Letters to the Editor

Treatment of decompression illness with heliox: the best of both worlds?

There are many ways to treat decompression illness (DCI) at increased pressure. In the last 20 years much has been published on the use of oxygen and helium/oxygen mixtures at different depths. The type of information ranges from impressive work on animals,[1] case reports, small series of case reports and, finally, mathematical work on the behavior of different inert gases in the hyperbaric physiological environment.

During a therapeutic compression, the use of a different inert gas from that which was breathed during the dive may facilitate bubble resolution. If the physical properties of the treatment gas are chosen in such a way that its rate of transport through the tissue is lower than that of the breathing gas, bubble shrinkage will be accelerated. Another factor to be considered is whether the exchange of gases in tissue and blood is limited by perfusion or diffusion. Finally, the solubility of the treatment gas in blood and fatty tissues, in relation to the breathing gas which resulted in bubble formation and DCI, should be taken into account.

The above-mentioned factors play a complex role in the choice of the treatment tables in relation to the different types of dives accomplished. Compressed air is used for professional dives to 50 metres' depth and, for shallower depths, nitrox can be used. Technical diving using trimix has become more widespread during the last decade, whereas saturation divers breathe different gases at different depths to prevent the effects of counter diffusion and the high-pressure nervous syndrome.

Almost all cases of DCI in humans diving to 50 metres with air or nitrox can be adequately treated at 283 kPa (equivalent to 18 msw), where 100% oxygen is both safe and effective. Serious neurological and vestibular DCI, with only partial improvement during initial compression at 283 kPa on oxygen, may benefit from treatment at 404 kPa with 50/50 heliox (Comex 30 treatment table, Cx30). Cases have been successfully treated with the heliox Cx30 or modifications thereof, or the US Navy 6A recompression table using 80/20 and 60/40 heliox instead of air.

Theoretically, the use of helium-oxygen during therapeutic recompression might be advantageous. However, experience with the use of deeper treatment tables with either helium or nitrogen as inert gas in a treatment mixture with oxygen, has not consistently shown an advantage of helium. Also, there is growing evidence that helium is biochemically not inert and has biological effects on organs and tissues.[2] In experimental research, helium reduces ischaemia-reperfusion damage in the brain.[3] Because this is one of the mechanisms in DCI, heliox mixtures could be advantageous and enhance the treatment of DCI. Four studies have described the possible role of helium in neuroprotection but only speculate on an underlying mechanism: antagonists of the NMDA receptor or removal of nitrogen from mitochondrial compartments have been suggested.[4–7]

Therefore, a systemic research programme is still needed, including animal models and large human trials, to define the benefit derived from the use of different treatment gases and depth profiles during recompression therapy.[8]

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