

- 3 Apply an antiseptic. This is not a substitute for thorough cleaning of the wound.
- 4 Cover the wound with a dressing and bandage.
- 5 Inspect the wound daily and seek medical attention if swelling and tenderness increase or persist.

Medical management

Patients may present despite good first aid management.

- 1 In deep or badly infected wounds radiological examination to exclude a foreign body is indicated.
- 2 If obviously infected or if cellulitis or lymphangitis are present culture the wound. Inform the laboratory that marine contamination occurred as routine culture media may not grow the marine organisms which are likely pathogens.
- 3 Clean and debride the wound. Local anaesthesia is often necessary. General anaesthesia may be needed for extensive or deep wounds or children. A scrub with an antiseptic e.g. Betadine may need to be followed by sharp debridement of dead tissue or slough. All foreign bodies must be removed. The wound should not be sutured.
- 4 Apply a no-stick dressing and bandage.
- 5 Ensure tetanus prophylaxis is adequate.
- 6 Administer antibiotics if infection is present. Some marine bacteria may be present. Doxycycline is the antibiotic of choice as it is active against marine vibrios and most skin organisms.

Research needs

Large prospective studies are needed to define the incidence of infection and the organisms responsible so that better antibiotic choices can be made.

Further reading

Edmonds C, Lowry C and Pennefather J. *Diving and subaquatic medicine* - 3rd Edition. Oxford: Butterworth-Heinemann, 1992.

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MANAGEMENT OF DIVING RELATED ILLNESSES IN TOWNSVILLE

Tom Fallowfield

Introduction

In addition to its main work of elective hyperbaric oxygen therapy, the compression chamber in Townsville General Hospital (TGH) is the treatment facility for all reported cases of decompression illness, previously known as decompression sickness and arterial gas embolism, arising from diving on the Great Barrier Reef. It also deals with divers from Papua New Guinea, and the islands of the South West Pacific out as far as Fiji and Nauru. So far, all the cases referred have come into the above categories and it must be presumed that other manifestations of barotrauma are dealt with locally.

Presentation

Case management must start on first contact with the patient by the diving doctor. The doctor may then be aboard a diving boat, at any airfield in the collection area, in the Accident and Emergency Department (A&E) or talking to a patient on the telephone at some remote location. Patients arrive at or are retrieved to TGH by the various routes shown in Table 1. About half reach the hospital "under their own steam".

TABLE 1

LOCATIONS OF RETRIEVAL OR ATTENDANCE FOR 235 DIVERS TREATED BY TGH BETWEEN 18.11.77 AND 30.4.91

Airlie Beach	19	Hayman Is.	1
Bamaga	1	Hervey Bay	1
Brisbane	6	Ingham	2
Buderim	1	Innisfail	1
Cairns	67	Lady Elliott Is.	1
Cape York	7	Maroochydore	2
Cooktown	1	Maryborough	1
Cow Bay	1	Mossman	3
Christmas Is.	1	Nauru	1
Darwin	2	PNG	14
Fiji	3	Rockhampton	3
Flinders Cay	1	Solomon Is.	3
Gladstone	1	Thursday Is.	3
Gympie	1	Townsville	91
Hamilton Is.	2	Unrecorded	4

TABLE 2
PRESENTING SYMPTOMS 1991

Neurological	57
Musculoskeletal	12
Pulmonary	3
Total	72

Unlike commercial divers, the large majority of recreational divers from the reef treated for decompression illness present with neurological symptoms. These vary from tingling extremities to rapidly increasing loss of power and sensation. The presenting organ systems found in 1991 are show in Table 2.

About half of those treated in 1991 attended late, two to five days after the onset of symptoms, for medical assistance. Most of these patients made their own way to the hospital and mostly had less severe symptoms.

TABLE 3
INTERVALS BETWEEN ONSET OF SYMPTOMS AND REPORTING SICK 1991

Interval	No. of patients
<1 hr	12
1 - 3 hrs	7
3 -12 hrs	13
12 -24 hrs	13
1 - 2 days	9
2 - 3 days	7
3 - 4 days	2
4 - 5 days	6
1 week	2
2 weeks	1
Total	72

Initial management

Away from the relative comfort of the hospital it becomes rather difficult to obtain a full history and do a detailed examination of the patient. Retrievals often take place in the middle of the night from an airfield in the rain with all facilities closed. Another scene is the deck of a diving boat rolling at her anchorage by the reef, with an impatient helicopter circling overhead.

The necessities are to confirm the diagnosis of de-compression illness and to assess the severity of the condition.

The patient is frequently found to be on oxygen, but not so frequently using a system delivering a concentration near 100%. Dextran 40, saline, dexamethasone and diazepam are on hand in our emergency kit for administration at the doctor’s discretion after assessment. The next action is to pursue the aim of early recompression.

If the retrieval is by helicopter, the patient is kept horizontal during the winching operation and given oxygen in transit to the compression chamber. The return flight is as fast and low as possible, typically 140 knots at 40 feet. In the instance of a hyperbaric retrieval from a distant airfield, using a portable chamber, the patient is recompressed there and then in the aircraft. This gives the major advantage of early relief, so that while the patient is being transported he is already feeling the benefit of treatment. If the remaining treatment time justifies it, arrival is followed by transfer under pressure into the hospital chamber.

Recompression schedules

At the Hyperbaric Medicine Unit in Townsville, three therapeutic tables are in general use. RN Table 62 is the first choice for the less severe cases of decompression illness and for use in the portable chamber, because of the limitations on the amount of gas that can be carried. More severe cases are treated using the Comex table, CX30 (figure 1), which starts off at 30 m on 50/50 helium and oxygen. If circumstances such as an uncontrolled ascent, indicate that the diver may be suffering from a cerebral arterial gas embolism, compression without delay to 50 m is followed by RN Table 63.

If the response to the first recompression is minimal or unsatisfactory, a second treatment with a CX30 will follow. This is unusual and any residua can usually be removed by short oxygen treatments at 10 m, repeated if necessary. The principle is to continue until complete relief is obtained or, unusually, there is no further improvement.

Further management

On discharge, patients are warned of the need to rest and of the possibility of recurrence of symptoms. In most cases follow-up is impossible, because the patients do not live in our area. However patients are encouraged to telephone later if they feel the need for advice. After complete resolution of decompression illness, they are advised not to dive for at least one month. If there are residual effects, the patient is brought back for review if possible. If not, advice is given to seek review by a diving doctor

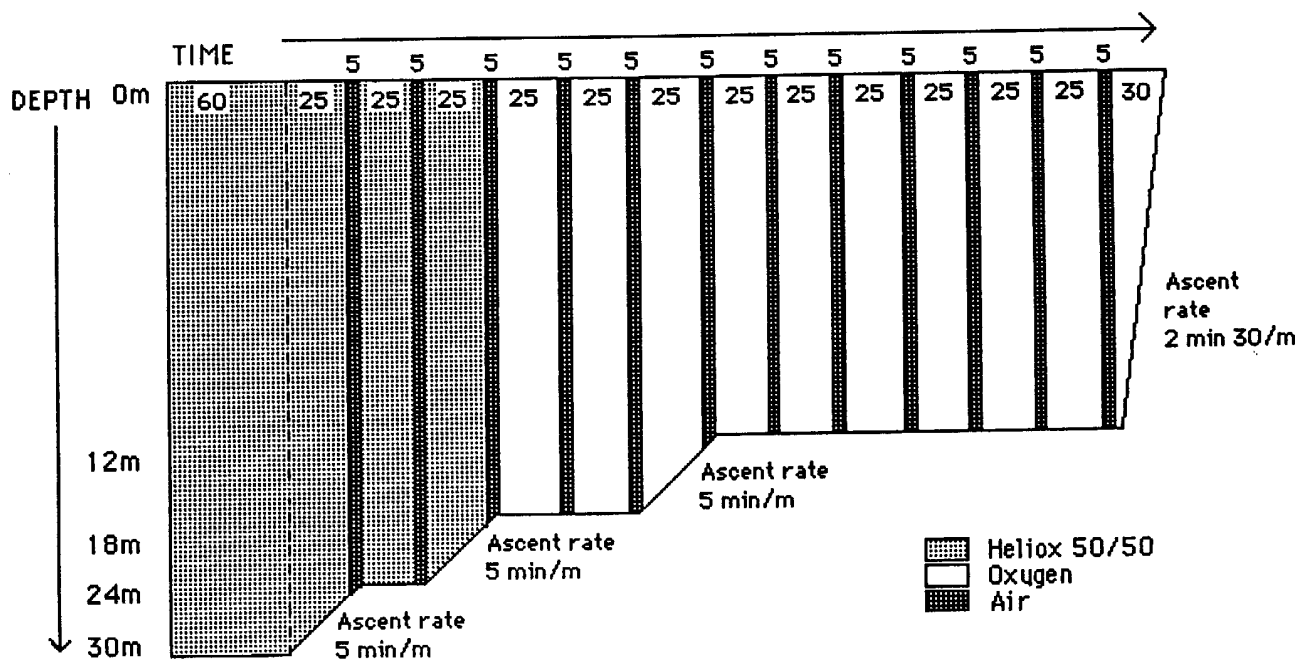


Figure 1. Comex treatment table CX30

elsewhere before contemplating a return to diving. After pulmonary barotrauma, the advice is to give up diving.

As most of the patients are tourists, the question of flying arises early. After complete resolution of the condition, a prohibition is put on flying for 48 hours. Persistent residual symptoms or signs make this question much more difficult. The only answer is a delay until the diving doctor is happy to allow the patient to fly.

Case histories

Case 1

Male, age 45, dived to 140 m, and surfaced following his computer's advice 42 minutes later. After 20 minutes he developed severe vertigo, nausea, vomiting and deafness in the right ear. He was seen at Honiara. There was no aural barotrauma. He had left lateral nystagmus and a positive Romberg test. He was recompressed in the portable chamber, started on an extended RN Table 62 and flown to Townsville.

Next morning, still unsteady, nauseated and vomiting, he was falling to the right with eyes closed and had coarse left lateral nystagmus. He was recompressed on Comex Table CX30 with relief from vertigo and nausea. Next morning he was feeling much better but still unsteady. He swayed with his eyes closed, and had faint nystagmus. Audiometry was normal. He was treated with hyperbaric oxygen, 10/60/30, twice. He was discharged without symptoms or signs.

Case 2

Male, age 29, dived to 36 m for 10 minutes. Shortly afterwards he had pain in his back, legs and groins, followed by numbness in both legs. A hyperbaric retrieval with portable chamber was undertaken. Before recompression he had loss of sensation below the mid chest and 1/5 power in both legs. He was treated with an extended RN Table 62, with transfer under pressure into the hospital chamber.

Next morning he had numbness and tingling in both legs and was walking with assistance. Examination showed 4/5 power in his lower legs, diminished touch and pain sensation below the upper right thigh and left knee, worsening to complete sensory loss in both feet. He was recompressed on Comex Table CX30.

On following morning, he was cheerful and complained only of flitting paraesthesiae. Diminished sensation was present in the lower left leg. The extent of sensory diminution decreased to zero with three hyperbaric oxygen treatments, 10/60/30.

Case 3

Female, age 23, admitted for neurological investigation of sensory loss in the perineum and right thigh. A myelogram was negative. She was referred by the neurologist on finding that she had dived to 30 m two weeks before. She had been seasick and abstained from fluids. She developed extreme and unreasonable fatigue after the dive. She was treated by RN Table 62 with complete relief.

She returned two weeks later with areas of persistent sensory alteration after two transient episodes. On examination, she had partial loss of touch and pin prick sensation over the left shin, right shin and calf. She was given 4 daily hyperbaric oxygen treatments, 10/60/30. Before and after the last treatment she had a small area of sensory diminution on the upper 1/3 of her right shin. This was left to resolve.

Case 4

Female, age 45, dived to 16 m for 37 minutes. Pain, gradually extending from the right ankle to knee and hip, started a few minutes after surfacing. She had tingling in both feet and the right leg. Flown ashore from an island to the local hospital, at 500 ft, her symptoms worsened during the flight. She was given oxygen in hospital with considerable relief. Hyperbaric retrieval, with RN Table 62 in the portable chamber, was arranged. Treatment continued after transfer under pressure into the hospital chamber with complete relief.

Case 5

Diving instructress, age 26, diving three times a day for the previous five days to about 12 m in spite of being very tired and having right ankle pain for the last two days. On the day after her last dive she developed additional pain in the right wrist and thumb, with palmar itching in both hands. She was transferred by air at sea-level cabin pressure. Two short generalised tonic seizures occurred during transfer. When conscious she complained of a choking sensation and difficulty in breathing.

When seen at TGH she had severe pain in her right arm and a choking sensation. She was dyspnoeic, distressed

and unresponsive to questioning. She was recompressed on an extended RN Table 62.

Her residual symptoms next day of slight pain in both wrists and the left side of her chest disappeared after one hyperbaric oxygen treatment, 10/60/30.

Case 6

Male, age 47, referred from A&E with symptoms, increasing in severity, after dive to 30 m four days before. He complained of paraesthesiae of both legs, dizziness and unsteadiness. Findings in A&E were nystagmus, sensory loss on the right side of his face, loss of power and deviation of his tongue to the right with diminished power and sensation in both right limbs.

He complained of claustrophobia and was nervous, sweating with a tremor. He was treated on RN Table 62 with the aid of a small dose of midazolam and improved. Next morning he was still dizzy so was given hyperbaric oxygen, 10/60/30.

During this treatment the patient's lady friend and his mate arrived to tell us that he had not been diving and that he had this problem about inventing such stories! He was told he was cured and given into custody of his friends.

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ARTICLES OF INTEREST REPRINTED FROM OTHER JOURNALS

DEEP DIVING DUFFERS DIVERT DOCTORS

Tim Parish

1992 has been a fairly quiet year for diving incidents when compared to the previous 2 years, particularly when compared to the increase in BS-AC membership and the growth of diving in general, with a reduction in the number of incidents overall. On the basis of our current figures it is estimated that around 1,500,000 "man-dives" were carried out during the 1992 incident year (1st October 1991 to September 1992 inclusive), with a total of 123 incidents being logged (compared with 201 in the preceding year). The dives were carried out by around 70,000 divers, of which 47,000 are BS-AC members.

The number of incidents does not include figures for "unreported" cases of recompression, which normally we obtain via BIGHT and the Institute of Naval Medicine (INM). A computer failure has meant that the INM have, at the time of writing, been unable to provide us with their data for this year. The number of decompression incidents, therefore, should be looked at while bearing in mind that the INM figures usually increase our own data capture figures by 20-30 per cent (probably increasing the number of incidents by about 40).

Considering the number of dives undertaken and the much reduced number of incidents reported overall, it is distressing to note that 17 fatalities have occurred this year (9 BS-AC members, 8 independent), one more than last year's total. However, three of these fatalities were victims