the damage of thigh in the bias wound area is

pulled out in the proximal and extremital direction.

With the blind-end fragmentation wounds most frequently the fragment is located in the region of break, and wound canal in its structure in no way differs from the described above wound canals with the blind-end wounds.

Tangential wounds. Among the tangential wounds of thigh oblique breaks also occupied the second place. However, they were encountered in this group of wounds more frequently than in first two, and they composed 18.40/o.

Differences in the wound canal depend mainly on the form of break, its extent and degree of the displacement of broken ends.

The character/nature of the wounding shell affected predominantly the degree of the damage of soft tissues.

With the oblique breaks the cracks were encountered more rarely than with other forms/species of break, in consequence of which and arthrites as complications with this break in the frequency stood at the latter/last place and composed 1.40/o.

Damage of vessels and nerves.

The damage of large/coarse arteries was encountered relatively rarely: into 2.70/o of all oblique breaks was only disrupted the integrity of the basic vessels, which feed extremity.

With the oblique breaks frequently were encountered hematomas, since the vessels, which feed soft tissues, were damaged by the broken ends of bone. Furthermore, with this form/species of break for the significant elongation/extent can suffer periosteum, why it is possible to see sub-pericsteal and paraossal hematomas. Their extent is small, and, as a rule, they were limited to the place of break. The damage of nerves was encountered in 7.80/c of all breaks of this form/species.

The wound of soft tissues and the displacement of broken ends contributed to the damage of the fascial leaflets, which delimit individual muscular vaginas, in consequence of which the flows were multifeature and they were encountered relatively frequently.

11.40/o of oblique breaks were complicated by suppurative flows, i.e., with this form/species of breaks flows were encountered so frequently as with the large-splintered ones.

Cross, longitudinal and packed in breaks.

This group of breaks is scarce. Among all bullet breaks of femoral bone cross were observed only into 5.00/o, longitudinal, just as those packed in, were observed into 0.90/o.

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Among the bullet wounds cross breaks were observed in 4.60/o, while among the fragmentation ones - in 5.70/c. Other relationships/ratios were observed with the packed in and longitudinal breaks. Thus, among the bullet breaks those packed in composed 1.20/o, and among the fragmentation ones - 0.60/c. On the levels of break the individual forms/species of this group were encountered approximately equally frequently (Table 157).

Wound canals with these forms/species of break differed little from those described above, and their building/structure depended not so much on damage to bone itself, as from the direct damage of soft tissues by the wounding shell.

Perforating wounds. With the perforating wounds cross breaks were encountered into 5.4c/c, longitudinal - in 0.70/o, and those packed in - in 1.10/o. Thus, this group of breaks together with the

perforated ones will cost at the latter/last place.

Bullet wounds. The character/nature of the structure of wound canals with the bullet perforating wounds in all three groups of breaks differed little from each other and from those described above.

The department of wound canal to the place of break and after it did not have large differences, but if here and were encountered some special features/peculiarities, then they were explained not so much by the character/nature of break, as by form/species of the wounding shell, by its kinetic energy and by size/dimension.

Fragmentation wounds. The damage of the integrity of soft tissues with the fragmentation perforating wounds, which are escorted/tracked by the described forms/species of the break of femoral bone, just as with the bullet ones. depended mainly on the character of the wounding shell and its form, since bone fragments with these breaks it is not observed, and therefore soft tissues by them are not damaged.

As the example of perforating fragmentation wound it is possible to give the following observation.



Wound 31/V 1943. Death 6/VI 1943. Preparation No 1869/2250.

Through fragmentation wound in middle third of left thigh. Anaerobic infection. In middle third of left femoral bone is visible the line of the break with the uneven edges. From the place of the violation of the integrity of bone in the extremal direction go two cracks over the posterior and front face of diaphysis (Fig. 147).

Defect of the posterior edge of the same bone in the place of break by the size/dimension 5x1 cm. From the place of break down will withdraw cracks on extent 5 cm, and upwards on extent 2 cm.

Blind-end wounds. With the blind-end wounds cross breaks were observed into 4.70/o, longitudinal - into 1.30/o and those packed in - into 0.50/o.

Any special features/peculiarities in building/structure of wound canals with the described forms/species of the breaks of femoral bone with nonpenetrating wounds it is impossible to note. As a rule, they are similar.

Table 157. Frequency of the packed in, cross and longitudinal breaks of thigh with the wound at the different levels (in the percentages).

(2) Вид перелома	Уровень перелома по третям (1)		(5) нижняя	(6) несколько третей	(7) В среднем
	(3) верхняя	(4) средняя			
(8) Включенный . . . . .	1,4	0,5	1,0	0,6	0,9
(9) Поперечный . . . . .	4,9	6,6	3,7	3,8	5,0
(10) Продольный . . . . .	0,8	0,9	0,9	1,9	0,9

Key: (1). Level of break on third. (2). Form/species of break. (3). upper. (4). average/mean. (5). lower. (6). several third. (7). On the average. (8). Packed in. (9). Cross. (10). Longitudinal.

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Fig. 145. Frontal cut of left thigh. Preparation VMM No 310/2475.

(Artist of T. V. Belyayev).

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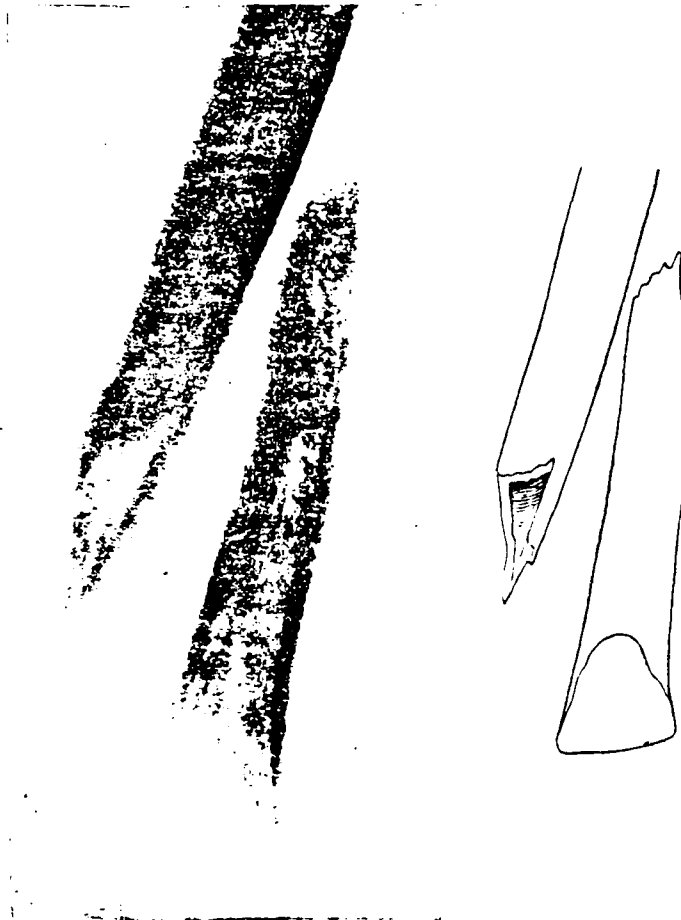


Fig. 146. Oblique break of left thigh with large displacement of broken ends along the length (X-ray photograph from preparation No 310/2475).

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As the example of cross break with the blind-end wounds of thigh it is possible to give the following observation.

The date of wound is unknown. Death 16/IV 1942. Preparation No 97/2210.

Blind-end fragmentation wound in upper third of right thigh. In middle third of right femoral bone passes the cross line of break with the edge/boundary defect as the size/dimension 2.5x2.5 of cm (Fig. 148).

In the X-ray photograph is visible the cross break of middle third of right femoral bone with the defect of its external edge. From the place of fracture down goes the crack in long to 2 cm.

Tangential wounds. According to the data of the deepened development of the histories of disease/illness, with tangential wounds not at all it was observed the longitudinal and packed in breaks, whereas cross were encountered they relatively frequently and composed 7.90/o.

Among the described forms/species of the break of femoral bone the cracks were encountered predominantly with the cross and longitudinal breaks, which finds its reflection in the frequency of arthrites.

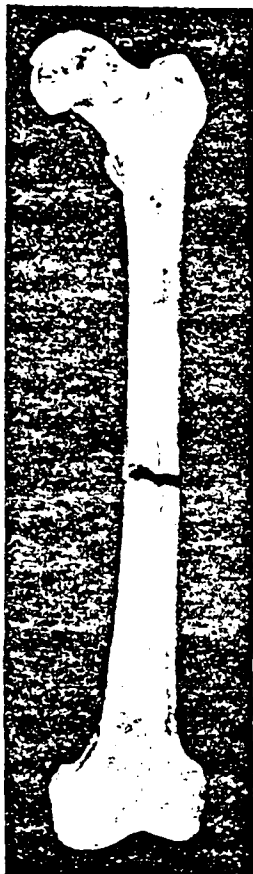


Fig. 147.



Fig. 148.

Fig. 147. Cross break of middle third of left thigh (preparation No 1869/2250).

Fig. 148. Cross break of right femoral bone. Back elevation (preparation No 937/2210).

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In the frequency of arthrites (5.7c/o) the longitudinal breaks of thigh will cost among all other forms/species of the break of this bone in the first place.

With the cross breaks arthrites composed altogether only 1.5o/c, while with those packed in in no way they were observed.

The damage of arteries with the cross breaks was observed into 3.4o/o, with the longitudinal ones - into 2.9c/o and with those packed in - into 2.7o/o of cases. Thus, these forms/species of breaks in the frequency of the damage of basic arteries occupied latter/last place.

With the packed in breaks the damage of nerves was encountered into 13.5o/o, with the longitudinal breaks - into 5.7o/o, with the cross ones - into 15.6o/c.

The development of suppurative flows and phlegmons with the longitudinal breaks of thigh among all other forms/species of breaks occupies the first place. Suppurative flows with the longitudinal breaks were encountered into 20.0c/o of cases, i.e., almost it is twice more frequently than with the crushed breaks.

The latter is explained by the extent of break, by the education of sub-periosteal and paracssal heratomas, which difficultly yield to removal/distance, which pass unnoticeably and subsequently serve as source the developments of both intermuscular phlegmons and flows.

With the cross breaks the flows were encountered into 9.3o/o, while with packed in - into 8.1c/c.

The topography of flows is different and is located in the close dependence on the level of break and damage of one or the other fascial bed.

However, the described above forms/species of the breaks of thigh do not envelop entire diversity. In certain cases of damage the thighs were the combination of oblique ones and perforated, cross and oblique, edge/boundary and longitudinal and finally multiple breaks.

It is logical that this group is different in its anatomical picture, and each case actually has certain characteristic features to get to know which possible after the analysis basic data, concerning typical breaks presented above.



As an example of compound fracture it is possible to give the following observation (Fig. 149).

Wound 20/II 1942. Amputation 3/IV 1942. Preparation No 1075/2207. Perforating bullet wound of right thigh with the break in two places. One line of break passes along lower third of thigh, crossing/intersecting its slantwise external condyle. The second skew line of break passes to middle third of thigh. Along the line of the break in lower third of thigh of higher than the pineal system by 1-1.5 cm is a through perforated defect, which passes from the front/leading to the posterior surface of thigh. Size/dimension of its 1.5x1 cm from the front, and from behind - 2x1 cm.

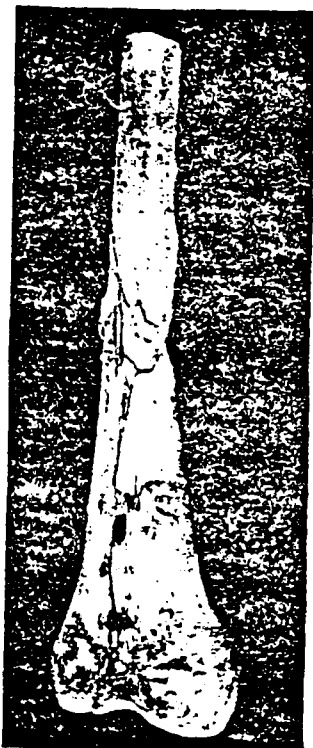


Fig. 149. Compound fracture of thigh (preparation No 1075/2207).

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The joint surface of the lower pineal system of thigh is deprived of compact bone plate. The external surface of pineal system is atrophied. In middle third of thigh over the surface of broken ends pass the sequestral flutes, limiting the periphery of broken ends.

The sequestrating surfaces are smooth. On the surface of diaphysis higher than the sequestral flute are visible the fine/small and large/coarse uneven education, which take places the form of osteophytes. Tuberosity is alternated with the planar increases and the fine/small depressions. Thus, Fig. 149 depicts the combination of perforated break with the oblique.

Symptoms diagnosis of the bullet breaks of thigh.

Clinical symptomatology diagnoses of the bullet breaks of thigh.

Docent Major of medical service L. Ye. Ruzhman.

In the basis of the stage treatment of the bullet breaks of long tubular bones in the Great Patriotic War was placed their correct and early diagnosis already in the foremost stages of evacuation.

The timely and correct diagnosis of the bullet break of thigh had as a goal not only to establish/install the volume of aid generally, but also the volume of aid in this stage, in this time, under the specific conditions of present combat situation.

The diagnosis of bullet fracture of thigh to the known degree (depending on stage and combat situation) always included in itself more or less distinct presentation/concept not only about the presence of break, but also about its character/nature, level, degree of the associated damage of the surrounding bone anatomical education (large vessels, nerves, joints and muscles), the general condition of casualty, also, about presence and character/nature of wound infection.

A similar diagnosis made it possible entirely to judge the severity of damages and their complications. Thus, taking into account the conditions of combat situation, it was possible to previously outline measures for the rendering to preventive and

therapeutic aid to casualty with the break of thigh.

Based on materials of the author's development of the histories of disease/illness, the diagnosis of the break of thigh was established/installed in the following stages (in the percentages): at PMP - 87.7 at DMP - 6.1 in army KhPPG - 2.3, in the army evacuation hospital - 2.3 in the front line evacuation hospital - 1.1, in the rear evacuation hospital - 0.5.

From the preceding information it is evident that in the Great Patriotic War the correct diagnosis of the break of thigh was set in the army area into 15 <sup>cases out of</sup> ~~15~~ 16, moreover in 7 cases of 8 correct diagnosis of fracture of thigh was set mind on PMP. Altogether only one of every 16 casualties with the damage to femoral bone arrived into the army region without correct diagnosis.

It should be noted that army and even front line hospitals frequently in attack were arranged/located in the immediate rear; in them struck the casualties with the break of thigh from the located hereabout troop units, which even more greatly increases a factual number of identified in the army area breaks of thigh.

As the clinical example of the correct diagnosis of the break of thigh at PMP can serve the following observation.

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S. 18/II 1944 in good condition is delivered from PMP to DMP with the diagnosis the blind-end fragmentation wound of left thigh with damage of bone upon the inspection/examination of casualty at DMP many signs of break (deformation, abnormal mobility and violation functions) were absent. There was, however, a sharp sickliness for the elongation/extent of extremity with the jerk/impulse, directed along its axis. During the surgical processing of wound was discovered the break of femoral bone.

The diagnosis of the break of thigh in the army area was accomplished in short periods after wound (Table 158).

Thus, at PMP the correct diagnosis of the break of thigh was set almost in half of cases (44.20/o) for the first 6 hours after wound. At DMP in the majority of cases (68.00/o) the break was identified in the first twenty-four hours after wound. The periods of the diagnosis of break at PMP were determined, as a rule, by the periods of the entry of casualties with the break of thigh to this stage, for periods of the diagnosis of the break of thigh at DMP to a considerable degree, furthermore, they depended on the periods of the

surgical processing of the bullet wound of thigh.

In the army, front line and rear hospitals the periods of the diagnosis of the not identified in the preceding stages breaks of thigh were almost always connected with the periods of early and late surgical processing, repeated operation interventions or with the periods of the first x-ray examination.

Based on materials of author's development, the signs, which put to use in the stages the evacuations during the identification of the bullet breaks of thigh, were following: 1) the strain of damages of extremity, 2) abnormal passive mobility, 3) the violation of the function of extremity, 4) bone broken ends in the wound, 5) pain for the elongation/extent of extremity with the jerk/impulse, directed along its axis, 6) crepitation, 7) the shortening of extremity, 8) the direction of tissues in the region of wound canal, 9) data of x-ray examination.

With the bullet wound of thigh to establish/install the presence of the break in the overwhelming majority of the cases was nonmetalliferous. The abundance of pathognomonic symptoms and more or less uniform severe clinical picture, the escorted/tracked bullet breaks of thigh, they facilitated their diagnosis.

Difficulties with the diagnosis could arise only in all forms of incomplete breaks and with the breaks of the upper pineal system of thigh. The character/nature of break and its extent clinically also it was not always easily establish/install. About this wrote already N. I. Pirogov: "the diagnosis of the bullet damages of the bones of extremities generally belong not to the difficult ones.... The mobility of the ends of the break, crack from their friction and other known signs of break almost always marked.



Table 158. Time of the establishment of the diagnosis of the break of thigh with the bullet wounds (in the percentages).

(9) Этап эвакуации	(1) Время	(2) До 1 часа	(3) От 2 до 6 часов	(4) От 7 до 24 часов	(5) Доляе суток	(6) Итого	(7) Срок не- известен	(8) Всего
ПМП . . . . .		7,6	33,6	48,4	7,4	100,0	19,2	100,0
ДМП . . . . .		—	12,0	56,0	32,0	100,0	8,0	100,0

Key: (1). Time. (2). To 1 hour. (3). From 2 to 6 hours. (4). From 7 to 24 hours. (5). It is later than days. (6). Altogether. (7). Period is unknown. (8). In all. (9). Stage of evacuation.

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It is encountered; however, it is sufficient the cases in the field practice and not the lungs for the diagnosis; it is not precisely always possible to determine by finger/pin place, direction of break and generally the degree of damage: . Diagnosis is completely impossible, if you deal with the crack or concerning the split of bone, covered with thick muscles or which penetrates into the joint".

The not diagnosed in the army area bullet breaks of thigh (6.1b/c) related exclusively to difficultly diagnosed under conditions of this area different forms/species of the incomplete breaks (perforated, edge/boundary, U-shaped, crack) whose small unit

was not identified even in the army and front line area, but it was revealed only subsequently in the rear after detailed x-ray examination, moreover 3/4 such casualties were evacuated from DMP, passing the bandaging separation/section.

There is sufficient foundations for assuming that in the majority of the cases actually the diagnosis of the full/total/complete bullet breaks of thigh in the Great Patriotic War began and was correctly realized already in the company where tried this to carry out within the limits of their diagnostic possibilities aidmen, sanitation instructor and stretcher bearers, who exert casualty first aid, who in this case were guided by the simplest and obvious signs. The presence of the break of thigh frequently stated/established casualty himself.

However, on the medical documents it is not possible to establish/install how frequently the diagnosis of the break of the thigh occurred in the company sector and at BMP and how it was successful, since filling of the cards of forward area was produced, as a rule, only beginning with BMP. Indirect and to the known degree as relative indicators in this respect can serve only the available in the medical documents data about the realization of transport immobilization with the bullet breaks of thigh in different stages of evacuation. Based on materials of the author's development of the

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EXPERIENCE OF SOVIET MEDICINE IN A GREAT PATRIOTIC WAR 1941-194--ETC(U)

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histories of disease/illness, transport immobilization with the bullet breaks of thigh into 66.60/c was realized in the company sector and at BMP. This makes it possible to assert that the correct diagnosis of the break of thigh was established/installed in the company sector and at BMP in a very significant quantity of cases. Based on materials of personal observation in N guards division, in all 4 years of war the correct identification of the break of thigh at BMP occurred in 74.30/c of wounds with the break of thigh, at PMP - in 17.70/o and at DMP - in 8.00/c.

During the Great Patriotic War the first medical diagnosis of the bullet breaks of thigh was realized at PMP, where during the identification of the break of thigh in the necessary order/formation was laid transport splint and they simultaneously took preventive antishock measures. At the same time, however, under conditions of PMP it was not always the possible during the identification of the break of thigh to put to use all enumerated principal signs of the break or at least greater than partly, especially when at PMP was produced neither shift/relief of primary bandage nor full/total/complete replacement of transport immobilization, superimposed in the preceding stages. But also under these conditions it nevertheless proved to be completely possible, it is attentive and systematically investigating casualty and taking into account his complaint, anamnesis and a number of the discovered symptoms, to

recognize or to confirm the presence of the break of thigh in the overwhelming majority of the cases (into 87.7c/o based on materials of author's development and into 92.0o/o based on materials of personal observation).

Based on materials of the deepened development, 8.0o/o of bullet breaks of thigh were escorted/tracked by the damage of large vessels.

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The correct diagnosis of the damage of large vessels with the break of thigh was realized, according to the observations of the author, into 85.5o/o even before the entry of casualty at DMP, and only in one casualty of seven damages of large vessel it was diagnosed during the surgical processing of wound at DMP.

The very great possibilities of the distinct and full/total/complete clinical diagnosis of the bullet break of thigh with the utilization of all enumerated signs (with exception of x-ray examination) were at DMP. On it the development/detection of break began immediately after entry of casualty into receiving-sorting separation/section where preliminary to diagnosis was produced by surgeon during the classification of casualties. In surgical dressing DMP after the removal/distance of transport immobilization and

primary bandage was produced the thorough external research of the damaged extremity and its comparison with the healthy/sound, which gave the full/total/complete possibility to place final diagnosis.

Based on materials of the deepened development of the histories of disease/illness, the bullet breaks of thigh in the overwhelming majority of cases (73.80/c) underwent at DMP the primary surgical treatment in process of which was always established/installed the series/number of very valuable symptoms. These symptoms not only contributed to the development/detection of the yet not identified break, but also made it possible to indicate form/species, character/nature and level of the break, or to determine presence and character/nature of wound infection, presence and degree of associated damage of other organs and tissues, also, first of all the damage of large vessels and nerves. This systematic external and internal research of the damaged extremity, supplemented by the research of the general condition of casualty taking into account of his complaints and anamnesis, made it possible in all cases to almost establish/install at DMP the full/total/complete diagnosis of the break of thigh.

The possibilities of the full/total/complete diagnosis of the break of thigh at DMP were considerably decreased, if according to the conditions of combat situation the unit of the casualties with

the bullet wound of thigh was forwarded directly from the sorting separation/section for the army area.

Since overwhelming majority (87.70/o) of the bullet breaks of thigh was distinguished at PMP, diagnostic work at DMP had its principal target of spreading, ascending and refining the diagnosis, set at PMP.

As can be seen from the materials of author's development, the final diagnosis of the bullet break of thigh, presented in the bandaging separation/section of DMP, on further stages of evacuation barely it was changed. Shock and anaerobic infection, which into 2.20/o accompanied the bullet breaks of thigh in the army area, also in proper time were diagnosed at DMP, where the casualties with such complications temporarily were hospitalized.

Thus, in the Great Patriotic War the diagnosis of the bullet breaks of femur in the foremost stages of evacuation, in particular, at DMP, was set sufficiently well. One should only note that with the diagnosis of the bullet breaks of thigh in the army area comparatively little it was given attention to the identification of the accompanying damages of the nerve trunks. Thus, based on materials of the deepened development of the histories of disease/illness, the damage of large/coarse nerve trunks with the

bullet breaks of thigh was observed into 10.60/o; from this number whether a few were identified at D.F.

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Examining the presented above signs by which were guided during the identification of bullet breaks the thighs in the stages of evacuation, it is important to establish/install, which the diagnostic value of each of them individually, as frequently those, etc. of them were noted and to what degree they could be in practice used on different stages of evacuation.

Based on materials of author's development, the distribution of the symptoms, noted with the basis of the diagnosis of the break of thigh, was following.

From the preceding information it is evident that the strain among other symptoms was encountered most frequently (32.70/o). It was developed during the examination/inspection of the damaged extremity and its comparison with the healthy/sound in the position/situation of wounded on the back in the form of prominences and hollows in the region of the predicted place of the break of thigh with a change in position/situation and direction of extremity. Entire/all damaged extremity of lower than the level of the predicted



break is rotated towards the outside, the extremital unit of the thigh is located at angle to its proximal unit. This bearing/angle with the break in upper or middle third of thigh is opened inward and back, and with the break in lower third - outside and forward. The degree of the rotation of extremity outwards also depended on the level of break and it was greatest with the low breaks.

The full/total/complete bullet breaks of thigh to a certain degree were always escorted/tracked by the strain of extremity. Deformation is the result of changing the configuration of femoral bone as a result of the displacement of bone broken ends along the length, at angle to the side or in the periphery under the effect of the severity tra, the severity of extremity itself and advanced as a result of break violation of the physiological equilibrium of muscles, that also determines a typical change in position/situation and direction of extremity.

"In spite of the presence of the "local stupor" of muscles with the bullet breaks, writes N. N. Yelaskiy, is observed the typical displacement of the broken ends of bones". Based on materials of personal observation (for DMP of N guards division), sharp deformations of extremity with bullet break of thigh, in spite of the presence of local tissue shock, they were observed frequently, moreover the typical displacement of broken ends was always

expressed, although the degree of displacement frequently proved to be smaller than it would be possible to expect, judging by the decomposition of muscles.

Thus, during the identification of the break of thigh the symptom of deformation could be used on all stages and in all cases of full/total/complete break as one of the principal signs of break.

As the example of the diagnosis of the bullet break of thigh on the basis only of one sign of deformation can serve the following observation.

N. 22/VIII 1942 from PMP to EMP is delivered with the diagnosis: the perforating bullet wound of right thigh with the break of bone: the sharp rotation of extremity towards the outside.

With the examination/inspection of casualty at EMP during the surgical treatment of wound was discovered the impacted turned-under break of thigh.

(1) Симптомы	(2) Процент
(3) Деформация . . . . .	32,7
(4) Укорочение конечности . . . . .	0,4
(5) Исnormalная подвижность . . . . .	18,5
(6) Крепитация . . . . .	1,7
(7) Нарушение функции . . . . .	17,5
(8) Наличие костных отломков в ране . . . . .	27,5
(9) Боль на протяжении конечности при толчке, направленном по ее оси . . . . .	0,8
(10) Направление раневого канала . . . . .	0,5
(11) Данные рентгенологического исследования . . . . .	2,4
(12) Итого . . . . .	100,0

Key: (1). Symptoms. (2). Percentage. (3). Deformation. (4). Shortening of extremity. (5). Abnormal mobility. (6). Crepitation. (7). Violation of function. (8). Presence of bone broken ends in wound. (9). Pain for elongation/extent of extremity with jerk/impulse, directed along its axis. (10). Direction of wound canal. (11). Data of x-ray examination. (12). Altogether.

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The deformation of extremity with the bullet break of thigh was frequently escorted/tracked by its shortening. This shortening, which depends on the degree of the displacement of broken ends, always is detected during the attentive examination/inspection and the comparison of the damaged extremity with the healthy/sound and can be easily measured.

However, for purposes of diagnosis this symptom in all stages was used extremely rarely and it was noted altogether only into

0.4c/o; in the army area it was in no way noted. The length of extremity with the bullet breaks of thigh was measured in 53.1o/o of total quantity of casualties with the break of thigh in other stages, but not for the diagnosis of break, but for determining the procedure of treatment the it is previously diagnosed break of thigh or to account for the advanced final anatomical and functional results.

Abnormal mobility - one of the main signs of full/total/complete break. This symptom among others was encountered into its 16.5o/o presence it was determined by the possibility to obtain passive lateral or rotational movements, where with the integrity of femoral bone this is completely impossible. From a number of cases of the utilization of this symptom to middle third it was necessary to 43.0o/o, to the upper - 28.0o/o and to the lower - 29.0o/o. This, apparently it is explained by the fact that to establish/install abnormal mobility with the breaks in upper or lower third of thigh, arranged/located near the hip or knee joint, is considerably more difficult than with the breaks in middle third.

This pathognomonic sign was used during the identification of the break of thigh in the stages of evacuation are comparatively rare, obviously, as a result of the universally recognized position/situation of military field surgery, that one ought not to attempt to establish/install the presence of pathological mobility,

since this any attempt to a certain degree is always escorted/tracked by additional trauma, sharp reinforcing of local sickliness and by violation of rest and, consequently, also by the danger of all possible severe complications.

The bone crepitation, detected faster with the feeling and that thinner/less frequent received by hearing/rumor, is, as is known, the classical symptom of full/total/complete break. The symptom of crepitation did not find wide practical use/application during the identification of bullet break on the stages of evacuation from the same reasons, as the symptom of pathological mobility.

The utilization of a symptom of crepitation was limited and because it frequently was absent even with full/total/complete comminuted fractures, if they were escorted/tracked by expressed hematoma or significant edema surrounding of soft tissues, interposition of the soft tissues between the bone broken ends of thigh and if broken ends withdrew far from each other or they adjoin one to another by the surface, covered with periosteum. This classical symptom among other symptoms was noted altogether only into 1.70/o.

The violation of the function of extremity is always extremely sharply pronounced with the full/total/complete unimpacted breaks of

thigh. This symptom among others composed 17.50/o.

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Limitation or full/total/complete violation of the functions of the damaged extremity with the bullet wounds of thigh can be the result of the series/number of the reasons: a) the sickliness, caused by bullet wound, b) hemorrhage into tendinous sheaths and joints, c) the violation of the integrity of large vessels and nerves, d) the disappearance of the muscular equilibrium of torn muscles and finally e) the violation of the integrity of bone lever. Due to the great variety of the reasons, which condition the violation of the function of the damaged extremity, this symptom with the diagnosis of the break of thigh was used in combination with other signs of break.

The presence of visible in the wound or projecting from it bone broken ends or fragments was noted into 27.50/o. This absolute sign of the violation of the integrity of bone was revealed/detected mainly during the surgical processing of wound and its internal examination/inspection (87.50/o), also, to a considerably lesser degree with the visual examination of wound (12.50/o).

Although with comminuted fractures this sign it was observed more frequently than with other forms/species of bullet break however

for the purpose of diagnosis it was noted more frequent with the edge/boundary and perforated breaks, (Table 159) with which other classical symptoms of break were absent.

The symptom of the restricted sharp sickliness in the region of the predicted break of thigh, which is maximally increased with the jerk/impulse, directed along the axis of extremity, comprised among other symptoms 0.80/o. The diagnostic value of this symptom in the absence of other signs is very relative. It cannot serve as the doubtless sign of break in view of the presence of bullet wound.

The anatomical disposition of entrance and exit wound aperture was used for purposes of the diagnosis of the break of thigh in the stages of evacuation in an insignificant number of cases and was noted among other symptoms only into 0.50/o, besides always in combination with other, more doubtless signs.

The disposition of entrance and outlet with perforating wounds of thigh, as can be seen from the materials of author's development, it was used extensively for determining the level of break, diagnosed on the basis of other signs.

As the example of the diagnosis of the bullet break of thigh on the basis of the anatomical disposition of entrance and exit wound

aperture can serve the following observation.

V. entered from BMP to DMP 9/VI 1944 in a good condition, without the transport immobilization with the diagnosis: the perforating bullet wound of left thigh without the damage to bone. With the examination/inspection of casualty in dressing DMP was suspected the break of thigh in view of the fact that the wound apertures were arranged one on the internal, and the second on the external surface of lower third of thigh in the plane, true with femoral bone. During the surgical processing of wound in operating DMP was discovered the perforated break of femoral bone.

The described above clinical signs made it possible to recognize and to diagnose to the x-ray examination the overwhelming majority of the bullet breaks of thigh (97.60/o). Only in 2.40/o of casualties the obvious clinical signs of break were absent, and break was identified after x-ray examination. This concerned mainly those cases of the incomplete break thigh, in which as a result of the character/nature of wound and wound primary surgical processing was not performed. According to V. I. Sobolyev's data, on the material of the hospitals of N fleet the clinical asymptomatic tangential breaks of thigh were observed into 1.0c/c of all bullet bone damages of thigh and they were discovered during the x-ray examination.



The distribution of the signs of the break in the dependence on form/species and character/nature of wound and form/species of break is given in Table 159.

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The form/species of the wounding shell and the character/nature of wound did not have any of essential effect on the distribution of symptoms. Very great effect on the distribution of symptoms is exerted the form/species of break. With the cross, oblique, large/coarse or small-splintered break of thigh of more frequent than other signs was encountered the deformation, abnormal mobility, violation of function and presence of bone broken ends or fragments in the wound. With the diagnosis of edge/boundary and perforated breaks from the noted signs most frequently was encountered the presence of bone splinters in wound (70.00/o) and data of x-ray examination (14.00/o).

Data, which relate to a question, on what number of symptoms was based the diagnosis of the break of thigh, they are presented, based on materials of author's development, in the following form (in the percentages to the result).

Table 159. Distribution of applied with the identification of the break of thigh signs in the dependence on form/species and character/nature of wound and form/species of break (in the percentages).

(4) Признаки перелома	(1) Вид ранения		(2) Характер ранения		(3) Вид перелома		
	(5) пулевое	(6) осколочное	(7) слепое	(8) сквозное	(9) края вырваны	(10) поперечный и косой	(11) крупно- и мелко-оскольчатый
(12) Деформация . . . . .	31,5	33,3	32,2	33,1	—	37,3	40,2
(13) Укорочение . . . . .	—	0,6	0,7	—	—	—	0,8
(14) Ненормальная подвижность . . . . .	14,5	17,8	16,8	16,2	—	26,9	17,3
(15) Крепитация . . . . .	3,6	0,6	2,0	1,4	—	1,5	2,3
(16) Нарушение функции . . . . .	18,0	17,2	17,5	17,6	8,0	19,4	19,5
(17) Костные отломки или осколки в ране . . . . .	27,2	27,7	27,5	27,5	70,0	14,9	20,1
(18) Боль на протяжении при толчке, направленном по оси конечности . . . . .	0,7	1,1	1,3	0,7	6,0	—	—
(19) Направление хода раневого канала . . . . .	0,9	—	—	0,7	2,0	—	—
(20) Данные рентгенологического исследования . . . . .	3,6	1,7	2,0	2,8	14,0	—	—
(21) Итого . . . . .	100,0	100,0	100,0	100,0	100,0	100,0	100,0
(22) Не указано, на основании каких симптомов распознан перелом . . . . .	41,5	42,6	41,5	42,0	13,7	47,2	44,8
(23) Итого . . . . .	100,0	100,0	100,0	100,0	100,0	100,0	100,0

Ключ: (1). Form/species of wound. (2). Character/nature of wound. (3). Type of break. (4). Signs of break. (5). bullet. (6). fragmentation. (7). blind. (8). through. (9). edge/boundary perforated. (10). cross and by sand bar. (11). large- and small-splintered. (12). Deformation. (13). Shortening. (14). Abnormal mobility. (15). Crepitation. (16). Violation of function. (17). Bone splinters or fragments in wound. (18). Pain for elongation/extent with beat,

directed along the axis of extremity. (19). Guiding of wound canal.  
(20). Data of x-ray examination. (21). Altogether. (22). Data of  
x-ray examination.

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	(1) Процент
(2) Один симптом:	
1. Деформация (3)	21,7
2. Ненормальная подвижность (4)	8,3
3. Костные осколки в ране (5)	18,5
4. Крепитация (6)	1,0
5. Данные рентгенологического исследования	2,4
	<hr/> 51,9
	(1) Процент
(8) Два симптома:	
1. Деформация в сочетании с другим симптомом (9)	6,9
2. Ненормальная подвижность в сочетании с другим симптомом (9)	5,5
3. Костные осколки в ране в сочетании с другим симптомом (10)	6,2
4. Крепитация в сочетании с другим симптомом (9)	0,7
5. Нарушение функции в сочетании с другим симптомом (11)	11,6
6. Прочие второстепенные признаки в сочетании с одним из вышеперечисленных симптомов (12)	1,7
	<hr/> 32,6
(14) Три симптома:	
1. Деформация в сочетании с двумя другими симптомами (13)	3,4
2. Ненормальная подвижность в сочетании с двумя другими симптомами (14)	2,0
3. Костные осколки в ране в сочетании с двумя другими симптомами (15)	2,1
4. Нарушение функции в сочетании с двумя другими симптомами (16)	3,0
	<hr/> 10,5
(19) Четыре симптома:	
1. Деформация в сочетании с тремя другими симптомами (17)	0,7
2. Ненормальная подвижность в сочетании с тремя другими симптомами (18)	0,7
3. Костные осколки в ране в сочетании с тремя другими симптомами (19)	0,7
4. Нарушение функции в сочетании с тремя другими симптомами (20)	2,9
	<hr/> 5,0
(24) Всего	100,0

Key: (1). Percentage. (2). One symptom: (3). Deformation. (4). Abnormal mobility. (5). Bone fragments in wound. (6). Crepitation. (7). Data of x-ray examination. (8). Two symptoms. (9). Deformation in combination with another symptom. (10). Abnormal mobility in combination with another symptom. (10a). Bone fragments in the wound in combination with another symptom. (11). Crepitation in combination with another symptom. (12). Violation of function in combination with another symptom. (13). Other secondary with signs in combination with one of symptoms enumerated above. (14). Three symptoms. (15). Deformation in combination with other two symptoms. (16). Abnormal mobility in conjunction with other two symptoms. (17). Bone fragments in wound in combination with other two symptoms. (18). Disturbance of function in combination with other two symptoms. (19). Four symptoms. (20). Deformation in combination with other three symptoms. (21). Abnormal mobility in combination with other three symptoms. (22). Bone fragments in wound in combination with other three symptoms. (23). Disturbance of function in combination with other three symptoms. (24). In all.

Thus, more than in half of cases (51.90/o) the diagnosis of the break of thigh was based on one absolute sign, almost in 1/3 cases (32.60/o) - to two signs and only in 1/6 cases (10.5+5.00/o) it was set on the basis of three-four signs.

This, obviously, is explained by the fact that the diagnosis of the bullet break of thigh was set, as it was indicated above, in the overwhelming majority of cases (93.80/o) in the army area where for the development/detection of all clinical signs, which characterize break, but the more for their introduction in each separate case into the medical documents it was neither need nor time.

Development/detection and introduction into the medical documents of all either the greater unit of the symptoms, discovered with diagnosis, occurred in the army area only in a small number of breaks of the thigh when according to the character/nature of wound and the form/species of fracture in this appeared need, or when this was possibly according to the conditions of combat situation.

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These, apparently should be explained the fact that into 41.80/o of total number of diagnosed breaks of thigh in the medical documents (in the medical cards of forward area) there are no instructions, on the basis of what symptoms the diagnosis was set.

During the identification of the perforated and edge/boundary

breaks of thigh the instruction documents to the presence of one or the other symptoms was absent almost three times less frequent, diagnosis it was not substantiated only into 13.7o/o.

The absence in the documents of instructions, on the basis of what was identified the break, as the basis of diagnosis only by one-two by symptoms, cannot be referred to the defects of diagnosis; it was the result of the strained work under conditions of army area very diagnosis of the bullet break of thigh in the army area in the Great Patriotic War was, as can be seen from the given above materials, it is sufficient correct and timely.

To judge according to the data of the deepened and author's development about how the frequently diagnosed in the army area break of Beer it was not confirmed in the subsequent stages, is not possible. According to the data of G. A. Podolyak, that concern combat in the sector of division with the penetration of the defense line of enemy in 1942, the disagreement of the diagnosis of the bullet breaks of thigh at PMP and DMP was determined by relation 1.6:1.0, i.e., from every 160 casualties, who entered DMP with the diagnosis of the break of thigh, in 60 upon the inspection/examination this diagnosis was not confirmed. Based on materials of personal observation during always of war, disagreement of the diagnosis of the break of thigh at PMP and DMP it was

determined by relation 1.2:1.0.

X-ray diagnostics of Beer's bullet breaks.

Academies of medical Sciences of the USSR professor D. G. Rokhlin.

In the Great Patriotic War roentgenological investigation of the bullet breaks of thigh was used, beginning from the army area, and it was the very disseminated method. The data about the first x-ray examination with bullet fractures of thigh, based on materials of the deep development of the histories of disease/illness, are represented in Table 160.



Table 160. Stages of the first x-ray examination on the years of war the casualties have with the bullet break of thigh (in the percentages).

(6) Год	(1) Этап ХППГ	(2) Армей- ские госпи- тали	(3) Фронт- ные госпи- тали	(4) Тыловые госпи- тали	(5) Итого
1941	1,8	9,9	48,2	40,1	100,0
1942	3,0	7,7	49,5	39,8	100,0
1943	4,2	10,3	44,3	41,2	100,0
1944	7,8	10,5	42,3	39,6	100,0
1945	18,0	15,5	38,4	28,1	100,0
(7) В среднем . . .	6,2	10,4	44,3	39,1	100,0

Key: (1). Stage. (2). Army hospitals. (3). Front hospitals. (4). Rear hospitals. (5). Altogether. (6). Year. (7). On the average.

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From Table 160 it is evident that the frequency of first roentgenological studies with the bullet breaks of thigh in KhPPG within the time of war increased 10 times, which is located in the specific bond with the introduction of the specialized aid on this stage.

Data of Table 160 make it possible to also conclude that the x-ray examination with the years of war increasingly more frequently and more frequently was produced in the army installations; however,

in 1945 2/3 by casualty this research was for the first time produced in the front line and rear evacuation hospitals. This is completely understandable, since the diagnosis of the break of thigh was established/installed into 97.6c/c of cases to roentgenological research. X-ray examination had by its principal target of refining and determining character/nature and form/species of break, its localization and extent, sizes/dimensions and quantity of broken ends and the character/nature of their displacement, presence and localization of foreign bodies and other extremely important details of the break of the thighs which cannot be reliably identified and established/installed with the aid of only one clinical research.

As can be seen from the materials of author's development, x-ray examination had the high value for the identification of different complications with the bullet break of thigh (osteomyelitis, anaerobic infection).

Displacement of broken ends with the bullet breaks of thigh.

Bullet break was frequently escorted/tracked by the significant damage of muscles. The displacement of broken ends, in particular, along the length, immediately after wound, in contrast to the closed breaks frequently it was not as a result of the fallout of muscular thrust (N. N. Yelanskiy, M. N. Akbutin et al.). However,

subsequently, after overcoming of the parietic condition of the damaged muscles, could advance the secondary displacement of broken ends.

As a result of the massiveness of beds the muscles of thigh usually rarely were damaged in such measure that the thrust of muscles would cease directly after bullet break. Therefore even during the first days after wound, and by the fact more after certain time the thrust of muscles was developed with the bullet breaks on the whole just as with the closed breaks, which was noted by the series/number of the researchers (M. N. Akhutin et al.) and is completely confirmed by the personal observations of the author.

As is known, with the bullet breaks of upper third of diaphysis of thigh in the majority of the cases appears varus position (wooden plough vaga traumatica) as a result of the removal/diversion of proximal broken end by the thrust of powerful/thick muscles - average/mean and small buttock. In view of this extremity broken end is arranged/located towards the inside from the proximal. Between these splinters is formed the bearing/angle, opened towards the inside. In view of contraction/abbreviation of psoas proximal broken end can still bend; in these cases extremity broken end is inclined at an angle opened not only towards the inside, but also toward the rear.

Both broken ends (proximal and extremital) are usually turned towards the outside. This rotation of the proximally arranged/located broken end was distinguished roentgenologically in the posterior photograph on the basis of the full/total/complete turn of a small trochanter. About the rotation of extremital broken end towards the outside testifies the corresponding position/situation of foot.

Rarely nevertheless were observed the bullet breaks of thigh in upper third of diaphysis with the displacement of extremital broken end not towards the inside, but towards the outside. Proximal broken end was located in these cases in the valgoid position/situation.

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With the bullet breaks of lower third as with the closed breaks with this localization, extremital broken end as a result of the thrust of gastrocnemius muscle was displaced toward the rear. This displacement was frequently to the width of the diameter of diaphysis, sometimes to 1.5-2 diameters. With that expressed, and sometimes also insignificant displacement toward the rear could arise, which frequently and was observed, the angular displacement, with which the bearing/angle was opened from the front. Extremital

broken end was usually displaced not only toward the rear, but simultaneously frequently, also, at angle, or to the side (usually towards the inside).

The bullet breaks in the region of extremital metaphysis, directly above condyles, they were frequently multifragment, step-like and impacted; they were frequently escorted/tracked by the displacement of extremital broken end toward the rear, but without the angular displacement, what it was not observed also with the packed in breaks.

With the closed break of extremital third of thigh frequently was observed the exudation in the region of the upper turn, adjacent to extremital metaphysis of thigh. It is understandable that with the bullet breaks of extremital third of thigh the implication in the process of upper turn and diamond-shaped space in the front/leading department of the region of knee joint was encountered fairly often. Each of the levels of the damage/defeat of knee joint indicated frequently could be identified already roentgenologically.

The bullet breaks in middle third of diaphysis of thigh led to the more different forms of displacement, which to a considerable measure depended on the level of break. Bullet break nearer to upper third usually led to the displacement, observed with the breaks upper

third, and break nearer to extremital third was usually connected with the displacement, detected with the breaks of lower third of thigh.

If on the photographs of the diaphysis of thigh in two projections both pineal systems (and trochanters) were not represented, which occurred with the photographs of comparatively small sizes/dimensions, then it was frequently difficultly distinguish posterior projection of the lateral. This refinement was provided as follows. In the posterior photograph the extremital department of diaphysis is more expanded than the same department of bone in the lateral photograph; in the side view of the diaphysis of thigh, besides that indicated it is above (i.e. the greater evenness of thickness and absence of the sharply pronounced thickening in lower quarter of diaphysis), is determined roughness on its posterior surface (linea aspera). Furthermore, in the side view the diaphysis of thigh is characterized by the slightly expressed archlike bending in the sagittal plane (with the convexity toward the front).

The bullet breaks in middle third and on the boundary of middle and extremital third relative to were frequently escorted/tracked by the significant setting of broken ends and, consequently, also by the shortening of extremity. Significant shortening with the bullet breaks of middle third of thigh was observed by the author 3 times

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