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ABSTRACTS OF RESEARCH PROJECT REPORTS BY NATIONAL NAVAL DENTAL --ETC(U)

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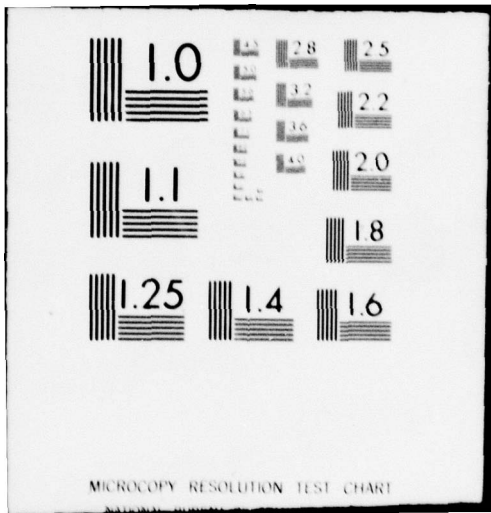
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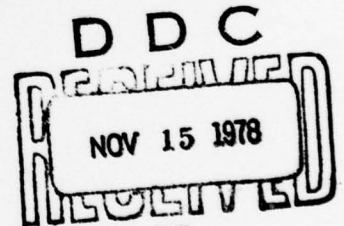
ABSTRACTS OF RESEARCH PROJECT REPORTS BY NATIONAL NAVAL DENTAL
CENTER FIRST, SECOND, AND THIRD YEAR RESIDENTS - JUNE 1978

by

G. B. PELLEU, JR.

and

L. L. LAUGHLIN, JR.



NATIONAL NAVAL DENTAL CENTER
BETHESDA, MARYLAND 20014

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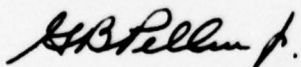
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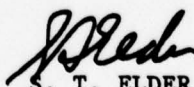
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Submitted by:



G. B. PELLEU, JR., Ph.D.
Chairman, Research Department

Approved by:



S. T. ELDER
Captain, Dental Corps, USN
Commanding Officer

ABSTRACT

These abstracts provide a synopsis of research projects conducted by dental officers enrolled in the first-, second-, and third-year residency programs at the National Naval Dental Center, Bethesda, Maryland, during the academic year 1977-1978. The projects were completed in partial fulfillment of the requirements of the programs.

The opinions and assertions contained in these abstracts are the private ones of the writers and are not to be construed as official or as reflecting the views of the Department of the Navy.

Animals used in the studies were handled in accordance with the "Guide for the Care and Use of Laboratory Animals" prepared by the Committee on Revision of the Guide for Laboratory Animal Facilities and Care, of the Institute of Laboratory Animal Resources, National Research Council.

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No. 1
DECONTAMINATION OF COMPLETE DENTURES

R. F. Acquavella and W. L. Fullerton

The oral cavity usually contains a multitude of potentially pathogenic microorganisms. During handling procedures, a patient's complete denture could serve as a vehicle for transportation of these organisms to laboratory personnel. An effective method is needed to eliminate the chance of cross infection during laboratory procedures. A 2% alkalized glutaraldehyde solution is one of only a few chemicals classed as a sterilizing agent. A study was undertaken to evaluate the effectiveness of a 2% alkalized glutaraldehyde solution in decontaminating complete dentures. The dentures were artificially contaminated with a suspension of *Bacillus subtilis* spores diluted in a 50% bovine serum solution. After a 30-minute drying period, the dentures were subjected for different times to a 2% alkaline glutaraldehyde solution used alone and in combination with ultrasonic cleaning. The dentures were assayed according to the standard dilution and pour plate technique. After incubation, recoverable organisms were enumerated as colony-forming units (CFU). Determinations for effectiveness were made by comparing microbial recoveries from dentures exposed to saline alone (control) to recoveries of dentures exposed to each technique using glutaraldehyde. The results were tabulated as mean microbial reductions. Mean reductions from about 10^5 CFU (control) to less than 100 CFU were found for dentures exposed to the glutaraldehyde solution for 30 minutes and for dentures exposed to glutaraldehyde for 15 minutes when combined with ultrasonic cleaning. Either method is believed to be an effective, simple, safe, and inexpensive means of decontaminating complete dentures before handling.

No. 2
SEALING PROPERTIES OF DOUBLE COMPOSITION HIGH-COPPER AMALGAM ALLOYS

R. J. Kielt and G. T. Peak

The recently developed double composition high-copper amalgam alloys are advocated for use in restorative dentistry because they show marked improvement in expansion, creep, corrosion resistance, and clinical appearance after aging. It is known that leakage for conventional amalgam alloys tends to decrease with time, but the sealing properties of the high-copper amalgam alloys have never been examined. This study was undertaken to evaluate the marginal sealing properties of three commercially available double composition dental amalgam alloys and one conventional alloy, Optaloy, which was used for the control. The three high-copper alloys used were Optaloy II, Microloy II, and Dispersalloy.

Thirty Class V preparations for each alloy were made in extracted teeth. The teeth were thermo-cycled from 45° C to 4° C for a total of 200 one-minute cycles. Ten restorations of each alloy were tested for microleakage, at storage times of 48 hours, 1 month, and 3 months after preparation using the ⁴⁵Ca autoradiograph technique. All alloys tested showed leakage ranging from moderate (grade 3) to severe (grade 5). No significant difference in microleakage was noted between the control and any of the test alloys at these time periods. When the results were evaluated for a change from severe to moderate type leakage, there was an apparent trend toward a reduction in the extent of leakage with all samples over the 3-month study. No differences in marginal seal were noted among the four alloys tested.

No. 3

AN EVALUATION OF MICROLEAKAGE IN EXTRACTED TEETH RESTORED
WITH GLASS IONOMER CEMENT

J. W. Hargrave and C. E. Spann

Class V erosions restored with ASPA glass ionomer cement have been recently reported to exhibit superior microleakage resistance. However, the study had limited clinical application, since neither cavity preparations nor intermediate bases were used. The purpose of this study was to determine whether the superior microleakage resistance reported for glass ionomer cement can be achieved using cavity preparation and an intermediate base, consistent with clinical usage. Seventy-two extracted human posterior teeth were prepared with Class V preparations at the cemento-enamel junction, and restored according to the manufacturer's instructions. The materials evaluated were ASPA glass ionomer cement, Concise Enamel Bond System, and Cervident. All specimens were thermally stressed for 500 cycles at temperatures of 4° C and 45° C. Microleakage was determined using the ⁴⁵Ca autoradiograph technique. The results of the study showed that microleakage occurred with ASPA cement in 24 of the 24 samples tested at both enamel and nonenamel margins of the restoration; 79% of the Concise samples and 91% of the Cervident samples leaked. Statistical comparisons of ASPA with each of the control values showed no significant differences in the incidence of microleakage. While the majority of leakage occurred at the nonenamel margin, statistically, there was no significant difference between the sites of leakage of each material or among the materials in cross comparisons. ASPA glass ionomer cement failed to demonstrate superior marginal seal or reduced microleakage when compared to the other test materials.

No. 4

AN EVALUATION OF THE MARGINAL LEAKAGE OF SPHERICAL HIGHCOPPER AMALGAM

R. C. House and M. W. Patterson

The tin-mercury (Gamma 2) corrosion phase of the standard silver amalgam alloys is believed to aid in the prevention of microleakage. With the advent of the new high-copper spherical alloys, the gamma 2 phase has been markedly reduced or eliminated. It is the purpose of this study to determine whether these new alloys produce a clinically acceptable marginal seal. Standard Class V restorations using Tytin (12% copper), Cupralloy (21% copper), Sybraloy (29% copper), and Spheraloy (control) were placed into 60 previously unrestored extracted bicuspid. The specimens were evaluated for microleakage using ^{45}Ca radioisotope at intervals following condensation of 1 week, 1 month, and 3 months. Since almost all of the restorations demonstrated microleakage to some degree, the specimens were evaluated for either gross (class 4) or moderate (class 3) leakage. Using a Chi square analysis, it was determined that Tytin and Cupralloy showed significantly less gross leakage than the control alloy Spheraloy. This finding suggests that the lack of a gamma 2 corrosion phase does not lead to an increase in microleakage. We believe that these new alloys do produce a clinically acceptable seal.

No. 5

A COMPARISON OF THE RETENTIVE ADAPTATION OF A COMPOSITE RESIN INSERTED BY A PLASTIC INSTRUMENT AND A CENTRIX C-R SYRINGE

M. S. Goldman and J. A. Kemp

Historically, anterior restorative materials have been placed with some type of "plastic instrument." More recently, a technique for placing composite resins with a Centrix C-R syringe was developed. Investigators report conservation of material and a reduction in the number of voids in the completed restorations with use of the syringe. This study was undertaken to compare the adaptation of composite resin into a retentive groove placed in natural teeth using four different placement techniques; that is, use of the Centrix syringe and the Stellite 1-2 plastic instrument with and without a matrix. Freshly extracted teeth were prepared for conventional Class V restorations, and the area of evaluation was established with a No. 12 wheel bur. Adaptic composite resin was then placed in the preparations. Fourteen restorations were placed using a Centrix syringe: seven with a matrix and seven without a matrix. Fifteen restorations were placed using a plastic instrument: seven with a matrix and eight without a matrix. Retentive areas of the restorations were evaluated to determine the percentage of each area that was involved with a void; that is, was not touched by resin, using a stereoscope at 25X and a Whipple grid. With a matrix, the percentage was $22 \pm 8\%$ using the syringe and $25 \pm 16\%$ using the plastic instrument. Without a matrix, the percentage was $48 \pm 30\%$ using the syringe and $47 \pm 14\%$ using the plastic instrument. No significant difference was found. An apparent doubling in the percentages was noted when there was no matrix. The results of this study indicate no difference between the Centrix syringe and the plastic instrument.

No. 6
THE PERMEABILITY OF BASE-VARNISH COMBINATIONS TO ^{45}Ca

M. J. Mailander and M. Sharrock

The application of cavity varnish to an intermediate base material before reaching its initial set results in the formation of a milky, viscous film over the dentinal surface. The purpose of this study was to determine the permeability of this base-varnish mixture on the dentinal surface to a ^{45}Ca radioisotope solution. The materials used in this study were: a calcium hydroxide preparation (Dycal), a zinc oxide-eugenol base (Cavitec), and a copal varnish (Copalite). Eighty-nine unrestored, caries-free extracted human molars were cleaned and prepared with a class V cavity preparation. The control teeth were divided into four groups: no base or varnish, Dycal only, Cavitec only, and two coats of Copalite only. One experimental group consisted of 30 teeth receiving a Dycal base, 10 of which received two coats of Copalite after 1 minute; 10, after 3 minutes; and 10, after 7 minutes. The same procedure was followed with a group of 29 teeth, using Cavitec as the base material. All teeth were sealed, labeled, soaked in ^{45}Ca for 1 and 1/2 hours, cleaned, sectioned, positioned on X-ray film for 17 hours, developed, and evaluated for either penetration or no penetration. All controls showed penetration in 100% of the samples tested, except for the Copalite controls, which showed penetration in only 53% of the samples. Permeability of the experimental base-varnish mixture was not significantly different from that of the varnish used alone, except for varnish applied over Dycal after a 1-minute setting time. The findings indicate that premature application of varnish to a base should not significantly increase penetration of substances through the materials.

No. 7
A STUDY OF FILLER PARTICLES IN COMPOSITE RESINS

M. L. Davis and R. C. Oehlberg

Recent investigations have linked contraction of composite resins to the percentage of diluent monomer. Other investigations have been undertaken to establish a relationship between filler content by weight and shrinkage of composites, but additional information is needed on filler size, shape, and percent composition by volume before filler content can be discounted as a factor in gap formation. The purpose of this study was to evaluate the percentage of filler content by volume in composite restorative materials for the effect on gap formation. Four composite resin systems (Concise, Adaptic, Prestige, and Simulate) were used in this study. Two separate lot samples were calcined, the first at 800°C and the second at 620°C . The specific gravity of the filler particles was determined by the use of a pycnometer. These values were then used to calculate the percentage of filler content by volume. No significant differences were found between specific gravity values of samples calcined at 800°C and 620°C . The values for percent volume of filler particles ranged from 60.5% to 61.1%. These values do not differ significantly, which indicates no apparent relationship between the percent volume of filler particles and polymerization contraction in the four composites studied.

No. 8

THE EFFICACY OF VARIOUS MEDICAMENTS IN THE DECONTAMINATION OF ROOT CANALS

J. A. Draude and J. B. McSherry

Aqueous 2% parachlorophenol (PCP) has been shown in recent studies to be less toxic, more diffusible, and equally as effective an antimicrobial agent as camphorated 35% parachlorophenol (CMCP). However, CMCP continues to be a far more popular medicament than PCP for use in endodontics. The purpose of this study was to compare the antimicrobial efficacy of 35% CMCP and 2% aqueous PCP in extracted teeth using an advanced method of quantitative microbial recovery. A total of 29 extracted human, single-canal teeth were endodontically prepared and sterilized prior to testing. Each tooth was then artificially contaminated with about 10 million Streptococcus fecalis bacteria and subsequently treated with a cotton pellet containing either CMCP, PCP, or saline (control). The pellets were squeezed "dry" to preclude direct liquid contact with the bacteria. After a 24-hour incubation period, the teeth were individually crushed in a pulverizer unit containing 10 ml. of saline. The recovered suspensions were serially diluted and plated. The colony forming units recovered for CMCP and PCP teeth were enumerated and compared with those of the control saline. CMCP demonstrated a 100-fold reduction, or a 99% kill of the bacteria, whereas PCP demonstrated a 10-fold reduction or a 90% kill. Whether a 100-fold or a 10-fold reduction is clinically meaningful is questionable. However, since an unusually large number of bacteria highly resistant to chemical and physical disinfection were inoculated into the teeth, these reductions suggest clinical importance. The findings indicate a similarity in medicament efficacy, since a 10-fold difference between reductions is not believed to be great enough to warrant a distinction.

No. 9

CLINICAL EVALUATION OF THE INTRAORAL TRANSMISSION OF STREPTOCOCCUS MUTANS WITH DENTAL FLOSS

J. J. Rizas and G. A. Owens

The findings that colonization of Streptococcus mutans is more frequent on approximal surfaces of teeth than on buccal or lingual surfaces and that each new colonization site has the potential of becoming a new carious lesion increase the importance of investigations on intraoral transmission of S. mutans. This study was undertaken to determine whether dental floss can transmit S. mutans from site to site within the same mouth. Appropriate sites of high and low colonization of S. mutans were selected for study in six male dental officers. The flossing procedure was carried out from sites of high to low colonization, with the experimental group using the same piece of floss and the control group using a fresh piece at each site. Plaque samples were then obtained once a week for 1 month, and once a month for the following 2 months. These samples were plated on Mitis-Salivarius agar and incubated both anaerobically and aerobically. Of the resultant colonies, only those of S. mutans were counted. When microbial counts were combined for the entire 82-day

study period and compared, counts for the procedure of not changing floss were significantly higher than were those for the procedure of changing floss from site to site. The results indicate that flossing transmits S. mutans from site to site, with the possibility of subsequent colonization of the low-count sites.

No. 10
AN EVALUATION OF METHYL METHACRYLATE VAPOR LEVELS
AS A POTENTIAL HEALTH HAZARD WITHIN
NAVY DENTAL LABORATORIES

R. C. Miller and J. T. Judkins

Although the U.S. Navy has numerous dental laboratory facilities where methyl methacrylate is used in abundant quantities for tray fabrication and prosthetic appliances, little effort has been made to determine whether a potential health hazard exists for laboratory personnel. Since methyl methacrylate vapors are known to be toxic and elicit adverse physiological changes in animals and humans, Federal regulations prescribe a threshold limit value of 100 parts per million over an 8-hour period as a safe methyl methacrylate exposure. The purpose of this study was to quantitate levels of methyl methacrylate vapor in a dental laboratory at the National Naval Dental Center in order to determine whether vapor levels are within prescribed limits of safe exposure. Air samples were collected by means of a vacuum apparatus that bubbled air through a standard KMnO_4 solution. The amount of methyl methacrylate reacting with the KMnO_4 was then quantitatively determined by a back-titration method. During the manipulation of methyl methacrylate monomer, results showed vapor levels to be well below the prescribed threshold limit value for safe exposure. No significant difference was found between vapor levels recovered during background sampling and during procedures in which methyl methacrylate was used. No recommendations are required for additional restrictions on the use of methyl methacrylate.

No. 11
LIFE CHANGE AND THE ONSET OF ORAL DISEASE

M. T. Tyler

It is well known that oral manifestations are often the first indication of systemic disease. However, no relationship has ever been established between the onset of oral disease and stress. Information on this would be particularly useful in the prediction of future disease patterns of military personnel being considered for certain critical duty. The purpose of this study was to determine whether such a relationship exists. Life change responses of 163 dental patients were evaluated using the Holmes-Rahe questionnaire. A random numbers table was used to select three equal groups of patients: those with lesions at the time of examination, those with a history of lesions within the past year but with none at the time of examination, and those with no lesions nor history of lesions within the past year. Mean life change unit scores (LCU) were compiled from the questionnaire for only 51 of the 163 patients examined. The highest mean value was 115 ± 110 LCU for patients with no lesions.

Statistical comparisons between the three groups of patient scores showed no significant differences. Because of the limited number of data available at this time, no valid conclusions can be made. The study is continuing in an effort to collect data from the remaining patients.

No. 12

THE EFFECT OF SODIUM HYPOCHLORITE ON ANIMAL PERIAPICAL TISSUE

W. S. Hwang and R. L. Sherman

Sodium hypochlorite (NaOCl) is probably one of the most popular irrigating solutions employed in endodontics today. Although NaOCl is reported to be highly irritating to vital tissue, no in vivo studies have been undertaken on the effect of NaOCl on periapical tissues. An in vivo study to evaluate the effect of sodium hypochlorite (NaOCl) on dog periapical tissue was undertaken. In the pilot phase of this 2-year project, 12 root-canals in 7 teeth of a beagle dog were treated endodontically. NaOCl (10%) was used as the test irrigant in order to establish a positive control, and normal saline solution was the control irrigant in two teeth. Under aseptic conditions, the root-canals were deliberately instrumented 1 mm beyond the radiographic apex and enlarged to a No. 60 file size to ensure complete removal of all pulpal tissue and contact of the irrigant with periapical tissue. Six to nine days after completion of the endodontic procedures, the animal was sacrificed. Block sections were removed, decalcified, embedded, and serially sectioned at 5 microns. In all sections, microscopic examination revealed at least a moderate inflammatory response, including polymorphonuclear leukocytes, lymphocytes, plasma cells, and a few macrophages. One sample irrigated with 10% NaOCl showed an area suggestive of necrosis surrounded by giant cells. In another section irrigated with saline solution, possible abscess formation was seen. No conclusions can be drawn at this time. Research is continuing with more samples and multiple evaluation periods.

No. 13

THE CHEMOTACTIC EFFECT OF ENDODONTIC ROOT CANAL SEALERS

W. Doblecki

When root-canal-treated teeth are examined histologically, they frequently demonstrate associated periapical inflammatory cells. However, the role of root-canal sealers in periapical inflammation has not been extensively investigated. The purpose of this study was to determine whether selected root-canal cements have an intrinsic chemotactic capability or whether they are able to activate complement via the alternate pathway. The root-canal sealers evaluated in this study were zinc oxide and eugenol, calcium hydroxide, Roth 801, Diaket, Kerr Sealer, Hydron, and Sargenti's Paste. For the quantitation of the chemotactic capability of these cements, Boyden chambers were used with ^{51}Cr -labeled guinea pig leukocytes. The leukocytes were challenged

with root-canal cements ground to a fine powder and suspended in Gey's Balanced Salt Solution and in guinea pig serum. Preliminary testing indicated that after some refinement this procedure will be a sensitive test for determining whether root-canal sealers produce tissue inflammation. The study is continuing, to include representative testing of all the commercially available root-canal sealers.

No. 14

EVALUATION OF THE IMMUNOGENICITY OF FREEZE-DRIED SKIN ALLOGRAFTS IN HUMANS

M. E. Gher, Jr.

The use of free mucosal autografts for the correction of mucogingival problems has been a successful periodontic technique for many years. Recently, the use of freeze-dried skin allografts was shown to give similar results, with the added advantage of decreased morbidity due to the elimination of a second surgical site for obtaining the graft material. However, if allogenic freeze-dried skin grafts are capable of stimulating the production of immunoglobulins in the recipient, rejection of a future life-sustaining graft may result. Therefore, the purpose of this study was to evaluate the immunogenic potential of freeze-dried skin grafts in humans. About 40 patients of the National Naval Dental Center requiring grafts for the correction of mucogingival problems received allogenic freeze-dried skin grafts from tissue-typed donors. Grafting was performed by the technique of Sullivan and Atkins. Blood samples were taken from patients and clinical measurements for documentation were made before the grafting procedure and at 1, 2, 3, 5, and 8 weeks after placement of the graft. The blood samples were analyzed for antihuman leukocyte antigen (HLA) antibodies using the microcytotoxicity assay. The clinical measurements will be used to determine graft success and to correlate graft success or failure with the development of new antibodies. To date, the results have not been analyzed because of the limited number of patients evaluated. The study is continuing as patients become available.

No. 15

IN VITRO ATTACHMENT OF HUMAN GINGIVAL FIBROBLASTS TO ROOT SURFACES OF ENDODONTICALLY TREATED TEETH

R. M. Dunlap and J. L. Gray

The effect of root-canal treatment on wound healing following periodontal surgery in which the cementum is completely removed is a subject of much controversy in the dental literature. The purpose of this study was to determine whether cultured human gingival fibroblasts will grow on planed surfaces of endodontically treated teeth. An experimental model was established for the study using the techniques of Aleo. Twelve periodontally involved teeth were sectioned longitudinally. One section of each tooth was denuded of all cementum; the other section remained untreated and served as a control. Six of the root-planed sections were incubated in a culture of human gingival fibroblasts at 37° C for 5 days, and six were incubated for 7 days. The cultures containing the tooth sections were then stained and evaluated for presence or absence of fibroblast growth on the roots. The results

for tooth sections that had been root planed showed complete monolayer coverage of two of the roots that had been incubated for 5 days and five of the roots that had been incubated for 7 days. The controls demonstrated monolayer growth on all portions of the root that had not been exposed to the oral environment. Those sections that had been exposed as the result of periodontal disease showed no growth. This model will be utilized in a continuing study to determine the effect of endodontic obturation for growth of fibroblasts on peripheral root dentin.

No. 16

EXAMINATION OF PATTERNS OF ALVEOLAR RIDGE RESORPTION OF THE DISTAL EXTENSION REMOVABLE PARTIAL DENTURE AND ITS EFFECT ON THE MOBILITY OF THE PRIMARY ABUTMENT TEETH

M. J. Tabacco and J. R. Carney

The preservation and maintenance of the residual alveolar ridge beneath the distal extension removable partial denture is one of the more elusive treatment problems we face. Numerous investigators have studied the resorption of the residual alveolar ridge and implicated several factors. Resorption of the ridge beneath the distal extension partial denture not only reduces support and stability of the prosthesis but may in turn influence the stability of the principal abutment teeth. This study was undertaken to investigate the anatomic factors of residual ridge morphology beneath the distal extension RPD and relate changes in the morphology to abutment tooth mobility. Patients included in the study were those requiring mandibular distal extension removable partial dentures. Posterior edentulous ridge form was measured in cross sectional area, surface area, and volume beneath the basal seat. Tooth mobility measurements were made using a force meter and a dial gauge assembly. Other local and systemic factors were also monitored. Recordings were taken before RPD insertion, and at 1 week and 3, 6, 9, and 12 months after insertion. Preliminary results on one patient showed the alveolar ridge in cross section and provided measurements for surface area and volume of the ridge beneath the basal seat. A generalized increase in abutment tooth mobility was seen after a bilateral mandibular distal extension RPD had been worn for 1 week. This study is continuing as more patients become available.

No. 17

COMPARATIVE ACCURACY OF SINGLE-TAILED AND DOUBLE-TAILED REMOVABLE DIE SYSTEMS WITH AND WITHOUT PRECISION SLEEVES

J. L. Lockwood and M. W. Richards

Three recently developed removable die systems were evaluated for accuracy and stability under normal laboratory usage. Comparisons were made between these systems and the commonly used single-tail brass dowel pin. For each die system, 10 standardized working casts were constructed for measuring accuracy. Measurements were made to within 0.0001 inch using a binocular crosshair measuring microscope. Each die was measured three times in the horizontal plane and once in the vertical plane before the casts were sectioned. The casts were sectioned, and the dies were removed and replaced 30 times to simulate laboratory conditions.

The dies were then measured as before. Pre- and post-sectioning measurements were compared and differences recorded. The values calculated represented the amount of horizontal, vertical, and rotational movement of the dies. Initial results for two of the four die systems have been collected. The study will be continued to complete the measurement of the casts in order to make a statistical analysis and a comparison of the die systems.

No. 18

THE EFFECT OF VARYING FULCRUM LINES ON BILATERAL
EXTENSION BASE REMOVABLE PARTIAL DENTURES

D. W. Anderson and J. J. Simkovich

Studies on abutment tooth movement dealing with distal extension removable partial dentures have primarily been concerned with fulcrum lines parallel to the occlusal plane and perpendicular to the sagittal plane. In the natural dentition however, it is not always practical to make a bilaterally symmetrical denture. Consequently, a partial denture is often constructed with a fulcrum line not perpendicular to the sagittal plane or parallel to the occlusal plane. The purpose of this study was to determine the amount of abutment tooth movement in patients with partial dentures that are not bilaterally symmetrical. A test model was fabricated, along with 16 partial denture frameworks utilizing the I-bar, cast circumferential, and wrought wire (PGP) clasps. With each clasp type, both lingual plate and lingual bar major connectors were utilized. Early results using a saddle for occlusal loading showed little rotation about the fulcrum because of the accurate fit of the castings to the model. Castings are currently being fabricated using extension bars which are relieved from the residual ridge to allow for rotation about the fulcrum lines. The results of this study will provide information on where rests should be placed in order to obtain equitable distribution of forces with the least amount of abutment movement.

ABSTRACTS OF SECOND-YEAR REPORTS

No. 1

A CLINICAL EVALUATION OF FREEZE-DRIED BONE ALLOGRAFTS USED ALONE AND IN COMBINATION WITH AUTOGENOUS BONE GRAFTS IN THE TREATMENT OF PERIODONTAL OSSEOUS DEFECTS

J. J. Sanders

Military and civilian periodontists were asked to evaluate freeze-dried cortical bone allografts when used alone and in combination with various types of autogenous bone. Wide three-wall, two-wall, one-wall, combination, and furcation defects were grafted and the sites evaluated for pocket reduction and osseous regeneration. Reentry surgery was carried out to verify osseous regeneration. Bony regeneration and pocket reduction were rated as complete, greater or less than 50%, or failure. A total of 272 defects were grafted with freeze-dried bone alone. Of these defects, 171, or 63%, exhibited complete or greater than 50% osseous regeneration; 178, or 65%, exhibited complete or greater than 50% pocket reduction. Seventy-four defects were grafted with freeze-dried bone plus autogenous bone. Of this group of defects, 60, or 81%, exhibited complete or greater than 50% osseous regeneration; 66, or 84%, exhibited complete or greater than 50% pocket reduction. When these results were compared to those for freeze-dried bone alone, significance was found for both osseous regeneration and pocket elimination. For freeze-dried bone grafts alone, complete wound closure and the presence of a non-endodontically treated tooth each appeared to be significant when considering success. From the data available, there is strong evidence that freeze-dried bone can be used successfully in the treatment of certain periodontal osseous defects. The data also indicate that combination grafts appear to be superior to pure freeze-dried grafts.

No. 2

PERIODONTAL EVALUATION OF THE DISTAL OF MANDIBULAR SECOND MOLARS FOLLOWING THE REMOVAL OF IMPACTED THIRD MOLARS

S. G. Detsch

Ash et al. stated that extraction may worsen the prognosis of the adjacent second molars, owing to an increase in pocket depth and gingival recession. Several authors, however, dispute this finding. The current study was undertaken to clinically observe epithelial reattachment levels and periodontal pocket formation distal to second molars after third molar extraction, and to relate these findings to the state of oral hygiene, surgical procedures, and the preextraction anatomic third molar position. An examination of 95 third molar areas in 50 patients 15 to 54 years old was made approximately 1 month before extraction and at 1, 3, and 6 months and 1 year after extraction. Sulcular depth from the free gingival margin to the epithelial attachment was measured around each second molar at seven positions using a Glickman periodontal probe. An eighth measurement was made from the distal marginal ridge to the free gingival margin. Oral hygiene groups were established initially using the Navy Plaque Index.

Microbial plaque was monitored at each examination, using the Plaque Index of Silness and Loe. These factors were subjected to a stepwise regression analysis, to determine their effect, if any, on post-extraction pocket formation. It was found that preexisting pockets more than 3 mm in depth were the most significant factor in postoperative pocket formation. This was followed in decreasing order of importance by postsurgical complications, the use of oral contraceptives, smoking, the sex of the patient, the amount of bone removed, and finally flap design. Other variables tested had no significant effect on pocket formation. A mathematical predictor model was developed from the functions obtained. With the use of this model, postsurgical results can be accurately predicted 85% of the time. The interrelationship of these factors and how they may affect the predictor model is discussed.

No. 3

THE HUMORAL RESPONSE TO ENDODONTIC CEMENTS

W. W. Stuart and L. V. Crowley

Root canal cements elicit a chronic inflammatory response, but it is not known whether this response is immunologic in nature. A humoral immunologic response could either provide protection or result in a tissue-damaging hypersensitive reaction. A hypersensitive reaction could be a cause for root canal treatment failures. The purpose of this study was to determine whether certain set endodontic cements are capable of eliciting a humoral (B-cell) immunologic response in rabbits. New Zealand white rabbits were inoculated intramuscularly with solutions of either calcium hydroxide, zinc oxide-eugenol, Procosol, or RC2B; or with control solutions of Freund's complete adjuvant. Serum was recovered and assayed for a humoral response, using the ring test and the Ouchterlony gel diffusion test. The results of the tests were all negative for presence of antibody in the collected serum. No evidence of a humoral response was found. Therefore, there appears to be no hypersensitivity reaction in rabbits to the endodontic cements tested in the set state. The findings indicate that root canal failures do not result from a hypersensitivity response elicited by endodontic cements.

No. 4

A COMPARATIVE STUDY OF REMOVABLE PARTIAL DENTURE FRAMEWORKS UTILIZING THE VACUUM CASTING AND THE CENTRIFUGAL TECHNIQUES

J. J. Shanley and S. J. Ancowitz

Although the vacuum pressure method of casting permits easy escape of gases and reduces turbulence of the molten metal, few studies have been reported on the use of vacuum pressure in casting stellite alloys. The purpose of this study was to compare the accuracy of the centrifugal and vacuum pressure methods in casting dental stellite alloy. A metal die was designed and constructed to simulate a dental arch. Five reference points were inscribed on horizontal ridges, of which two were placed in the opposing quadrants in the molar area, two in the bicuspid area, and

a fifth in the region of the incisors. Refractory casts were obtained by duplicating the metal die in hydrocolloid. Each cast was measured under a binocular measuring microscope. Measurements were made from the molar region of one quadrant to the molar region in the opposing quadrant, from one bicuspid region to the opposite bicuspid quadrant, and from the molar region of the right quadrant to the anterior reference point. Castings were made with nickel-chrome alloy, and the metal was melted with oxygen-propane. Measurements of the castings were made using the same procedure as was described for the refractory casts. Comparisons between measurements of the refractory casts and the resultant castings showed significant differences, regardless of the casting method used. Comparisons between castings fabricated by the centrifugal and vacuum pressure techniques showed no significant differences. Likewise, comparisons between the two casting techniques for vertical accuracy, made by placing synthetic resin at designated points on the castings, showed no significant differences. Our findings suggest that laboratories should be able to use the vacuum pressure method of casting removable partial denture frameworks and achieve similar accuracy as that obtained by the centrifugal method of casting.

No. 5

THE EFFECT OF VARIOUS ABRASIVE DENTAL STONES ON THE SURFACE QUALITY OF A NONPRECIOUS METAL UTILIZED IN CERAMOMETAL RESTORATIONS

K. B. Bilger and R. Moore

Examination of metal surfaces by scanning electron microscopy (SEM) suggests that porcelain should not be applied to nonprecious metal as it comes from the investment. Some type of abrasive surface preparation is needed. A need exists for a standardized technique of metal surface preparation that yields optimal porcelain bond strength and minimal porcelain crazing. The purpose of this study was to evaluate the effect of various metal preparation techniques on the surface quality of nonprecious metal prior to porcelain application. After initial preparation with the abrasive air eraser and ultrasonic cleaner, Ticon castings were prepared with either an aluminum oxide wheel, rubber point, Mizzy heatless wheel, or diamond stone. The resultant surfaces were then evaluated for surface contamination with foreign particles under the SEM at magnifications of 50 X, 200 X, and 500 X. Microtopography and contamination of the metal surfaces were then reevaluated after degassing and again after re-treatment with the abrasive air eraser. The findings of this study indicate that whatever preparation technique is used, the metal surface should be treated subsequently with an abrasive air eraser to ensure a uniform surface with minimal contamination prior to porcelain application. In subsequent studies to determine a relationship between porcelain craze line propagation and metal surface irregularity, porcelain crazing was demonstrated in all samples, with no apparent difference between metal surface preparation techniques.

ABSTRACT OF THIRD-YEAR RESIDENT REPORT

No. 1

THE DEVELOPMENT OF A METHOD FOR OBTAINING REPEATABLE
INTRINSIC SKIN SHADES IN METHYL METHACRYLATE

W. W. Luther

The primary use of methyl methacrylate is for intraoral prostheses; thus, it is not commercially available in skin shades. Consequently, a technique for standardized intrinsic tinting and a range of shades must be developed to enhance the use of methyl methacrylate for facial prosthesis. A study was undertaken to evaluate a technique for intrinsically coloring methyl methacrylate for repeatability and practicability, using a standardized system, developed at the National Naval Dental Center, for duplicating shades of MDX-4-4210 silicone. An effort was also made to develop formulas for a methyl methacrylate shade guide that would closely duplicate the existing shade guide for MDX-4-4210 silicone and to expand the range of shades available for matching skin tones. A total of five rectangular blocks 60X20X4 mm in size were made for each method of intrinsic tinting using standard clear acrylic polymer and monomer. The three methods of adding pigments to methyl methacrylate were: (1) dry earth pigments to clear acrylic polymer, (2) oil paints to the acrylic monomer, and (3) prepared silicone base colorants to acrylic monomer. The third method, adding prepared silicone base colorants, proved to be the most practical and repeatable method of developing a shade guide for methyl methacrylate. A shade guide was also developed that contains 35 shades to match caucasian, oriental, and black skin tones. A total of 15 expanded shade formulas were developed for the MDX-4-4210 silicone shade guide currently in use at NNDC. The formulas for duplicating the shade guide in both methyl methacrylate and MDX-4-4210 silicone and the formulas and a technique for preparing the silicone base colorants are presented.

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Block #19 (continued)

Composite resin
Decontamination
Dental floss
Endodontic cement
Endodontic irrigant
Endodontic sealer
Facial prosthesis
Freeze-dried skin grafts
High-copper amalgam
Immunogenicity
Methyl methacrylate
Nonprecious metal alloys
Oral and systemic disease
Removable partial dentures
Ridge resorption
Root canal treatment
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Tooth dies
Tooth extraction

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