Sleuthing to find the disease

In diagnosing decompression illness (DCI), we rely heavily on the various elements of the diver's history and the clinical exam. This is especially true when an injured person presents vague and ambiguous symptoms. Unfortunately, conventional medical diagnostic exams are not available for DCI. In other words, there's no blood test that'll tell us if you're bent. So, although the practice of dive medicine is well defined in many ways, sorting through the details and arriving at a diagnosis of DCI demands savvy clinical practitioner as it is a science. Determining that post-dive symptoms are not due to DCI requires similar skills. The following case, while serious, represents some of the challenges facing modern medicine. It serves also as an illustration of the challenges faced by divers and their diving doctors.

THE DIVER

The diver is a healthy 20-year-old male who, with his family, traveled to a popular dive site in the South Pacific. Each member of the family planned to complete open-water certification dives. Before the trip, the diver and his family had completed a series of classes and fine-tuned their skills in confined water throughout the first six weeks of summer.

THE DIVES

Day one involved the customary open-water training dives in 40 feet (12.5 meters) of water, in which family members demonstrated skills of buoyancy control, mask-clearing and use of alternate air sources. They also practiced controlled emergency swimming ascents, among other skills. The dives proved uncomplicated, since participants were well prepared.

THE COMPLICATIONS

When he returned to the boat after the second dive, the young man complained of a sudden headache, fatigue and malaise. These symptoms were accompanied by persistent muscle spasms throughout his arms. The spasms gradually resolved to an episodic level, four to five brief spasms daily; they continued throughout the trip. Despite his persistent symptoms, family members persuaded him to continue diving for another two days to complete his certification. The diver earned his open-water certification and toured the island. He continued to experience muscle spasms, but pronounced them bearable. His return flight home proved quiet.

BACK AT HOME, MORE ISSUES

One week after the onset of symptoms, and without warning, he experienced a grand mal epileptic seizure while driving on a local expressway. A passenger brought the car under control and drove the diver to a local emergency department. He was admitted for evaluation and observation. One week later, two weeks after his last dive, the young man experienced another seizure. A brain MRI proved normal. His neurologist prescribed Depakote®, an anticonvulsant medication. Lacking other compelling information pointing to a cause of the symptoms, doctors began questioning his dive history and activities. To explore any possible connection to diving, the attending neurologist consulted with the local hyperbaric physician. Uncertain, the hyperbaric physician called DAN regarding the need for hyperbaric oxygen therapy. The DAN physician, however, did not feel the evidence suggested DCI. While it is theoretically possible that a small gas embolus (air bubble) could have occurred during the second dive, the seizures were probably not related because they occurred several days later. DAN noted additionally that even if the seizures were related to the dives, hyperbaric oxygen 14 days later was unlikely to be helpful.

BACK AT SCHOOL

Released from the hospital the next day, the young man returned to college. His condition progressed,

however, to include frequent and severe migraine-like headaches, with both visual and gastrointestinal disturbances. In addition, he experienced short-term memory loss, which resulted in problems following instructions for medication. As it advanced, his illness prevented him from attending classes. He fell further behind in school. To provide care for him at home, his family decided to remove him from school four weeks after starting it. He was readmitted to the hospital.

THE CONDITION WORSENS

Further medical tests, including the preliminary report on a spinal tap to check for meningoencephalitis, an inflammation of the brain, were negative. With reports of normal EEGs, CT scans, MRIs and spinal taps, physicians were puzzled: here was a healthy 20-year-old, honor-roll student who, in the course of four weeks, was forced to leave school, became bedridden and required round-the-clock health care. At this juncture, the young man was constantly irritable and experienced recurring migraine-like headaches, twitching, vomiting, drooling, difficulty walking and progressive short-term memory loss. Given the uncertainty of local physicians, the family made yet another, yet separate, appeal to DAN, again questioning the possibility of DCI or perhaps a contaminated air supply. A contaminated air supply seemed unlikely and was immediately ruled out. Given the late onset of new symptoms, such as altered mental status, asymmetric weakness and gait problems, the clinical picture for possible DCI (which can include seizures, headaches and gait disturbances) seemed less likely. All in all, in the context of diving, the clinical picture was baffling.

THE DIAGNOSIS: WEST NILE VIRUS

Four weeks after onset, a breakthrough came. Following several unsuccessful regimens of antibiotic and antiviral medications, doctors administered intravenous steroids, with remarkable results: symptoms began resolving almost overnight. In addition, exhaustive laboratory results confirmed increased levels of the West Nile Virus IgM antibodies (immunoglobulin gamma M) in the cerebral spinal fluid. This fluid surrounds the brain and spinal cord of the infected person. Based on his symptoms and treatment results, doctors concluded the diver had contracted West Nile Virus one week before his open-water certification dives. Whether diving contributed to the progression of the disease or its symptoms remains unclear, however: the coincidence challenged the good judgment of some of the most astute diagnosticians in several hospitals.

West Nile Virus, a mosquito-borne pathogen, emerged in the West Nile delta of Uganda in 1937; it was first documented in the United States in New York City in 1999. The rapid expansion of the virus quickly caught the attention of the Centers for Disease Control and Prevention, whose epidemiological studies have since reported 9,862 U.S. cases for 2003, an increase of 137 percent from 2002 cases (n=4,156). At last follow-up, family members told DAN they expected a full recovery within the next two months: the young man still experienced residual weakness and was working to regain the 20 pounds (9 kg) he lost prior to his symptoms resolving. They also reported he would resume school at the beginning of the next semester.

THE DISCUSSION

If an acute illness occurs after a dive, especially one with neurological signs and symptoms, it is likely to be attributed to DCI. In this case, however, the onset was merely coincidental. Many conditions have symptoms similar to DCI – for example: ciguatera fish food poisoning, spinal cord compression or disease, migraine headaches and even occasionally, acute myocardial infarction. In this case, dive doctors discovered that symptoms of West Nile Virus can mimic DCI, too. The risk for DCI in recreational divers is, by all accounts, remote. Supporting data from DAN's Project Dive Exploration (PDE) summarizes the risk for "Shore / Day-Boat" divers on the order of three cases for every 10,000 dives (as noted on page 42 of the 2004 DAN Report on Decompression Illness, Diving Fatalities and Project Dive Exploration). The Report

shows that 48 percent of PDE participants describe some existing medical or health problem. The investigation for possible DCI in the young man uncovered a complex health history, as it can for other injured divers. This provides a diagnostic challenge presented to the clinician(s) assessing each cases.