

## Fitness to Return to Diving after Decompression Illness

DMAC I3 Rev. 3 – December 2022

*Supersedes DMAC I3 Rev. 2, which is now withdrawn*

### 1 Introduction

Decompression disorders are known to be complex, involving more systems of the body than is apparent from the clinical presentation. They may result in chronic injury to some tissues, particularly the nervous system and, possibly, the lungs and bones. As a result, there has been a continued emphasis on the early treatment of even minor symptoms, and of potential cases where the diagnosis is not certain.

The guidance for returning to diving after decompression illness (DCI) is mainly founded on policies established within large organisations or professional networks (US Navy, UHMS, DAN etc) rather than a solid scientific basis. There is a paucity of studies investigating the risks associated with diving after DCI. From an industrial point of view, guidelines are nevertheless needed to ensure a reasonable degree of consistency in the management of individual cases. The present guidelines have been established to provide sufficient time for recovery after DCI. The scope of this document is to provide guidance for (approved) medical examiners of divers and physicians responsible for follow-up of commercial divers treated for DCI. The document may further serve as guidance for divers and diving contractors if divers return to work after DCI.

### 2 Considerations

The following concepts are important in the formulation of this guidance:

- ◆ Pain only, skin and lymphatic decompression illness is very unlikely to have any long-term adverse effect on the diver other than a possible increase in the risk of dysbaric osteonecrosis.
- ◆ Neurological decompression illness may be associated with permanent injury.

There is little scientific data available for risk assessing the consequences of continued diving in divers having suffered DCI. There is insufficient evidence to conclude whether divers who have sustained an episode of decompression illness are likely to be at greater risk of having a second episode in the future, though a persistent Patent Foramen Ovale most likely is a risk factor. Though neurological DCI may leave long-time sequelae it is not known whether the extent of these sequelae is increased further if later diving is uneventful. There is no data to support a specific guidance on absence from diving after an initial DCI insult to avoid short- or long-term health effect. It is however well documented that serious neurological DCI is associated with a worse prognosis than mild DCI. This is the basis for the different advice on periods of absence from diving after mild and serious (neurological) DCI. Various scoring systems have been published to separate “mild”, “moderate” and “severe” DCI but these are generally applied in research studies rather than clinical practice and we have continued to provide guidance based on the traditional manifestations of DCI.

DCI may present with non-specific constitutional symptoms such as headache, fatigue, nausea, and loss of appetite. Whether some of these should be considered neurological symptoms will require clinical experience. If these symptoms are considered neurological, the guidance for neurological DCI should be followed.

If a diver has suffered permanent neurological injury, the ability to recover from a future episode may be impaired.

The final decision should be made by a diving medicine specialist considering the nature of the incident, the type of diving which may be undertaken in the future and the risk to the diver of serious injury from a future episode. It may require investigation for the presence of individual risk factors. The diver should be made fully aware of the issues involved.

### 3 Guidance

The following guidance provides recommended **minimum** time intervals for return to diving after different forms of decompression illness. In some cases, longer intervals may be appropriate or necessary in order to complete the investigations required. The recommended minimum time interval begins after completion of successful treatment.

- A) Limb pain, or non-specific manifestations (e.g., persistent headache, excessive fatigue, loss of appetite, nausea)
- With uncomplicated recovery: 7 days
  - After recurrence or relapse mandating further recompression: 14 days
- B) Cutaneous and lymphatic manifestations without neurological involvement, i.e. skin rash with severe itching or swelling of tissues: 7 days
- C) Neurological manifestations uncomplicated and complete recovery after one recompression treatment
- No involvement of visual, cognitive, brain stem, vestibular, cerebellar, autonomous or motor function: 28 days  
*Return to diving only after review by a diving medicine specialist.*
  - Pulmonary DCS (Chokes), visual, cognitive, brain stem, vestibular, cerebellar, autonomous or motor dysfunction: 3 months  
*Return to diving only after review by a diving medicine specialist.*
- D) Pulmonary barotrauma resulting in a pneumothorax or mediastinal/subcutaneous emphysema. Following appropriate investigation, including HRCT of chest, a diver may be considered fit to return to diving, but no earlier than 3 months after complete recovery.  
*Return to diving only after review by a diving medicine specialist.*
- E) In cases where multiple treatments were required to achieve improvement or there are residual neurological manifestations due to DCI, the diver should be considered on a case-by-case basis, but usually not allowed to return to diving for 3 months following the injury.

Divers having experienced livedo racemosa (cutis marmorata) or who have previously experienced DCI should not be allowed to return to diving until reviewed by a diving medicine specialist.

Shortening of these minimum time intervals should only be done on the written advice of a diving medicine specialist experienced in the handling of DCI.

### 4 Conclusion

It is the view of DMAC that in the current state of knowledge, there is insufficient evidence to endorse any policy which would automatically disqualify a diver who has made a complete clinical recovery from an episode of neurological decompression illness.

All cases mentioned above as requiring “review by a diving medicine specialist” should be referred to one and the divers concerned should not be allowed to dive until they have received full clearance to do so, in writing.

The diving medicine specialist should consider all the potential causative factors for the DCI and have all the relevant information at his disposal. Consideration should also be given to investigating for individual risk factors and the diver should be fully informed of the potential risks associated with returning to dive and methods of controlling risk.

There is an increased incidence of PFO in divers who have suffered neurological, vestibular or cutaneous DCS. Following neurological DCI, additional screening with chest CT/HRCT should be considered after possible pulmonary barotrauma cases. Other investigations may be necessary based on the nature of the particular case.

## 5 References

- ◆ British Thoracic Society Fitness to Dive Group, Subgroup of the British Thoracic Society Standards of Care Committee. British Thoracic Society guidelines on respiratory aspects of fitness for diving. *Thorax*. 2003 Jan;58(1):3-13. doi: 10.1136/thorax.58.1.3. PMID: 12511710; PMCID: PMC1746450.
- ◆ Smart D, Mitchell S, Wilmshurst P, Turner M, Banham N. Joint position statement on persistent foramen ovale (PFO) and diving. South Pacific Underwater Medicine Society (SPUMS) and the United Kingdom Sports Diving Medical Committee (UKSDMC). *Diving Hyperb Med*. 2015 Jun;45(2):129-31. PMID: 26165538.
- ◆ Department of the Navy. Bureau of Medicine and Surgery. Manual of the Medical Department (MANMED), NAVMED P-177 Chapter 15. Section IV. Special Duty Examinations and Standards. Chapter 15-102 Diving Duty (3)(n) Decompression sickness/Arterial Gas Embolism. 22 May 2018, 15-77c-d. [Accessed 29.11.2021 from <https://www.med.navy.mil/Directives/MANMED/> ]
- ◆ Undersea Hyperbaric Medical Society. UHMS Best Practice Guidelines. Prevention and Treatment of Decompression Sickness and Arterial Gas Embolism. UHMS 2011. [Accessed 29.11.2021 from [https://www.uhms.org/images/DCS-AGE-Committee/dcsandage\\_prevandmgt\\_uhms-fi.pdf](https://www.uhms.org/images/DCS-AGE-Committee/dcsandage_prevandmgt_uhms-fi.pdf)]
- ◆ Blatteau J-E, Lambrechts K, Ruffez J. Factors influencing the severity of long-term sequelae in fishermen- divers with neurological decompression sickness. *Diving Hyperb Med* 2010;50(1): 9-16. doi:10.28920/dhm50.1.9-16. PMID: 32187612
- ◆ Blatteau JE, Gempp E, Simon O, Coulange M, Delafosse B, Souday V et al. Prognostic factors of spinal cord decompression sickness in recreational diving: retrospective and multicentric analysis of 279 cases. *Neurocrit care*. 2011;15:120-7. Doi: 10.1007/s12028-010-9370-1. PMID: 20734244
- ◆ Jungyoup L, Kyuseok K, Sunkyun P. Factors associated with residual symptoms after recompression in type I decompression sickness. *Am J Emerg Med* 2015;33(3): 363-6 doi: 10.1016/j.ajem.2014.12.011. Epub 2014 Dec 18. PMID: 25636518.
- ◆ Xu W, Liu W, Huang G, Zou Z, Cai Z, Xu W. Decompression illness: clinical aspects of 5278 consecutive cases treated in a single hyperbaric unit. *PLoS One*. 2012;7(11):e50079. doi: 10.1371/journal.pone.0050079. Epub 2012 Nov 21. PMID: 23185538; PMCID: PMC3503765.
- ◆ Gempp E, Louge P, Blatteau JE, Hugon M. Risks factors for recurrent neurological decompression sickness in recreational divers: a case-control study. *J Sports Med Phys Fitness*. 2012 Oct;52(5):530-6. PMID: 22976740.