

behind a blocked nose to this water pressure. "I had prolonged earache for about six weeks afterwards." This is due to the Mandibular Dysfunction Syndrome.³

"One of the two ENT Specialists I saw ..." He obviously shopped around and was probably told by the first one that there was nothing wrong with his nose or sinuses. As he had already had his tonsils out I suspect he had been circumcised and had his appendix out and came from a surgically minded family⁴ and was all set for another ENT operation. All surgeons are trained to operate! "...performed a right anterior" where else do you do it! He probably means intra-nasal. "Antrostomy to dry and relieve the sinus." This calls for prolonged comment. Apart from the intra-nasal antrostomy being a useless operation harking back to the witch doctoring of the 1920's, the diver produced no evidence that it was ever indicated. If purulent sinusitis, for which antrostomy is indicated, was present, and he was having trouble with both ears, one would assume that the operation would have been done on both sides if at all. Also, the vast majority of ENT specialists would have washed out his sinuses first to confirm that there was some infection present before embarking upon the antrostomy operation. The operation is not indicated to "dry" the sinuses but to provide immediate free drainage of pus from the antrum. He could have misinterpreted the reason or have been misguided. Anyway, he states that both sides of his nose are less blocked, further illustrating the "shock" or immunological effect of operating on normal sinuses.

"While I admit that side is freer" Does he mean more nasal discharge, a complication rather than a benefit. "to the extent that my nose is seldom blocked, my ears always feel under pressure." It is about time he had his impacted wisdom teeth removed, or he should give up grinding and clenching his teeth and give up biting his mouthpiece so hard, as the Mandibular Dysfunction Syndrome is about the only condition which can produce this pressure and the prolonged earache (six weeks) that he suffered previously.

My advice to this diver would be to suggest cauterisation of his inferior turbinates, counselling on the techniques of clearing the ears, and to have his wisdom teeth removed or, if these were not troubling him, to do jaw muscle stretching exercises and give up worrying, or at least to give up grinding and clenching his teeth and biting his mouthpiece. Do not get me wrong but patients can strew the path with red herrings or even lobsters. To get at the bottom of a diver's problem can be difficult as he has not had a medical training which includes a new vocabulary of about 14,000 words that a medical student picks up in his first 6 years. The doctor has to act as his own interpreter.

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APPENDIX I

Roydhouse N. Earache and adolescent swimmers. *NZ J Sports Med*. 1977; 5(2): 15-18.

"Swimmers, both surface and underwater, seem to suffer from earache more commonly than the average sports person. Because many doctors, including Ear, Nose and Throat Surgeons, regard water sports as the reason for the earache they tell their patients to give up swimming. Accordingly the case histories of twelve adolescents who suffered earache and were swimmers were examined. In all cases it was shown that the primary causative pathology was not in the ear and that immersion in the water was not the prime cause of the trouble. The prime cause was erupting or impacted molar teeth, teeth grinding and psychological upset, with the exposure to the cold water as the precipitating factor. Prevention is to put up with the problem until the molar teeth have erupted or to have the appropriate dental treatment. Reassurance after explanation with the cessation of grinding and clenching the teeth was often all that was needed."

COMMENTS FROM MELBOURNE

John Knight

Dr Roydhouse, in his entertaining and instructive Imaginary Consultation states that unless equalisation has occurred by the time the diver has descended to 2m the Eustachian tubes are blocked, or locked shut, by water pressure compressing the inner soft tissue end of the Eustachian tube, and that the chest muscles cannot generate sufficient pressure to overcome the external pressure. This would be true for a snorkeller, but is it true for a Scuba diver, whose chest and pharynx are at ambient pressure? In this case the pressure to be overcome is either negative, if the diver is descending feet first, or at most 0.5m if he is descending vertically head first, and these relativities will not change with depth.

Many scuba divers "clear" their ears to the extent that discomfort goes, but do they restore the normal middle ear volume? Judging from those I see they do not, as they have evidence of barotrauma. Oxygen is taken up from the middle ear by the tissues lining the middle ear, leading to a drop in middle ear pressure. Normal pressure is restored every time the Eustachian tube opens and air travels up it. The normal openers of the Eustachian tubes are movements of the pharyngeal muscles. Divers do not suck a dummy, which would move their pharyngeal muscles, they have their teeth biting into a regulator. They seldom talk, swallow or otherwise move their pharyngeal muscles. They usually have to make an effort to get air up their

Eustachian tubes. Many fail to maintain the middle ear volume normal and accept mild discomfort throughout their dive.

With a higher than normal PO₂ in the middle ear and a normal tissue PO₂, we would expect more rapid uptake of oxygen during diving, and unless the diver “clears” his ears at intervals an almost constant negative pressure in the middle ear. It has been shown that a negative pressure of 6.6 cm of sea water for 5 minutes in the middle ear of a guinea pig results in fluid exuding from the swollen middle ear lining.¹ A negative pressure of 13.2 cm of sea water results in a bloody fluid after 5 minutes. A diver who stays at 30 feet for 30 minutes without clearing his ears would, if human ears behave like guinea pig ears, be very likely to have fluid in his ears. That fluid may well have difficulty escaping down the Eustachian tube as the swelling of the middle ear lining will include the proximal part of the Eustachian tube, and this swelling, while developing in minutes, takes hours to disappear, which can explain uncomfortable ears after diving

I wholeheartedly agree with Dr Roydhouse that interpretation of the diver’s story by discovering what he means by “sinusitis” and other misused words is essential for proper diagnosis and treatment of diver’s disorders.

I would like to thank Dr Roydhouse for introducing me to the Mandibular Dysfunction Syndrome which now explains to me the symptomatology of a patient I saw last year.

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THEY DIDN'T MEAN TO DO IT, BUT IT'S DEADLY ALL THE SAME

Twenty tonnes of Dinoseb, a deadly herbicide, were lost overboard from a freighter during a storm in the North Sea early in January, along with 80,000 bottles of whisky. The 80 drums will, hopefully, survive for a sufficient time to allow their localisation by a search ship, and their careful recovery. Should this operation fail there is danger that the leaking of their contents will kill all life on the Dogger Bank, a vital spawning ground for fish, and possibly be fatal to seamen if they come into any contact with it. It is lethal even through the skin. The crew of the freighter did not immediately notice the loss of the lethal cargo, and continued foul weather prevented an immediate attempt to recover the drums.

It is believed that the drums lie in 54 metres of water and special computers, television robots and sonar search gear is being employed.

It is a pity drums containing such deadly poisons are not more securely transported.

DIVING EMERGENCIES IN REMOTE SITUATIONS TWO CASE REPORTS

*Based on reports made to the PROJECT STICKYBEAK
Non-fatal Incidents file*

Those who go diving in areas remote from easy access to centres equipped to provide definite care for decompression sickness (DCS) or cerebral air embolism (AE) must include a contingency plan for the management of such events. Serious incidents can arise even in groups of apparently experienced and trained divers and the quality of the immediate response will be critical to the ultimate outcome, as is demonstrated by these two cases.

Case 1

The victim had been diving on hookah at 60 ft for 50 minutes, working vigorously when the hose became kinked and he was forced to make an emergency ascent. He was able to exhale correctly during his ascent but was not able to make any decompression stops. About 90 minutes after surfacing he developed a discomfort in his chest, “a feeling of bubbles moving”. A little later he had a similar feeling in his left elbow and became aware of paraesthesiae in both calves. His legs felt very heavy. He felt very weary and almost unable to walk after going up some stairs.

He was driven to the nearest hospital which was 4 hours away. There he reported paraesthesiae in both arms and the backs of both legs, also that his legs were very heavy, and that he felt unwell and very fatigued. The nearest diving medicine consultant was contacted by telephone and the hospital was advised that this was a case of DCS with spinal involvement. He was given 100% oxygen, aspirin and copious fluids while arrangements were made to fly him in a pressurised aircraft to the recompression facilities. Delays were experienced arranging this transport but the treatment given improved his condition somewhat. However there was some relapse during the flight.

Initial treatment was by Table 62 (RAN), which resolved the symptoms within half an hour. Following this he was given 100% oxygen alternate hours overnight. There was total clinical recovery. However he was advised against further diving using compressed air because the response to the initial insult had been much greater than the gas burden of the dive profile would seem to predict, and because of the probability that, even after a clinical cure, residual cord damage remains.

Case 2

The victim, a healthy trained diver aged 35, was swimming at 20 ft through a reef channel to escape the worst of the rough water. His buddy was leading and only realised the victim’s absence on arriving at their destination. He swam back and found the victim’s weight belt. Other members of the party had observed the victim surface, without his mask, swim sluggishly for a few strokes, then roll onto his back and attempt to ditch his scuba set before becoming unconscious. He was rapidly pulled from the water and found to have had a cardiac arrest, with dilated pupils and white froth coming from his mouth.

Resuscitation was commenced by a medical member of the group and the pupils responded quickly. It took 25 minutes of resuscitation, including intravenous adrenalin, before independent heart and respiratory activity were regained.

He remained unconscious, though making spontaneous movements.. There appeared to be some inability to use one arm in involuntary movements for the first two hours, but this apparently recovered. The patient remained irritable and made restless movements but did not seem conscious of his surroundings.

He was taken by boat to harbour as attempts to air-lift him with a helicopter were thwarted by a combination of communication problems, extreme range and sea conditions. He was transferred to an RAN patrol boat at sea which brought him to shore more rapidly than would have been possible on the dive boat. He was still very irritable and totally unconscious when carried ashore, though moving and responding to stimuli. He was transported breathing 100% oxygen by Royal Flying Doctor Service pressurized aircraft to the nearest recompression chamber where he was recompressed, initially on Table 6, thereafter to 6A with maximum extensions.

Great difficulty was experienced in controlling the patient, who was totally irrational and uncoordinated. Little improvement occurred during this recompression treatment. At the end his behaviour was such that he could occasionally drink and obey simple commands, but he objected to being handled and was even biting the attendants. He had received some intravenous fluids and steroids but because of his violence it was impossible to maintain an IV.

He was maintained on 100% oxygen and transferred to the nearest major recompression facility by pressurised aircraft the next day. There he was assessed and received further therapeutic recompression, but without making significant improvement. Over the next few days he received repeated recompression to 9 metres, with adjunctive therapy. Improvement was slow and did not appear to be related to treatment.

The patient was finally transferred to a neurological recovery unit, and three months later is making an excellent recovery. It is expected that he will be able to resume his work, which requires the accurate use of his mind, six months from the episode.

The history suggests that this patient sustained an acute air embolism, probably as a result of uncontrolled ascent, following some sort of underwater crisis. Cardiac arrest resulted. Resuscitation was effectively carried out, but due to the extreme remoteness of the site there was an interval of 26 hours before the patient was first recompressed. Oxygen was only available for a portion of that time. The final picture was that of global brain ischaemia, probably due to hypoxia associated with cardiac arrest. He is making the expected slow progressive recovery from this major insult.

NEW ZEALAND DIVING-RELATED FATALITIES 1981-82

Douglas Walker

Four breath-hold (snorkel using) divers and eleven scuba divers have been identified as dying in New Zealand waters while diving during 1981-1982. Five had been diving alone and all the remainder were to some degree separated from their companion(s) during the critical time, though in case SC 6 this separation was minimal and non-contributory to the fatal outcome of the victim's "heart attack". One victim was an epileptic with a history of survival from previous in-water attacks. Three victims had a history of asthma, but in none was this of proven significance. Cold water, rough seas, aspiration of vomit and possible nitrogen narcosis, were other factors noted. The available records were, in general, unhelpful in establishing the training and experience levels of the victims and rarely noted the diving skills of the other divers present. Police reports were available concerning the two cases where no Inquest was thought to be necessary.

CASE NOTES

Case BH 1

The victim was diving for paua and kina from a beach, the sea being too rough for the intended boat dive. The victim and his companion were diving independently of each other while a third person remained ashore. He saw the victim surface and became alarmed when there was no plume of water to indicate the snorkel was being cleared. He immediately entered the water, but had to return to the beach to better identify the victim's position before he could find him and bring him back to the beach. Resuscitation efforts were ineffective. The victim was an epileptic on medication and with a history of previous in-water fits from which he had recovered without ill effects. He was wearing shorts, shirt, jersey, sandals, mask and snorkel.

EPILEPSY. ALONE. SANDSHOES. NO FINS.

Case BH 2

Three friends went diving, two deciding to spearfish about 20 ft away from where the victim was to dive for paua. They last saw him alive as he sat on a rock, apparently about to re-enter the water. About 45 minutes later one of the spearfishermen came across the victim floating at the surface, face down, minus mask and snorkel. The water was cold and the victim had worn a shorty wet-suit for protection. Attempts at resuscitation were unsuccessful. They had had "a hard night out" the previous evening but blood alcohol was absent on test. Similarly, the history that the victim previously suffered asthma attacks appears to lack significance. As his diving skills and the water depth are alike unknown the possibility of hyperventilation as a factor cannot be evaluated.

SEPARATION. COLD(?). POST LATE-NIGHT FATIGUE(?). FOUND FLOATING.

Case BH 3

After a morning spent breath-hold diving the victim mentioned over his lunch that he felt seasick. Despite this