so you may only dive for 5 minutes for a no-decompression dive. Hence the maximum allowable bottom time for the second dive is 5 minutes. Again do not forget to do the safety stop en route to the surface.

Example 6

You are planning to do two dives. The first is to 34 m for 18 minutes and the second, five hours later, is to be a no-decompression dive to 27 m. Calculate the decompression required for the first dive and the maximum allowable bottom time for the second.

Enter the 36 m box and move down column 2 to 20 minutes. Moving across, the required decompression is 2 minute sat 6 m and 5 minutes at 3 m. The repetitive group is E. Entering Table 2 at E, move across to find the surface interval of 5 hours. This row ends at 4.00 hours which means that, for group E, after 4.00 hours no residual nitrogen needs to be added. In other words, the previous dive can be ignored.

This situation occurs after a surface interval of 2.00 hours for group B, 3.00 hours for group C and up to 12.00 hours for group G. Therefore to find the allowable bottom time for the second dive, return to Table 1, enter the 27 m box and the maximum bottom time is found to be 21 minutes.

Determining the repetitive group after dives with bottom times less than the no-decompression limit is done by referring to the bottom part of Table 2, the repetitive group for no-decompression dives.

Example 7

Find the repetitive group after a dive to 9 m for 30 minutes.

Enter the bottom half of Table 2 at the 9 m column and move downwards to find the 30 minute (or next greater) bottom time. In this case we get 37 minutes and by moving across to the left the repetitive group is found to be group B.

Similarly after a dive to 30 m for 7 minutes (the no-decompression limit is 9 minutes) we are in group A and after a dive to 18 m for 38 minutes (the no-decompression limit is 44 minutes) we are in Group E.

<u>If the bottom time is exactly (or more than) the no-decompression limit the repetitive group must be taken from Table 1</u>. The repetitive groups in Table 1 do not always coincide with those in Table 2.

C. FLYING AFTER DIVING

The surface interval required before flying (or otherwise ascending) to normal commercial cabin altitude (2,400 m) is found in the following manner:

Use the repetitive group after the last dive to enter Table 2. Move across until entering the rightmost column with the picture of the aeroplane. This gives the time required before flying. After this interval it should be safe to fly.

Example 8

After a dive to 27 m for 20 minutes you are in repetitive group E. Entering Table 2 at E and moving across, you will find that after 3 hours it should be safe to fly. If after the dive you were in group F, you would have to wait at least 4 hours before flying.

D. DIVING AT ALTITUDE

Table 1 can be used for diving at altitudes between 0-700 metres. Table 3 is for use for dives at altitudes 701-2,500 m above sea level. This table is governed by the same rules as the 0-700 m tables and utilize the same repetitive dive timetable (Table 2).

NOTE: *This article is taken from the draft of a book relating to decompression and practical diving which is currently being prepared by John Knight and John Lippmann. The author wishes to thank Professor Dr Buehlmann and Beat Mueller for their assistance in the preparation and checking of this draft.*

John Lippmann is a diving instructor (FAUI 561 and NAUI 7352). His address is 24 Frogmore Road, MURRUMBEENA VIC 3163, Australia.

<u>PULMONARY OEDEMA FOLLOWING AN IRUKANDJI STING</u>

Ivan Herceg

It appears that stings by the small jellyfish “Irukandji” (Carukia barnesei) are relatively common in northern Queensland, some 61 cases being reported in the 1985-1986 summer season.[1] Although the Irukandji syndrome, as described by Barnes,[2] is extremely unpleasant, no life threatening complications have been described. It is generally believed that with correct supervision Irukandji sting carries no threat to

life.[3]

A case of life threatening pulmonary oedema, severe enough to require mechanical ventilation, is described following an Irukandji sting.

CASE HISTORY

While snorkelling near Seaforth Island on the Great Barrier Reef, a previously fit 28 year old man was stung on the face and neck by an unseen marine stinger. He swam to the boat without difficulty and immediately applied household vinegar to the affected area.

Within five minutes, he had developed abdominal cramps, sweating and heaviness of the legs. The symptoms worsened over the next thirty minutes with the development of severe low back pain, generalised myalgia, profuse sweating, chest tightness and marked apprehension. he thought he was going to die.

On arrival at hospital an hour after the original sting, he was very agitated and his main complaint was back pain. The face and neck were swollen and erythematous, but there was no blistering or skin damage. His blood pressure was 210/150 and a third heart sound was noted. There was no respiratory difficulty, his chest was clinically clear and a chest x-ray was normal. Aside from a tachycardia of 130/ minute, the ECG was normal. Later a brief run of bigemini was recorded.

The patient was a non-smoker, had no history of heart or lung disease other than childhood asthma. He had no previous exposure to marine stingers.

Pain relief in casualty was provided with intravenous pethidine to a total of 250mg. Hydralazine, 20mg intravenously was used to control the blood pressure, which fell to 170/100. He was given diazepam (Valium) 10 mg, promethazine (Phenergan) 50 mg, and hydrocortisone 100mg, all intravenously.

An Irukandji sting was assumed responsible, and a pethidine infusion was started at, initially, 30mg/hour. Intravenous fluids were commenced, 0/9% saline with 40 meq KCl over 12 hours, as the serum potassium was 3.0 mmol/l (normal 3.5-5.5 mmol/l).

Nine hours after the initial sting, the pain and the facial oedema were settling, but he developed acute shortness of breath, profuse pink frothy sputum, cyanosis and widespread crepitations in both lung fields.

Chest x-ray showed the changes of pulmonary oedema. He was treated with oxygen with a face mask and intravenous frusemide 80mg. Deterioration continued, and by thirteen hours after the sting, he was no longer coping. His arterial PO_2 on 50% inspired oxygen was 45 mmHg (normal 75-100 mmHg). PCO_2 was normal. At this stage, he was intubated and ventilated.

A total of fifty hours of ventilation was necessary, with oxygen concentrations as high as 55% and a positive and expiratory pressure (PEEP) of 7.5cm H_2O. Three days after admission, his PO_2 on 28% oxygen via mask, was 83 mmHg, and his blood pressure had settled to 130/80. He was discharged the following day.

Muscle enzyme studies showed a markedly increased creatine kinase, to a maximum of 1266U/l (normal 20-200U/l). However, as has previously been reported,[1] the myocardial isoenzyme portion was normal.

DISCUSSION

The composition and action of C. barnesei venom is unknown.[4] Many of the symptoms and signs of envenomation are those of excess catecholamine release. Hypertension is described,[1,5] but it is difficult to attribute this patient's pulmonary oedema to hypertension alone as the blood pressure was controlled promptly and remained below 170/115 after admission. Fenner et al1 suggest the use of phentolamine for an alpha-blocking agent, for the control of the blood pressure. However in this case it seems the Hydralazine worked well. A direct toxic effect on the myocardium or the pulmonary vasculature can be postulated.

Barnes believed that several jellyfish in Australian waters were capable of producing the "Irukandji syndrome". Possibly this specimen was of a more toxic variety than those commonly encountered, or the patient hypersensitive. Nevertheless, it seems that the Irukandji is a jellyfish potentially lethal to man.

REFERENCES

1. Fenner PJ, Williamson J, Callanan VL and Audley L. Further understanding of, and new treatment of "Irukandji" (Carukia barnesei) sting. Med J Aust *19*86; 145: 569-574.

2. Barnes JH. Cause and effect in Irukandji sting. *Med J Aust 1*964; 1:897-904.

3. Williamson JAH. *The Marine Stinger Book*. 3rd edn. Brisbane: Queensland State Centre, Surf Lifesaving Association of Australia, 1985: 18.

4. Sutherland SK. *Australian Animal Toxins: the creatures, their toxins, and care of the poisoned*

patient. Melbourne: Oxford University Press, 1983: 381.

5. Fenner P, Rodgers D, Williamson J. Box-jellyfish antivenom and Irukandji stings. *Med J Aust 1*986; 144: 665-666.

Dr Ivan Herceg's address is Mackay Base Hospital, MACKAY QLD 4740, Australia.

ROYAL ADELAIDE HOSPITAL HYPERBARIC MEDICINE UNIT COURSE FOR NURSES - RCC ATTENDANTS

Objectives

Basic

To introduce medical practitioners to the underlying principles of Undersea and Hyperbaric Medicine (UHM), and to enable medical practitioners to adequately assess the fitness of candidates for either diving or hyperbaric exposure (eg. compressed air work).

Advanced

To enable medical practitioners to provide appropriate initial management of patients requiring hyperbaric therapy.

Both courses will qualify candidates to the appropriate regulations and standards.

Duration

Basic: five days; Advanced: five days

Course Composition

The course will comprise both theoretical and practical sessions. A detailed course programme is available on request.

Cost

Basic: $A 250; Advanced: $A 250

Enrolment

People interested in this course should either write to:

Dr D Gorman
Hyperbaric Medicine Unit
Dept Anaesthesia and Intensive Care
Royal Adelaide Hospital
North Terrace
ADELAIDE SA 5000

or ring him on (08) 224-5116

The Royal Adelaide Hospital Hyperbaric Medicine Unit also runs courses for divers and nurses. Details are available from Dr Gorman.

BOOK REVIEWS

Medical Examination of Sport Scuba Divers, Edited by Jefferson C Davis MD. Best Publishing Co., PO Box 1978, San Pedro, California 90732, USA. 60 pages

Price - US$13.50 plus postage and handling: $3.25 (surface), $12.00 (air).

This is an excellent booklet which provides the reader with a comprehensive and reasoned review of the medical factors which deserve consideration when deciding on the medical fitness to dive of some applicant. As the title indicates consideration is limited to the recreational diver, and by inference one with some common sense, it being assumed that such persons will not attempt to dive in obviously adverse sea conditions. There is recognition of the possibility that after their training they may choose to go diving at locations far from readily available emergency aid and have become less fit than when they were initially examined, and are likely to be far less well supervised than professional divers would be in such locations. The role of the instructor in providing a thorough and appropriate training and in persuading some pupils that diving is not an appropriate activity for them is implicit in this text because it is admitted that not only is a medical examination not always required before obtaining scuba instruction but there is no present requirement that the doctor examining the applicant should have knowledge of Diving Medicine. Most instructors would welcome the closing of this loophole, one which sometimes makes a mockery of a Diving Medical Certificate.

The text deals briefly but comprehensively with matters ranging from cleft palate (can the ears be "equalized"?) to psychiatric and neurological problems, from septal defects to asthma, diabetes, and the Gas Bloat Syndrome. There is a listing of the conditions in order of their discussion and a subject index which makes it a simple matter to locate any of the conditions discussed.

This booklet should be useful to instructors and to doctors who are faced with a need to undertake Diving Medicals but are not interested in studying the matter deeply. Even those who have a copy of Diving and Subaquatic Medicine and read this Journal can find items of interest in this booklet.