

## **CEREBRAL GAS EMBOLISM IN THE COURSE OF MILDLY SYMPTOMATIC PULMONARY BAROTRAUMA IN A SCUBA DIVER**

Brunon Kierznikowicz, Stefan Teresiński

Institute of Maritime and Tropical Medicine of the Military Medical Academy, Gdynia, Poland

### **ABSTRACT**

The paper presents a case of pulmonary barotrauma in a scuba diver. Swallowing water and respiratory arrest during the ascent caused the trauma. Symptoms from the respiratory system (including the Behnke's symptom) appeared several minutes after the completion of the dive and were not severe. However, symptoms from the peripheral nervous system, which appeared later, increased rapidly until the seizure episode and loss of consciousness. Hyperbaric treatment was applied in a decompression chamber on board the ship from which the dive was conducted. The treatment resulted in complete remission of symptoms without any consequences.

**Keywords:** diving, pulmonary barotrauma, case, cerebral embolism.

---

### ARTICLE INFO

---

PolHypRes 2020 Vol. 71 Issue 2 pp. 41 – 44

**ISSN:** 1734-7009 **eISSN:** 2084-0535

**DOI:** 10.2478/phr-2020-0008

Pages: 4, figures: 0, tables: 0

**page www of the periodical:** [www.phr.net.pl](http://www.phr.net.pl)

**Publisher**

Polish Hyperbaric Medicine and Technology Society

**Casuistic (case description) article**

**Originally published in the Naval Health Service  
Gdynia 1983-1984**

**Acceptance for print in PHR: 13.0.2019 r.**



## INTRODUCTION

Pulmonary barotrauma in divers is a consequence of a sudden increase in airway pressure, exceeding the physiological strength of the pulmonary parenchyma [1,5,6,7,8,9,10].

Pulmonary haemorrhage (from the mouth) or spitting of foamed bloody secretion, dyspnoea, coughing attacks are some of the symptoms of a barotrauma. Sometimes, however, these symptoms may be poorly expressed. The blood in the sputum may be minimal and coughing sporadic, in particular after inhaling cigarette smoke (Behnke's symptom).

Such a condition may cause serious diagnostic difficulties and be ignored by an inexperienced diver or an insufficiently trained doctor. When establishing an assessment of the diver's state of health, it is important to carefully consider the history of his or her diving. The so-called 'forced ascent to the surface', even if the diver does not report any complaints in the first period after departure, should increase the vigilance of the doctor who is on duty. The present case is confirmation of this.

## CASE DESCRIPTION

A military diver, aged 21, was assigned the task of diving to a depth of 25 metres. During the descent, at a depth of about 12 metres, difficulties in equalising ear pressure occurred. During the intensive blowing of the Eustachian tubes he lost his mask, which prompted him to ascend to the surface. As he was surfacing, he aspirated water through his nose and choked, which led to a temporary respiratory arrest. Directly after stepping aboard the ship he did not report any ailments. Ten minutes after the emergence the diver lit a cigarette. While inhaling the cigarette smoke, coughing occurred, which ended in expectoration of sputum with traces of blood staining. As a result, he reported to the duty doctor, complaining about chest pains, mainly behind the sternum. A short time afterwards he experienced severe headache and dizziness, general weakness, dyspnoea and tingling and numbness of the upper and lower limbs.

Respiratory and pulse acceleration (112/min) was found during the examination. The arterial pressure was initially 110/75, and within a few minutes it dropped to 90/60 mm Hg. Psychological and motor anxiety occurred. The patient was administered pure oxygen to breathe through a mask. The dyspnoea initially decreased but after a few minutes of breathing oxygen tonic-clonic seizures followed, ending with muscle weakness and loss of consciousness. In this state, the diver was immediately

transferred to the decompression chamber on board the ship. In the compression stage in the chamber at an overpressure of about 1.5 ata the diver regained consciousness, and at 2.2 ata he reported that he did not feel any dyspnoea and "started to breathe easily". However, paraesthesia's, feeling of cold and lack of feeling in fingers and toes continued. The above mentioned ailments disappeared at the pressure of 6 ata, first in upper limbs and then in lower limbs.

Therapeutic recompression was performed according to the table for pulmonary barotrauma [8].

After completion of recompression, the diver's health condition did not raise any objections, nevertheless he was prophylactically hospitalised.

## DISCUSSION

In pulmonary barotrauma, owing to overpressure in the airways, when ascending to the surface with respiratory arrest, pulmonary alveoli and vessels may rupture with subsequent air entry into the vascular system and formation of gas embolisms, and their migration to the periphery, inter alia, to the brain.

In the case of cerebral air embolisms, caused by pulmonary barotrauma (as well as decompression sickness), therapeutic recompression must be performed immediately [1,5,8,10]. The timing of the commencement of treatment is important in these cases; in the case we have presented, recompression began about one and a half minutes after the loss of consciousness, which saved the patient from irreversible damage to brain tissue. This was made possible by ensuring there was a decompression chamber on site prior to starting the dive, in this case on board a ship.

## CONCLUSIONS

1. The presented case is a rare form of pulmonary barotrauma as the pulmonary symptoms were not commensurate with the diver's severe and rapidly deteriorating general condition.
2. Sudden, severe headache, tonic-clonic seizures and loss of consciousness were the result of gas congestion in the blood vessels of the brain.
3. The formation of a gas embolism in the brain should be considered in any form of pulmonary barotrauma.
4. The correct and only treatment for pulmonary barotrauma is immediate treatment in a decompression chamber.

## REFERENCES

1. Dolatkowski A., Ulewicz K.; Diving physiopathology outline. PZWL, Warszawa 1973;
2. Grabiński T.; Diseases of the respiratory system. PZWL, Warszawa 1963;
3. Hołyst J.; Insufficient blood circulation in the brain. PZWL, Warszawa 1971;
4. Łokucijewski B., Teresiński S.; Neurological diagnosis of acute decompression sickness. *Lek. Wojsk.* 1973, 3;249;
5. Łokucijewski B., Teresiński S., Filipek B.; Pulmonary barotrauma in scuba divers. *Lek. Wojsk.* 1971, 6;577;
6. Miasnikow A.P.; Miedicinskoje obiespieczenije liegkowodołazow i akwalangistow. Izdatielstwo Miedicina, Leningrad 1967;
7. Nazarkin W.J.; O niekatorych piezinach i projawljenijach barotrawny liogkich. *W.M.Ž.* 1961, 3;65;
8. Tabele Dekompresji Lecznicezej Gdynia 1970;
9. Zimmerman J.; Lungenbarotrauma. *Poseidon* 1973, 10;15;
10. US Navy Diving Manual. Washington 1965.

**Brunon Kierznikowicz**

Institute of Maritime and Tropical Medicine  
Military Medical Academy  
Ul. Grudzińskiego 4  
81-103 Gdynia