

SOUTH PACIFIC UNDERWATER MEDICINE SOCIETY
NEWSLETTER



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1. EDITORIAL

A small group of people interested in diving medicine and physiology met at HMAS Penguin on 3rd May, 1971. The intention was to form a small but select society of medical and paramedical workers currently involved in this field. We assumed that there would be less than 30 people so involved. There was no suggestion of a large organisation, complex or intricate constitutions, grandiose ideas (unless implemented by the proposer) or heavy financial commitments.

Prior to the meeting we envisaged an annual or bi-annual meeting, often having social as well as academic interests at heart, and conducted in an informal manner.

The topics discussed ranged from erudite taxation legalities to sex under water, but most of these will probably not be fully covered in the minutes.

One of the more onerous tasks inflicted at this meeting was the publication of a newsletter to be sent to members of the society. This epistle is the first. The continuation of such a newsletter, or its modification, will depend very much on the enthusiasm and interest of the members. It is hoped and anticipated that case histories of diving accidents will be sent to the Editor for publication in the newsletter. It is also hoped that as many people as possible will attend the meetings, which will be held at suitable sites. A suggestion that the meetings are held underwater has been vetoed.

(CARL EDMONDS)
6A Mistral Avenue,
MOSMAN. 2088.

2. INAUGURAL MEETING

Minutes of the Inaugural meeting of the South Pacific Underwater Medicine Society, held in the Wardroom, HMAS Penguin, Sydney, Monday May 3rd, 1971 at 4.30pm.

Present: Dr C Deal, Surgeon LCDR C Edmonds RAN, Surgeon Lieutenant R Thomas RAN, Dr I Unsworth and Dr D Walker

Apologies: Surgeon Commander R Gray RAN

Business:

1) Title: In view of the broad geographic area proposed for coverage, it was agreed that the title of the group shall be the "South Pacific Underwater Medicine Society", referred to hereafter as the "Society".

2) Aims: The aims of the Society shall be the interchange and dissemination of information on research, recent advances and clinical data in the broad field of Undersea and Hyperbaric Medicine and Physiology. It should also be of value in the distribution of information to interested parties, eg. Standards Association, Diving Clubs, etc., but without accepting responsibility for this information.

3) Election of Officers:

Secretary: Dr I Unsworth
Nominated by Dr C Edmonds
Seconded by Dr C Deal
No other nominations.

Treasurer: Sblt F Ashmore, SUM, HMAS PENGUIN
Nominated by Dr C Edmonds
Seconded by Dr R Thomas
No other nominations.

4) Membership:

It was decided to have Honorary Members and Ordinary Members. Ordinary Membership shall be by subscription initially 2 dollars (\$2.00) payable annually to the Treasurer. Those eligible for Ordinary Membership of the Society shall include medical practitioners whose interest lie within the aims of the Society. Specialists able to contribute from allied fields such as pure and

applied physiology, environmental medical and bio-medical electronics, will also be eligible.

Invitations for Honorary Membership shall be extended to outstanding home or overseas workers in the field of coverage of the society on recommendation from the Committee and general member agreement.

5) Meetings:

It was agreed a maximum of three (3) business meetings be held yearly - one (1) in Sydney and the others in South Pacific area centres to be selected by vote at the previous meeting. These meetings may take the form of short, informal reports from members, a single formal paper presentation or other format to be agreed upon.

It was also considered useful to hold one social meeting yearly to which the ladies may be invited. The venue for this meeting shall be decided yearly in advance.

6) Affiliation:

There was agreement that the Society apply for affiliation with the Australian Postgraduate Federation in Medicine and the Postgraduate Medical Foundation. It was also suggested that the Society be the regional division of the Undersea Medical Society of the United States. This would require members to belong to the United States Undersea Medical Society, not a great financial burden as such subscriptions are tax-deductible.

7) Newsletter:

To facilitate the spread of information, news, views and current affairs, it was agreed that a Newsletter be printed and distributed to members, not more frequently than quarterly, the first Newsletter to be sent to all interested parties home and abroad.

8) Next Meeting:

The date for the next meeting was not decided, but will be communicated through the Newsletter.

There being no further business, the Meeting closed at 5.50 pm.

3. CASE REPORT - DECOMPRESSION SICKNESS

Presenting Symptoms

A Queensland diver, aged 29, presented to his local hospital with severe pains in the left arm and forearm, abdomen and chest, of five hours duration. He had also noticed an area of parasthesia over the left maxillary and frontal region. He desired to urinate, but could not succeed in this.

Past History

This included an anterior spinal fusion in 1969, and a previous diving accident resulting in severe epigastric pain lasting four to five hours, during 1966.

Diving Details

As far as can be ascertained the dives performed that day were as follows:

At 0730 he dived for about 40 minutes to a depth of 14 fathoms, for salvage.

At 0900 for 35-40 minutes at 14 fathoms (salvage). An attempt at staging at the 10 feet mark for 20 minutes was not carried out, as the emergency or reserve supply failed.

The third dive was performed at approximately 1000 for 25-30 minutes at 14 fathoms. This dive had to be terminated when the diver was compelled to do a free ascent, as he ran out of air. A new tank was used each time for the dives, and he was diving with companions who had no symptoms. The gas supply came from the same source.

At approximately 1030 he performed a series of "staging dives" in which he descended to 14 fathoms, slowly, stayed on the bottom for an undisclosed time, but used half a tank of air in a gradual ascent. He then went down a few more times to undisclosed depth for undisclosed times. Five aqualung tanks were used. This group of dives was used as an attempted recompression therapy.

Symptoms

Following the third dive he arrived on the surface "almost unconscious", with severe chest pain and dyspnoea. Pains in the left wrist and elbow commenced 2-3 minutes later, and it was these symptoms that prompted the attempts at water recompression. The descent produced mild relief, however this was changed to extreme pain as

he surfaced in each case. On examination at the District Hospital there were no gross physical signs, apart from the patient's general state of apprehension and confusion and discomfort. It was thought that there was no bladder able to be percussed, and that the left arm reflexes appeared hypertonic. The left arm was difficult and painful to bend. An area of numbness to sensation was noted over the left maxillary area. IV Valium was given, and repeated without symptomatic relief.

Examination Prior to RCC Treatment

The patient was conscious, co-operative, but drowsy. He was in considerable pain and distress.

Respiration There appeared no abnormality in the respiratory tract. The FEV_{1.0}/VC was 5.0/5.7L.

Locomotor Pain was related to the left shoulder, elbow and wrist, with less severe pain involving the right arm (between shoulder and elbow). Difficulty in movement was encountered, but the range was full.

Alimentary There was considerable pain in the abdomen, mainly suprapubic. The patient had managed to pass urine once, with considerable difficulty. He also noted increased borborygmi, verified with auscultation.

Neurological The patient had a frontal headache, with numbness over the left maxillary and frontal regions. The only abnormalities on CNS examination were a past pointing with the left hand, missing the nose by about two inches, increased reflexes especially in the right knee, gross weakness of the left hand, Romberg's sign present (falling consistently and rapidly backwards to his left side), and (?) nystagmus.

Others There were no skin manifestation, areas of ischaemia, lymphatic obstruction or signs of shock. Application of pressure to the pain sensitive areas, via a sphygmomanometer cuff pressurised to 250 mm Hg, produced no change in pain sensitivity.

Treatment

The patient was placed on an oxygen enriched mixture, and the transfer via a pressurised aircraft was arranged for the 600 mile trip to a large recompression chamber. With the minimum of movement by the individual, this transfer was carried out and he arrived at the PCC at approximately 0200 on the following day, viz, 15 hours after the start of symptoms. An initial attempt was made to obtain relief using

the shorter oxygen table, designed by Workman. The patient did not obtain significant relief of symptoms after 10 minutes at 60 feet depth on O₂, and thus he was continued on the longer O₂ table (285 minutes). Complete relief was obtained with this therapy, and the patient was taken from the chamber, asymptomatic, approximately 24 hours after the first dive commenced. In the subsequent 24 hours the patient had to be constantly monitored to maintain his relief from symptoms, by the use of different O₂ mixtures. This was achieved without difficulty.

Investigations

Unfortunately few investigations could be carried out in this particular case, but there were no abnormalities noted in the serum enzymes (LDH, CPK, SGOT, SGPT).

Further Treatment

The patient was sent back to his home, with the provision that he must not travel in commercial aircraft, that he must remain at rest for some days and that there must be no further diving or flying for a minimum of one month.

Provisional Diagnosis

This patient, according to the signs listed just prior to his being recompressed, had decompression sickness involving the upper limbs, the abdomen and the cerebellum.

Comments

1. It is about time that divers stopped relying on their emergency supply for decompression staging.
2. The duration and depth of the dives far exceeded that expected to produce decompression sickness.
3. The diver's attempts at decompression staging were grossly inadequate. Water recompression usually leaves the patient worse than it finds him and especially if one attempts it with an inadequate gas supply and a demand valve system.
4. The possibility of a high cervical spine bend, of worry to his local and receiving medical officers, necessitated the constant supervision of the patient during transport, with the ability to

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intubate and take over respiration needed at all stages.

5. The necessity to use aircraft pressurised to ground level is re-emphasised, if air transport is used.
6. The post RCC treatment is considered at least as important as the recompression in achieving a satisfactory final result.

4. HYPERVENTILATION AND BREATHHOLD DIVING *

A large number of children and skin divers have found that they can extend the duration and distance of underwater swimming by a practice termed hyperventilation. Their aim may be to surpass their colleagues' efforts with an ability to perform breathhold diving, longer, deeper or further, or perhaps it was found necessary to obtain an elusive angler's prize. Most cases of drowning occur during participation in recreational activities, and over half occur in young adults and children.

A puzzling problem, up till the last decade, has been the unexplained drowning of good swimmers. The paradox of healthy young swimmers drowning in the apparent safety of a swimming pool is now able to be explained by recent work on hyperventilation. Hyperventilation may be defined as a voluntary increase in depth or rate of respiration. The would-be record breaker then takes a full inspiration, and performs his task.

Under normal conditions, when the swimmer does not hyperventilate, the following physiological changes occur during breathholding: the oxygen tension within the alveoli of the lung (100mm Hg) decreases, because of oxygen consumption; carbon dioxide level rises above normal (40mm Hg); the arterial blood reflects the alveolar gas tensions. The normal stimulus to respiration is the rise in the carbon dioxide tension. The drop in oxygen tension is a much less powerful stimulus, and before this drops to a dangerous level, respiration has been recommenced due to the rising carbon dioxide tension. Although factors influencing the gas exchange cycles under water are far more complex than this, the basic concept of a rising tissue carbon dioxide stimulating respiration and preventing loss of consciousness due to oxygen lack is still applicable. This is a physiological safety mechanism of considerable benefit to us.

Hyperventilation before diving results in the following sequence: the alveolar oxygen tension is increased (from 100mm Hg to approximately 140mm Hg); the amount of oxygen carried by the blood is slightly increased; the carbon dioxide level of the alveolus falls considerably (from 40mm Hg to as low as 15mm Hg).

Now the swimmer is able to commence his dive with a slight increase in this arterial oxygen tension, but a considerable drop in his carbon dioxide tension. Because of the carbon dioxide debit, he is able to swim a much greater distance and depth without the usual desire for air. Unfortunately, the oxygen continues to be consumed at the normal rate, and thus he may enter a zone of oxygen tensions that is below that required to sustain consciousness. There may be little

or no warning of this impending loss of consciousness, and the subsequent series of events, usually leading to a coroner's report on drowning, is well known.

This situation is particularly dangerous because of: the adventuresome and active spirit shown by young swimmers; the difficulty in explaining the physiological changes which occur; the irresponsibility of some diving instructors who have not appreciated the consequences of this practice; and finally the absence of specific pathological findings at autopsy, apart from the effects of drowning.

There has been a considerable number of typical cases of this syndrome in Australia, with well recorded clinical data available. The number of vocal protagonists of hyperventilation has diminished subsequent to their diving accidents, over the last few years.

Without necessarily attempting to explain the physiology involved, it is recommended that swimmers and divers, in schools or clubs, be strongly discouraged to attempt hyperventilation, otherwise, in an attempt to gain endurance of depth in diving, they may succeed beyond their wildest dreams. By performing hyperventilation, the swimmer reduces one of nature's safety mechanisms - the stimulus to breathe. The price he may pay is sudden loss of consciousness due to oxygen lack. Unconsciousness under water is likely to lead to drowning.

- * Compiled for a lay audience. Dr R Thomas will present a report on the complex physiological sequence of events in a later Newsletter.

5. CORRESPONDENCE

As this is the first Newsletter, no specific correspondence has been initiated. Some interesting snippets of information, showing the activities of the last few months, are as follows:

RCC for South Australia?

There are rumours running rife that the Royal Adelaide Hospital are considering the possibility of acquiring a small emergency RCC system, possibly a two man chamber with TUP facilities. At this stage it is anyone's guess as to whether the project will get off the ground. Both Tasmania and Queensland have tried similar schemes, but in each case they became bogged in bureaucracy. It is just possible that the South Australians could again show the way to other states with their more progressive outlook.

Repatriation RCCs

Will the Repatriation Hospitals take over recompression facilities in each capital city, for use by divers and for hyperbaric oxygen? Apparently the Gorton austerity program has squashed this idea, at a very low level. Unless someone has the ear of the Minister for Health, this excellent concept will be shelved for another decade.

HMAS Neverbudge

The Prince Henry Hospital Hyperbaric Unit is now open for treatment. The unit at Little Bay, Sydney, is now a functioning concern. Under the Director, Dr Ian Unsworth, and supported by full ex-naval staff, this unit is now treating medical and surgical patients who require hyperbaric oxygenation. This does not include diving accidents, but is serving a most valuable function in the Sydney area. This also means that the Navy chamber, often previously occupied by civilian medical patients, can now be freed for the use of both Navy and civilian diving accidents. The division of labour between the two units is most satisfactory to all concerned. Cases of gas gangrene, ischaemic necrosis, skin ulceration and burns go to the Prince Henry unit, while the bends and burst lung cases go to the RAN unit. NSW has even further outstripped the other states in recompression facilities.

Undersea Medical Society

There is a rumour that the Undersea Medical Society is going to break away from Aerospace Medicine. This means, if it eventuates, that medicos interested in diving will be able to subscribe a

relatively small subscription direct to the Undersea Medical Society, without being obliged to fly to such academic and financial heights as is required by the Aerospace group.

Cairns in Winter

There is a rumour that our Underwater Medicine Society is planning to meeting in Cairns, or on Green Island, at an appropriate time, when the diving is good, during 1972.

Frontiers of Science

A certain Naval Medical Officer has switched to plastic stethoscopes to continue his underwater medicine speciality. "They don't rust".

Deals

A certain cardio-thoracic surgeon in the Society is not allowed to attend the Aquatic Club of Sydney, unless he comes disguised with a coat. His argument viz. that if the waiters don't wear coats, why should he, seems valid. He was so upset that he inadvertently paid the wine bill.

Editor

6. BUBBLIES' BUNGLINGS

Time - 1.30 pm

Patient: The main problem is that I have developed a peculiar squarking voice. This seemed to occur after a dive this morning, and is not improving.

Medic: What were the diving details?

Patient: We did a 60 ft dive off Ship Rock for about 40 minutes. It was fairly hard work with the current coming around the rock, but there was no special difficulty encountered during the dive. I ran out of air towards the end, and had to use my emergency supply for the last five minutes. We finished the dive at about 11 am, and after clearing out gear I came straight round to you.

(CORRECT DIAGNOSIS - TOP MARKS)

Medic: Were there any other symptoms?

Patient: I did feel very weary on the journey back from Ship Rock. In fact my wife carried the lung and drove back, and I have just been sitting in the car waiting for her to strip the gear down. She dived with us and did not notice any symptoms, even though she used identical equipment, and the same compressor. Of the other four people who carried out the same dive, none had any symptoms.

Medic: Do you have any aches or pains in the joints?

Patient: No.

Medic: Any problems with skin rashes or numbness or tingling?

Patient: No, nothing like that.

Medic: At any stage during the dive, did you aspirate any water or attempt buddy breathing?

Patient: No.

Medic: Did you have any coughing or expectoration following the dive?

Patient: No.

(CORRECT DIAGNOSIS - YOU SHOULD HAVE GOT IT BY NOW.)

Medic: Has there been any trouble with your breathing?

Patient: Yes, there is a tendency to some tightness on inspiration. I also feel a little bloated around the throat, perhaps I am getting an infection.

Medic: Did you try to continue your dive for as long as possible, while on your emergency supply?

Patient: Yes, I did try and stay down there, as there was still some work to be done and some specimens to be obtained.

Medic: Was there any resistance to breathing from the emergency supply?

Patient: Yes, towards the end. I did however get to the surface without any problems and without needing to do a free ascent. There was no more air available from the tank when I surfaced.

Medic: Any history of asthma or hay fever in the family?

Patient: Both I and my son have asthma, but not recently.

(CORRECT DIAGNOSIS - IF YOU HAVEN'T GOT IT NOW, GIVE UP DIVING.)

Medic: I would just like to examine you.

Medical examination revealed Hommans sign positive, crepitus on auscultation over the supraclavicular fossae and an x-ray of the chest revealed mediastinal emphysema, without any evidence of a pneumothorax.

Diagnosis - Pulmonary Barotrauma, resulting in mediastinal emphysema, unassociated with pneumothorax or air embolus, and precipitated by the diver breathing against a high resistance (running out of gas) and perhaps the clinical history of obstructive airways disease.

Comment. The delay between the dive and the presentation of the patient for treatment, viz. some two hours, is not exceptional in the mild cases of pulmonary barotrauma. Only in the severe cases and in those having air emboli do the symptoms occur concurrently with the ascent to the surface. An explanation for this delay in some cases is the nitrogen gradient between the tissues and the gas bubbles in the mediastinum, subsequent to ascent. This would ensure a passage of nitrogen from the tissues to the gas bubbles, for some

hours. The 'Donald Duck' voice is probably due to recurrent laryngeal nerve involvement.

The association between obstructive airways disease and pulmonary barotrauma is axiomatic. Clinical history, vitalograph recording and/or x-ray evidence of cystic degeneration would have excluded this man from diving permanently.

7. POST SCRIPT

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4. The Physiology of Breathhold diving - Dr R Thomas.
5. Hyperbaric Unit - Dr I Unsworth.
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Any contributions for either articles or correspondence will be greatly appreciated.

Is There a RCC Near You?

There is an abysmal lack of knowledge on RCC facilities in Australia. We are attempting to compile a list of RCCs which may be used in an emergency. This list will be updated periodically - if we can obtain your assistance. Please inform us of any RCCs with which you are familiar. The details we require are:

- (1) Name and address of operator
- (2) Site - fixed or portable
- (3) Maximum working depth
- (4) Approximate internal size
- (5) Locks for people, materials and/or other RCCs
- (6) Number of people it can accommodate
- (7) Name of manufacturer and date, if available
- (8) Like problems with operating chamber

Diving Medicos

Do you know of any doctors interested in underwater physiology or diving? If so, perhaps you could pass on this newsletter. Even an inveterate gossip like the editor cannot know everyone who dips his stethoscope in the briney.