

ALTERNOBARIC FACIAL PALSY FOLLOWING AN
UNEVENTFUL DIVE

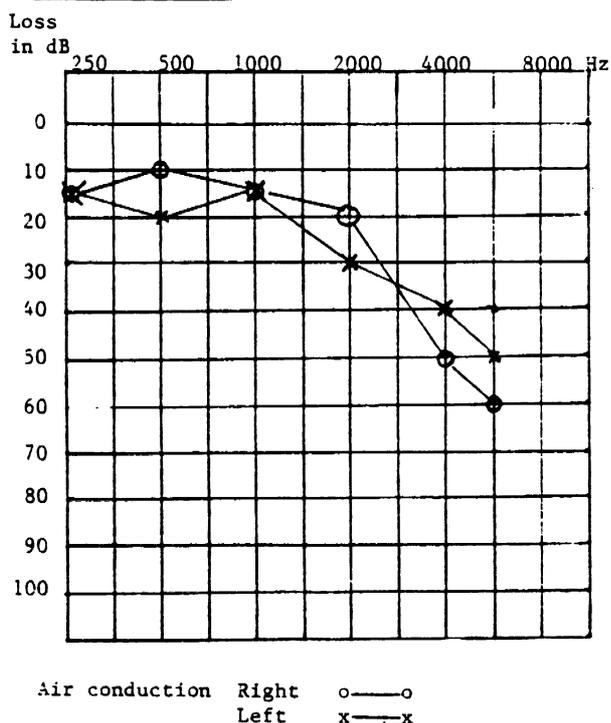
From the STICKYBEAK Non-Fatal Incidents File

A healthy 58 year old man suffered acute right ear pain and right facial palsy shortly after surfacing from a pleasant hookah dive at 43 feet for 75 minutes on an offshore wreck. Ischaemia of the facial nerve as it traverses the middle ear is suggested as cause. Resolution of the paresis may have been accelerated by hyperbaric oxygen therapy, which definitely relieved the severe ear pain. He was free from apparent symptoms on discharge from hospital the next day, though still presenting bilateral drum changes and post nasal drainage of blood stained exudate. Follow-up has revealed no residual hearing deficit, though decreased lacrimation of the right eye, thought to be permanent, troubles him.

Case Report

The victim was a 58 year old man, of good health history, who had received numerous physical checkouts before undertaking diving "to ensure safety". He attended an ENT specialist regularly and was known to have some bilateral loss of higher frequency appreciation (Figure 1). He had received certification in basic scuba diving about 8 months before the incident, though he had been diving for 18 months prior to this. It had been noted that he tended to be "air hungry" as a pupil. In the past he had encountered considerable difficulty in clearing his ears, and usually would find a small amount of blood in his mask after diving. He accepted this as a small price to pay for the pleasure of diving. He made it a habit to descend slowly and equalise carefully, ascending a short distance when he could not clear his ears immediately.

FIGURE 1.
AUDIOGRAM 14.3.80.



The dive site, a wreck, was about 2 miles offshore. There were three divers, one using scuba and two others by 20 feet hoses from a common twin-tank fed single hose. Dive bottom time was about 75 minutes, depth never greater than 43 feet, a safe non-decompression schedule. Although the water was cold at first, this was soon forgotten by the divers.

The dive was enjoyable, the victim feeling totally relaxed and at ease. On one occasion he yawned and allowed a small quantity of water into his regulator, but this was swallowed without any adverse symptoms resulting. The dive was terminated when the buddy noticed that the air supply was a little restricted, though the victim himself noticed no change. Ascent was slow, though the buddy made an accelerated ascent for the last 20 feet after inhaling a little water.

Immediately after surfacing, the victim felt a sharp, severe pain in his right ear, which became persistent and almost intolerable as he climbed back into his inflatable (Table 1). He then began to notice a strange sensation over the top of his left eye, a "prickly, numb feeling" of the forehead above the eyebrow. He mentioned this unpleasant feeling to his companions, who wondered whether his hood had folded over itself and caused a local restriction of the circulation. He doubted this as his left eye now felt heavy, as if it wanted to close itself. He also noticed a similar numbness at the base of his tongue on the right side, "like the feeling of a local anaesthetic received at the dentist", and he could barely control his bottom set of false teeth.

About five minutes later he noticed that his right eye could not be closed, although his left eye was now back to normal. The piercing earache continued and his tongue was still numb. They all discussed the problem and felt it was something to do with sinus pain or a middle ear problem. It took them 25 minutes to reach the shore, where the pain was so bad that he only wanted to get home.

He walked to his car and then realised that the entire right side of his face was paralysed and the right side of his mouth was drooping. He collected his diving gear from the boat and informed some friends who had just arrived that he intended to go home. During his journey he felt increasingly queasy and he was afraid that he would become violently ill while driving, although there was no dizziness. He therefore stopped at a relative's home and started to phone around for advice. By the time he had contacted a "diving doctor" and discussed his symptoms, he noticed that he was now able to close his right eye. It was decided that there had probably been middle ear damage and he was advised to attend the nearest hospital for several hours of oxygen therapy. It was now 70 minutes after the onset of symptoms. However, at this time, a diving instructor, one of those persons he had tried earlier to contact, phoned back. After a general discussion it was decided that he should go straight to the nearest large hospital, where hyperbaric facilities were available if required, driven by a friend.

TABLE 1

<u>PLACE AND TIME</u>	<u>NUMBNESS/ PARALYSIS</u>	<u>EAR PAIN</u>	<u>DEAFNESS</u>	<u>TINNITUS</u>	<u>NAUSEA</u>	<u>DIZZINESS</u>
Immediately after surfacing	Nil	Severe (right ear)	Nil	Nil	Nil	Nil
In boat, within minutes of surfacing	Numbness felt over top of left eye, above eyebrow	Increasing	Nil	Nil	Mild	Nil
In boat, minutes later	Base of tongue on right side, numb. Left eye wanted to close itself	Severe	Nil	Nil	Increasing	Nil
In boat, 5 minutes after surfacing	Right eye could not be closed; Left eye back to normal. Tongue still numb.	Severe	Nil	Nil	Increasing	Nil
On shore, about 30 minutes after surfacing	"Entire right side of face" paralysed. Right side of mouth drooping	Severe	Nil	Nil	Increasing	Nil
Driving home in car	Numbness decreasing	Severe	Nil	Nil	Near - Vomiting	Nil
Talking on telephone	Numbness decreasing	Severe	Nil	Nil	Increasing	Nil
At hospital before recompression	Paralysis subsided	Severe	Nil	Nil	Nil	Nil
During recompression and later	Nil	Nil, after 10 minutes.	Mild	Nil	Nil	Nil

In the hospital's ICU he was given Valium and placed in their mono-place hyperbaric chamber for oxygen therapy. He was taken to 30 psi gauge on oxygen, at which pressure all remaining symptoms disappeared. After 30 minutes at this Pressure he was slowly decompressed over the next 30 minutes. When he "surfaced", he noticed some right ear deafness but the ear pain had cleared. He was allowed to return home the next morning, residual deafness apparently being slight. The Hospital's Clinical Summary makes no comment concerning the appearance of the ear drums and the case was diagnosed as being decompression sickness.

Inspection on the second day revealed grade II (R) and grade I (L) ear barotrauma. Audiograms (figure 2) showed high tone loss, but this was a pre-existing condition. ENT specialist check on day 6 reported right haemotympanium, some blood-stained exudate in the left middle ear, and drainage of some of these exudates in the form of a dark, blood stained post-nasal discharge. It was not thought necessary, then or later, to perform either a paracentesis or insert ventilation tubes. His hearing has returned to pre-incident levels (figure 3).

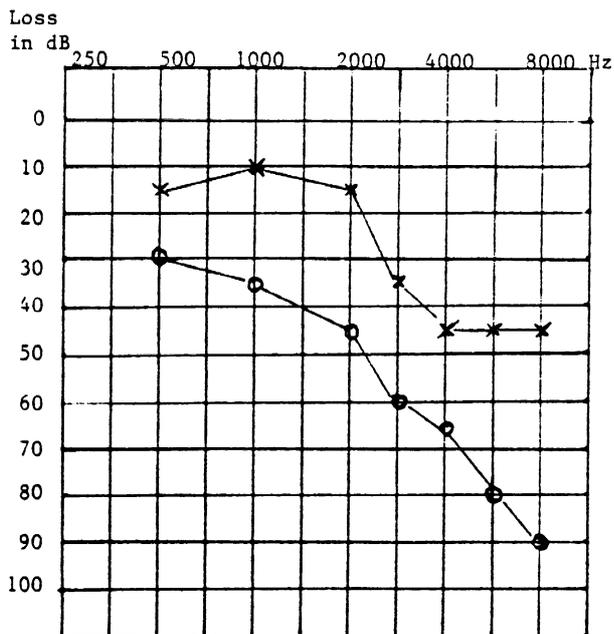
Since this incident the victim has performed two problem free scuba dives, both in less than 30 feet of water and the second for about 90 minutes. However, he has been troubled by

dryness and soreness of his right eye of a progressive intrusiveness. This ultimately forced him to obtain specialist ophthalmic advice. He was informed that the lacrimal gland was not functioning and that artificial lubrication (drops) would be required for an indefinite period. Although coincidence of an unrelated factor cannot be excluded, the condition may well be a consequence of damage to the facial nerve in the middle ear.

DISCUSSION

The history suggests that this man was one of the large group of divers who have equalisation problems with their para-nasal cavities. Such difficulties he minimised with careful attention to descent equalisation. It is possible that on this occasion the cold water, combined with some minor reaction in the post-nasal space from the small amount of water unexpectedly swallowed, disturbed a precarious balance of factors controlling middle ear ventilation. He had no warning symptoms of equalisation failure on either descent or ascent, which was unusual for him and no stress on ascent. This makes the sudden onset of bilateral middle ear barotrauma unlikely to be due to gross errors by the victim and more likely to reflect the existence of some significant anatomical variation from the average. The left-sided forehead symptoms may indicate frontal sinus dysbarism alone, but there is the possibility that the left facial nerve was malfunctioning.

FIGURE 2.
AUDIOGRAM 13.10.80



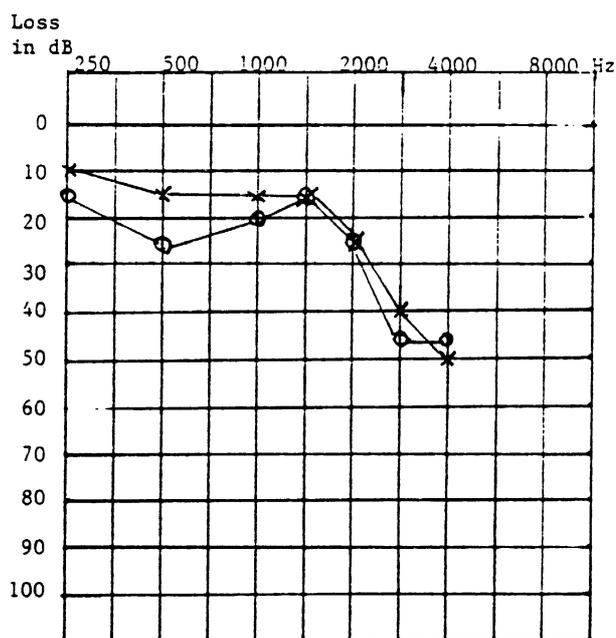
Air conduction Right o o
Left x x

The right-sided facial palsy is of the same nature as the cases described by Molvaer and others.¹

In his paper he described the occurrence of dehiscence of the facial canal towards the middle ear, a condition said to have an incidence between 5 and 57%. The transient nature of the symptoms in this and other cases makes it unethical to test the hypothesis by surgical exploration and the fact that exposures to pressure changes are common but symptoms rarely point to the complex changes of events necessary before compression of the nerve occurs. The dysfunction of the lacrimal gland can reasonably be explained by damage to the branch of this gland from the facial nerve. It cannot now be determined whether this damage occurred at the time of the paralysis or was a secondary effect through some resultant damage to the vascular supply of the branch to the gland. It is known that this dive, to 43 feet, was the deepest dive he had made.

The diagnosis of middle ear barotrauma made by every diving orientated person involved in the case, was confirmed clinically. The use of oxygen was apparently beneficial, although the symptoms were resolving before this was initiated. Whether the use of hyperbaric oxygen was theoretically correct or not may be debatable, but it appeared to result in rapid and lasting resolution of the severe right sided ear pain. The use of a clinical diagnostic label of "decompression sickness" may indicate the need for any facility having a hyperbaric chamber to be better aware of the basic diving problems which may unexpectedly come into their care. The differential diagnosis of barotrauma and decompression sickness affecting the ear has been well described.^{2,3,4}

FIGURE 3.
AUDIOGRAM 31.10.80



Air conduction Right o o
Left x x

References

1. Molvaer OI. Alternobaric facial palsy. *Medicine Aeronautique et Spatiale, Medecine Subaquatique et Hyperbare*. 1979; Tome XVIII (71): 249-250.
2. Farmer JC. Inner ear injuries in Diving Differential Diagnosis of Inner Ear Decompression Sickness and Inner Ear Barotrauma. Paper presented at 7th Symposium in Underwater Physiology, Athens, 1980 (reprinted *SPUMS Jnl*. 1981; 11(1)).
3. Edmonds et al. *Otological Aspects of Diving*. 1973, Australian Publishing Co.
4. Edmonds et al. *Diving and subaquatic Medicine*. Sydney, Diving Medical Centre.

INNER EAR INJURIES IN DIVING
DIFFERENTIAL DIAGNOSIS OF INNER EAR
DECOMPRESSION SICKNESS AND
INNER EAR BAROTRAUMA

JC Farmer, Jr.
Duke University Medical Center

Persistent inner ear injuries in diving have been noted more frequently over the past decade and have been described in several publications. These injuries have been classified as follows:

1. Inner ear barotrauma and labyrinthine window rupture.
2. Inner ear injuries occurring at stable deep depths.
3. Inner ear decompression sickness or air emboli.
4. Sensori-neural deafness in relation to high background noise during diving conditions.