E30 The Risk for Immersion Pulmonary Edema (IPE) From Scuba Diving

Benjamin Mokdad, IML CHU Rouen 1 Rue de Germont, Rouen, Normandie 76000, FRANCE; Isabelle Leblanc, MD, CHU Charles Nicolle - Institut Médico-Légal, 1 rue de Germont, Rouen 76000, FRANCE; Gilles Tournel, PhD, CHU Charles Nicolle - Institut Médico-Légal, 1 rue de Germont, Rouen 76000, FRANCE; Sophie Thureau, MD, CHU Charles Nicolle - Institut Médico-Légal, 1 rue de Germont, Rouen 76000, FRANCE; and Anne-Claire Lhoumeau, MD, CHU Charles Nicolle - Institut Médico-Légal, 1 rue de Germont, Rouen 76031, FRANCE*

The goal of this presentation is to reveal how risk factors for IPE are still poorly understood and how this study investigated a diver's susceptibility.

This presentation will impact the forensic science community by making people aware of the danger of IPE, which differs from drowning accidents.

IPE occurs when the alveolar capillary barrier fails due to the constraints on a diver's lungs during a dive in which obstructing fluid entering the lungs can resemble symptoms of drowning. IPE can induce death in 1.1% of descents, which is higher than the risk associated with decompression sickness. Some advance figures even put IPE as high as 15%. The onset of IPE generally begins 15 to 20 minutes into a dive with symptoms of dyspnea, coughing, laryngeal sounds, and a feeling of chest tightness without genuine pain. Due to these symptoms, a diver may interrupt decompression breaks during an ascent, thus increasing chances of decompression sickness and hypoxia, which is found in 15%-20% of reported cases. Divers experience sensations of suffocation, coughing up blood, or if serious enough, the diver dies upon resurfacing. This report examines two fatal accidents that occurred during cold sea diving trips.

A 55-year-old man died from cardiac arrest a few minutes after beginning his dive into cold water (5°C). Heavily weighted and swimming against a strong current, fatigue eventually occurred and the diver quickly descended to a depth of 28 meters. During his quick descent, he attempted to resurface, but failed. Another diver made an emergency descent to rescue the failing diver. When the rescuer made it to the individual, he was conscious, but quickly lost consciousness during the ascent. Upon resurfacing and after removing the diver's breathing equipment, a bloody mass came out of his mouth. Unfortunately, the diver died after attempts to resuscitate him at the hospital, where pulmonary X-rays were determined to be normal.

Another unfortunate diving incident occurred in cold water at a depth of 20 meters when a 25-year-old soldier spent 25 minutes in the water. During his ascent, his partner felt a dead weight at the end of the attached rope and noticed that his partner withdrew his regulator as a distress gesture. After resurfacing, the soldier was found unconscious and a blood mass was discharged upon resuscitation attempts. The autopsy revealed no macroscopically visible cardiac lesions, as did a pathology examination. This soldier had regular medical exams and was considered able to perform his duties.

Neither autopsy found signs of macroscopically visible cardiac abnormalities. Hearts were not found to have coronary network obstructions or calcifications and exhibited perfect permeability of the coronary artery; likewise, toxicology examinations did not find any anomalies. No failures were found upon examination of the dive equipment for the two victims.

Both individuals lost consciousness during their ascent and coughed up a bloody mass when they emerged from the water, a sign of pulmonary edema. These two accidents reveal the danger of IPE, which can happen to all divers, even experienced ones. The occurrence of IPE in diving has multiple factors. Incidence and severity increase with age and cardiopulmonary comorbidities. Forensics and the diving community should be aware of the danger of IPE, which differs from drowning accidents; therefore, these events should not be ruled as a drowning accident.

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*Presenting Author