



A Drowned Diver – Four Expert Witness Opinions – Who is Right?

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Abstract

BACKGROUND: The paper describes the case of a drowned diver in the Adriatic Sea near Pula, Croatia.

CASE PRESENTATION: The deceased diver had not been trained at any Health and Safety at Work programs nor had he been examined by the occupational medicine (OM) specialist. The pathologist in Pula concluded that this accident was caused by drowning and that diver's blood was saturated with 38% carboxyhemoglobin (COHb). The second pathologist in Zagreb concluded that the diver drowned due to atherosclerosis sickness but that COHb was not present in his blood. The third expert witness from Forensics in Rijeka evaluated that the diver died due to increased exertion while diving, due to atherosclerosis and weakened heart. The fourth, the OM specialist expert witness from Rijeka, explained that the diver was a healthy athlete who died due to faulty diving equipment.

CONCLUSION: Persons who work under the special working conditions should be examined at an Occupational medicine department as well as trained for work in a safe way. Periodical examinations and permanent training courses should be provided. That way the risk of fatal accidents would be reduced to a minimum.

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Introduction

Diving and hyperbaric medicine has first of all been military medicine specialty, but over the time diving also developed commercially, as well as a sports and recreational discipline [1]. To prevent fatal accidents, developed countries follow elaborate official rules for controlling the above mentioned activities and therefore fatal accidents are very rare [2]. Diving medicine demands elaborated practical guidelines that need trained medical staff [3]. To be evaluated as fit for diving, the candidates must be sent to strict preventive medical examinations [4].

This paper describes the death by drowning in the Adriatic Sea in Istria, near Pula, Croatia. The Public Prosecutor of the Republic of Croatia started forensic investigation of this death case.

Case Report

Here is presented a case of deceased professional, commercial diver, (born in 1967), who went diving with another diver, his employer, the shell fishing business owner.

After an hour and half of diving, the boss came to the sea surface and spotted his employee fellow

diver struggling to gain the vertical position. He hurried to his help and dragged him to the coast where he tried to resuscitate him, after approximately 15 min came ambulance but reanimation failed and 20 min later the diver was proclaimed dead.

As this was a fatal accident at work, on the scene arrived the police, State Inspector and Health and Safety at Work inspector. In cases like this ID has to be provided along with the occupational medicine (OM) health evaluation certificate, certificate for training for work under special conditions, as well as the health and safety at work certificate. The employer had not been able to provide any of the above mentioned certificates as he did not manage his staff according to law.

The public prosecutor ordered autopsy. At the pathology in Pula was found atherosclerotic changes on the blood vessels and enlarged heart, congestive lungs with emphysema, brain edema, and eye ecchymosis. Pathologist issued the statement that death was caused by drowning as well as the presence of 38% carboxyhemoglobin (COHb) from an unknown source in blood.

The tissue samples are also sent to pathology in Zagreb. The pathologist issued a statement that the death was caused due to deceased diver's poor general health due to atherosclerosis, while COHb in blood was not found.

The compressed air tank was sent at the Centre for Forensic Investigation. It was found that the

15 l – tank contained 78% nitrogen, 20% oxygen, and 0.04% carbon dioxide. The pipe that comes out of the tank to the buoyancy regulator was broken.

Engaged was also the Forensic Medicine expert witness from Rijeka and he concluded that the diver had an impaired heart that was enlarged, which during physical exertion failed, thus causing death by drowning.

Finally, the OM specialist from Rijeka explained that the diver was a healthy athlete and that he died due to damaged scuba diving equipment.

Discussion

Although the diver never attended a Health and Safety at Work course, he did, 14 years previous to the fatal accident, pass a 259 h training for commercial fishing divers. Thus, this is not a case of an amateur who, for example, panicked or vomited in their mask due to consumption of fizzy drinks or alcoholic beverages before diving [5]. Although the drowned diver had a basic diving knowledge and was an experienced diver, that does not free his employer of guilt of not providing a Health and Safety at Work training for this specific job on a fixed-term contract. Further, every immersion has to be reported so that emergency help like helicopter transport can be organized immediately [6]. According to pathologists, the elevated level of COHb (if so, for one pathologist reported 38% of it in blood and the other did not find any) was surely not caused by liver disease, cirrhosis, as the autopsy confirms [7]. COHb sources are often generated from houses, faulty chimneys, or engine exhaust gases [8]. Persons who work under the special working conditions should be examined at an Occupational medicine department as well as trained for work in a safe way. Periodical examinations and permanent training courses should be provided. That way the risk of fatal accidents would be reduced to a minimum [9]. Inhaled compressed air with water vapor which has an impact on breathing regulator was also described as the cause of elevated levels of COHb. CO as a gas poisoning was also described in an isolated case of commercial diver, when breathing compressed air [10].

Hypoxemia can easily also cause mental confusion [11]. Psychological state must be at the upper level of the average to achieve guarantees for calmness and stability. Divers often also manifest neurological disorders due to the fact that bubbles released during emerging out can enter not only brains but also the spinal cord [12]. Hearing apparatus must be too, because changes during pressure equalization can cause vertigo and disorientation that can be fatal for the diver [13]. The deeper diver dives, the greater the danger becomes [14].

This diver was not medically examined; therefore, it was not possible to act preventively and this brings one to the importance of an early diagnosis. After he died it was very difficult to come to the right conclusion, because later many items go to the domain of speculations [15].

The OM specialist as the only clinician of the above-mentioned expert witnesses; in this case, concludes that the diver was healthy. The atherosclerotic plaques (macroscopic findings of the pathologists) on diver's blood vessels and on the cardiac endothelium were not of such a size that they stopped or narrowed free circulation and thus as such had clinical effects. The OM specialist was asked by the Public Prosecutor whether the deceased diver would pass the OM examination positively. In conclusion, the diver would have most likely passed the examination at the OM. The probable findings of enlarged heart chamber on the electrocardiogram are presented with higher R and deeper S marks which do not present contraindications for diving. An athletic heart should be distinguished from a myocardopathic heart.

The OM specialist from Rijeka explained that the diver was a healthy athlete and that he died due to damaged diving equipment, probably of compressed air failure.

Conclusion

The diffusing capacity for carbon monoxide and nitric oxide after 8 hours of diving showed significant reduction in divers breathing 100% oxygen compared with divers breathing compressed air.

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