

Decompression illness in a tropical resort

Michael Davis and Robyn Williams

Key words

Decompression illness, resort diving, first aid

Abstract

A case of decompression illness at the 2002 SPUMS Annual Scientific Meeting in Vanuatu is presented. The diver was a 59-year-old woman with over 24 years of uneventful diving experience with over 800 logged dives. Mild musculoskeletal and neurological signs developed within 15 minutes of surfacing from the twelfth of a series of dives over six days. Symptoms and signs were relieved by surface oxygen using a semi-closed system and hydration. She was air evacuated 11 hours later and was asymptomatic on arrival at the recompression chamber. She made an uneventful recovery. Eight decompression accidents have occurred either during SPUMS meetings or on pre- or post-conference tours over the past 16 years, 5 in women and 3 in men. In all, multi-day repetitive diving had occurred, and clear risk factors such as dehydration and excessive alcohol intake could be identified in a few cases. The overall incidence per dive is estimated to be approximately 0.03%. Prompt oxygen and fluids at the tropical venue followed by air evacuation to recompression facilities resulted in all divers making good recoveries as far as we are aware. Most have returned to diving subsequently.

Case report

The following account, published with her permission, is from a delegate at the 2002 ASM in Vanuatu. This 59-year old diver has an Advanced open water dive certification, has been diving for 24 years, logging over 800 dives in varied conditions, and has never previously had a diving injury. She is, slim, physically active and in generally good health. However, like many divers in this age group, she has several medical conditions. Hypertension was diagnosed in 1980 and has been well controlled on Atenolol and Accupril. She has hypothyroidism, currently euthyroid on thyroxine replacement, and is also taking oestradiol. On the day of the incident she had some nasal congestion and took pseudoephedrine 30 mg at 0700hr and 1100hr and oxymetazoline and fluticasone, one puff in each nostril, at 0700hr.

THE DIVING INCIDENT

On the trip to Vanuatu she did six days of diving, with two air dives each day. All had slow ascents and safety stops, and were well inside the safety limits of the Nitek 2 (set on air) and Prosub computers she dives with. She was well hydrated on all dive days. Water temperature was approximately 26°C. She wore a 5/3mm wet suit, 3mm vest and a beanie but was still very cold and shivered on every dive.

On the fifth evening, she consumed two rums and one and a half glasses of wine over dinner as well as plenty of water. On the sixth day, the first dive was a wreck dive to a maximum depth of 40 m with a slight current running. Total dive time was 25 minutes with two safety stops, six meters for five minutes and three meters for five minutes on the 'hang bars' beneath the boat. After a surface interval of one hour and 18 minutes, the second dive was to a maximum depth of 20 m

with a 41 minute bottom time, and two safety stops, six meters for five minutes and three meters for five minutes.

After surfacing, she spent about 15 minutes taking off her wet suit, packing up her gear and attending to personal needs. While attempting to take off the dive vest and with her hands over her head, someone on the top deck grabbed the bottom edge of the vest. He jerked on the vest with great force literally causing her to leave the deck twice. Along with being very cold, this was the only thing that was different to any of the other dives.

About ten minutes after that, she developed severe pain in the lateral aspect of her left arm just below the shoulder. Numbness then occurred in the lateral areas of the wrist and elbow of the left arm. She also experienced some numbness in both feet and ankles. On the right thigh there was an area of hyperaesthesia.

At that point, she asked her husband to get oxygen, telling him she thought she was experiencing decompression illness. A fellow diver who is a GP with an interest in diving medicine stayed with her until they docked. Oxygen was given at 5 l.min⁻¹ with a Hudson mask. This provided relief of the numbness almost immediately but the pain remained in the left arm for about 20 minutes. Oxygen 100% was then administered through a semi-closed Bain system from the time she returned to her hotel room until she was air-evacuated 11 hours after the dive to The Wesley Hospital, Brisbane.

While on oxygen the shoulder pain recurred for an hour or so about four hours after the initial episode. Three hours prior to evacuation, 800 mg of ibuprofen was administered orally. She received five litres (measured) of water prior to being evacuated.

On arrival in Brisbane, clinical examination was 'unremarkable, in particular, cranial nerves, power and sensation were normal. Sharpened Romberg's test was 60 sec on the third attempt.' She received an USN Dive Table 6, and the following day was treated again with 2.4 bar oxygen for two hours. She remained asymptomatic. A subsequent Doppler study did not reveal a patent foramen ovale.

She returned to diving five months after this incident, doing 35 dives over a 16 day period, and a further 10 dives three months later without incident.

Discussion

The diving activities described are fairly typical of a SPUMS Annual Scientific Meeting – multi-day, multiple and multi-level dives over one or two weeks, depending on whether a pre- or post-conference diving holiday is taken in conjunction. The conference days are long, some dives requiring the divers to be ready by 0600hr or even earlier, often lunches are taken late, and a four-hour conference session precedes dinner, taken at about 2000hr or later combined with other evening activities. Alcohol intake is variable, from none to considerable excess into the small hours. A similar pattern, excluding the scientific meeting would be typical of many tropical island diving holidays.

Numbers of divers at each ASM vary from year to year but, according to the conference agents, average about 100, with only about 5% not taking up their full complement of ten dives, for various reasons. About half attend pre- or post-conference diving trips, when the diving is often more intense, with three or more dives a day being common. Thus SPUMS members collectively carry out 1500–1800 dives each year on these trips, or 24,000 to 29,000 dives over 16 years.

In the past 16 years, we believe there have been eight divers, 5 women and 3 men, who have required treatment for suspected decompression illness (DCI) on SPUMS ASM trips. This gives an approximate rate of clinically reported DCI of one per 3000 to 3500 dives (approximately 0.03 %). The Abacus Project in British Columbia reported a clinical treatment rate for DCI in their region of 0.01% and an identical rate was reported by Gilliam for a tropical live-aboard diving charter vessel.^{1,2}

It would seem from this that the incidence of DCI for SPUMS conference trips may be higher than expected. In order to resolve this possibility, accurate diving records should be kept on all future SPUMS conferences and their ancillary diving holidays. Additionally, permission should be sought from all divers suffering a suspected DCI for their case records to be retained confidentially.

Treatment has varied from surface oxygen in one, in-water oxygen treatment for another, evacuation to a local recompression chamber for three and a major air evacuation

for a further two; with the management of one unknown. Details of these cases and their clinical outcomes are not all known to the authors, except in the present case. Anecdotally, heavy alcohol intake and/or dehydration were clearly identifiable risk factors in a few cases.

In the present case, cervical trauma from the sudden lifting of the diver off her feet by the wet suit vest over her head soon after the dive cannot be entirely excluded as the cause of her symptoms. However, this was discounted at the time, and the repetitive dive profile was sufficiently provocative for DCI. Based on the Canadian DCIEM tables, despite her dual computers always being in the safety zone, several of the dive profiles, including the 40 m dive on the sixth day, exceeded the square-wave dive limits for these tables.

Age and polypharmacy, particularly the use of a large dose of pseudoephedrine, a potent vasoactive agent, may have played a role. The nasal congestion and the diver's unusual sense of cold whilst diving in reasonably warm waters with adequate thermal protection raises the possibility of an intercurrent infection as a contributing factor. Hypothermia may also have contributed directly.

It is commonly advocated that divers doing multi-day repetitive dives should have a break from diving every three to five days as this is believed to reduce the risks of DCI. However, the evidence for this and other risk factors such as age and obesity is largely anecdotal.³ In this case, the diver dived for six days without a break.

There are several lessons for SPUMS members from this incident. All divers are potentially at statistical risk of DCI to some degree or other when scuba diving. Minimising this risk is paramount, especially when a long way from home and recompression chambers.

The availability of plentiful oxygen supplies, without depleting the local resources, is emphasised by Guy Williams in this issue of the journal.⁴ Avoidance of dehydration in a tropical climate, especially if you are not acclimatised, is an important self-care practice. Excessive alcohol intake should be avoided as well as overtiredness.⁴ SPUMS members diving abroad are advised to take out appropriate health and diving insurance.⁴

The evacuation illustrates some of the difficulties in managing DCI in a remote locality. Firstly, Vanuatu's own recompression facility was non-operational, as it was in process of being moved from Santos to Port Vila. Secondly, even SPUMS oxygen supplies ran low and a local supply had to be sourced. A SPUMS member very experienced with evacuations throughout the Pacific region spent many hours on the phone trying to facilitate the evacuation.

The problems to be faced included the availability of suitable aircraft and a suitable medical team and pilot, availability of

a suitable airstrip, including its accessibility at night, and the availability of immigration and customs officials out of hours to clear the patient and crew. The air ambulance company that was retained gave an assurance the plane would arrive at about 2100hr that evening. In fact, the plane finally arrived at 1245hr the next day. The evacuation and subsequent hyperbaric treatment eventually cost over Aust \$100,000. This was met entirely by the diver's diving insurance policy.

Acknowledgements

The diver would like to thank Drs Walker, Williams, Acott and Emerson for their care, and John Lippmann of DAN-SEAP. The authors thank the diver for permission to publish details of her diving incident and treatment.

References

- 1 The Abacus Project: establishing the risk of recreational scuba death and decompression illness. *SPUMS J* 2002, 32:124-128

- 2 Gilliam B. Evaluation of decompression sickness incidence in multi-day repetitive diving in 77,680 sport dives. *SPUMS J* 1992; 22:24-30
- 3 Walker R. Decompression sickness: clinical. In: Edmonds C, Lowry C, Pennefather J, Walker R, eds. *Diving and subaquatic medicine, 4th edition*. London: Arnold 2002: 137-140
- 4 Williams G. Travel medicine: A personal view on medical equipment for a peripatetic diving doctor. *SPUMS J* 2003; 33: 22-24

Michael Davis MD, FRCA, FANZCA, DipDHM is Editor of the SPUMS Journal.

*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: <hyperbaric.medicine@cdhb.govt.nz>

Surgeon Captain Robyn Walker MB, BS, DipDHM, is President of SPUMS.

E-mail: <robyn.walker@defence.gov.au>

ALLWAYS DIVE EXPEDITIONS





ALLWAYS DIVE EXPEDITIONS
 168 High Street
 Ashburton, Melbourne
 Vic. Australia 3147
 TEL: (03) 9885 8863
 Fax: (03) 9885 1164
 TOLL FREE: 1800 338 239
 E-mail:
 <allwaysdive@atlasmail.com.au>
 Web: www.allwaysdive.com.au



*Contact us for all your travel requirements within Australia and overseas.
 Ask about our low cost air fares to all destinations
 or our great diver deals worldwide.*