DECOMPRESSION METERS PHILOSOPHICAL AND OTHER OBJECTIONS

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The use of decompression meters (DCMs) is not new, and has involved a wide range of apparatus, from mechanical to electronic, and both diver-worn and remote. The Canadian Defence and Civil Institute of Environmental Medicine surface-based decompression computer represents one extreme of this development and has proved useful. However, the active marketing of a new range (not "new-generation" as is claimed) of diver-worn DCMs requires that the case against such devices be stated again.

Multi-level Diving

A major advantage claimed for DCMs is that they account for the multi-level nature of most recreational diving. Consequently, a DCM will "permit" a longer exposure to pressure, for a given multi-level dive, than that allowed by the traditional use of the same decompression schedule (which assumes that the entire exposure was at the maximum depth).

The number of cases of Decompression Sickness (DCS) presenting for treatment in Australia and New Zealand has increased since 1980 and has shown an alarming predominance of nervous symptom involvement. These episodes of neurological DCS often arise after dives that either were conducted in accordance with conventional tables (with and without fudging), or were within no-decompression limits (despite being multi-level).

Based on current treatment rates it is anticipated that in 1987 between 300 and 400 divers will be treated for DCS in Australasia. While this does not establish that the disease rate (eg. DCS/1000 diving hours) has increased, it is clear that the diving practice of the recreational diving community needs to become more conservative. This recommendation for safer diving is not consistent with the increased exposure possible with DCM-controlled multi-level diving.

Measurement of Exposure

While the marketing information released with each new batch of DCMs declares the arrival of a "new generation" of devices, this is simply not true. All devices that have been sold, and are about to be sold, measure depth and time, and not tissue nitrogen tensions. What does change with each new model is how the information is manipulated and presented. The expected body-tissue nitrogen tensions are calculated from this input, using one or more mathematical models. In general, these models are perfusion-based and do not account for the diffusion limits of intracellular fluid. Whatever the basis of calculation, it is important to understand that the kinetics of inert gas uptake and elimination have not been accurately described. Not surprisingly then, the accuracy of calculated tissue nitrogen tensions using these available mathematical models of decompression is quite poor.

This intrinsic inaccuracy of decompression models, and hence of DCMs, will remain until a DCM can directly measure an individual's tissue nitrogen tension (eg. using transcutaneous or implanted electrodes). Such a DCM would only then be a "new generation" device.

Electronic Reliability

An absolutely reliable electronic instrument has not and never will be built. Trials with all available DCMs have shown a real, although often small, failure rate (including total display loss). Obviously electronic diver-worn DCMs can never be used in isolation. Divers using DCMs should always carry and use a hard copy of suitable decompression tables.

Summary

Although DCMs are simple to use and account for multi-level diving, it is not possible to support or advocate total reliance on them. They may have a useful role in diving, but only in conjunction with a careful dive plan and concurrent use of a hard copy of decompression tables.

ASSESSMENT OF THE ORCA EDGE DIVE COMPUTER

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INTRODUCTION

The Royal Australian Navy School of Underwater Medicine first became interested in decompression meters used by divers during 1972. Many patients sought treatment for decompression sickness, following the use of the SOS decompression meter. A study of this meter showed that it indicated shorter decompression times than required by the US Navy decompression tables when used for repetitive dives, and for dives in excess of 60ft.[1] The Farrallon Multi-Tissue Decomputer was also studied[2] but was unacceptable because of its unreliability. The DECO-BRAIN suffered a similar fate when tested, approximately two years ago.

The senior author was involved in the treatment of a diver in 1986 who used an Orca EDGE for two dives to 87ft, after which she developed decompression sickness. It appeared that the meter had allowed a dive combination that would not be permitted by the US Navy tables. There were several possible explanations of this decompression incident: a chance occurrence because of the fallibility of the decompression tables, a misreading of the meter, a fault within the meter itself, or the meter programme permitted unsafe diving profiles.

It was against this background that it was decided to test the EDGE decompression meter's no-decompression repetitive dives and compare these with the established decompression tables.