

Chapter 19

HIGH PRESSURE NEUROLOGICAL SYNDROME

(HIGH PRESSURE NERVOUS SYNDROME, HPNS, HELIUM TREMORS)

This condition is a problem for deep commercial diving operations where helium/oxygen (Heliox) mixtures are breathed at depths in excess of 130 metres (430 feet). It causes a serious limitation to very deep diving and gets worse as the depth increases.

It is not a problem to recreational divers unless a grave (sic) miscalculation of depth or buoyancy has been made.

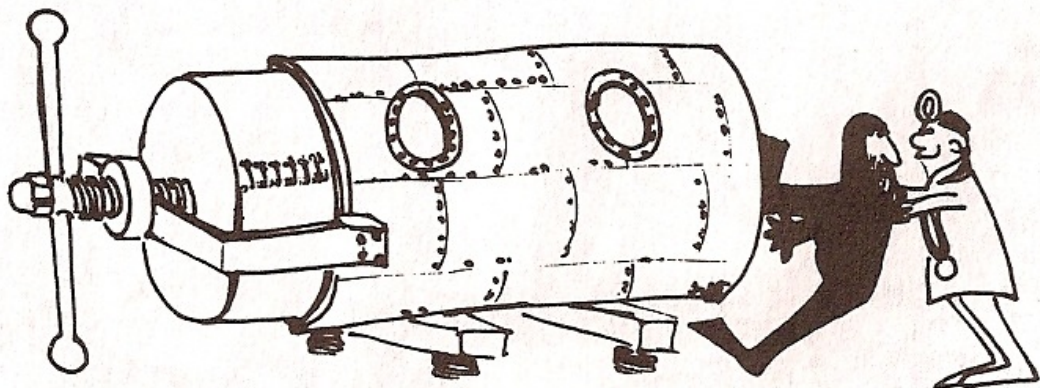


Fig. 19.1

CLINICAL FEATURES

The first sign is usually a mild uncontrollable tremor, with muscle twitching and difficulty in coordinating movements. If the diver then continues with the descent, confusion, drowsiness, disorientation and unconsciousness may follow. Respiration may also be affected by the neurologically induced incoordination of muscle activity. A tremor particularly affects the hands and arms and resembles the shivering due to cold (which helium breathing may also produce).

The condition is aggravated by rapid descent and thus a slow descent rate is a requirement in all deep diving operations using exotic gas mixtures.

The cause of HPNS is not fully understood. It is probably due to an excitation of a part of the brain by the direct mechanical effect of pressure. Evidence for this is that drug induced anaesthesia in animals can be reversed by simply compressing the animal to depths which provoke HPNS.

TREATMENT AND PREVENTION

Since the effects of HPNS resembled an excitation of the brain, early researchers reasoned that an agent which caused sedation might reverse the condition. Nitrogen narcosis is a common cause of sedation during diving, and so divers affected by HPNS were given small concentrations of nitrogen to breathe. This produced an effective reduction of some of the symptoms of HPNS. This helium-nitrogen-oxygen mixture (Tri-mix) is now used in most deep diving and by some technical divers. Small percentages of nitrogen have been included to reduce the HPNS – but not enough to cause significant nitrogen narcosis.

The added nitrogen in Tri-mix also permits better speech comprehension (because helium distorts sound production in the human larynx) and may slightly reduce the rapid heat loss with helium.