Neuro Hit

The Diver

The diver is an advanced open-water diver with additional training in enriched air diving. He is 35 years old, is in good general health and has no history of dive-related injuries or recent illnesses. He has been diving for 21 years and averages 30-40 dives a year.

The Dives

The diver and his buddies planned a dive to 108 feet (33 meters) for 30 minutes. He had originally planned to use nitrox, but after considering the dive parameters, he decided to use compressed air. The first dive went as planned; they experienced no problems or incidents. Before returning to the surface, they performed a three-minute safety stop. Once on the boat, however, the diver soon began to feel dizzy and nauseated. He attributed these symptoms to motion sickness from the choppy seas.

While his dive buddies made their second dives, he remained on board. Hoping his nausea might be due to hunger, the diver ate, and after a two-hour surface interval, he decided to make his second dive. This was his buddies' third dive. His second dive was to 63 feet (19 meters) for 44 minutes. Again, they experienced no problems or incidents. When they surfaced, the diver discovered that he had not changed his computer to correspond with his selected breathing gas. It was still set for nitrox. During the boat trip to shore, the diver's symptoms began to worsen. Despite the dizziness and nausea, he drove himself home.

The Complications

Some four to five hours had passed since his symptoms had first begun. Since he had access to surface oxygen at home, he administered it. After exhausting the oxygen, he noticed his symptoms had not decreased: the dizziness seemed to be the most pronounced symptom. By the time the diver called the DAN Diving Emergency Hotline, he had waited almost 24 hours after his dive. He described the circumstances and symptoms to the DAN on-call medic, who gave him information about the local hyperbaric chamber and encouraged him to let someone else drive him to the hospital. The diver then spoke to the hospital staff; the attending chamber physician instructed him to go directly to the hyperbaric center for an evaluation.

The Diagnosis

On arrival at the hyperbaric facility, the diver wa still experiencing dizziness and nausea. At no time, however, did he experience joint pain, numbness, weakness, chest pain or breathing difficulty. Still, the attending physician conducted a thorough neurological exam. He confirmed that the diver did not have any weakness, reduced sensation, ear injury, difficulty walking or the involuntary rapid eye movement (nystagmus) that sometimes accompanies cases of neurological decompression illness.

During the examination, the attending physician had the diver stand with his feet together and his eyes closed, one of the steps involved in testing for neurological symptoms. When performing this test, the diver was observed to be unstable. He was then asked to walk heel to toe, a test similar to those used by law enforcement officers to determine sobriety. The diver also had difficulty performing that test. (Note: physicians may perform the first neurological test listed here. Divers experiencing neurological problems may begin to sway or even fall when their eyes are closed. This is known as a positive Romberg's sign*.)

Based on the dive history and clinical findings, the attending physician determined the diver needed hyperbaric treatment. The diver was treated with a modified Hart-Kindwall Table**. In the first 10 minutes of treatment, the injured diver's symptoms resolved. After the treatment, the physician repeated the

neurological examination: results were all normal, and the diver had none of his earlier unsteadiness. He was advised not to dive for the next 30 days. Within three weeks of the incident, the diver remained symptom-free.

The Discussion

This case focuses on more than one issue. While technology has improved diving equipment, it has also brought additional consequences and responsibilities. Most diver training courses recommend a thorough pre-dive equipment inspection. As we gain experience, those inspections may become routine: this is not an indictment of conscientiousness but of familiarity. Mishaps occur more often with tasks we do frequently than with newer tasks. Fortunately, equipment-related problems represent a small percentage of dive injuries and fatalities. Whether this diver's symptoms resulted directly from computer oversight may never be established, but it is likely a factor. Certainly, the oversight can complicate accurately determining the contributing factors.

The symptoms that this diver experienced were not typical of what is usually seen with decompression illness (DCI). This is why early evaluation is important. Following a dive, any unusual symptoms should prompt concern. Signs and symptoms of DCI may be subtle. In the DAN On-Site Neurological Assessment for Divers course, providers are trained in a more extensive neurological examination, which is designed to seek out the more subtle signs and symptoms that often go unnoticed. It is often easy to dismiss some symptoms to other causes. Joel Dovenbarger, DAN's vice president of medical services, often says: "Divers don't call us because they have symptoms; they call us because they have symptoms that don't go away."

In the DAN Report on Decompression Illness, Diving Fatalities and Project Dive Exploration for 2003, statistics show that most recreational divers delay seeking treatment. Divers who experience serious symptoms generally seek treatment early and receive treatment within 12 hours. Divers with less serious symptoms often wait longer, and on average 37 hours elapse before they receive treatment. Despite delay, with proper treatment most divers generally find that their symptoms resolve. What is paramount for divers to remember is that sometimes-mild DCI symptoms may progress to more serious symptoms. The more serious the symptoms the more complicated both treatment and recovery may be. Early recognition and evaluation are important.

When in doubt, call DAN.

* Romberg's sign gets its name for German physician Meritz Heinrich Romberg (1795-1873). It is the inability to maintain the body balance when the eyes are shut and the feet close together. The sign is positive if the patient sways and falls when the eyes are closed. This is seen in sensory ataxia (imbalance).
– Taber's Cyclopedic Medical Dictionary.

****The Hart-Kindwall Table**

The patient being treated is receiving oxygen for the duration of the treatment. Pressurized to 2.8 ata (60 feet) for 30 minutes. 15-minute decompression to 2 ata (30 feet) hold at depth for 60 minutes. 15 min decompression to 1 ata (sea level). If the patient is experiencing serious neurological symptoms, i.e., paralysis, unconsciousness or their symptoms do not improve in the first 10 minutes of treatment then a longer schedule (e.g., slower ascent rate) is used. Pressurized to 2.8 ata (60 feet) for 30 minutes. 30-minute decompression to 2 ata (30 ft. feet) hold at depth for 30 minutes. 30-minute decompression to 1 ata (sea level).