

Decompression sickness as a threat to divers

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Abstract

Decompression sickness (DCS), also known as divers' disease, the bends or caisson disease, is the biggest threat of diving, including saturation diving. DCS is a condition caused by gas bubbles appearing in the organism resulting from desaturation of bodily fluids and tissues, provoked by prolonged high-pressure exposure. Statistics show that decompression sickness develops during 36 hours after diving, and in 50% of cases during the first 30 minutes. It may cause death and can be prevented by slow transition to normal pressure.

Key words: decompression sickness, health threats, diving

Introduction

In recent years, Poland has witnessed a dynamic increase in popularity of diving, both professional and recreational. Thanks to widespread access to the specialist diving equipment, the sport is increasingly popular amongst young people. Unfortunately, quick development of the diving technique and technology concerning underwater works is not always matched by knowledge of the issues associated with diving physiology, use of breathing mixtures or decompression risks.

Lack of appropriate knowledge often leads to diving accidents, including decompression sickness [1,2].

It should be remembered that apart from DCS the important causes of fatal diving accidents include pulmonary barotrauma and *arterial gas embolism* [3]. Safety of diving relies chiefly on the decompression procedures. Each of these procedures should account for the following: the decompression profile, diver's physical state or composition of breathing gas mixtures. Moreover, should the decompression sickness occur, the guidelines for emergency decompression or for therapeutic recompression have to be established. However, the most important part of diving is the decompression profile, which should enable

safe ascents of divers in the shortest possible time without causing the symptoms of decompression sickness. The decompression time should be adjusted to the divers' physiological abilities to remove the excess of the dissolved gas [4].

The amount of the gas dissolved in tissues is mainly influenced by the depth and time of diving, i.e. the parameters specified in the decompression tables. Decompression that does not allow timely removal of the gases released from tissues causes a risk of decompression sickness [4].

Currently, no decompression table guarantees absolute safety of divers. Even with close following of the guidelines, divers can still develop DCS [2, 5].

Statistical data show that decompression sickness develops within 36 hours after diving; in 50% of cases during the first 30 minutes, in 90% within the first 3 hours and in 99% during 12 hours after diving [1,6].

Decompression sickness is a threat not only to divers but also to workers in caissons and pilots. The sickness can be divided into type I and type II [1, 7].

The forms of type I DCS include:

- **joint-muscular form** (the bends) – symptoms appear in the area of large joints: shoulder, elbow or hip. The pain is usually dull and pulsating and

the joint is rarely painful on palpation. In some cases, swelling or redness of the joint area is observed.

In severe cases, the pain may be so acute that it forces the non-physiological positions, i.e. the „bends” [1, 8].

- **skin form** – manifesting itself with macular rash (purple, marble-like) occurring predominantly on the limbs and accompanied by itching [4].

Forms of decompression sickness type II include:

- **cardio-pulmonary form** (the chokes) – pulmonary emboli cause pulmonary function impairment. The most frequent symptoms include retrosternal pain, rapid and shallow breathing, paroxysmal cough, dyspnoea, pulmonary oedema [5].
- **neurological form** – the most severe form of decompression sickness, affecting the CNS, mainly the spinal cord. The symptoms include sensory disorders, hyperaesthesia, reduced muscular power, tingling, and in severe cases paralysis, especially of the lower limbs, as well as bladder and bowel dysfunction. Moreover, in some cases, the individuals affected can lose consciousness [6, 7].

The decompression accident is treated with therapeutic recompression, i.e. re-exposure to high pressure. Fast compression and subsequent slow decompression allow to remove gas embolism [1, 8, 9].

The treatment of decompression sickness includes the following:

Reduction in the volume of gas bubbles in the organism in the shortest possible time to the values that do not induce DCS symptoms

Provision of adequate tissue oxygenation (to prevent hypoxia) [1, 10].

Conclusion and summary

Diving has recently become very popular. A prudent diver should remember that this sport involves numerous risks that can be eliminated or limited by keeping fit and obeying the general safety

rules. Lack of awareness may lead to accidents and diving diseases, including DCS.

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