

Case Report

FATALITY IN SCUBA DIVER

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Abstract:

The term scuba stands for Self-Contained Underwater Breathing Apparatus. Several underwater heavy works are carried out easily by SCUBA divers with the help of advance technique and apparatus. Working in the hyperbaric condition underwater is a difficult task. Due care and trained persons are always required. Still unavoidable accidents occurs rarely. Decompression sickness, barotraumas, previous systemic diseases, fatigue and physical trauma are the main causes of fatality. It has been recommended that the autopsy itself should be conducted in a decompression chamber in order to prevent the post-mortem dissipation of gas. This is hardly possible [1]. So the autopsy should be done with some protocol and in water seal condition, especially thorax dissection. The case presented here illustrates the autopsy findings to ascertain cause of death in case of a SCUBA diver death.

Key words: SCUBA, barotraumas, autopsy, hyperbaric, decompression

Introduction:

Both SCUBA and skin diving have unusually serious accident potential. So the investigation of diving fatality is multi-faceted, involving inquiry into number of areas; including

- Past medical history,
- Past diving history,
- The circumstances of dive,
- The equipment used,
- The events before and after the fatal accident,
- The resuscitative measures taken,
- The medical finding at post-mortem examination.

Civil suits for compensation may arise and in these circumstances a forensic pathologist may well become involved as expert witness providing the autopsy evidence [1].

Case report:

A corpse of 41 years old SCUBA diver referred to morgue of forensic medicine department, Government Medical College, Mumbai. The diver found dead underwater in the deep sea nearly 70 meter depth. The police papers & clinical summary written by doctor on the deck of the ship revealed that; he was a skilled SCUBA diver with occupation of engineer involving in a skilled underwater work. As a regular part of his job he went underwater with all equipment for the job assigned to him of cutting the metallic leg guard. He took approximately 1 hour to reach at work place underwater, which was at 70 meters depth. After discontinuation of communication between diver and operator at ship, another diver went underwater. Another diver found deceased unconscious at place with broken and displaced oxygen mask. He carried out deceased on the floor in pressure chamber. On-floor doctor of ship examined him and declared dead. The accident was registered after noting fall of heavy girdle of 5 tons on the diver. Body sent for post-mortem examination. While cutting the girdle probably it fell on him and caused fatality.

On external examination a well-built body of male with tattooing done all over trunk and hands was observed. The face is markedly congested and swollen. Rigor mortis was fully developed all over body. Post-mortem lividity present over back, fixed and purple. The skin over chest and neck were crepitant and gritty, on palpation. Also skin over trunk and legs has granular and puckered appearance. There was a transverse abrasion resembling ligature mark around neck, at the level of thyroid cartilage, 18 cm in length and 1.5 cm in breadth. The underlying skin was parchmented. Another abrasion present over right anterior part of chest, half-moon shape, oblique, of size 27 cm in length and 7 cm in breadth. Lower border of abrasion was straight and upper border convex. Another linear abrasion present over right side of chest, near anterior axillary line, red, 8 cm in length, vertical.

On further dissection of neck, the anterior neck muscles and para-tracheal tissues show haemorrhages with blood clots. There was thyroid cartilage fracture. Right sided first five ribs in mid-clavicular line, and clavicle at medial end were fractured. There were tiny bubbles beneath fatty layer of skin.



Photo 1: Semi lunar shaped abrasion over chest, and transverse abrasion resembling ligature mark over neck.



Photo 2: Transverse fracture of body of C-7 vertebrae, with transection of spinal cord

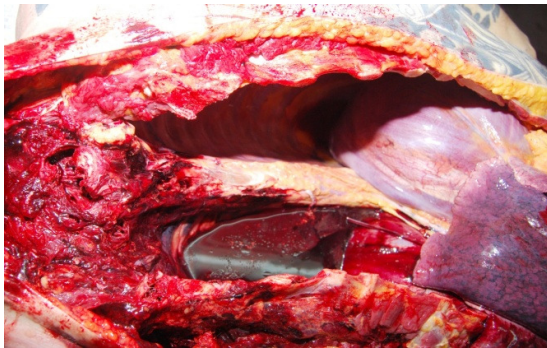


Photo 3: Massive hemo-thorax on right side.



Photo 4: Puckered and Granular Appearance of skin with tattoo on trunk. (Goose skin)

On dissection of chest underwater after making compartment with the help of skin flaps, shows escaping of large amount of air through right side, suggestive of air within pleural cavity at right side of thoracic cage. After opening chest cavity there was a massive hemo-pneumothorax approximately 2 litres. Right pleura and lung were lacerated at places with emphysematous bullae present over apex. Left lung was collapsed, showed some

emphysematous bullae over surface. Heart dissection did not reveal evidence of air embolism. There was no frothy fluid in trachea. Stomach was empty, with congested mucosa. On brain dissection after tying all vessels, no evidence of any air in vessels was detected but cut surface shows petechiae. All other organs were congested and normal.

On inspection of spine there was a complete transverse fracture of 7th cervical vertebrae body. This was associated with transection of spinal cord at C-7 level. No other significant injuries found over the body.

Radiological examination was non-significant.

Discussion:

Adequate investigation of a fatal diving accident demands more than a meticulous autopsy [2]. SCUBA diving fatality should be investigated in an organised way. WAIT (Water Accident Investigating Team) is one of the agencies for proper investigation [3].

In the present case after perusal of the history, obtained through police inquest, discussion with colleagues and co-workers of the deceased, safety officer and the ship medical officer before autopsy we ruled out other contributing factors responsible for death. Diver didn't have any past medical disease history. He was appointed after regular training and was continuously engaged in diving profession. There was no history of alcohol or any other drug consumption. The equipment was functioning in good condition.

After the detail autopsy examination, findings were suggestive of trauma under water and cause of death was confirmed as death due to complete transection of the spinal cord as a result of fracture and dislocation of seventh cervical vertebrae. The possible events correlated as when the diver went under water at depth of 70 meters and was doing his job of cutting the leg guard, there was accidental fall of heavy girdle on his right side of body, the hit of which dismantled the mask, leading to impact on neck, resulting in fracture dislocation of cervical vertebrae with transection of spinal cord, resulting in sudden death. This impact also resulted in injuries over neck, trunk causing fracture of ribs of right side, with development of hemo-pneumothorax. As death was immediate after sustaining trauma, no air embolism was observed

Air might have forced through the lacerated lung parenchyma and entered into pleura space and percolated into subcutaneous tissue under skin resulting in crepitanity at few places. The cause is same as for air embolism; over expansion of the lungs causing air to leak through the alveoli and bronchial tubes into surrounding tissues[4]. This gives the crepitant feeling to skin. It must be recognised that the very act of decompression is likely to allow bubbles to form within the body; even if they were not there; when death took place. Thus the finding of gas in the vessel and tissue interpreted in the knowledge that they may be an artefact; part of differentiation is quantitative [1].

The physical effects related to increased pressure are referred to as barotraumas- otherwise known as dysbarism [5]. The three syndromes in which pulmonary barotraumas are manifest are pneumothorax, interstitial emphysema and air embolism [3]. Drowning is the terminal event but it is important for the investigation to explore and identify potential underlying causes- inability to swim, fatigue, decreased level of consciousness, natural diseases, trauma, physical disability, equipment malfunction.

Conclusion:

The fatalities in SCUBA diver are not uncommon. The major deaths are accidental. The event of accident can be interpreted by obtaining history from all available sources. Meticulous autopsy specially looking for air embolism, decompression sickness, aggravation of natural diseases leading to fatal consequences and most vulnerable injuries both external

and internal with adequate investigation including chemical analysis plays an important role. However in under water sudden death, the classic typical finding of decompression syndrome may not be observed.

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