programs.

Despite the above comments, in an extreme emergency, where access to a chamber is impossible, underwater oxygen recompression might still be worth attempting, especially if diver monitoring is available to increase the safety of the procedure. For even though a full 2 or 3 hour therapeutic profile may not be possible, it appears that at least an hour of oxygen at 2 ATA could normally be safely delivered and might well prove to be of considerable value.

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Cold, diver monitoring, decompression sickness, recompression, hyperbaric oxygenation, skin temperature.

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CLINICAL REVIEW ROYAL ADELAIDE HOSPITAL HYPERBARIC MEDICINE UNIT 1990

Chris Acott

Introduction

Since its inception in 1986 the Royal Adelaide Hospital (RAH) Hyperbaric Medicine Unit has had a steady clinical work load (Table 1).

During 1990 the medical staff of the Unit was a full-time Director, four Specialists, a part-time General Practi-

TABLE 1

Year	No of Patients	Patient Treatments	Chamber Runs
1986	109	565	319
1987	169	1480	759
1988	122	1379	654
1989	117	1033	548
1990	116	792	477

tioner and one Visiting Specialist involved in research. The Director and specialists all had other clinical commitments in the RAH Anaesthesia and Intensive Care Department.

The nursing staff consisted of a Charge Sister, one full-time RN and two part-time RNs. As well there was a nursing pool of 26, 4 of whom had Critical Care nursing skills. There were 2 full time Hyperbaric Technicians.

Patient treatments

The patient numbers treated were similar to previous years (Table 1).

The complication rate was low. There were 3 deaths, one each from cyanide poisoning, carbon monoxide poisoning and cerebral arterial gas embolism. Two patients required myringotomies because they could not equalize. One patient developed a pneumothorax.

Cases treated

Carbon monoxide poisoning, decompression sickness, osteoradionecrosis and chronic refractory osteomyelitis were the main conditions treated. The full list appears in Table 2.

Carbon monoxide poisoning

Sixty one patients were treated. Thirty one were from accidental exposure and 30 from suicide attempts.

The total number of treatments was 205. The average number per patient was 3.4 with the range being 2 to 8.

The range of carboxyhaemoglobin levels on admission was between 6-77 mg% averaging 24 mg%. The level on admission had no correlation with the number of treatments the patient received. Table 3 lists the causes of the accidental exposures. Faulty gas heaters and faulty car exhaust predominate. Forklift drivers still continue to be exposed.

TABLE 2

CASE LOAD

Carbon monoxide	61
Decompression sickness	20
Osteoradionecrosis	9
Gas gangrene	5
Osteomyelitis	4
Wound healing	3
Idiopathic hearing loss	2
Spinal sydrome (ischaemic muscle)	2
Cerebral arterial gas embolism (CAGE)	1
Venous stasis ulcer	1
Necrotising fascitis	1
Cyanide poisoning	1
Chemical inhalation	1
Non-healing bone graft	1
Cerebral ischaemia	1
Post-partum fitting	1

TABLE 3

CARBON MONOXIDE POISONING ACCIDENTAL EXPOSURE

Fire fighters	(2Country Fire Service)	3
Faulty car exhaust	(2 families of 4)	8
Faulty gas heater		8
House fire		2
Accident at work		3
Fork lift drivers		4
Fire in prison		2
Miners		1

Experience at the RAH contradicts the opinion of the Australian National Institute of Occupational Health and Safety which stated in 1989 “fire-fighters who are working on bushfires...are unlikely to experience hazardous exposure to carbon monoxide”.[1]

A hose attached to the car exhaust is still a popular way to try to commit suicide. In majority of cases the hose fell off, while some changed their minds, and in others the car ran out of petrol. Only 1 patient, who attempted suicide, had had a previous exposure to carbon monoxide. This was from a faulty car exhaust.

At 18 month follow-up 2 patients had neurological sequelae (short term memory loss and poor concentration). One patient who had attempted suicide died 3 days after admission.

Decompression sickness

Of the 20 cases only 3 presented with joint pain alone. The rest had neurological symptoms or signs. Table 4 shows the sex breakdown and the number of treatments given.

TABLE 4

DECOMPRESSION ILLNESS

No. of cases		
Male	18	
female	2	
Total		**20**
No. of treatments		
Range	1-8	
Average	3.5	
One only	5	
5 or more	8	
Total		**69**

All patients received a RN Table 62 as the initial treatment. Five were given IV fluids. None received steroids or aspirin.

Follow-up at 1 and 3 months revealed that 3 still had residual problems. These 3 have ceased diving. At the 12 month follow-up 2 still had residual problems.

Table 5 lists the dive tables used. There was an increase in 1990 of the number of divers who were using computers compared with previous years.

Forty five percent of the dive profiles were within DCIEM tables, however, all of these were associated with accepted predispositions to DCS. These were:- heavy alcohol intake, multiple ascents, recent or concurrent illness and clinically a patent foramen ovale.

TABLE 5

DECOMPRESSION ILLNESS DIVE TABLES USED

Table used	Number	Inside DCIEM limits
None	4	1
Dive Computer	4	1
BS-AC/RNPL	1	1
Comex	1	1
PADI (old)	1	-
RDP	2	2
USN	5	3
Unknown	2	-

TABLE 6

DECOMPRESSION ILLNESS ASSOCIATED FACTORS

Alcohol	4
Previous DCS	1
Multiple dives	16
Multiple ascents	9
Flying after diving	4
Altitudeafter diving	1
Viral illness	2
Last dive deepest	6
Deep bounce dive	1

Table 6 lists the associated factors with all the cases of decompression sickness. There are some disturbing factors associated with some of the diver's diving habits; divers not using any recognised diving schedule, the deepest dive being the last dive of the day and deep bounce diving.

The shallowest recorded was 8 m, while the deepest was 56 m of sea water. The average depth was 20.5 m. The 8 m dive included 8 ascents to the surface.

Sixteen were local divers, therefore transportation to treatment was not a problem. However, only 6 divers presented for treatment within 12 hours of a problem being noticed. Table 7 lists the time from onset of symptoms to treatment.

TABLE 7

DECOMPRESSION ILLNESS BETWEEN DELAY SYPMTOMS AND TREATMENT

0 - 12 hrs		6
12 - 24 hrs		1
24 - 48 hrs		3
48 - 72 hrs		1
72 - 96 hrs		1
96-120 hrs		1
> 120 hrs		7
Mean	**89.6 hours**	
Range	**5.5 hours - 7 days**	

The qualification levels of the divers treated is listed in Table 8.

Osteoradionecrosis

Nine patients were treated. This involved a total of 235 treatments. All patients, the mandible was involved. All

TABLE 8

TRAINING LEVEL OF TREATED DIVERS

Basic	10
Advanced	3
Instructor	2
Not recorded	3
Commercial	2

Average years of diving 3.5 years.

were following radiation and surgery for head and neck carcinoma. Five still continued to smoke at the time of treatment. All had a good clinical result.

Osteomyelitis

Four patients were treated, involving a total of 125 treatments. Three patients had a successful clinical outcome which was judged by sinus and wound healing. The fourth patient's treatment continued on into 1991.

Gas gangrene and necrotising fascitis

Five patients with gas gangrene were treated. All received at least 6 treatments, one patient received 11. All were diagnosed at the time of surgery. All cases were post traumatic and Clostridium Welchii was isolated in all. One patient with necrotising fascitis was treated. The infection responded well to hyperbaric oxygen.

Idiopathic hearing loss

Two patients were treated for a total of 17 treatments. Both patients had a marginal increase in their hearing.

Venous stasis ulcer

There was no improvement in this patient.

Slow healing wounds

Threepatients were treated with poor results. All had very poor wound toilet despite constant encouragement by the Unit staff.

Spinal ischaemia

Two patients were treated with limited success.

Cyanide poisoning

The one patient poisoned by cyanide died.

Arterial gas embolism

One patient had an iatrogenic cerebral arterial gas embolism during coronary artery by-pass. Inspite of treatment the patient died.

Education

During the year two Medical Officers Diving Medicine courses were held. There were three Diving Medical Technicians Courses, two Hyperbaric Nurses courses and an Abalone "Shellers" course. Three Diving Safety Seminars were held.

Research

Research into Gas Embolism and Carbon Monoxide Poisoning continues. Dr Chris Acott is supervising the diving incident monitoring survey, which will reveal for the first time accurate figures of what are the common problems of recreational diving. It is hoped that the training agencies will be able to learn from these figures and then change their teaching so that more emphasis is given to avoiding the problems.

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