

# Sudden hearing loss after a trimix dive

November 2015, Italy. Gabriel\*\*, an experienced Spanish diving instructor in his forties, traveled to Italy with his friends by car. He is enjoying his first dive of the day using a closed-circuit rebreather. He is on trimix (oxygen, helium and nitrogen) and wears a Petrel dive computer.

By the end of his dive, he clocks up a total bottom time of 95 minutes at a depth of 40 meters (with 45 meters at maximum). His dive was uneventful but during his ascent he felt a muffled sensation in his right ear which did not disappear right away. This was not the first time he experienced something similar - so he didn't worry too much about it. He assumed the sensation will clear up during the forthcoming hours, as it always has. However, thirty hours go by – without any improvement. Unfortunately, Gabriel felt worse.

Two days later, he realised he can't hear anything from his right ear after trying to use his mobile phone. He started to get worried and also experienced some postural vertigo. Gabriel felt miserable and wanted to go home. He decided to return to Spain the following day and seek medical treatment there.

Back in Spain, Gabriel stopped at the ER of a hospital. The doctors there believe it is an ear barotrauma and recommend some ibuprofen. Being an experienced diver and instructor, Gabriel tried to explain he believes it is not a "common" ear barotrauma. Unfortunately, the doctors simply recommended for him to come back the following day for a more detailed ENT check. At that point it was already late in the evening. What is he supposed to do? So he returned home.

The next morning, Gabriel decided to get a second opinion from doctors specialized in diving-related illnesses and hyperbaric treatment at another hospital. He was not at all surprised when he received a new diagnosis: sudden deafness. The doctor explained the sudden deafness in a diver is not a sequel of decompression sickness but the result of a problem with the stato-acoustic sensorineural nerve that causes a sudden loss of hearing. It's not necessarily a dive-related condition. Anybody, even non-divers, can get it. But due to the pressure changes, it can happen to divers, too.

The hyperbaric doctor prescribes him 20 sessions of hyperbaric oxygen treatment (HBOT). He also explains that it cannot be treated with classic ENT treatments but sometimes improves or even recovers completely with hyperbaric oxygen therapy. Improvement will never happen only after one HBOT session but good results have been produced by proceeding with the treatment for 3 weeks. Sometimes there is sudden restitution towards the mid or the end of the treatment period. So they start Gabriel on the HBOT.

## What is sudden deafness?

In sudden sensorineural hearing loss or sudden deafness the stato-acoustic sensorineural nerve is affected for some unexplained reason and causes rapid loss of hearing—usually in one ear—either at once or over several days. If it occurs, it is of paramount importance for patients to see a doctor immediately. Delaying diagnosis and treatment may decrease the effectiveness of

treatment outcome. People often notice the hearing loss when they try to use the deafened ear, for example, when they use a phone. Dizziness and/or ringing in the ears (tinnitus) can be accompanying symptoms. Typically adults in their 40s and 50s are affected. About 50% of the cases recover their hearing spontaneously usually within 1 to 2 weeks. 85% of patients receiving treatment recover some of their hearing. In about 15% of the cases the cause can be identified as an infectious disease, head injury or brain trauma, an autoimmune disease, drugs that harm the sensory cells in the inner ear, blood circulation problems, a tumor on the nerve that connects the ear to the brain, neurologic disorders like multiple sclerosis, or disorders of the inner ear.

The condition means complete and permanent hearing loss and therefore impairment for the majority of activities in life. Although it is a rare problem, it has been known in the diving field for many years. As mentioned earlier, it's not a condition specifically in divers. Anybody, even non-divers, can get it. However, in divers it may be triggered by pressure changes whereas in non-divers the trigger factor can be something else (see mentioned above).

### **How to treat sudden deafness?**

A proven and promising treatment is hyperbaric oxygen treatment (HBOT). Another common treatment in the non-diving world is with corticosteroids. They reduce inflammation, decrease swelling and help the body to fight illness. Steroids can be taken orally or can be directly injected behind the eardrum into the middle ear (intratympanic corticosteroid therapy). Additional treatment may be needed if an actual underlying cause is discovered. Infections, drug allergies or autoimmune disorders can cause the immune system to attack the inner ear. Antibiotics, immune system suppressiva or other drug treatments may help.

### **How is sudden deafness diagnosed?**

A hearing test called pure tone audiometry is the method of choice. It helps to determine whether the hearing loss is caused by sound not reaching the inner ear because something obstructs the way, or by a sensorineural deficit, meaning that the ear cannot process the sound. The diagnosis is positive if the test shows a loss of at least 30 decibels in three connected frequencies.

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When in doubt, remember that the DAN Europe medical team is always at your disposal to give medical advice via its 24/7 emergency hotline. Just reach out for help. As an active member, always keep DAN emergency numbers close to you.

Unfortunately, we heard from Gabriel that, despite the HBOT treatment, his hearing hasn't returned yet. We wish him the best and hope his hearing will eventually recover.

\*\* name changed by the editors