Diary on a Case of Inner Ear Barotrauma

August 31

Finally, time to depart! Two days of diving activities in Croatia await me. Our group is composed of three Open Water divers (one of whom with over 200 dives), and three Advanced Open Water divers (myself, my husband and one expert diver). The dives that we planned with the diving centre are simple and always within the safety curve (with max depth of 30 meters for us Advanced Open Water divers).

Before diving in Bumbište, we depart by boat together with other divers and guides.

It's a sunny day and the mild temperature lends to a nice dive. At our established signal, I dive in together with my other diving friends. The hood of my wetsuit is tight and it bothers me a bit, and so I decide to stretch it to let in some water. I know how I am, I've been on over sixty dives; I know that I need to start equalising immediately, within the first few metres, because my right ear is "difficult." The other divers descend without problems, but I'm not rushing, I prefer to do things calmly. I equalise in continuation, but I need to descend slowly. My husband slows down his descent too, and waits for my OK sign. I continue to have difficulty equalising until, after a while, I feel that I've correctly equalised. I feel no particular pain and I'm calm… and then they've always told me that when a problem is serious the pain is too. In this moment however, I don't feel anything except a slight discomfort.

I surface with my right ear full of water and things sound muffled and far away. I have a nosebleed, but it only lasts for the time it takes me to get back onto the boat. "It'll all pass by this afternoon, " I tell myself, "or within the next few days." On board I feel a little dizzy, but then it passes immediately.

In the afternoon, after spending adequate amount time on land, we go to Jarbol for another amazing dive. Unfortunately, all the symptoms from that morning recur in the same way during and after the dive, with a lot of dizziness and bleeding from my nose.

The feeling of having my right ear full of water is so strong that by now I can't hear from it at all. On the other hand, I'm still convinced that it can't be something serious because if it were it would hurt… Or not?

September 1

This is the day of the most anticipated dive: the one to the caves in front of the diving centre. With my hearing giving no signs of returning to normal, I dive in and realise that now I'm able to equalise better and faster than the previous day, or at least it seems that way. Only once inside the cave do I feel the need to equalise and I feel a discomfort, but it gets better once I resurface. I get out of the water without any problems, and I don't think even remotely that I've suffered any related physical damage.

September 2

It's Monday, and we've returned from the weekend away, but my hearing loss doesn't show signs of improving. At this point, my husband thinks it best to call DAN for a consultation, only for precautionary measures. With their usual courtesy and professionalism, the operators put me in contact with DAN's medical division, who strongly recommends that I have a visit to an ENT specialist as soon as possible.

September 4

As DAN suggested, I go to the health center in Trieste. After various tests, including audiometry and tympanometry examinations, it is found that I have a severe loss of hearing in my right ear caused by the

dive. What I'm worried about isn't only the test results, but also the fact that no one attempts to predict a recovery in my hearing. The doctors consult each other, and in the end I am asked to return the next day to officially diagnose the problem. They recommend that I remain on one side as much as possible to avoid rupturing the components of my inner ear, like the oval window and the cochlea.

September 5

More audiometry and tympanometry tests, another medical consultation, and finally, the verdict: the barotrauma from the dive caused damage to my inner ear, and the loss of hearing is severe. The possibility of recovery: unknown. Obviously, I can no longer hear anything, not even the dial tone of a phone up to my ear. I am prescribed cortisone steroids, and sent to the diving and hyperbaric medical centre.

I am confused, lost and incredulous, but when I enter the diving medical centre I almost feel at home; photos of fish line the walls, I see "thank you" letters from diving clubs, dive maps, and crests from various organisations and diving clubs. Dr. Rinaldi, the dive medicine doctor, is fantastic just like all the personnel… and there's even a DAN sticker! I feel right at home. I start the hypbebaric treatment with a renewed hope.

I send all the medical documentation to DAN who, almost instantly, affirms to the validity of the medical protocol prescribed to me at Trieste. In that moment, any response is so important, and the specialists at DAN don't let me feel abandoned.

From there begins a hopeful course, fortunately one of exciting progress. After three days of hyperbaric and medical treatment, the sound of the telephone – far away, remote, surrounded by the absolute silence around me – starts to make its way through to my injured ear. A sound that, after a cycle of hyperbaric treatment (8 sessions), is very loud and clear… I can even hear some words while speaking on the phone! It's a blaze of happiness, a joy that makes me dizzy… I'm responding well to the treatment, and maybe I won't remain completely hearing-impaired after all. I have never so strongly desired to hear the hum of a dial tone.

With far from a little trepidation, I undergo another audiometry test – 335 decibels recuperated of the 460 lost since the last audiometry examination. When the results are positive, everything is simpler, and the body probably responds well to that too. I go through a second round of hyperbaric treatment with great, immense hope… to be able to hear the sounds of the world like before the accident.

The more that time passes, the greater the relief knowing that I am only getting better; with the effects of tinnitus fading and sounds becoming more defined, sharp and distinct.

October 4

A month has passed since the first visit when I was diagnosed with severe hearing impairment. After the sixteen sessions of hyperbaric treatment, the audiometry test is liberating: 435 decibels recuperated of the 460 lost. I consider myself a diver, rather, by now, an ex-diver, who is very, very lucky. I still have light tinnitus, but I'm confident that one fine day it will go away completely.

Yet it isn't just good luck; luck just helps. Since the very first dive I was always signed up for DAN medical insurance, convinced that, even when planning every minimal detail of every dive, that there is always a small measure of risk that makes it necessary to have timely and competant assistance and medical help from the DAN organization. Probably the majority of divers won't ever be in need, but for those who find themselves in an emergency situation, to be able to count on an institution of specialists and professionals

is so important. In my case DAN had a decisive role in advising an immediate ENT visit, and in confirming that the treatment I received conformed to the most up-to-date guidelines.

For this reason I really wanted to share my accident: to caution all my diver friends about the kind of problems I had to face. Ear barotrauma, especially in the inner ear, is a risk that's given little consideration; by instructors and divers in general, from any training organisation. During all our courses we were always made aware of Decompression Sickness, Nitrogren Narcosis, the rupturing of the ear drum due to incorrect equalisation, latent micro-bubbles, and even oxygen toxicity in far depths, but never of the possibility of Barotrauma onset, outside of Decompression Sickness, generated by a normal (not forced) equalisation, or perhaps resulting from an overly tight wetsuit hood. I hope that my experience can serve to prevent this silent but dangerous injury.

Comments from the Expert

This is a very clear case of inner ear barotrauma, probably caused by an inner ear injury, most likely affecting the oval window, or directly the cochlea. It's interesting to highlight the known and frequent difficulty in equalisation reported by Mrs. Bolzan, who also incorrectly believes that such difficulty should also always be painful. "If there is no pain, the problem isn't serious!" This isn't the case; the sole difficulty in equalisation can itself cause a pressure imbalance between the middle and the inner ear, which, even in the absence of significant pain, can cause damage. More than ever, it is worthwhile to insist upon the fact that a difficulty in equalising should be considered an alarm sign, and that forcing equalisation is not safe.

Regarding Mrs. Bolzan's statement, who now calls herself an "ex-diver", I don't think she should be so pessimistic: the treatment was, in actual fact, successful, with full recovery and minimum residual effects. I would suggest to try to identify and correct the problems underlying her equalisation difficulty.

Lesson learnt: forcing equalisation on the first dive, and then go again for a repetitive, regardless of clear symptoms of ear discomfort and loss of hearing, is not a good idea.

Having learnt this lesson, I don't see why she should consider herself an ex-diver.

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