

necessary surgery was done through a sternotomy. Now he has asked me "Can I dive again". We had a bit of a chat about informed consent and I suggested that he have a proper diving medical. Other than having survived those injuries he a normal person. At the moment he is not diving. In people who have had open heart surgery and penetrating chest wounds we worry about adhesions and other things that may predispose them to a pulmonary over-pressure event. Are these people at any significant extra risk when they want to dive, or if they want to dive again?

Paul Thomas

From the point of view of his pneumothorax he should not have underlying structural lung disease so you would think that he should not be at risk. If one has got blood in ones chest that often causes scarring between the two layers of pleura so therefore one is much less likely to have another pneumothorax. The other point is that the scarred lung will be abnormal and there is the possibility of an over-pressure event, but I do not know of any information about the risks.

Guy Williams

It seems to me that he fits within concept of informed consent. That one can explain the risk to him and he can decide for himself what to do. I think his extra risk is probably not all that high. But, as we discourage people with penetrating chest injuries from diving, there is no evidence.

Cathy Meehan

The Australian standard says that a penetrating chest injury is an absolute contraindication, so you have to be really careful.

References

- 1 Elliott D H (Editor). *Are asthmatics fit to dive?* Maryland: Undersea and Hyperbaric Medical Society, 1996
- 2 Gorman D, Veale A and Richardson D. SPUMS policy on asthma and fitness for diving. *SPUMS J* 1995; 25 (4): 213-215
- 3 Jenkins C, Anderson SD, Wong R, Veale A. Compressed air diving and respiratory disease. A discussion document of the Thoracic Society of Australia and New Zealand. *Med J Aust* 1993; 158: 275-9
- 4 Walker D. *Report on Australian Diving Deaths 1972-1993*. Ashburton, Victoria: J.L.Publications, 1998: 221
- 5 Butler BD and Hills BA. The lung as a filter for microbubbles. *J Appl Physiol* 1979; 47: 537-43.
- 6 Katz JM, Blackburn JG, Leman RB and Crawford FA. Cardiac pacing under hyperbaric conditions. *Ann Thoracic Surg* 1983; 36 (1): 66-68

DIVING CANDIDATES AS THEY PRESENT FOR FITNESS TO DIVE ASSESSMENT DIVING MEDICINE CASE STUDIES Part 2

Vanessa Haller and Guy Williams
with audience participation

Key Words

Barotrauma, cardiovascular, case reports, decompression illness, dysbaric osteonecrosis, injury, medical conditions and problems, pulmonary barotrauma, spear fishing.

Vanessa Haller

General practitioners do a lot of the screening of new divers but we also see them after they have been diving for years when they come in with problems. Unfortunately we cannot do much to prevent them diving or from continuing to dive and sometimes we need some help in how to deal with these problems.

Case 15

I only met this gentleman two weeks ago, when I was visiting his mother. He is a 46 year old professional underwater photographer. This story came up in conversation. About 8 years ago, in South Australia, he had some sharp pain in the left side of his chest with a little bit of shortness of breath, but he ignored this, thinking that it was muscular. The next day he went for a dive and was separated from his buddies. He was in a bit of a surge. He surfaced to look for them and became short of breath on the surface, so feeling that he was better at depth, he went back down again, because then he was less short of breath. Eventually he had to surface because he was running out of air. When he surfaced he had severe shortness of breath, severe left sided chest pain and collapsed. Obviously on the day before the dive he had had a spontaneous pneumothorax which had become a tension pneumothorax by the time he reached hospital. He had a surgical repair of his pneumothorax. Six weeks later he was given the OK to continue diving and for the last 8 years has been diving quite successfully with the repaired pneumothorax.

Diving is his income. He has no obvious bullae on chest X-ray now. Would anyone like to comment on this?

Unidentified speaker

A spiral CT or a MRI for studying the lung should be done.

Deborah Yates, Respiratory Physician, Sydney

I know what respiratory physicians might do but that might not be what is recommended by diving specialists. I think this man is actually at a significant risk. Whenever anybody has had a single pneumothorax I always worry about disease on the other side. His surgical repair should mean that he should not have another one that side. But I

would be worried about the other side. I would like to get full lung function tests and also a CT scan just to make sure he has not got any bullae, as a chest radiograph is not very good at picking them up. The other thing I think would be useful to ask about his smoking history and in particular, also about his history of smoking marijuana, because that appears to be associated with upper lobe bullae.

Vanessa Haller

He is a non-smoker, but I did not ask him about marijuana so that is interesting. According to the Australian Standards, anyone with a spontaneous pneumothorax should be excluded from diving.

Mike Bennett, Hyperbaric Physician, Sydney

I accept that there is great intellectual interest in all those marvellous investigations but they are irrelevant. This man could be counselled that he is at a significant risk and he should be fully informed. He should be told that if he wants to dive again to never ever associate your name with that activity.

Vanessa Haller

Case 16

This 50 year old abalone poacher, who had been diving for years, was working in shallow water where there was a large swell. As he was poaching it was a night dive. He was concentrating on the abalone and he was going up and down in different depths without actually noticing. On surfacing he had a lovely Donald Duck speech and clinically he had subcutaneous emphysema. He said he had no previous decompression illness (DCI) but his sharpened Romberg test was only 10 seconds. On chest X-ray he had mediastinal emphysema. He refused any suggestion of recompression treatment. He did however, let me give him some oxygen and the Donald Duck speech settled to a certain extent, so that he sounded normal within 24 hours and all the subcutaneous emphysema settled within about 48 hours without doing anything. I counselled him not to dive but he continues to dive and probably is still poaching abalone and he is at risk of doing that again.

Robyn Walker, Naval Hyperbaric Physician, Sydney

If one tells people the risks and they continue to undertake the activity, surely that is their responsibility? I do not lose too much sleep if people do not want my advice. On the information given that I would suggest that he does not dive again.

Certainly there is some evidence that the sharpened Romberg time is reduced in people with decompression illness.^{1,2} I do not fail people at diving medical because they can only do 10 seconds. I examine them to make sure there is no other problem. A lot of people actually improve with just becoming familiar with the test. Various people do sharpened Rombergs in bare feet, others do it in shoes. I have seen one girl who could only do it in stiletto heels, because she normally wore stilettos. She could not do it at

all in bare feet, but she when put her stilettos on she was perfect. I think one just records what they can do.

Vanessa Haller

The sharpened Romberg, which we do as a screening test when we first do a fitness to dive, is a test of the balance system. We like someone to do it for sixty seconds and we do not take any notice if they cannot do it initially, because they do improve with practice and with shoes or bare feet and which foot is forward. But later on when they are having a diving incident, how important then is it if the sharpened Romberg drops dramatically and stays low?

Robyn Walker

I ask the people I treat whether they did the sharpened Romberg when they did their dive medical. If they say yes they could do it and they did it for the required time, it gives me an indication that something is wrong if they fall over within one to two seconds. However, the diagnosis is always going to be based on the clinical picture, the history of the dive and ones positive findings.

Vanessa Haller

Case 17

This was a 38 year old professional abalone diver with years of diving experience. One day he was playing some social tennis and injured his shoulder. This brought him to me. He had very poor short term memory and his speech was slurred. His sharpened Romberg was about 10 seconds. X-rays showed quite severe dysbaric osteonecrosis (Figure 1). He had an A4 Juxta-articular lesion, a severely damaged joint with a loose fragment.³

He was unsure whether he had ever had DCI. I suggested that he give up diving but that was unacceptable and anyway he was more comfortable under water.

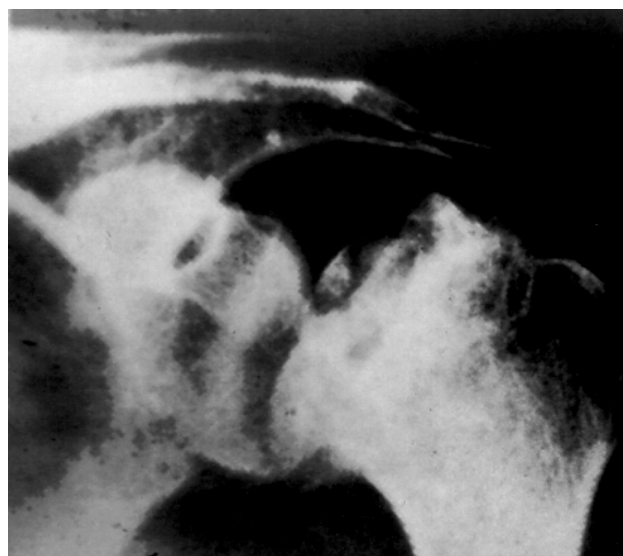


Figure 1. There is an A4 Juxta-articular lesion in the humeral head which has led to a severely damaged joint with a loose fragment of humeral head cortex.

He was an abalone diver in Tasmania and he had a lot of diving deeper than 30 m and for very prolonged times. They would often be in the water up to 8 hours a day. He continues to dive, because that is his living and he did not have any treatment for it. Not that there is much in the way of treatment, as he needs a new joint and shoulder replacements are not very good at the moment.

Case 18

This unfortunate 28 year old sport diver stood on a stingray in Port Phillip 14 months ago. He got an exceptionally painful puncture wound to his foot. He went to the local hospital and they had no idea what to do for a stingray injury. They were uncertain whether or not there was a foreign body or whether it was toxin or trauma. The whole foot was quite inflamed and red and lacerated. They eventually put it in hot water as they had been advised to over the phone. He was quite pain free in the hot water. That was the best he felt for the 14 months. They operated on the wound and the debrided it. They found no foreign body. They put him on long term antibiotics. He continues to return to hospital because the foot is painful. Ultrasound just shows some swelling. The surgeons have further debrided it and given him further antibiotics and that has only been helpful for very short periods of time. He had an injection of local anaesthetic and steroids into the area which helped again only for a short time. The wound has completely healed but it remains painful. Does anyone have any ideas of further management of this foot?

Unidentified speaker

He has probably got an altered pain threshold and needs to see a pain therapist.

Alan Walley, Christmas Island

We treat them a bit better than that on Christmas Island. Has he had any bone X-rays? Was the bone involved at all?

Vanessa Haller

The bone was not involved. He has had a bone scan.

Jürg Wendling, Switzerland

Another point to be considered is whether there is some iatrogenic nerve trauma provoking the pain. Being a hand surgeon I have seen many cases of that kind that have been revised many times, and then finally one treats the consequences of the revisions.

Vanessa Haller

Case 19

This 26 year old male is an unusual case. Like many people he had fillings in his teeth. He did a full day's diving, 25 m for 1 hour then, a 3 hour surface interval, then 1 hour at 18 m. He had no problems equalising. Driving home they went up a small hill and there was a bang. The driver thought he had a blown a tyre. The patient knew it was not as a whole tooth has completely disintegrated in his jaw.

Case 20

A 22 year old student had problems equalising during his dive course. This is a common problem. On ascent he had some pain and vertigo. Clinically he had barotrauma to the ears and it was thought he had a round window rupture. Treating round window rupture is difficult because the ear nose and throat specialists all treat them differently, even if they have got an interest in diving. The management varies between doing nothing, giving them steroids and immediate surgery. We are now also seeing a lot of round window injuries in underwater hockey players.

Has anyone had any new information on treating round window rupture?

David Elliott

I certainly have no new information. But basically there are Carl Edmonds,⁴ Fred Pullen from Miami, Joe Farmer from Duke and Bill McNicoll in the UK and I think that they would all say that one has to operate within 24/48 hours. Waiting for 5 days to see if recovery occurs is wasting opportunities to save hearing.

Recently Bill McNicoll spoke at a Medical Assessment of Fitness to Dive meeting. His first remark was "Are there any ENT specialists at this meeting?" There were none. His comment was "That shows the amount of interest ENT surgeons have in diving." The next comment was "What do ENT specialists know about diving? Nothing. How good are they at treating round window rupture. Not very good." In the UK, ENT surgeons do not know very much about round window rupture and some of them have never even heard of it arising from diving.

It is a question of education. Key articles are Pullen who first described it about 15 - 20 years ago.^{5,6} I know Carl Edmonds wrote something about it around that time.⁴ Bill McNicoll has also written on this.⁷

All you can do is to get hold of your local ENT surgeon, send him a few referrals and get him interested in the subject. Until that happens, we will continue to get permanent deafness from something that could have been fixed with an urgent operation.

Henrik Staunstrup

A question for the audience. In Denmark we have a problem with a commercial diver who dived on a sunken fishing boat. He did a forceful Valsalva on his way down after which he started to get vertigo. On his return to the surface he had nausea and tinnitus, all the symptoms of round window rupture. He still has tinnitus today. We have presented him to the insurance company as a round window rupture. The problem is that he has it in both ears. Has anyone here ever heard of that happening? Because our ENT specialist tells us his troubles have nothing to do with diving because he is affected in both ears. But the onset was definitely when he went down to that sunken fishing boat. As he is also an ambulance driver there is possibility of noise damage from the sirens which usually only causes for minor deafness.

Simon Mitchell

I have never seen a case of bilateral inner ear barotrauma. But statistically it has to be possible. I think that it would be incredibly rare to get inner ear barotrauma with bilateral hearing loss that is symmetrical. But it has to be possible.

Mike Bennett

I wholeheartedly agree with David's bleak outlook. However, in Sydney we have an excellent ENT surgeon who has become very interested in the treatment of round window fistulae and we preferentially send all the round window ruptures we can find to him and he operates early. But he has got so interested that he sends us patients and says this patient has such and such a history, not dissimilar to yours from Denmark, although I have never seen a bilateral one, and he wants us to see if we can reproduce the problem by giving the patient a dip in the hyperbaric chamber. We do audiograms before and after and are drawing some conclusions from that.

Robin Walker

I have seen a patient who had a bilateral round window rupture. She was inexperienced and had difficulty clearing her ears. On one dive in Vanuatu she did a forceful Valsalva which produced severe hearing loss, tinnitus and vertigo with nausea and vomiting. No audiogram could be done there so she was evacuated to Australia. She had a normal audiogram at her diving medical. Now she had a 70 dB loss in one ear and a 90 dB loss in the other ear. She was operated on and a fistula with leaking fluid was observed bilaterally. That is the only case that I know of.

Mike Bennett

Our ENT surgeon says that his experience makes it difficult to believe that people see these fluid leaks. He has shown me in the theatre that the middle ear is moist, it is wet, there is fluid all over the place but he never seen fluid welling up.

John Knight

For those who do not believe that there are fistula that can be seen leaking, I have photographs, taken down the side arm of the operating microscope, in two cases of diving round window rupture, showing a drop grow, and then collapse as it grew too large to remain a drop, on the round window.

Unidentified New Zealander

Our ENT surgeon in Auckland says that a leak from a round window is actually quite a hard thing to see.

David Elliott

I was very encouraged by hearing that the British Thoracic Society and the Australian and New Zealand Thoracic Society are individually preparing standards of care in their specialist fields. I wonder if this Society has one or more ENT surgeons whom we might ask to do the same for

diving related round window ruptures? It is apparent from Vanessa's case that there is a need for a standard of care that can be used by an ENT surgeon who has no knowledge of diving. There is a 24 to 48 hour threshold before permanent damage occurs. Those who repair round window ruptures say they get about a 98% recovery and what is more, these persons, provided that they no longer have any difficulty in clearing their ears, can return to diving.

Guy Williams

Case 21

This patient of mine, a relatively inexperienced diver, developed decreased hearing and tinnitus in his left ear after a dive. Like most divers he rolled up a few days later. He had quite a severe high tone hearing loss in his left ear (see Figure 1). The first ENT surgeon that I referred him to said wait and see. After a few days the patient came back to me saying "I'm not getting any better, I do not want to wait and see". So I sent him to a second ENT surgeon, with diving experience, who basically said "I do not think there is much we can do for you. I would really encourage you not to dive again". That advice was not accepted. He is still diving. And there were no real precipitating factors. He just came up after the dive and noticed that he could not hear properly out of one ear.

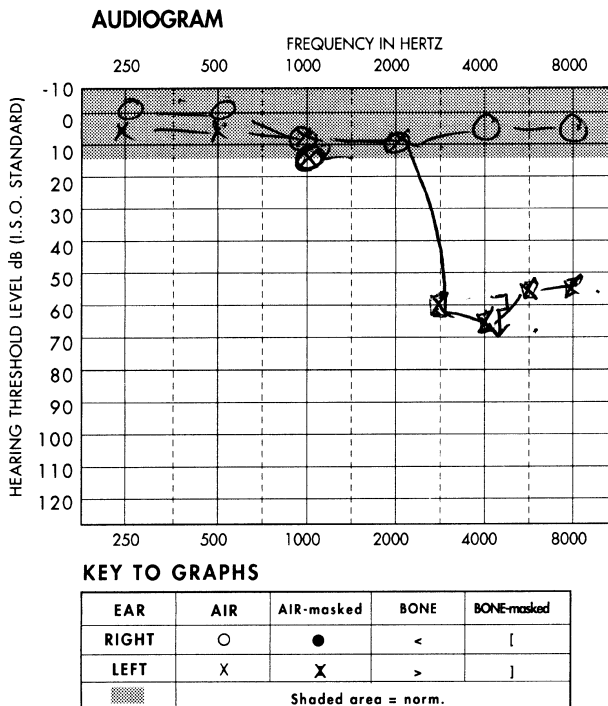


Figure 2. Patient 21's audiogram showing significant high tone loss in the left ear.

Vanessa Haller

Case 22

Spearfishing seems to be having a resurgence, as does a lot of breathhold diving and underwater hockey. This young boy was spearfishing with a gun without a safety

catch on the trigger. An accidental release of the gun left him with the pranger in his nose. Figure 2 shows the pranger spikes, cut free from the shaft, in the patient's face before their removal. The pranger was removed piecemeal as the barbs prevent the spikes being pulled out backwards. Figure 3 shows the patient's face after the spikes had been removed and an intact pranger laid across the face to show its size. At the end of the operation he looked quite reasonable.

Unfortunately diving doctors will come across spearing accidents. Should spears have a safety catch or not? Most of the spear fishing people do not use safety catches. The reason is if the safety catch is off one knows that the spear is always ready to fire. Nowadays, particularly in deep water spearing, people are diving in pairs, so there is less of a risk of people drowning when they black out from anoxia after hyperventilation. In most states of Australia and in New Zealand it is either illegal or unethical to spear fish on scuba. But in many places, like Fiji, people do spear on scuba.



Figure 3. The patient's face showing the four pranger spikes cut short.



Figure 4. A pranger held over the patient's face to show the length of the prongs.

Case 23

Our last case is a cautionary tale. A very experienced, over 20 years of diving, male surgeon, who swims daily and is accustomed to having quite firm goggles on his eyes, bought himself a new mask. He does not need to equalise his ears often during descent. He forgot to equalise his mask and came up with subconjunctival haemorrhages and subcutaneous haemorrhages with marked swelling which took about two weeks to resolve. A severe mask squeeze which could have been easily avoided by blowing air into the mask.



Figure 5. Mask squeeze showing subconjunctival haemorrhages and bruising and swelling below and above the eyes.

Paul Langton

I have a case for which I want advice. I was sent a man, a very keen diver, who has been diving for 30 months by the local hyperbaric chamber after he had been treated for decompression illness. He has only done one decompression dive and that was an unplanned event when diving a wreck at about 35 m. He had not planned on doing a decompression dive but his buddy was inexperienced and towards the end of the dive disappeared back into the wreck. My patient did the responsible thing, went in, grabbed him and came out. He did the requisite decompression stop as shown by his computer. Some time afterwards he had marked impairment of concentration, inability to continue with his work, word confusion and number confusion. His only localising symptom was right facial numbness. The hyperbaric facility said that he had normal central and peripheral neurology. He did have problems with the minimal mental state. Although he scored 30 out of 30 he had great difficulty performing serial 7s and that impressed them because his work involved numbers. He also had some subjective problems with sentence recall. It was decided that he had neurological decompression illness. They treated him and he returned to normal. Because it was thought to be a relatively unprovoked episode they had a trans-thoracic echocardiogram done, which showed a patent foramen ovale. Their working diagnosis was arterial gas embolism and he was advised never to dive again.

Unfortunately he wants to continue diving and is not going to give up diving regardless of advice. He came to see me as he wanted medical clearance to do a Nitrox course to try and reduce the risk of such events in the future. He

had read all the literature and was very cognisant with most of the studies.

My questions are whether he had decompression illness, should he be able to dive again on the basis of those symptoms, and should he have the PFO closed?

David Elliott

Yes, Yes, Yes.

Paul Langton

Closure of PFO is something that we are going to start seeing. More and more patients are being referred because we have a special interest in the area. We get the cases of unexplained decompression illness from the local chamber and we have got the facility to use trans-catheter closure of PFOs with a new device. Peter Wilmshurst has reported a series of these cases but the thing about them was that they all had early onset, clear neurological symptom decompression illness which this man did not really have.⁸ He had some difficulty doing serial 7s but he was able to work as a statistician without any clear impairment. I wonder if some of his symptomology may be related to anxiety or a near stress sort of trauma. But he has keen to have the PFO closed. We wanted to look into a little bit more about whether it may be relevant and there is one interesting paper from several years ago where a group had done a series of studies on divers without clear cause for their decompression illness. They had looked for a right to left shunt (suggesting a patent foramen ovale) with a trans-cranial Doppler technique. They did high resolution brain MRIs on all of them and found that there is a small group who have a high flow right to left shunt and are much more likely to have multiple "white lesions" on an MRI.⁹ He is going to have a brain MRI. It is an extravagant investigation but it is aimed at trying to firm up the likelihood that his PFO has something to do with his clinical event. If he has a normal scan I think it is less likely that the PFO is related to his clinical events. If he has lots of multiple lesions, given his diving experience I think we are on stronger grounds for closing him but I would be interested in your comments.

Simon Mitchell

I think this gentleman definitely had decompression illness and moreover his symptoms were all in a sort of cerebral distribution. They could all be explained by a shower of bubbles to the cerebral circulation and so I think the fact that he has a patent foramen ovale probably should not be ignored. He clearly wants to dive again and I think that under those circumstances it would be justifiable to close his PFO. I appreciate your attempts to try and nail down the significance of his PFO but I think that at the end of the day, you are not going to be able to do that with any acceptable certainty and my advice would be to close it. So, it is yes, yes and yes, like David.

David Elliott

I had a close look at that paper and various others. Alf Brubakk found that most of the lesions were unidentified

white objects. A study in Bergen found that the control population, Bergen policemen, actually had more lesions than the divers.¹⁰ Peter Rink, who runs the MRI unit in the University of Trondheim, says we have no standards of normalcy, even now, for MRI of brains. That paper you quoted is not generally accepted in our diving medicine literature because we just do not believe the MRI has any great clinical significance.

Simon Mitchell

I will not have to sign a piece of paper because no piece of paper is necessary for him to resume normal diving activity that he is already trained for and I think that makes it a little easier for me. With the exception that he wants to go off and do further training and get a new clearance, we may be able to find a way around that. What we have not really talked about is there are risks with closing a PFO and there is not enough experience of the procedure to know what those risks really are. It may be that his risk of future events is less than the risk of a closure procedure.

David Elliott

My concern is his mental function. He really needs to have a full neuro-psychometric study. I think he should be advised again not to dive, because of cognitive dysfunction. I would never ever sign a piece of paper for him. I would only agree to a closure if he was intending to ignore the advice he has been given that he should not dive at all.

References

- 1 Fitzgerald B. A review of the sharpened Romberg test in diving medicine. *SPUMS J* 1996; 26 (3): 142-146
- 2 Lee C-T. Sharpening the sharpened Romberg. *SPUMS J* 1998; 28 (3): 125-132
- 3 Fagan CJ, Beckman EL and Galletti JB Jr. Sample Survey of osteonecrosis in Gulf of Mexico commercial divers. In *Dysbarism-related Osteonecrosis*. Beckman EL and Elliott DH. Eds. Washing DC: National Institute for Occupational Safety and Health, 1974; 9-20
- 4 Edmonds C, Freeman P, Thomas R, Tonkin J and Blackwood FA. *Otological Aspects of Diving*. Glebe, New South Wales: Australian Medical Publishing Co. Ltd., 1973; 32-33
- 5 Pullen FW. Round window membrane rupture: A cause of sudden deafness. *Trans Am Acad Ophthalmol Otolaryngol* 1972; 76: 1444-1450.
- 6 Pullen FW, Rosenburg G J and Cabeza CH . Sudden hearing loss in divers and fliers. *Laryngoscope* 1979; 89: 1373-1377
- 7 McNicoll WD. Otorhinolaryngology and Discussion. In *Medical Assessment of Fitness to Dive*. Elliott DH. Ed. London: Biomedical Seminars, 1995: 156-158, 162-167

- 8 Wilmshurst PT, Byrne JC and Webb-Peoloe MM. Relation between interatrial shunts and decompression sickness in divers. *Lancet* 1989; 335: 1302-1306
- 9 Knauth M, Ries S, Pohimann S et al. Cohort study of multiple brain lesions in sport divers: role of a patent foramen ovale. *Br Med J* 1997; 314: 701
- 10 Todnem K, Skeidsvoll H, Svihus R, Rinck P, Riise T, Kambestad B K and Aarli JA. Electroencephalography, evoked potentials and MRI scans in saturation divers. An epidemiological study. *Electroencephalogr Clin Neurophysiol* 1991; 79: 322-329

FITNESS TO DIVE

Panel discussion with audience participation

Chairman Guy Williams

Panel members David Elliott (Guest Speaker), Robyn Walker, Des Gorman and Vanessa Haller

Key Words

Diving medicals, fitness to dive, medical conditions and problems, questionnaires, risk

Guy Williams (Chairman)

This is a summary session and perhaps we may be able to produce a policy statement or other statement on fitness to dive.

David Elliott

Hidden amongst all the information presented this week are one or two things which I consider to be important.

When it comes to reviewing fitness to dive, remember that instructors and dive guides are occupational divers and they require a different examination to that of recreational divers.

My concern with the idea of using informed consent to pass anybody who turns up, is what to do with the paranoid schizophrenic who wants to be your buddy.

I have no problem with solo divers. Nobody is going to find them anyway so putting the buddy at risk is not a problem.

Why are we so fanatical about health in diving when brain and equipment failure actually kill more people than pre-existing medical problems? It is because not just the diver is put at risk, there is the buddy and the others who may become involved in the rescue. It is true that some diving fatalities have been found at post mortem to have had medical problems, but these findings had no proven

relevance to the cause or mode of death. So let us not get too influenced by a history of asthma.

SPUMS is involved with recreational diving. It is important for the Society to consider the definitions of recreational diving. I consider that we should exclude rebreathers and mixed gases at this time. This equipment may be used for recreational purposes but its safe use requires considerable further training beyond the basic Open Water Diver. So we will focus on open circuit scuba using air or nitrox. Nitrox has depth limitations in order to avoid cerebral oxygen toxicity but can be used safely with attention to remaining above the danger depth. A lot of people dive to 60 m or so on air and experienced people might do it safely. I suggest that we call such diving "deep recreational diving". The idiots are those people who go to 80 or 90 m or even deeper ("extreme air diving"). Possible SPUMS definitions of recreational diving using open-circuit scuba are shown in Table 1.

TABLE 1

RECREATIONAL SCUBA DIVING

| Description | Breathing gas | Depth range |
|--------------------|----------------------|--|
| Normal | Air | Depth to 40 m |
| | Nitrox | Depth limited to PO ₂ 1.4 bar |
| Deep Air | Air | Between 40 and 60 m |
| Extreme Air | Air | Below 60 m |

Des Gorman has made some very important points about the validity of self-assessment forms and I think we really must take more notice of that. The most important medical anybody ever has is the one before they start diving. That is the one time we can stop candidates from diving and they can go and take up something else, probably just as happily.

The other important medical is the review required after some significant illness. Our medical intervention is needed there and it has to be done by a doctor who is competent. It can never be done by prescriptive rules.

I would like us to consider, if we have time, what to do with people who do not easily fit into the conventional recreational envelope. During the week we have considered that and decided that people, even if they are stable asthmatics, can be fit for independent unrestricted diving within the envelope under certain circumstances. If they are fit to dive, then they can do anything within that envelope.

Some people will have self-imposed shallow diving restrictions, such as those who have had a previous bend with probable scarring. They might like to dive on enriched