

UNCLASSIFIED

Defense Technical Information Center  
Compilation Part Notice

ADP011068

TITLE: Spanish Navy Up to Date Data in DCS

DISTRIBUTION: Approved for public release, distribution unlimited

This paper is part of the following report:

TITLE: Operational Medical Issues in Hypo-and Hyperbaric Conditions  
[les Questions medicales a caractere oprationel liees aux conditions  
hypobares ou hyperbares]

To order the complete compilation report, use: ADA395680

The component part is provided here to allow users access to individually authored sections of proceedings, annals, symposia, etc. However, the component should be considered within the context of the overall compilation report and not as a stand-alone technical report.

The following component part numbers comprise the compilation report:

ADP011059 thru ADP011100

UNCLASSIFIED

## Spanish Navy Up to Date Data in DCS

**LtCol. Viqueira, A. ( Antonio )**  
**Lt. Col. Ríos, F. ( Francisco ), Lt. Pujante, A. ( Angel )**  
**Lt. González, J.D. ( Juan de Dios ), Lt. Olea, A. ( Agustín )**  
 Spanish Navy Diving Centre  
 Base Naval de la Algameca  
 E-30290 Cartagena, Spain  
 ( [avc@planetmail.com](mailto:avc@planetmail.com) )

### **Summary:**

*In this paper we present a short update on Spanish Navy Decompression sickness ( DCS ) treated at the Spanish Navy Diving Centre (CBA) located on La Algameca Naval Base of Cartagena ( Southeast, Mediterranean coast ) with special emphasis on diagnosis, clinical types, treatment and results, and hyperbaric facilities.*

### **Key words :**

***Decompression sickness, hyperbaric, diving accidents.***

Spanish Navy (SPN) has been diving from the first new world ship wrecks, however modern diving started with CBA ( SPN Diving Centre ) during 1970, with a 150 m. Draëguer hyperbaric complex.

Today SPN carry out SCUBA air diving until 50 meters, surface supplied diving with air (60 m. ) or heliox (90 m.), and close bell diving with heliox until 110 m.

In CBA from 1970 were trained and formed 8177 people, including civilian, military, security forces, firemen, etc., and up to date we have 715 navy active duty divers.

Main diving units are located on navy bases : Ferrol ( north ), Cádiz ( south ), Canary Islands, and Cartagena (east ).

Hyperbaric treatment facilities are : 5 transportable compression chambers, 8 built into ships, 6 permanently sited ashore ( one of this is a 20 multiplace seated patients located in a Naval Hospital ). All of them have NATO ring

SPN diving Centre of Cartagena ( CBA) is where most DCS patients were treated, and it is also where protocol DCS sheets of other patients treated in another Spanish Navy chambers are databased.

The most frequently cause of DCS it is partial or completed omission of decompression during diving. From 1969 until to 2000 we have treated 234 cases of DCS and 36 cases of lung overpressure. Annual rate of DCS was between 2 and 14 patients per year, civilian and military. Civilian DCS patients usually had serious DCS with a typical high elapsed time to the hyperbaric chamber, and lesser for military ones. On 1990 and 1997 two civilian hyperbaric chambers were opened on our area, and by this reason DCS treated patients rate decreased clearly. So during 1999 we have not any treatment and during 2000 until June only one.

Diagnosis was based on clinical signs and symptoms, following de London Decompression Panel of Medical Research Council of London by Golding et als ( 1960 ) whom described DCS in Type 1 DCS ( “mild” ) Type 2 DCS ( “ serious ). Only in few cases we use also bubble doppler detection when the ill diver arrived to the chamber to confirm bubbles level, or – along experimental dives- during decompression phase or just when they get surface to prevent DCS.

DCS develops after the diver has commenced decompression or ascent or in the next hours. Onset of symptoms are very close to other world navies, so 209 patients ( 89%) develop their clinic within first 6 hrs after diving , and only had 25 cases (11%) later than 6 hrs.

From DCS 234 cases, 119 (50,8%) were minor or DCS Type 1, and the rest 115 (49,2%) serious cases or DCS Type 2

Minor forms or DCS Type 1 were : pain only (69 %), skin bends ( 13 %) and rest (18%) mixed.

Serious cases or DCS Type 2 distribution were : central nervous system ( 58%), lungs clinic ( with or without "chokes" ) 4%, inner ear ( 16%) and mixed cases (22 %).

About treatment tables results it is necessary try to explain some conclusions about it: first until 1985 we use mainly the Air Tables, and after Oxygen tables; second we must realize that tables choice it is a function of gas availability, clinical type and medical choice, evacuation method, elapsed time until recompression, diving profile and other factors. So this tables are applied on different therapeutic protocols, with quite separated gravity index, by those important reasons it is incorrect to make a direct comparison between tables and final results.

Tables 1, 1A and 5 do not have sequelae because if they are unsuccessful we change to another Tables, and we only register the last one

It is clearly important use supportive and drug therapy as an adjunct to recompression therapy.

Total recovery after recompression treatment for all DCS types was 80%. Minor sequelae ( chronic pain ) was observed after 14% of DCS type I cases. For DCS type II we only had 6% of sequelae ( paresia, paralysis ). We have noticed that when the elapsed time until patients started recompression therapy was more than 6 hrs. Sequelae rate increase clearly.

### ***Conclusions:***

DCS is a low frequency disease find during military diving. In our statistics from 1969 until now we have seen and treated 234 patients. Civilian cases usually are serious cases and military ones minor types. One quickly and clear diagnosis and recompression treatment on hyperbaric facilities it is mandatory, following by drugs and other therapeutic measures. Final results are similar to another world navies diving centres

### ***Bibliography:***

- 1.- Pujante, A.; Inoriza, J; Viqueira, A.  
Estudio de 121 casos de enfermedad descompresiva  
Medicina Clínica, vol . 94, n° 7, 1990
- 2.- Rivera, J.C.  
Decompression sickness among divers: An analysis of 935 cases  
Milit. Med. 1964; 129:314-334
- 3.- Bennett, P.B., Dovenbarger, J., Corson, K.  
Etiology and treatment of air diving accidents  
In Diving Accidents Management, Bennett PB, Moon RE (Eds) Bethesda:  
Undersea and Hyperbaric Medical Society 1990; 12-22
- 4.- US Navy Diving Manual, Volume 1  
Best Publishing Company. Flagstaff Arizona USA  
1993
- 5.- Moon RE, Sheffield, P  
Guidelines for treatment of decompression illness  
Aviation, Space, and Environmental Medicine, 1997; 68(3):234-243