Painful Memories

Q: I get a headache about 10-15 minutes into my dive. It lasts throughout my dive but disappears within a few minutes of surfacing. What is it due to and what must I do?

A: You pose an interesting problem. Your headaches appear to be unrelated to descent, ascent or depth. The only constant factors are time – about 10-15 minutes into the dive – and the fact that pain disappears within a few minutes of surfacing.

Headaches usually follow a distinct pattern in each diver who experiences them. They can occur regularly during or after a dive, at the bottom, on ascent and, very commonly, immediately after surfacing. Aside from the perennial diver hangover headache or a direct bang on the head during an ascent, the following are the usual causes of headaches in divers. Your headaches could fit some of these causes and I hope this article helps you.

PSYCHOLOGICAL CAUSES

Anxiety is a common cause of headaches in tense novice divers. It shows up as a classic tension headache, with pain over both sides of the head and at the back of the neck. It is due to insecurity about being exposed to a potentially dangerous underwater environment. With increasing experience and underwater skill, it invariably disappears.

New divers with a fear of losing their air supply under water often bite too tightly on the regulator mouthpiece. This may cause spasm of the temporalis muscles in the temples and produce headache. A malaligned bite or a filling that is riding too high may result in uneven stress of the joints between the jawbone and the skull. This will also cause headache when clamping a mouthpiece tightly between the teeth.

PHYSICAL CAUSES

Tight gear is another common cause of headache in inexperienced divers. Adjusting mask straps too tightly in the hope of avoiding mask leakage during the dive causes pressure right around the head, exactly like a very tight hat or glasses that are too small for the wearer. This pressure effect of the mask straps starts some minutes into the dive and gets worse the longer the dive. It is relieved by removing the mask after the dive and pain usually disappears rapidly. Wetsuit collars fitting too tightly around the neck is another cause of headache. Tight collars compress the veins that drain blood from the skull and brain and can cause retention of carbon dioxide in the brain. This can precipitate a typical carbon dioxide headache. If the collar is very tight, compression of the carotid sinuses in the carotid arteries in the neck can occur with a reflex drop in blood pressure and even sudden unconsciousness – the so-called carotid sinus reflex. Headaches can also occur with wetsuits, straps or buoyancy compensators that are too tight-fitting around the chest and restrict easy breathing. This again can cause carbon dioxide build-up and headache. Sinus squeeze causes headaches that are referred to the sinuses involved. Nasal and sinus allergy, polyps or infection can easily cause obstruction to the small openings between the sinuses and the nose. This makes it difficult or impossible for air to pass freely between the sinuses and nose and, with the increasing pressure of descent, Boyle's Law* operates and sinus barotrauma occurs.

The most common site of sinus squeeze is the forehead, relating to the frontal sinuses. Pain over one or both cheeks or even the upper teeth is referred from the maxillary sinuses. Pain in the eyeballs is due to ethmoid sinus squeeze, and pain at the back of the head on descent often relates to sphenoid sinus squeeze. The pain is usually relieved by ascent.

The reverse can also occur. Compressed air trapped in a sinus after a successful descent will cause headache on ascent. Management is obviously avoidance of diving in the presence of significant nasal obstruction and having allergy or infection treated. Neck problems related to previous motor vehicle accident whiplash injuries to the cervical spine, or other head or neck trauma, quite commonly result in headaches while diving. The pain is usually right at the back of the head and neck and can radiate to the forehead and shoulders. It is caused by the extended neck position that all divers have to adopt in order to see in front of them while swimming horizontally under water. It is equivalent to walking on land and looking up at the sky for up to an hour. Neck muscle spasm or compression of neck spinal nerves can occur. This causes headache. The diver may be totally painfree at all other times, the pain only occurring when assuming the abnormal neck position under water. It usually occurs in divers with a history of neck injury and it can last for minutes, hours or even days after diving. It is often helped by swimming forward with the body axis at a 30¡ angle to the sea bed. This allows the diver to see in front and progress forwards without excessive extension of the neck. However, divers assuming this position must remain vigilant to the environment around them: kicking may damage fragile marine organisms.

Some divers may choose to substitute ankle weights for some of the belt weights to help them in adopt this position underwater. Other divers may find them fatiguing, so make this choice with particular care. Cold causes a severe throbbing headache in cold-sensitive divers, occurring in the forehead or back of the head. It is very similar to the "brain-freeze" experienced when rapidly eating ice cream. This type if headache is variable: it can occur right away or some some minutes into the dive, usually gets worse the longer the dive, and persists for a while after leaving the water. This type of headache can be mitigated by wearing a hood, but not always. For frequent cold headaches, combine the hood with habituating the skin prior to immersion. Try wetting the face with progressively colder water before entry: this usually help eliminate cold-water headaches. Carbon dioxide build-up, in the whole body due to skip breathing or contamination of the air supply, or locally in the brain due to the congestive effect of a tight neoprene wetsuit collar, results in a headache that gradually develops during the dive as the amount of retained carbon dioxide slowly increases, or occurs almost immediately after surfacing and breathing atmospheric air with the resultant sudden decrease in blood carbon dioxide, one of the carbon dioxide "off effects." Some divers develop high CO2 in the blood even without these factors. Carbon dioxide headaches are severe and throbbing, are not always relieved by painkillers and can last for hours after the dive. Other gases responsible for headaches are carbon monoxide following air supply contamination, and CO2 toxicity following deep diving on oxygenenriched mixes or after using pure oxygen rebreathers.

Saltwater inhalation that occurs inadvertently during a sea dive can cause headaches. These headaches generally commence about half an hour after diving, are usually accompanied by body aches and pains and are worsened by exercise and exposure to cold. Acute neurological decompression illness usually occurs within minutes of surfacing. It is manifested by a headache following a long or deep dive with a heavy nitrogen or other inert gas load, or it may be due to arterial gas embolism following lung barotrauma. Headache is an extremely serious symptom when it's due to inert gas overload. It is usually accompanied by other manifestations of central nervous system bubble injury such as weakness or paralysis, confusion and abnormalities of sensation. For treatment, immediate surface mask oxygen, urgent contact and discussion with a diving doctor, and emergency recompression therapy are absolutely essential. Looking into the sun or glare on the water for prolonged periods during a diving cruise can cause headache due to spasm of the scalp and forehead muscles. The solution is obviously to wear dark glasses, preferably with polarized lenses, when exposed to prolonged glare.

All of the above causes of headache in divers can precipitate an underwater migraine, a potentially dangerous event. This type of headache, whether contracted above or below the waterline, can cause nausea and vomiting. Some people experience neurological abnormalities in association with a migraine, such as partial blindness, weakness and numbness. A blindingly painful headache can result in confusion, inability to react to the challenges of the underwater milieu, vertigo and vomiting through a regulator. Individuals with frequent migraine headaches should not dive, especially if there are accompanying neurological manifestations. Migraine is sometimes precipitated by diving. Furthermore, severe headache after a dive, especially associated with neurological symptoms, may be impossible to distinguish from acute cerebral decompression illness including arterial gas embolism. Should a migraine sufferer with headaches of this type insist on diving, trio or double buddy pair teams may be helpful to ensure that a diver totally incapable of saving his or her life if a migraine hits can safely be returned to the surface and professional help. The best advice, however, is to avoid diving. Headaches remain a problem in divers. The causes are manifold, and proof of the exact cause can be difficult to determine. In many cases, the exact cause is never clearly determined. If you are an underwater headache sufferer, consider the above causes clearly and honestly. If the reason for your pain is still a mystery, consult a diving doctor or request an opinion from a neurologist – there are many less common causes for headache and you could fit the bill. Enjoy diving, and do it with care.

**Boyle's law states that at a constant temperature and mass, the volume of a gas is inversely proportional to the pressure exerted on that gas. This means that when the pressure is doubled – as in descending in the water column – the volume is reduced to one half of its original amount.*