

treated cardiac arrest patients who had 5 minutes to 22 minutes of cardiac standstill. How much cerebral oedema we get with cardiac arrest we do not know, but they used barbiturates. It is a debate that is going on on both sides of the North of the Atlantic. I am one who ardently believes.

Dr Jimmy How

Patients should be transported with a clear airway and adequate oxygenation.

Dr John Miller

Yes, and hyperoxygenation of the patient. Hyperoxygenation is a cerebral vasoconstrictor and a reducer of intracranial pressure.

Question: (unidentified voice)

Do you give the barbiturate all at once?

Dr Chris Acott

No, the slug dose is titrated. You do not draw up a gram and just give it. If you do not get the response you want with 3 mg per kg give more and see what happens.

Chairman (Dr John Knight)

Any more questions on barbiturates, cerebral oedema and so on? If not, I think we will ask Jimmy How to tell us about the diving habits of the people he treats, and why they get bent 4 days out from Singapore.

Dr Jimmy How

I will not talk too much about the fishermen divers because you can hear a great deal of this at the conference in Singapore. Professor Ong is looking after them in terms of the preventive side and Professor Bose of the orthopaedic department after we have finished with them and have sent the patient to the rehabilitation unit.

We see four categories of patients. Firstly, we have professional divers. They come to us because we have good communications in Singapore and we have the chamber here. The cases that come have already been treated and failed.

By and large these cases are due to failure to follow the tables. They are rushing. In an emergency they have to surface, and when they surface their problems start. They also like surface oxygen decompression. They come up to about 40 feet and then from 40 feet they shoot up to the surface. They rush into the chamber and try to be under pressure again within 5 minutes. Then they breathe oxygen just to cut short the decompression time. Many of them have problems at the stage when they leave the water, getting caught up with things as they rush into the chamber. When they reach the chamber some of them start to get the symptoms and signs coming on. They come to us from Brunei, from the Indonesian side and even from the east coast of Malaysia. All these come to Singapore for treatment.

In the second group are the fishermen divers. They are the people you will hear about in Singapore. Their equipment is primitive. They just do not know anything about diving. They do about three or four dives a day. Basically, they are of the older age group. One would think that because they do so many dives a day they would have a tolerance, but this is not really so. When they get a hit, it is just purely because of the type of diving that they are doing. The best way to get their fish is just to throw some dynamite in, "boom" it goes, and then they can take any hookah and go down and choose the size of fish they want. That is exactly what they do at 120 feet out in the South China Sea, about three days away from Singapore.

By and large those who come back to us have gone down to fish as soon as they anchor. They remain underwater for two or three hours and they come up. They have their lunch and down they go again. They repeat the same thing over again. They go on about three dives a day. The amazing thing is that they have been doing this for 10 years and no bends. But lo and behold in the tenth or eleventh year they become completely paralysed.

The sports divers are mostly visitors. They come up here and they get very engrossed in their diving. They put on a second tank and they go in, they put on a third tank and they go in. Some of them do not use the tables properly and decompress less than they should. They too come back to Singapore and give us some problems.

The fourth group we see are divers in the Navy and it is a very small group. They do not get decompression sickness. We have some experimental diving. We have to push them deep. We get some problems. So these are the sorts of cases we have seen in Singapore.

We will hear more in Singapore regarding the fishermen divers, when we will be showing you some slides about these people. The equipment they have is very primitive. They wear a World War II gas mask. Air comes in through the hose and bubbles out at the side of the mask. There is one chap on top controlling the compressor. As they lower the hookah they increase the pressure. Sometimes the compressor stops and no more air reaches the man. They ditch the mask and charge all the way up. Very, very primitive indeed. We are trying to educate these fishermen divers, they are beginning to understand decompression and lately we are receiving fewer cases.

Chairman (Dr John Knight)

Thank you Jimmy, that is a most illuminating description of what I would have called an almost suicidal method of diving. But it is not very different from what the abalone divers were doing in Victoria 10 to 12 years ago. The abalone divers had problems with decompression sickness. I am sure Jimmy can remember very clearly the two men who went out from Eden and did what turned out to be a suicidal series of dives. They involved other

people in a lot of inconvenience because they did not die before the boat was picked up and towed in. They died in the chamber later, which was partly due to chamber problems. But they had gone out and done a series of dives which, if you looked at the tables, the amount of missed decompression was so much that you could only have thought that they did not really want to survive. Anybody got any questions to ask Jimmy?

Question (unidentified voice)

I visited Nauru early last year. They disregard their decompression stops and sometimes they get bent and sometimes they seem to be alright.

Chairman (Dr John Knight)

If I could just elaborate on that. In Nauru there is a delicacy known as a red fish which many years ago used to be found plentifully at 50 feet. People could breathhold dive and spear them. Then the island got its first scuba tanks and quite quickly the red fish was fished out to about 190-210 feet. Now you do not see them of any size much above that. Surprisingly, few of them get bent. Those that do mostly have either run out of air, and have had to make a rapid ascent, or have seen a shark and made a rapid ascent.

Two years ago Nauru was achieving up to 12 cases of decompression sickness a year with a diving population of about 50. About then, the Nauru Government bought their own chamber, because the nearest chamber was in Sydney. The first bloke they treated in the new chamber died, but considering what he was like before he was treated, that was not really surprising. I went up there to try to inform the local doctors about decompression sickness and also talked to the volunteer chamber attendants. These were all people who give up their free time. They do not like using long treatments because that means they cannot go to work. The Phosphate Commission will not pay them if they do not turn up. The Nauru Government will, but the Phosphate Commission is the major employer, so they had an economic incentive to give the shortest possible treatment. In spite of this, they have had some quite good successes using a primitive chamber that is so hot that everybody inside it is sweating buckets. Which, if you remember John Miller talking about fluid load, is fluid unloading to make everything as difficult as possible.

Dr John Miller

This sort of diving practice is of course not unknown in many other parts of the world. There is a delightful paper in one of the sociology journals written by an American sociologist called H Russell Bernard. In the mid-sixties he wrote this superb paper about a year that he spent with the sponge divers of the Greek island of Kalimnos. He was able to describe a whole set of social circumstances, all the things to do with the macho image, where these people stand in their community and what happens to them. When we are dealing with what

we consider to be an odd diving practice, we need to look at the total picture of how that fits in with the local society instead of rushing in and pointing out how wrong they are.

I am not, on the other hand, saying that we should simply withdraw and allow the noble fellows to go on doing their thing. I think we have to be fairly circumspect about how we educate people.

Dr Mike Davis

It is worth remembering that observation of one group of divers produced a fundamental new concept of decompression sickness. That was the paper by Le Mesurier and Hills on the Torres Strait divers. So as well as throwing up our hands in horror, we ought to look at their diving habits because there might be something we can learn from them.

Question (unidentified voice)

How do you explain how whales can go down thousands of feet? How far can whales go down?

Dr John Miller

Whales have been caught in nets as deep as 3,000 feet. Now that does not mean that whales do repetitive breathhold dives to 3,000 feet. Repetitive breathhold dives in man can indeed cause decompression sickness. All of the diving mammals have specialised parts of their circulation. They have an overgrowth of the epidural venous plexus that enables them to shunt blood away from the lung. It enables them to shunt blood into the thorax in such a way that they can selectively, as the pressure increases, compress the tissues of the lung. They have a very highly compliant thoracic wall and very highly compliant lungs. Then they splint the rest of the lung with the blood from the epidural venous plexus. They certainly seem to have an enormous capacity for dissolving nitrogen. I think it is very uncommon for most of the diving mammals to repetitively dive to exceptional depths. I think they spend a great deal of time close to the surface and only occasionally sound to great depths.

A young Danish submarine medical officer was intrigued by the way his instructors were able to breathhold dive down to 100 feet to the bottom of the submarine training tank. Eventually one of them developed decompression sickness, which led him to think about the possibility of developing decompression sickness following repetitive breathhold dives. He and others were able to demonstrate that decompression sickness following repetitive breathhold dives is indeed a possibility. Mythology is probably behind Taravana, which is severe decompression sickness that some Pacific Islanders get. They have to brave the wrath of the Princess who guards the black coral which is found at extreme depth. They then dive repetitively to get this and the more dives they do per day the greater the standing they have in the community until eventually the wrath of the Princess gets them.

You can imagine that on each of these dives some of the nitrogen in the lungs goes, with a great driving pressure, into the tissues and does not all come back out. This progressively builds up. These people go down to quite extreme depths on their breathhold dives and then pedal like hell for the surface. This is very much equivalent to a blow-up. It is not surprising that when they get decompression sickness it is either the chokes or very severe neurological decompression sickness. That is what the Princess does to them.

Chairman (Dr John Knight)

Taravana is known to the English speaking world through a chapter written by ER Cross in a book on breathhold diving. He wrote that one group of islanders went pearl fishing and got this strange disease, but the men of the next island never got it. The only difference between the two group's techniques was the time spent at the surface between dives. Both groups did the same number of dives in a day, but the second group spent longer hanging on to the canoe before they went down again. Presumably, being able in that time, to breathe off some of the nitrogen that they had absorbed.

CANADIAN HIGH ARCTIC NURSES TRAIN AT LOS ANGELES HARBOUR COMMERCIAL DIVING CENTER FOR BEAUFORT SEA OFFSHORE JOBS

A pilot group of registered nurses and paramedics completed a diving medical course on February 13, at the Commercial Diving Center in Wilmington, California.

The medical personnel are employees of the Arctic Exploration Services Ltd., which is headquartered in Calgary, Canada. The firm specializes in furnishing professional and technical specialists for Canada's oilpatch operations in the Beaufort Sea in the high Arctic.

The exclusive training contract was engineered by Terry Hodgins, Superintendent of CAN-DIVE OCEANEERING in Vancouver, British Columbia, and Jim Rippon, Operations Manager for Arctic Operations Services. CAN-DIVE is an affiliate diving contractor of OCEANEERING INTERNATIONAL INC., of Houston, Texas, which also owns the Commercial Diving Center. Both Rippon and Hodgins attended the training.

The initial group of medical people are based in Tuktoyaktuk on the Beaufort Sea, some 100 miles north of the Arctic Circle. The five female nurses and nine male paramedics rotate from the home base out to the offshore oil drilling platforms off the coast of Canada's Northwest Territory.

While stationed aboard the drill ships, the medical personnel are on call 24 hours a day, seven days a week. They perform medical support for the non-diving, as well as the diving people on the rigs.

Arctic Exploration Services foresaw the need for increased diving medical training but none was available in Canada. Terry Hodgins, himself a graduate of the Commercial Diving Center's Emergency Medical Technician/Diver Course, solved the problem by setting up the contract for Arctic Exploration's people to come to Southern California for the specialized medical training.

As its title suggests, Arctic Exploration Services provides highly skilled individuals and technical equipment to frontier regions of the world. In addition to medical services, Arctic Exploration also furnishes Marine Radio Officers, Radio Operator/Weather Observers and technical equipment rentals.

CAN-DIVE provides both conventional and bell/saturation diving services and some 60% of its divers are graduates of the Commercial Diving Center.

The training at CDC provided a basic foundation in emergency diving procedures for nurses and paramedics working in cooperation with diving personnel who must function in the remote and unique environment associated with offshore petroleum exploration and production in high Arctic regions.

The objectives of the course were to instil within each participant the necessary knowledge to work in close co-operation with diving crews to provide emergency medical care management for divers who are ill or become injured while working offshore.

The training emphasized the hazards of the underwater environment, causes, symptoms, treatment and prevention of diving injuries and related diving diseases.

The medical personnel were given an understanding of basic definitions and terminology associated with commercial diving operations, and to know safe diving practices.

All made dives in CDC's operational diving ball to acquaint them with the diver's perception of his working area. One of the factors taken into consideration in awarding the exclusive training contract to CDC is that the school is the only school in the US with an operation bell/saturation diving system, which is similar to saturation systems being used in the Arctic.

Tuktoyaktuk, site of Arctic Exploration's base, is the Eskimo name meaning "place where the reindeers cross", and 90% of the village's population are native Eskimos.

CALL-DIVE and Arctic Exploration, in conjunction with the Commercial Diving Center are planning to continue to update the information and experience the nurses and paramedics have gained from this pilot course.