FREMANTLE HOSPITAL HYPERBARIC MEDICINE UNIT ACTIVITY REPORT FOR 1990

David Davies and Harry Oxer

Summary

Under the guiding influence of Dr Harry Oxer, the Hyperbaric Unit at Fremantle Hospital has been busier than was predicted. It has provided an efficient and effective service for the people of Western Australia. A wide variety of cases have been treated, with results comparable to those from other units. There was a small complication rate.

Introduction

The Hyperbaric Medicine Unit at Fremantle Hospital was officially opened on December 15th 1989 by the Hon. John Dawkins but, like a lot of politicians, he missed the boat as we had treated our first patient on November 27th 1989. He was a diver who, after repetitive dives the previous day, presented with headache, lethargy, pain in the shoulders, paraesthesia of the hands, anaesthesia of the right hand and foot as well as difficulty with micturition, He was treated initially on RN Table 62 followed by RN Table 61 on each of the following two days with complete resolution of symptoms. Two further divers were also successfully treated before the official opening.

The unit

The unit, and its staffing, has been described in a previous paper.[1]

Routine

The normal practice for the Unit is to have two chamber runs per day, six days a week. Occasionally emergency work has required up to four runs per day. The only limiting factor is the availability of trained nursing staff to act as in-chamber attendants. For emergencies, we use one of the pool staff in the chamber with the on-call full time person outside to fetch and carry. Our aim is never to dive the staff more than once a day, though occasionally this rule has to be broken.

Fortunately, our after hours case load is small at 0.04%. That is, 75 treatments extended beyond normal working hours. Of these, 13 started in hours and dragged on, 22 started after hours and 40 were conducted on Sundays. As none of the medical staff receives payment for being on call but are paid for call back, this has not proved to be a great financial imposition on the hospital. The chamber operators and full time nursing staff are both paid call and call back. The pool nurse however, is co-opted from elsewhere in the hospital at the time so does not get extra.

Patient load

In the calender year 1990, 187 patients were treated in the Unit. In all there were 1,808 patients in 806 chamber runs. Of these, 82 were regarded as emergencies. Twenty seven patients were over the age of 70 years.

Acute cases

We have divided the indications for treatment into two groups. The acute cases include air embolism, decompression sickness (DCS), carbon monoxide poisoning, traumatic ischaemia, burns, head injury and so on. The ophthalmic case was an elderly gentleman who presented with sudden blindness in one eye resulting from central retinal artery occlusion. He was treated on an 18 m table, at the end of which he had quite good two point discrimination in that eye. Unfortunately, he relapsed overnight and despite repeated treatments over succeeding days, ended up with only peripheral vision in that eye. Still, this was an improvement on no vision at all.

TABLE 1

ACUTE CASES TREATED IN 1990

Problem	Cases	Average number of treatments
Air embolism	2	2
Carbon monoxide poisoning	28	3
Traumatic ischaemia	8	7
Decompression sickness	39	3
Wound healing	22	10
Burns	5	10
Oedema	1	2
Head injury	3	2
Ophthalmic	1	9

Surgical cases

We have grouped the post operative cases with the traumatic ischaemias, compartment syndrome, ischaemic flaps and crushed limbs together as “surgical” as their pathologies are all similar. For these early referral is essential and we are fortunate to have an excellent relation-

TABLE 2

SURGICAL CASES TREATED IN 1990

Problem	Cases	Treatments	Average
Post operative	10	143	14
Grafts/flaps	12	69	6
Crushed limb	2	13	7
Compartment syndrome	2	17	9
Ischaemic flaps	4	15	4

ship with the Emergency Department. The aim of treatment is to reduce oedema, facilitate restoration of the blood supply and preserve the viability of doubtful tissue. On at least two occasions we were able to improve the circulation to the injured limb such that amputation was avoided. One of these was a 10 year old child who got into ischaemic problems after reduction of a supracondylar fracture of the humerus.

Carbon monoxide poisoning

Of the 28 cases of carbon monoxide poisoning, most presented in the acute phase with significant neurological deficits, but there were several we treated late to prevent the long term psychological sequelae of the disease. As a result of these cases, Dr Paul Mark has researched the literature and his paper will be presented to the Editor of the SPUMS Journal in due course.

Divers

Forty divers presented for treatment last year. Three were diagnosed gas as embolism, 21 as Type II DCS and the remainder we called Type I because we could not find any neurological signs. Only 6 cases were from remote areas of the State, four from Broome and two from Esperance. The rest were from the metropolitan area or close by. In the pearl diving industry there are about 60 divers, each doing six to seven dives a day every day. That only four were sufficiently bent to require evacuation suggests that the industry has got its house in order. All four divers came from the same company which has now been persuaded to alter its work practices. However, it is still the custom in Broome to treat pain only bends with in-water recompression at the site and to refer on only the severe decompression sickness or obviously neurological bends. It is interesting to note that we treated no abalone divers last year.

Of the 40 divers who presented, 24 did so after multiday diving, 18 after repetitive dives, and in nine there was an associated rapid ascent though this did not seem to be sufficient to cause an arterial gas embolism. The rapid ascenders usually had dives that were within the tables but had run out air for one reason or another. Half of those who presented either did not use or were diving outside the limits of any of the recognised tables. The article by Geoff Wilks on divers misuse and/or inability to use the tables has great relevance here.[2] Of the 40 divers who presented, only 12 required treatment that commenced after hours.

Chronic cases

The vast bulk of our work was the patients with chronic problems. These are all related to tissue hypoxia as a result of infection, radiation or vascular insufficiency. The 42 patients in this group underwent a total of 1,017 treatments. Patients with osteoradionecrosis of the jaw presenting for dental extractions do much better if they receive treatment in the chamber both before and after their surgery. This group also benefit from the secondary effects of restoration of mucosal function. After years of dry mouths, and often dsyphagia, they are often able to salivate, swallow, taste and even smell again.

Non-healing ulcers form a large part of the work and the results are variable. It depends largely on the major vascular supply to the region. If there is no pulse in the region then we are wasting the patient's time and the Unit's facilities.

TABLE 4

CHRONIC CASES TREATED IN 1990

Problem	Cases	Average number of treatments
Wound healing	17	30
Necrotising fasciitis	1	6
Osteomyelitis	6	14
Radionecrosis	19	21

TABLE 3

DIVERS TREATED IN 1990

Problem	Cases	Treatments	Average
CAGE	3	10	3
DCS Type I	17	33	2
DCS Type II	21	76	4
Total	**41**	**119**	**3**

TABLE 5

RADIATION DAMAGE CONTROL 1990

Problem	Cases	Treatments	Average
Bone	6	169	26
Bladder	3	55	18
Soft tissue	10	193	19

TABLE 6

WOUND HEALING 1990

Problem	Cases	Treatments	Average
Peripheral Vascular disease	6	140	23
Diabetic ulcers	6	232	39
Venous stasis	5	142	28
Osteomyelitis	6	86	14

Research

There were 18 dives done as part of the pilot study of our current research project. This is attempting to find a way of rapidly identifying patients who will benefit from early surgical revascularisation of the myocardium after an infarct. In conjunction with the standard treadmill stress thallium scan we do trans-oesophageal echocardiography before and after a 30 minute 18 m oxygen soak. After a myocardial infarct there is an area of myocardium surrounding the dead tissue that seems to go into hibernation. In a significant number of patients, oxygen at high pressure can kick start this muscle into activity again and it is suggested that these people may respond better to surgical intervention at an early stage.

Complications

What problems have we had over the year? The chamber was out of action for half a day because of an oily smell in the compressed air. This was rapidly rectified by reducing the working pressure of the main compressor. There were also some complaints about the heat in the chamber when the temperature outside hit 46.2° C.

One patient had an oxygen toxicity fit shortly after a missed air break at 18 m and had no sequelae. Eight patients suffered mild ear barotrauma after having difficulties equalising their middle ears. Five patients either refused treatment or discontinued their therapy because of claustrophobia.

We did have one case of decompression sickness in member of the nursing staff. She completed a 10 m dive as the attendant and then after a surface interval of only 30 minutes did the first part of an 18 m dive to practice diving with a patient on a ventilator. This dive was aborted as soon as it was realised that it was her second dive and so was very brief. That evening, she complained of pain in the elbow and in the index finger. She presented next morning at the Unit and was found to be depressed, with a labile affect, the sensory defect was confirmed and the sharpened Romberg was limited to about 12 seconds. Treatment with RN table 62 resulted in rapid improvement in her mood and by the second oxygen period at 18 m all the symptoms and signs had disappeared. She was given one further treatment with a Table 61 and after 24 hours was declared fit for routine ward duties. She was able to return to the Unit after one week.

References

1 Davies D and Oxer H. Fremantle Hospital Hyperbaric Unit; the first year. *Spums J* 1991; 21(1): 77-80.
2 Wilks J and O'Hagan V. Queensland divers and their tables. *Spums J* 1991; 21(1): 11-14.

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THE SPUMS DIVING MEDICAL SUBMISSION TO STANDARDS AUSTRALIA

John Knight

History

In 1972 the Standards Association of Australia published Australian Standards CZ18, Rules for Underwater Air Breathing Operations and Z67, Specification for Underwater Air Breathing Apparatus.[1] These were applicable to employed divers only and laid down in Section 2.1 that

"No person shall employ, instruct or allow any person to be employed as a diver and no dive shall be carried out unless the diver-

(a) has passed all medical requirements set out in Appendix A; and

(b) has practical experience, has a knowledge of diving practice, and has a full understanding of the diving apparatus in use: and

(c) is undergoing training under immediate supervision of a diver who has the necessary experience, knowledge and understanding required by (b) above."

SPUMS, as an organisation, had no input into the preparation of this Standard, but some founding members, Carl Edmonds (first President of SPUMS) and Bob Thomas, provided the medical input which produced Appendix A. The Medical Standards for Divers were copied from those in use in the Royal Australian Navy (RAN). At that time the RAN School of Underwater Medicine (RANSUM) at HMAS PENGUIN was the only establishment with full time medical staff devoted to diving and hyperbaric medicine. In Appendix C appeared the telephone numbers of both the Diving Officer and the OIC RANSUM. This was the first beginning of the current Diver Emergency Service (DES) now based at the Royal Adelaide Hospital.[2] The only other unit in Australia which had 24 hour hyperbaric treatment facilities was at Prince Henry Hospital in southern Sydney. Here Ian Unsworth (founding Secretary of SPUMS) was employed as an anaesthetist as well as part-time Director of the Hyperbaric Unit.

In those far-off days none of the diving instructor organisations considered that a diving medical was needed before a student commenced diving. Owing to the hard work of Carl Edmonds and Bob Thomas and those who were taught by them the message slowly got out to diving instructors. The publication of the early Stickybeak reports[3-7] by Douglas Walker, showing that people, who would have been advised not to dive if they had had a medical, were dying unnecessarily added to the educational effort. In the early 1970s the dive shops were taking over from club instruction, but not always safely. In Victoria these training accidents led a group of club instructors to form the the Underwater Instructors Association of Victoria (UIAV). They wrote to the Navy asking for help in training themselves to be safe diving instructors. I have seen a copy of a letter which the then President of FAUI (Federation of Australian Underwater Instructors) wrote requesting that the RAN refrain from assisting UIAV. However the task of teaching was delegated to the Diving Team of the RAN Reserve at Port Melbourne. I was the Medical Officer for DT 6. To the best of my knowledge this 1973 course was the first, certainly the first in Victoria, to teach basic diving medicine and physiology, up to the standards used by the RAN, to budding scuba instructors. Shortly afterwards FAUI, in Victoria, ran its first instructor training course where a doctor, myself, was invited to present the diving medicine and physiology parts of the course. This happy state of affairs lasted for some years and then the training instructors again took over diving medicine and physiology. One major result of my involvement in training FAUI instructors was that an appreciation of the need for diving medicals spread through the diving community in Victoria.