

point of their own safety in a worst-case scenario, i.e., if the adult buddy becomes unresponsive for whatever reason. Again, diving instruction addresses these issues but, as with some adults, this may not be consistently applied underwater. Behaviour is difficult to predict, particularly in the 10–15 year age group. There are many incidents of children acting to save the life of an adult. Most examples, however, occur on land when any initial period of panic usually occurs in a more forgiving environment than that present underwater.

Many parents allow their children to participate in sports of their own choosing. Participation in diving requires the consent of the parent (or guardian) as well as that of the child. Informed consent from a child, even as they approach 15 years of age, can be a difficult issue. They are more likely to consider only the immediate self-directed benefits and enjoyment and, depending on how the facts are presented, the immediate dangers. They are less likely to give thought to long-term consequences. It is important that a parent recognises that in giving consent for any 'minor' to dive they take the risks and responsibilities entirely upon themselves. Whilst injuries during diving appear to be less frequent compared with those sustained by children in some contact sports, they are generally more severe. Parents need to clearly understand that there is a small but well-documented risk of death or permanent disability, and that such adverse outcomes can occur during the dive training process.^{4,5} A small, prospective 'theoretical' risk will almost certainly be viewed differently with the benefit of retrospectivity.

Few would argue the potential joys and benefits of diving. It opens children up to a world of travel, geography, underwater interests, colour and beauty. Achievement and enjoyment boost self-esteem and confidence, which may have a positive impact upon schooling and social skills. It

is an activity that for most children will be family oriented, something they can share and build upon with their parents and siblings.

The various cognitive, developmental and physical fitness issues need to be carefully considered in assessing the suitability of each child to participate in a given level of dive activity. Diving is certainly magical but it is more complex than simply meeting the minimum requirements for one's certification, donning the gear and getting into the water.

References

- 1 AS 4005.1 – 2000 Training and Certification of Recreational Divers - Minimum Entry level SCUBA Diving. Australian Standards, 2000
- 2 International PADI Inc. *Children and SCUBA diving. A resource guide for instructors and parents.* Rancho Santa Maragrita: International PADI Publications, 2002.
- 3 Mitchell S. Is age an issue? *The Undersea Journal* 1999; 4: 88-92
- 4 Walker D. *Australian diving deaths 1972-1993.* Melbourne: JL Publications, 1998
- 5 Warren S. Growing up too fast? *Diver* 2001; June: 26-32

Dr Anita Cvitanovich is a Paediatrician at the Princess Margaret Hospital for Children, Perth, Australia.

Dr Paul Langton is Clinical Lecturer, University Department of Medicine, and Cardiologist, Hollywood Private Hospital, Perth, Australia.

E-mail: <paul.langton@echo-services.com.au>

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Decompression sickness in a 14-year-old diver

Michael Davis

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Abstract

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A 14-year-old boy was boat diving with three adults on a remote off-shore reef when, on entering the water, he was swept off the reef by the current, losing contact with his dive buddy. He reached the bottom at 63.8 m seawater depth. Unable to inflate his buoyancy compensator or to fin off the bottom, as he was considerably overweighted at this depth, he ditched his weight belt and made a swimming ascent. He was soon unable to control his ascent rate. He rapidly developed neurological and musculo-skeletal symptoms of decompression illness after reaching the surface requiring a complex evacuation to a recompression facility. Following a 30 m helium-oxygen treatment and a week of daily hyperbaric oxygen treatments, he made a complete recovery. This case illustrates the potential disparity between diving training agency guidelines for children and what may happen in actual diving practice.

The following case report is presented to remind readers of the dangers that children who have been taught to scuba dive may face underwater if the diving environment is not rigorously controlled by the supervising adults. His diving accident is reported with his mother's kind permission.

Case report

During a diving trip to a remote area of southern New Zealand, a 14-year-old Open Water diver suffered an uncontrolled rapid ascent from a depth of 63.8 m. He was diving with his elder (in his late 20s) brother and two other adults. This was his fifth dive over a two-day period, two of the previous dives having been in excess of 30 m. The dive site was on a reef several kilometres off shore, which on entry into the water he missed in the current, finding himself instead alone in deep, dark water. He was unable to inflate his buoyancy compensator or to swim off the bottom. He had the presence of mind to drop his weight belt in order to get to the surface but then was unable to control his ascent rate.

He rapidly developed neurological and musculo-skeletal symptoms of decompression illness (DCI), and on return to shore the emergency services were called but took some time to reach him. When first seen, he appeared shocked and delirious. He was evacuated by ambulance, then helicopter, another ambulance and finally by pressurised, fixed-wing aircraft over the Southern Alps to the nearest recompression chamber several hundred kilometres away. During this time, he was maintained on high-flow oxygen and intravenous saline.

On arrival at the chamber, he was complaining of moderately severe pain in the left knee, but was not aware of any other problems. On examination, he was fully conscious and there were no signs of circulatory shock or respiratory distress. Neurological examination showed weakness of all muscle groups in the left arm, most particularly in the distal muscles, and almost certainly similar weakness in the left leg, but this could not be assessed adequately because of his knee pain. He was hyper-reflexic generally, with down-going plantars. There was hesitancy and past-pointing with finger-nose test on the right, but the left appeared normal and he had a borderline sharpened Romberg's test with a best time of 25 seconds.

Hyperbaric therapy was commenced and he was reassessed after two oxygen periods at 2.8 bar (286 kPa). At this stage there had been minimal improvement in his neurological signs, though his left-knee pain was much better. The decision was made to proceed to a 30 m helium treatment (RNZN Table IA). This was completed without event and with significant improvement. At the end, power on the left side was normal, he had no pain in his left knee and, in addition, bladder sensation and function were normal. Secondary deterioration occurred following this first treatment, and he then commenced on daily hyperbaric

treatments at 2.4 to 2.8 bar (245–286 kPa) each lasting two hours, to a total of seven treatments. He continued to make steady progress and at discharge no neurological signs were present.

Discussion

This incident had a number of potential implications for this boy and his family. First, our general advice to sport divers suffering neurological DCI is that they should never dive again. However, our view was rather coloured by the fact that his own presence of mind in the absence of responsible adult supervision underwater undoubtedly saved his life. There are few inexperienced adult sport divers who would have the presence of mind to ditch their weight belt at over 200 feet in the dark, narcotised and confused, let alone a 14-year-old schoolboy. We advised the family that he could return to diving when he was 16 years old.

Second, his father had died recently, and this accident was a severe shock for his mother who was clearly in a distressed state. It was felt both of them would need support over the ensuing months. Post-traumatic stress problems are not uncommon in divers following this type of injury and we were concerned that the boy could well be quite susceptible to behavioural and schooling problems. However, these apparently did not eventuate.

Finally, this accident reflects badly on the supposedly responsible adults with him. His brother's view was that he would rather have him doing adventurous sports than hanging around street corners sniffing glue. Whilst one applauds the general sentiment, nevertheless divers must modify their diving activities to meet the needs of a growing child. There were gross errors in the conduct of diving activities where this 14-year-old was concerned.

The recreational diving training agencies, such as the Professional Association of Diving Instructors and Scuba Schools International, have well-designed training programmes, clear recommendations regarding limitations on young children's diving and defined levels of supervision. However, it is the general diving public that determines whether these criteria are conscientiously put into practice or not. The analogy with speeding or drink driving is obvious. Such frailty in the human psyche is certainly not programmable into any training programme or recommendations. Thus, the decision regarding the training of children to scuba dive remains one for each parent or guardian and their child to make together.

F Michael Davis FRCA, FANZCA, Dip DHM, MD, is Editor of the SPUMS Journal and Medical Director, Hyperbaric Medicine Unit, Christchurch Hospital, Private Bag 4710, Christchurch, New Zealand.

Phone: +64-(0)3-364-0045

Fax: +64-(0)3-364-0187

E-mail: <mike.davis@cdhb.govt.nz>