

The Ups and Downs of Defending a Recreational Dive Injury Case

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Scuba diving is a popular and widespread sporting activity that has become easily accessible to amateurs. Participants in recreational scuba diving are exposed to risk of injury and even death due to the high-pressure environment that is part of the diving experience. Every year, amateur scuba divers suffer a variety of injuries that require medical intervention. Some dive accident victims recover without residual injury. Other less fortunate divers may suffer permanent, serious neurologic injuries. Some of these divers may file lawsuits against their health care providers, arguing that negligent medical treatment resulted in a worse outcome for their injuries.

The attorney who defends such a health care provider will need to: (1) be equipped with an understanding of the basic concepts of dive injuries; (2) be acquainted with the resources available to both divers and the medical providers who treat them; and, (3) will need to anticipate and respond to the arguments made by plaintiff's attorneys in sport diving cases. This article is intended to cover each of these areas in an overview that will provide the defending attorney with a head start if he or she is called upon to defend a sport diving case.

Types of Dive Injury

Dive injuries are a result of the increased ambient pressure that a diver experiences by descending below the surface of a body of water. There is one atmosphere of pressure at sea level. At a depth of 33 feet that pressure is doubled, and at 100 feet it increases fourfold. This increase in pressure affects the manner in which the diver's body metabolizes the gases

breathed from compressed air tanks. Also, rapid changes of the pressure inside the diver's body can produce stress on organs. These conditions can result in a variety of injury mechanisms that the defense lawyer will need to understand.

Arterial Gas Embolism

As the diver surfaces, the ambient pressure decreases and this results in expansion of the volume of gas in his lungs. If a diver surfaces too quickly or holds his breath while ascending, the gas in the alveoli of his lungs may expand faster than it can be eliminated by exhalation. This expanding gas can rupture the alveoli, causing gas bubbles to be introduced directly into the blood vessels surrounding the alveoli. The bubble then travels into the heart and to the brain, causing a stroke-like mechanism of injury. This arterial gas embolism ("AGE") will obstruct flow of oxygenated blood to brain tissue. The result is usually a sudden loss of consciousness. It may also cause additional clinical signs of brain injury such as hemiparesis, and other loss of neurologic function resulting from damage to brain tissue.

Decompression Sickness

The air we breathe contains 79 percent nitrogen and approximately 20 percent oxygen. At sea level pressure, nitrogen gas is not absorbed by the body in significant amounts. However, as the diver descends, the higher pressure causes more nitrogen to be absorbed into the blood. This results in elevated blood and tissue nitrogen levels. This increased nitrogen uptake is affected by the depth and duration of the dive, as well as the diver's activity level.

At depths in excess of 100 feet, this increased level of nitrogen can cause a temporary alteration in consciousness, known as "nitrogen narcosis," during which the diver may experi-

ence confusion and disorientation. However, most sport divers do not reach depths in excess of 100 feet and the increased nitrogen uptake generally does not cause any problems. At increased pressure, the nitrogen remains in a soluble (liquid) form in the blood or tissue and does not react with the body's chemistry. However, a problem is created when the diver returns to the surface without allowing sufficient time for his body to breath out, or "off gas," this excess nitrogen. Nitrogen in the blood and tissues will change from the liquid to the gas form as the pressure decreases during a diver's rapid ascent to the surface. This causes the formation of bubbles in the blood vessels and tissues which can cause injury to the diver. The process is similar to what occurs when a container of carbonated beverage is opened: the carbon dioxide that is placed into solution under pressure will bubble out when the pressure in the container is reduced by the opening of the container.

The result is decompression sickness ("DCS"), commonly known as "the bends." It is labeled as Type I or Type II, depending on the symptoms manifested by the formation of nitrogen gas bubbles. Type I decompression sickness refers to bubbles which accumulate in the joints. This "pain-only" bends causes pain in the joints or tendons and is the most benign form of DCS. Type II DCS, or "serious symptoms" DCS, results when bubbles in the blood or tissue obstruct blood flow to the spinal cord or nerve tissue. DCS can also occur in brain tissue. This results in damage to the nervous system which is manifested clinically by headache, numbness, paralysis, weakness, sensory loss, loss of bladder and bowel control, speech disturbance and other neurologic deficits.

Some researchers have also described a Type III decompression sickness. This is a label for a combined DCS and AGE. Type III DCS was

first described in a 1990 publication; it is characterized by a diver who dives within the limits of a no decompression dive but experiences immediate neurologic symptoms of AGE with a delayed response of DCS II, which is generally resistant to treatment. See T.S. Neuman and A.A. Bove, *Combined Arterial Gas Embolism and Decompression Sickness Following No-stop Dives*, Undersea Biomedical Research, Vol. 17, no. 5, 1990. Type III DCS is a new and evolving category of dive injury that is not always recognized by experts in dive medicine.

The injuries suffered by the diver in the more serious forms of decompression illness, such as DCS II and AGE, are a result of decreased oxygen delivery to tissues. This can occur initially by the mechanical obstruction in the blood vessels caused by the bubbles. Over time, injuries result from the body's host response to the presence of gas bubbles, which initiate a foreign body type reaction leading to thrombosis and further obstruction of blood vessels.

The goal of treating dive injuries, both AGE and DCS, is to restore oxygen delivery to oxygen deprived tissues. This is done by administration of 100 percent oxygen to the patient. Definitive treatment for dive injuries also includes placing the patient in a recompression chamber. The decompression will reduce the size of the gas bubbles and thereby eliminate their obstructive effect. Recompressing the diver also enhances the delivery of oxygen to damaged tissues and helps to wash out excess nitrogen. Recompression is carried out according to standardized tables that provide a schedule for duration and depth of recompression. The most widely used tables are the U.S. Navy treatment tables 5 and 6. These tables may also be extended to provide additional breathing cycles.

Resources for Defense

There are numerous resources for information available to the attorney defending a dive accident case. Diver's Alert Network ("DAN") is an organization established for the purpose of providing assistance in diving

injuries. It is headquartered at Duke University Medical Center. DAN coordinates a nationwide network of specialists and treatment facilities. Your case may involve contact with a DAN consultant. If so, it is important to know that DAN generally keeps a record of calls for assistance and these should be obtained. Each year DAN issues an annual report in which it publishes statistics compiled by DAN on diving accidents and fatalities. These statistics may be relevant to establishing standards of care for treatment or for responding to other contentions in the plaintiff's case. It is highly recommended that the defense obtain a copy of the DAN report for the period during which treatment was rendered. DAN can be contacted at (919) 648-2948.

The Undersea and Hyperbaric Medical Society ("UHMS") is an organization established for the purpose of archiving and disseminating information relating to hyperbaric medicine, including treatment of dive medicine. UHMS's librarians are very helpful and will, over the telephone, provide medical literature searches relating to treatment and diagnosis of dive injuries. UHMS can be contacted at (301) 942-2980.

Standards for navy divers are also published by the U.S. Navy in the U.S. Navy Diving Manual. As discussed below, the plaintiff may attempt to use these materials to establish a standard of care for treatment of recreational divers.

There are several certifying organizations for recreational divers. These include NAUI, PADI and SSI. These organizations establish and publish standards and educational materials for recreational diving safety. These organizations may be contacted through local dive shops.

An important part of defending a dive injury case will be the selection and retention of a qualified dive expert. The defense attorney should be aware that there is no board certification or formal residency or fellowship training for dive medicine. Rather, dive medicine experts generally embrace a variety of medical specialties. They generally acquire their expertise

through their own educational efforts and by direct experience in treating patients in their hyperbaric practice. Identifying these experts may be accomplished by reviewing the literature of dive medicine and by contacting the hyperbaric departments of institutions that are geographically located in areas that provide a heavy traffic of recreational dive injuries, such as Florida and California.

Arguments in Dive Injury Cases

In most cases, an important issue will be the experience and competency level of the health care provider. Credentialing may be an important issue, especially if the hospital or other health care institution is also a defendant in the case. As discussed above, there is a lack of formal credentials in this area of medicine and the defendant health care provider's education may be limited to introductory courses of only several days in duration. The defense will want to emphasize that the use of hyperbaric oxygen is simply another tool or drug in the panoply of treatments that a physician is trained to use. Rather than an intensive area of study in medicine, it is an application of a single concept, the high pressure environment, to broad concepts of medicine at a level of competency that all physicians are possessed of. The jury will need to understand that in most community hospitals, the hyperbaric department is dedicated mostly to non-dive injury applications.

The plaintiff will attempt to establish a uniform, nationwide standard of care for the treatment of dive injuries. This may create unfair expectations for health care providers who have limited experience in treating dive injury patients, but who are nevertheless called upon to treat a patient in an emergency situation. The defense will want to emphasize the reasonableness of the conduct in diagnosis and treatment, in light of the knowledge and experience of the particular health care provider whose conduct is under scrutiny. There are few true "experts" in dive medicine. They are generally physicians who, because of special circumstances, have enjoyed a high level of exposure to

treating dive patients. These individuals will need to be differentiated from the defendant physician who may be credentialed with hyperbaric privileges, but whose practice consists of mainly non-dive injury treatment and who may only have an occasional opportunity to treat dive injury patients. Also, the defense must be aware of the plaintiff's effort use studies and statistics from the commercial and Navy dive communities to establish the standard of care. However, treatment and conditions are markedly different for these divers as compared to those in the recreational dive community.

Delay in treatment will often be the central focus of the plaintiff's case. Statistics from the annual DAN report will establish standards for the national average of delay from onset of symptoms to treatment of recreational divers. The defense will want to attack causation vigorously. While the maxim of dive medicine is that early recompression is beneficial, the defense will also need to stress that the outcome of any particular patient is highly speculative. The plaintiff's case will emphasize that DAN statistics show that more serious residual symptoms occur in patients who are treated later in time from time of injury. However, the DAN reports, as well as other studies, contain case

histories of patients who are treated within the first two hours, but still develop serious neurologic impairment. Other patients receiving treatment in more extended periods of delay may literally walk away from serious symptom DCS without any residual impairment. One prospective study has concluded that delay in treatment is not related to outcome. See J. Desola, *et al.*, *Outcome of Dysbaric Disorder is not Related to Delay in Treatment*, Journal of Slovenian Medical Association, EUBS 97 Congress, Bled, Slovenia, I.B. Mekjavic, M.J. Tipton & O.Eiken (eds.) Another study has shown that late recompression, for periods as late as 15-60 hours after a gas embolic event may have salutary effects. H. Bitterman and Y. Melamed, *Delayed Hyperbaric Treatment of Cerebral Air Embolism*, Israel G. Med. Sci., Vol. 29, No.1, Jan. 1993. It is generally believed that patients with the so-called Type III DCS do poorly regardless of early intervention and are unresponsive to traditional recompression therapy. The DCS Type III case will provide strong causation arguments for the defense.

Finally, the patient's own negligence may become an issue. Depending upon the jurisdiction, the diver's pretreatment conduct may or may not be considered as comparative negli-

gence in causing or contributing to the injuries. Even in those jurisdictions that preclude the consideration of such conduct, the defense will want to use this information to its best advantage. A thorough review of the diver's level of training and experience may demonstrate that the diver disregarded fundamental practices of safe diving. Though such conduct may not be argued to be comparative negligence, it will certainly help deflate the sympathetic value of the plaintiff's case. Also, the history provided to all health care providers and emergency medical personnel should be scrutinized for accuracy and uniformity. It is well known by experienced dive physicians that divers will often distort or fabricate the factual circumstances of their dives.

Conclusion

The lack of uniformity and standardization in "dive medicine" creates opportunities for creative lawyering for the defense in recreational dive injury cases. By becoming acquainted with the fundamentals of dive medicine, and the resources of the recreational and commercial dive communities, the defense will be in a better position to respond to criticisms leveled by plaintiff's attorneys and their experts.

CASE SUMMARIES

WASHINGTON

The Washington State Supreme Court Strikes Down Medical Malpractice Statute of Repose

IN A FIVE TO FOUR DECISION, the Washington State Supreme Court struck down an eight-year statute of repose for adult medical malpractice claims. The statute, passed in 1976 as part of a tort reform act, was held to violate the privileges and immunities clause of the State Constitution. To

reach this goal, the majority effectively found that the limited number of claims that were subject to the statute of repose could not bear a rational relationship to the state legislative goal of helping to control rising insurance rates. The dissent argued the majority was engaged in legislation.

DeYoung v. Providence Medical Center, 136 Wash. 2d 136, 960 P.2d 919 (Aug. 1998).

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