

probably had numerous minor bends, and ignored them before his accident. His temporary unfitness to dive, with multiple chest infections, raises the question of how long divers should be banned from scuba use after a chest infection. He was given questionable medical clearance to dive. The tardy transport to a recompression facility delayed recompression. What was the diagnosis? Was it CAGE or was it rapid onset decompression sickness?

POSTSCRIPT

This case stimulated discussion and consultation with the emergence of a rapid evacuation network for diving accident victims in the far North of New Zealand.

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A CASE OF ALTERNOBARIC VERTIGO

John Knight

Alternobaric vertigo, which was first described by Lundgren in 1965, is usually noticed on ascent.¹ Lundgren was interested in the condition as he had suffered "sudden rotational vertigo during ascent from diving as well as in the hyperbaric chamber." His paper was based on the replies to a questionnaire about vertigo sent to 550 members of the Swedish Association of Sports Divers. He received 354 answers of which 92 (26 per cent) had experienced vertigo during scuba diving or when breath-hold diving which could not be explained as due to some known cause.

26 divers had suffered vertigo due to such causes as caloric stimulation, decompression sickness, seasickness, sensory deprivation, food poisoning, over-distention of the gut with air, exertion, hypoxia or hyperventilation and were excluded from the study. In this condition one middle ear pressure is higher than the other. This results in the labyrinth on that side being exposed to a higher pressure, transmitted through the round window, than the other and the result is a mismatch of messages from the two labyrinths and this is misinterpreted by the brain as a rotatory movement. The usual cause is failure of one Eustachian tube to function, so retaining air in the middle ear. Eventually, the pressure in the affected side is sufficient to open the Eustachian tube and air blows out. This equalises the two middle ear pressures and all is well again. Failure to equalise one ear completely during descent is the basic cause. The result of a failure to equalise is at least some degree of swelling of the lining of the middle ear. If this swelling is sufficient to obstruct the Eustachian tube the scene is set. Edmonds classifies alternobaric vertigo as a middle ear barotrauma of ascent in most cases but it can be due to unequal vestibular responses.² Edmonds' classification is given in Table 1.

I wish to present a case of alternobaric vertigo which not only did not commence on ascent but also continued long after the dive was over and recurred with every dive.

TABLE 1

VERTIGO IN DIVING

Due to unequal vestibular stimulation

1. Caloric
 - 1.1 Unilateral external auditory canal obstruction
 - 1.1.1 Cerumen
 - 1.1.2 Otitis Externa
 - 1.1.3 Miscellaneous
 - 1.2 Tympanic membrane perforation
 - 1.2.1 Shock wave
 - 1.2.2 Middle ear barotrauma of descent
 - 1.2.3 Forceful auto inflation
2. Barotrauma
 - 2.1 External ear barotrauma of descent
 - 2.2 Middle ear barotrauma of descent
 - 2.3 Middle ear barotrauma of ascent
 - 2.4 Forceful auto inflation

3. Inner ear barotrauma
 - 3.1 Fistula of inner ear window
4. Decompression sickness
5. Miscellaneous

Due to unequal vestibular response

1. Caloric
2. Barotrauma
3. Abnormal gas pressures
4. Sensory deprivation

The diver is a man in his 30s who has been snorkelling for 16 years and diving for 8 years. For the first seven years of his snorkelling he was quite unable to equalise his ears, which limited the depth he could dive to when spearfishing. Nine years ago he was spearfishing in a competition and was not doing as well as those who went deeper. So he went down and this time was able to equalise. However, it could not have been proper equalisation, as he was completely deaf in one ear for two weeks! Having learnt to equalise he learnt to scuba dive and had no problems with his ears until 1985.

His work involves many snorkel dives and two shallow tank dives every day that the weather is suitable. He has done this for a few years. However, in about April 1985, he started to develop vertigo and nausea after about half an hour of snorkel dives. At first this did not occur after every occasion but it soon became a regular event. As his livelihood depends on his diving he continued to work. Although he had vertigo with snorkel diving he did not have any when using scuba. After about 6 months his vertigo came on after ten minutes with the snorkel. At this time he decided to take a holiday and was out of the water for some three weeks. During this holiday he went for a trip in a boat and was seasick for the first time in his life.

When he went back to work he used scuba in an attempt to avoid developing vertigo but it started half way through the second tank. He did not let the vertigo stop his dive. He was usually in 10 to 15 feet of water when using scuba. Over the next three days he discovered that the vertigo was related to the size of the swell and that working deeper put off the onset. On the fifth day (Thursday) he consulted me. This time the vertigo had not settled soon after he got out of the water. It had lasted the night through and was still present in the morning. When I saw him it was possible to induce vertigo, but not nystagmus, by putting his head back although he had been out of the water for 24 hours. He said that he was much better than he had been. On questioning he admitted that he had tinnitus. On examination, neither ear drum moved. He had blood behind the right drum (grade 4 barotrauma) and the left drum looked normal except for injection of the malleus handle (grade 1 barotrauma). These appearances suggested that he was failing to equalise his ears. So he was shown how he should do it and advised to keep out of the water for a week to let the damage to his ears settle down. He was advised to clear his ears every foot on the way down and to descend fees first on all future dives. My diagnosis was either alternobaric vertigo or an inner ear window fistula.³ As an inner ear fistula, which usually presents in divers with deafness and vertigo is a surgically treatable condition I referred him to a diving otolaryngologist who saw him on the Monday. His opinion was that it was alternobaric vertigo and because of the short history he advised the patient to take a week off diving. He considered that decongestants should be held in reserve as a last resort.

I next heard from him over the telephone two weeks later. He had taken a week off and then gone back to work. His vertigo had returned during the second half of the second tank and it was persisting long after he had got out of the water. He was given decongestants and more advice about the need for equalising efficiently.

He came back three weeks later still having problems. He complained of things moving when he looked at them after a dive. From the description it was nystagmus. The symptoms of nystagmus settled sooner than the vertigo which was usually present next day and had just cleared when he started his next dive. His vertigo came on during the second tank although he was clearing his ears all the time. He stated he could feel air bubbling into the back of his nose when he finished equalising. The left drum moved well but the right hardly moved when he auto inflated. Beconase was added to his medication.

He was reviewed a week later when both drums just moved. I had run out of ideas to help him so I referred him back to the ENT surgeon with the suggestion that perhaps one vestibular apparatus was more sensitive than the other and that perhaps some anti-vertigo drugs might help him.

Some months later he rang again. He had been put on Dramamine and he had returned to diving. He had "slowly come good". After two months free of symptoms he had stopped taking his pills and for a week had been symptom free. Then he was diving in a big swell and the symptoms had started again. My advice was to restart Dramamine. This has been successful and he has been able to continue diving without vertigo.

Given his history of difficulty clearing his ears in his early days of snorkelling, it is likely that the vertigo that he suffered when snorkel diving in shallow water was due to inadequate equalisation. The vertigo occurring when on scuba is more probably due to him having one vestibular apparatus more sensitive to pressure changes in his ear than the other. This would explain the vertigo coming on with the swells passing over him.

REFERENCES

1. Lundgren, CEG. Alternobaric vertigo a diver's hazard. Br Med J. 1965; 2: 511-513.
2. Edmonds C, Freeman P, Thomas R, Tonkin J and Black FA. Otological Aspects of Diving. Sydney: Australasian Medical Publishing Company, 1973; 55-66.
3. Donoghue P and Knight J. The causation of perilymph fistulae in divers. SPUMS J. 1980; 10(2): 13-14.

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NEW ZEALAND CHAPTER OF SPUMS FIRST AGM AND SCIENTIFIC MEETING

To be held on 13, 14 and 15 November 1986 in Whangamata, New Zealand.

All SPUMS Members, both New Zealand and Australian, are welcome.

The Conference will commence on Thursday 13 November with initial Registration, followed by the first AGM of the New Zealand Chapter SPUMS. Scientific Papers will be given in the afternoon.

Conference Delegates will have the option of booking into the Cedarwood Motor Inn which has 26 fully self-contained units and all holiday resort facilities. On the Thursday evening following cocktails a barbeque and tennis tournament will be conducted on floodlit tennis courts, weather permitting.

On Friday 14, weather permitting, a chartered boat will take divers out to Mayor Island for one of two possible dives at that location. It will be possible for people to go ashore on Mayor Island and spend the afternoon walking the island's various tracks. This locality is a mecca for big game fishing in the North Island. A late afternoon return to Whangamata will be followed by a Seafood Smorgasbord (with luck) dinner with a short scientific meeting to follow.

On Saturday morning the chartered launch departs for further dives in local dive spots, with lunch on board. Alternative activities will be made available for non-diving delegates or spouses who choose not to dive.

A free session will be made available on Saturday afternoon to be followed by further papers between 6 pm and 7.30 pm. Dinner and a Cabaret evening conclude the formal aspect of the Conference on the Saturday night leaving a further half day on the Sunday for those who want to take the opportunity for a further dive.

For further information on the programme or registration please write (airmail) to Dr MR Fraundorfer, PO Box 56, Tauranga, New Zealand.