ENT PROBLEMS OF DIVING

Dr Bill Hurst

The common causes of nasal obstruction are septal deviation, allergy, polyps, vasometer rhinitis and infection. Polyps are usually the result of allergy or infection.

Acute sinusitis, often precipitated by a cold, inhalation of infected material or by infected teeth, requires treatment with antibiotics (Amexil, Bactrim, Tetracyclines) and decongestants. The infecting organism is often a haemophilus. If there is no improvement in two weeks antral washout should be considered.

Chronic sinusitis which gives rise to a continuous purulent nasal discharge, nasal obstruction and a headache, should be treated by operation, either an intranasal antrostomy or a Caldwell-Luc.

Sinus barotrauma. In the series reported by Fagan, McKenzie and Edmonds, there were 68 patients with barotrauma of descent and 32 with barotrauma of ascent. The common symptom was frontal pain. 50% had recently had an upper respiratory tract infection and 50% had ear abnormalities at the same time.

The best prophylaxis is not to dive. The acute phase should be treated with decongestants.

Otitis externa. Before going to the tropics one should have wax and debris removed from one's ears.

For prophylaxis he recommended Vosol, which contains acetic acid in 70% alcohol. This lowers the pH and inhibits the division and multiplication of pseudomonas. The alcohol helps dry the ear.

For treatment he recommended Sofradex, which contains Framycetin, Colistin and Hydrocortisone.

Other prophylactic drops could be used, eg. aluminium acetate, gin or vodka.

Physiology of Immersion

Glen Egstrom

NAASA published an annotated bibliography of immersion and its effects in 1974 which he had found very useful.

Immersion affects respiration. A person immersed to the neck has a decrease of his expiratory reserve volume of 11% and 20 cm underwater using apparatus there is the same effect. Breathing oxygen neck immersion reduced the vital capacity by 22% compared with air breathing control. Oxygen breathing potentiates atelectasis, which can be reduced by forced deep inspirations. Nitrogen elimination is increased with immersion to the neck. In 35°C water it is 35% more than in air, while in 37°C water it is 42% more. The rate reduces with time and the increased elimination is probably due to increased peripheral circulation.

Vail showed some years ago that there was a reduction in small airway diameter with forced expiration leading to collapse and gas trapping. Even in shallow immersion one gets gas trapping with a decrease of the vital capacity of 2%. Exercising in the horizontal position gives rise to a lesser decrease. Going from negative through the eupnoeic to positive pressure breath can negate the changes.

The breathing pattern in air is a pause after breathing out. In water the pause is after inspiration with inspiration following immediately after expiration.

Cardiovascular changes include an increase of 38% in cardiac output, with an increase in stroke volume of 25 ml (35%). Diving bradycardia occurs with face immersion. There is an increase of up to 700 ml in the central blood volume. The CVP rises. There is a bradycardia which increases with time immersed. The diving reflex, apnoea and bradycardia on face immersion is more noticeable with cold water. The forearm blood flow is decreased by 60% while the forearm resistance is increased by 40%. Although the heart rate goes down the energy cost is unchanged.

The sudden death syndrome has recently been described. Middle aged men return from a dive on the surface, are alright for a while then develop respiratory trouble and die. The post mortems have normally given the cause of death as drowning. There is speculation that what kills them is a hypertensive episode opening intracardiac shunts L-R.

Diuresis is almost inevitable. A diver working hard at 150 feet will develop a 3 to 4 pint (American) decrease in his plasma volume. Negative pressure breathing induces a diuresis of up to 500 ml/hour; diuresis subsides after 2-3 hours with individual variations. Sodium excretion is increased. Cold causes diuresis, as does alcohol. Respiratory water loss is 500 to 600 ml a day in normal air, dry gas increases the water loss. The effects of water loss in terms of performance, work capacity gas uptake, etc. is not understood. Immersion diuresis is reduced by positive pressure breathing. The diuresis varies with water temperature, fitness, age, etc.

Skin does not take kindly to being constantly wet, the diver develops pain, cannot work properly and the skin eventually sloughs.

NEW TOYS
Glen Egstrom

This was a review of various advances in diving technology.

1805 - Fullarton produced a diver's suit which protected the areas of high heat loss.
1918 - De Graaf produced a 1 atmosphere diving system. It leaked.
1918 - Leavitt produced a 1 atmosphere diving system with articulated arms and legs. There were problems with the ends of the arms.

The USN standard diving dress Mark V is very similar to that introduced by Siebe Gorman over 100 years ago.

The Mark VIII is capable of 1000 foot depth in theory, however 600 feet is as far as it has been taken. There are two 90 cuft 5000 psi bail out bottles which give a bail out capability. This is enough for a no-stop 300 foot dive ascent. No dive to that depth is no-stop. It is a hotwater suit with an umbilical connector block weighing 23 lb. There are troubles with the umbilical - 300 feet costs $17,000. Although the umbilical was designed to weigh 1/10th of a pound per foot it has flexible walls and at 450 feet actually weighs 6/10th of a pound per foot. The helmet is buoyant and the diver is weighted on his chest and waist.

The Mark XII should have been in service two years ago. The helmet is neutrally buoyant. The diver wears the weights on his thighs which gives him better mobility. It is in its 7th year of development. The major problem is that Mark V trained divers are reluctant to learn the new skills demanded by this equipment.