

DIVING AND EPILEPSY

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Although the vast majority of dive medical experts would agree that people with a history of epilepsy should never dive, it is reality that some do. In a recent postal survey of scuba divers in Australia, of the 346 divers who returned the questionnaire, two admitted to having a past history of epilepsy¹. The main concern with diving is that if a seizure occurs whilst underwater, it is highly likely to be fatal through loss of consciousness and death by drowning.

For a real incident involving a diver with a history of epilepsy, refer to the Incident Insights case study.

What is epilepsy?

Epilepsy is a common neurological disorder affecting about 1%-2% of the population^{2,5}. This disorder is characterised by recurrent, spontaneous, stereotyped seizures. Seizures may present in many forms but are always due to bursts of abnormal electrical activity in the brain². The various “forms” include episodes in which the patient appears transiently distracted, distant or disoriented; episodes in which one limb may exhibit abnormal uncontrollable movements; and episodes in which the patient becomes unconscious and exhibits a dramatic “tonic – clonic” seizure (a short period of rigidity followed by violent jerking of the limbs and trunk). There is potential for a high degree of variability between patients in terms of the form, frequency, and severity of seizures. Significantly, some patients have little or no warning of an impending epileptic seizure.

What causes epilepsy?

Epilepsy has a variety of causes, and the specific underlying lesion in any one epileptic is unknown. The problem is often explained as an imbalance in chemicals responsible for transmission of nerve impulses within the brain, and while this suffices for discussions such as this one, it is almost certainly too simplistic. About 70% of people develop epilepsy not knowing why; in other words, there is no obvious cause. This type of epilepsy often arises in childhood.

For the remaining 30% the start of the problem can be related to such events as birth injuries, severe head trauma, meningitis, encephalitis, degenerative/vascular dementias, stroke, hormonal changes, or tumours². Brain tumours are perhaps the commonest cause for a first epileptic seizure in adults and that is why it is critical that any such event occurring in an adult for the first time must be investigated promptly.

Patterns of epilepsy are highly variable with some patients suffering frequent seizures that are refractory to medical treatment, whilst some never have seizures provided their medication is taken regularly. Still others may have one or two seizures, but then never have another again. This is particularly true of those patients whose epilepsy can be linked to a particular event such as head trauma.

Seizures can be triggered by a variety of stimuli such as stress, certain visual stimuli (such as flashing lights), some drugs, fever, changes in blood chemistry, anxiety, sleep deprivation or alcohol. It is true to say that everyone has a seizure stimulus threshold which, if exceeded, will result in a seizure. People designated as epileptic have a lower threshold, and so have seizures more often.

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Most “normal” people have a high threshold and so will probably never have one. Susceptibility changes through life, even in normal people. Thus, high fevers can produce seizures in otherwise normal infants who do not subsequently go on to be “epileptic”. In contrast, adults seem less vulnerable to the effect of fever.

What are the risks in scuba diving?

There are several risks to be considered:

Firstly, seizures may result in unconsciousness. Unconsciousness underwater is likely to lead to the regulator falling out of the diver’s mouth, water entering the lungs and drowning. Experience has shown that seizures occurring underwater are frequently fatal.

Secondly, compounding this is the fact that rescue of the unconscious diver to the surface risks pulmonary barotrauma or gas embolism as any gas trapped in the lungs expands.

A third consideration is the nature of the drugs used to control epilepsy, some of which are sedative to some degree and might thus exacerbate nitrogen narcosis or cause its onset at an unexpectedly shallow depth³.

Finally, diving itself exposes the participant to several stimuli which may increase the risk of an epileptic seizure. These include unusual sensory stimuli associated with “weightlessness” and inversion, stress and anxiety, increased carbon dioxide partial pressures, and increased oxygen partial pressures. Although there has been some recent debate over whether the mechanism of oxygen toxicity is relevant to the epileptic patient, these potentially “epileptogenic” aspects of diving remain a significant concern.

What does the ‘UK Sport Diving Medical Committee’ say³?

The British Sub Aqua Club (BSAC) follows the recommendations of the UKSDMC. The UKSMC acknowledges that an epileptic attack occurring underwater while using conventional scuba equipment is usually a fatal event and therefore states that it is imperative that no epileptic should dive if there is any serious possibility of an attack occurring underwater.

In recognition of the sedative effects of medications used to control epilepsy the UKSDMC state it is not considered safe for any epileptic to dive if he/she is currently taking any anti-epileptic medication.

The relapse rate in epileptics who are taken off medication decreases exponentially, with the majority of those relapsing doing so within the first eighteen months of ceasing treatment and the rate of relapse becoming insignificant after three years. The UKSDMC suggested requirements for an epileptic to be permitted to dive are therefore set at five years free from fits and off medication. Where the fits were exclusively nocturnal, this can be reduced to three years.

A past history of petit mal (one of the less dramatic forms of epilepsy described earlier) should not disqualify, provided that no attacks have occurred for five years and that the condition has not progressed to epilepsy. Seizures associated with fever in childhood may be disregarded if not followed by epilepsy.

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What does 'Divers Alert Network' say⁴?

DAN reiterates the view that most diving physicians are of the opinion that unless previous seizures or episodes of unconsciousness were due to: (1) fainting (which is sometimes followed by a brief period of seizure activity) due to remaining upright in the presence of low blood flow to the brain; (2) other causes of acute low blood pressure, low blood sugar, medication or recreational drugs; or (3) fever, but not after the age of 5, they would not feel confident about advising a person with a confirmed diagnosis of epilepsy that it would be safe to dive.

Like the UKSDMC, DAN recognises that individuals who have been free of seizures without medication for 5 years are unlikely to have further seizures. However, DAN also recognises that the probability of another convulsion is still greater than in the rest of the "normal" diving population. Thus, DAN avoids endorsing diving by epileptics, even after a seizure free period of 5 years. Moreover, although DAN suggests that the diver must ultimately decide, they note that most diving physicians are very reticent to encourage an individual with a known risk factor to accept an elevated or unquantified risk, for which the adverse outcome is likely to be fatal.

Local attitudes

Despite a palpable liberalisation in attitudes to diving by selected patients with other significant diseases such as asthma, the diving medicine community in New Zealand and Australia has maintained a very conservative approach to the issue of diving by epileptics. Most diving physicians would not endorse a diving candidate with a history of epilepsy, even after a seizure free period of 5 years on no medication. Most would take the attitude that diving is not a necessity and that there are alternative adventure activities that the "epileptic" can undertake whilst putting themselves (and others) at less risk.

Most long-term epileptics accept this, and it is unusual (though not unknown!) for them to present for diving medicals. However, by far the biggest related problem in the experience of the authors, are candidates who have had a serious head injury, and who may or may not have suffered a seizure at the time but are subsequently seizure free with no medication. In these cases there is a more liberal view but approvals to dive are only given after at least several years, and after careful investigation and discussion with any neurologists who were involved in the case. In other words, such cases are decided on their own merits.

What about other activities?

Although there are rare cases of exercise induced seizures, studies have shown that exercise can reduce seizure frequency as well as lead to improved cardiovascular and psychological health. The majority of sports are therefore considered safe for epileptics to participate in provided certain precautions are taken. Although contact sports, including football, hockey and soccer, have not been shown to induce seizures, the risks and benefits of participation must be carefully considered. Water sports like swimming are considered safe if seizures are well controlled and direct supervision is present. Additional care must be taken with activities involving heights, such as gymnastics, harnessed rock climbing and horse riding. Like scuba diving, activities such as hang-gliding, or free rock climbing are not recommended given the risk of injury or death if a seizure were to occur during the activity⁵.

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Summary:

- The Recreational Scuba Training Council (RSTC) Divers Medical Questionnaire asks: “Have you ever had or do you currently have epilepsy, seizures, convulsions, or take medications to prevent them?” Anyone answering “yes” to this question should consult with a physician. The physician consulted, should be a doctor who has undergone additional training in diving medicine.
- Most diving physicians would not feel confident about advising a person with a confirmed diagnosis of epilepsy that it would be safe to dive.
- The UKSDMC suggested requirements for an epileptic to be permitted to dive is five years free from fits and off medication. This can be reduced to three years where the fits were exclusively nocturnal. This policy is not universally recognised, particularly in Australasia.
- There are many other activities that are more suitable for a person who has a history of epilepsy.

References:

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