I am sorry, I will not accept that statement without further elaboration. I do not believe that abalone divers' physiology is different from sports diving physiology, nor from Navy divers' physiology nor from commercial divers' physiology. The laws of physics apply to all. I question the basic premise. I certainly accept there are certain individuals that are "more susceptible to the bends", or less susceptible. There is a distribution curve people are on, certainly. But one cannot define that curve individually. One cannot pick out one individual and say you are here on the curve. It is almost an impossible thing to do. I am not answering your question basically because I cannot accept the question or the premise.

Financial problems

We make no money from the use of the chamber. The patients usually do not pay. The collection rate is almost non-existent and as a result it is a publicly supported facility. Most other chambers that depend on diving accidents are either closing or are somehow supported publicly. They cannot exist on the income from divers. Divers will not pay their bills in the United States. Most of them have insurance and still will not pay.

However our chamber operation has never been successfully sued. I said successfully, that is nobody has collected a thing. There have been six law suits during our 12 years that the patient or relatives initiated. In all six cases they named everybody in the world except our chamber. We feel grateful, we thank them profusely, but I do not know how much they collected. This is a constant threat, the number one reason why our chamber will probably, or could possibly, close is because of insurance rates. The University insurance went up from $200,000 last to $2.5 million this year. Rates like that mean you can't operate.

SUMMARY

I feel in diving accident management the easiest part is after you get to the chamber, the hardest part is getting patients to a chamber adequately and I think communications and transportation are the key. I would put a patient on true 100% oxygen, in order to exclude nitrogen, and transport him on his side, also head down for suspected air embolism cases, as soon as possible as close to sea level pressure as possible.

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DECOMPRESSION TABLES AND DIVE COMPUTERS

Andrew Pilmanis

Decompression Tables

I firmly believe that the Standard US Navy Tables when used to the limit cause bubbling in the body in 100% of the population. This has been shown by Doppler studies, years of them. So what do you do? What we have done in our own facility and are encouraging around Southern California and Canada is to switch to other tables.

A few years ago we did a Doppler study of USN no-stop dives. With a dive to 30 m (100 feet) for 25 minutes (USN maximum no-stop time) the numbers of bubbles decreased over a period of three hours. A similar curve can be generated by just about any of the tables. In four years we ran hundreds of dives and many divers. These are typical graphs. So that is one of the reasons I make that statement.

You may ask the question, "How far off are these tables?" If one takes a dive to 100 feet for 25 minutes, which is right on the limit and use a 60 ft a minute rate of ascent, using exact depths, exact times and exact ascent rate one hears bubbles in all the divers. The divers are normally symptom free but bubbling. If one takes the same individuals, does the same dive and except for adding two minutes of decompression at 3 m (10 feet) in the hyperbaric chamber the bubble count drops dramatically. One can add one minute at 6 m (20 feet) and four at 3 m (10 feet), in other words arbitrary hanging off, and eliminate bubbles. This tells you that the US Navy when they wrote the tables on an end point of symptoms were not far off. They did not have a Doppler. One does not have to back up too far and the diver is out of the bubble zone. That is why I say that the US Navy Tables should not be used to the limit.

I have been asked how long ago did we, in the United States, begin questioning the US Navy Standard Air Decompression Tables and following other procedures. At present probably the majority of the diving population in the United States still follow them. I happen to be more in the scientific diving arena which tends to be a little bit ahead of the recreational community and we have questioned and used alternative methods for at least 10 years. There are several other institutions who have done likewise. In the beginning all we did was use the 5 minute rule, subtract 5 minutes from all no-stop times. That is a rather arbitrary, simplistic approach but it is a warning to the divers. One can increase surface intervals. One can use the next greater depth in the table. One can do a variety of things. We have required for at least 10 years, if not longer than that, that one of those procedures be done. In other words in our programme one cannot dive to the limit of the US Navy Tables.

Last year we switched to the University of Michigan decompression tables developed by Carl Huggins. They provide no-decompression limits and repetitive capability. They do not provide stage decompression tables. The reason is that they are directed at sports diving and decompression diving is not supposed to be part of sports diving. The reason I like these tables is they are based on an end point of no bubbles rather than no symptoms. They are not just more conservative, but they are based on a somewhat different model from the US Navy tables. Our Diving Control Board now makes it mandatory that all divers in our programme use those tables. It is absolutely forbidden to use USN tables. I know of three University programmes that have this rule.

The Edge dive computer

Then we have the Edge. It gives nodecompression limits at various depths. As one goes down the pressure transducer is activated and the clock is activated and it provides all the information you need on the dive. It is a real decompression computer. I do not own part of the company and I am not advertising for them, I like the Edge because I know the model is programmed into it is based on an endpoint of no bubbles rather than no symptoms, it has 12 half time tissues rather than six, therefore shallow, long dives are covered better. It is a good model. The instrument itself is like all gadgets, it can fail if you do not take care of it. On this trip I did not put a new battery into it. It told me I was negligent in taking care of it and refused to provide me with any information! You must put batteries in it and you must turn it on. But it is relatively idiot proof in that there is only one control. It recalculates the dive profile every two seconds, so multi-level diving is covered. The National Park Service in California has used it for three years exclusively for a tremendous number of dives. They have had no bends and they have increased their average daily bottom time by an hour and a half because it follows the diver wherever he goes. One does not have to take the deepest depth as one does with tables. It calculates the diver's decompression. I think this is the way to go in the future. I think tables are archaic and eventually will be used for a back-up only. The US Navy has decided to build its own dive computer because obviously they can do it better than civilians. They have made the decision that within 5 to 10 years every diver will be wearing a dive computer rather than using tables. Frankly, I am happy to see it go that way. Depth gauges are incredibly inaccurate and the divers do not always look at their watches. The Edge does it all for them.

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