Anxiety Induced Hyperventilation Danger to Divers

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(NAUI A-78)

Any condition which can render a diver unconscious or immobile should be of great concern to the diving public. These effects can result from hyperventilation. The production of unconsciousness following the voluntary hyperventilating practiced by breath-hold divers intending to increase their underwater breath-hold times is a problem well covered in texts on Underwater Physiology, but the result of involuntary hyperventilation due to anxiety, stress through apprehension or other strong stimulus, anticipation, excitement or other cause has not been documented well (if at all) relative to divers. This is despite its common occurrence on land. It is naive to assume that it neither does nor could occur in diving. This form of uncontrolled breathing may result in muscle cramps, aches, stiffness, convulsions, tingling of the feet, hands, mouth and tongue and carpal spasms. The changes in the blood chemistry and lung filling/buoyancy effects are outside the scope of this article.

If the victim is caught in time and can be brought to dry land or a boat and allowed to rest, the (tetany) symptoms will gradually subside and the person return to normal. This return to normal with regard to breathing and the other symptoms can be speeded by administering 5% Carbon Dioxide or forcing the victim to rebreathe expired air by breathing into and out of a paper bag for a short period of time.

If a diver undergoes such an occurrence, quite apart from the obvious danger to himself there is a severe scare to the diving buddy or instructor, they at once suspecting that air embolism or some other of the demons they were told about in scuba course lectures has struck. I'm sure that every diver has seen a relative novice diver suffer extreme anxiety at being presented with a new and less than satisfactory diving situation. This is the perfect set up for trouble if that diver is also prone to hyperventilate under stress conditions. The following incidents, seen through the eyes of a medical layman, will hopefully serve to bring out the significance of this reaction to stress. I have trained many thousands of students during my 20 years of teaching and have not lost any in a diving accident. In fact there have been so few "close shaves" that it is not too difficult to recall them. Until a few years ago all such close calls for which I could find no satisfactory answer were filed away mentally with the appropriate question marks. However, about that time a close relative started to hyperventilate during moments of stress and armed with this new experience and with a mental picture of the symptoms, etc of the "new affliction" of the divers, the many pieces of a puzzle began to fit together, albeit in a loose manner. I hesitate to class the following as Case Histories but they appear to be worth presenting as evidence for incriminating involuntary hyperventilation as a cause of diving accidents.

Case 1 A fellow scuba instructor was personally conducting several novices on a tour of a shelf 60-70 feet below the surface. One diver was not relaxed so the instructor came in close and decided to escort him to the surface. On approaching the diver he noticed that he was quite stiff. He grabbed him by the arm and proceeded to ascent. As he was not breathing the instructor forcibly pushed him in the abdomen, causing him to exhale. The ascent completed, after surfacing the diver admitted to near panic. The instructor felt that the victim was unconscious of events at the start of the ascent.

Case 2 Mr Jack Albert was accompanying a group of surgeons diving from the 85 footer "Cayman Diver" when one of the group surfaced, apparently in great distress. He stiffened up and passed out (though not necessarily in that order). His colleagues

felt that the gentleman had undergone a heart attack. Upon returning to New York the diver consulted a number of heart specialists. Results indicated no abnormalities. In the meantime he also got in touch with Mr Albert, who offhandedly mentioned my concern about apprehension and possible blackout, tetany, etc, from hyperventilation. He immediately felt that this could well have been the case with himself since he was extremely apprehensive prior to the dive. He further commented that failure to recognise the symptoms did not surprise him since he and his colleagues had been away from diagnostic medicine for many years.

It is surprising how frequently tetany and paralysis are confused by both lay and medical people, at least in the situations I have encountered. Conversations with a number of friends in the medical profession were the first to bear this out. The confusion seems to be not with the general practitioner or the internal medicine specialist but with highly specialised surgeons. My relative spent several hours on pure oxygen in a hospital emergency room because the only doctor present, a highly qualified surgeon, erroneously felt she was undergoing a heart attack. If this is a real situation, as I feel it is, perhaps it might be wise to educate scuba instructors and divers into recognising the symptoms of hyperventilation and the use of a paper bag or whatever to restore normal breathing.

Case 3 The diver surfaced next to his instructor and shouted “I’m paralysed! I can’t move, I can’t breath!” Since the boat was very close he was rapidly brought aboard, there to lie stiff and having a difficult time breathing. The instructor and other observers assumed all sorts of possible reasons for such behaviour, mostly associated with those “demons” of the diving medicine lectures. The first thought was to administer oxygen but fortunately it was late in coming and recovery was uneventful. The consensus of opinion is that the use of oxygen would prolong the trouble. This incident was followed up and it was found that the victim had had other bouts of hyperventilation associated with excitement and anticipation.

Case 4 A dive at a deeper than normal depth resulted in a witnessed anxiety with subsequent passing out of the diver. The witness, a doctor, was not certain whether or not exhalation bubbles were present during the ascent of the unconscious diver. Possibly laryngeal spasm had occurred, for lung damage and evidence of air embolism were found at the autopsy.

Case 5 This may throw may throw light on the preceeding case. The diver was exploring a depth not reached by him before. It was dark and barren. He was observed to become stiff and “frozen”. An instructor who happened to be present grabbed him and started to bring him up. As he remained stiff and neither breathed nor exhaled, the instructor had to squeeze him to ensure that he exhaled during ascent. It is possible that during such an anxiety period the throat may close through laryngeal spasm.

Case 6 This diver admitted later that she had felt apprehensive on this her first dive in the Catalina island kelp beds. She felt that something was wrong with her regulator as she was unable to satisfy her breathing demands. She therefore headed for the surface, inflated her vest, removed her mouthpiece and breathed directly through her mouth. But she found that she was still unable to satisfy her breathing demands. Her plight was recognised by the Dive Master, John Schultz (NASDS, PADI), who immediately jumped in and brought her to the boat. Upon reaching the boat breathing returned to normal. The regulator was checked and found to supply more than sufficient air for (normal) diving at that depth (25 feet.)

Case 7 This lady was hanging from the anchor line waiting for an escort for her snorkel swim back to the shore. She was very apprehensive, for it was her first time in the water. All those on the boat faced in the opposite direction for a minute: when

they next looked, she was gone. Several divers present jumped into the water and dived to searched for her but it was several minutes before she was located in about 30 feet of water with her weight belt still on. Several more minutes passed before mouth-to-mouth resuscitation could be administered. Despite the delay she responded successfully and showed no residual ill effects, although the doctor who treated her had feared that anoxic brain damage would occur. Her successful survival may be due to the increased partial pressure of the alveolar oxygen at 30 foot depth (plus the dive reflex). The victim did not remember passing out but admitted to anxiety preceeding the event. Hyperventilation is a possible cause of this incident.

There are numerous situations where difficulty of breathing has been reported to myself or my teaching staff. I have now incorporated a screening of anxious or apprehensive divers. On the medical questionnaire we inquire as to the existence of a history of hyperventilation and in the pool we screen for the presence of anxiety. Buddy breathing is a good test, a positive direct correlation existing between apprehension and reluctance to part with their regulator. Rate of breathing is another indicator used. Students who fall in this category are handled on an individual basis. If the problem seems permanent they are asked to give up. We also spend a lot of time in assuring our students that at no time will they be asked to make any radical entrance into this new environment. This has been found necessary since sensitive, intelligent people with active imagination anticipate a more radical experience on their first open water introduction. I feel the use of extensive snorkelling experience prior to scuba would lessen this problem considerably. The instructor who raises his or her entrance standards too high (ie. previous snorkelling experience) will merely lose the prospective student to another instructor who is not so strict. I feel that higher standards of prerequisites will almost certainly have to be enforced by the certifying agencies.

Several of the people in these incidents later proved to have had a bout with hyperventilation before. Most all had consumed a far greater amount of air than their buddy. Perhaps we should also look at that “air hog” in a different light.

It is interesting to speculate whether or not this tendency to involuntary hyperventilation under stress conditions might not exclude a person from taking up the sport of scuba diving.

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* This article first appeared, for a lay readership, in NAUI News June 1974. We are greatly indebted to both the Author and NAUI for the opportunity to republish it. It has been amended by the insertion of some additional case histories most kindly supplied by the author. This article not only draws our attention to a neglected facet of diving medicine but also demonstrates the valuable role that can be played by observant divers/instructors in the identification of problems otherwise overlooked.

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David Brown, the Queensland Gold Coast marine biologist and curator of mammals at Marineland there, is to open an underwater oceanarium in Tahiti. The project, the first of its kind in the world, is to be developed in a lagoon where people descend in mobile underwater observatories to spy on marine creatures. Already the observatory modules are being built in Sydney. “In Tahiti, instead of people going to see creatures in tanks, the people will be in the tanks”, says Mr Brown, who admits he “cherishes” such an idea.

The Australian, 5 May 1976