

Sports Injuries

Local tissue damage from sport may have four basic components:

1. The tearing or breaking of elements of the tissue, such as ligaments, tendons, muscle fibres or bone.
2. Damage to nerves preventing essential signals to active tissue such as muscle.
3. Damage to blood vessels, causing leakage of plasma with swelling and the escape of blood into the tissues.
4. The release of tissue debris such as fat or fibro cartilage into the circulation as micro emboli.

Oxygen and Wound Healing

The most essential substance in the repair of any tissue is oxygen. The body cannot store oxygen in the way it can store other substances, such as glucose. Unfortunately when a tissue is damaged and the blood supply is reduced so is the supply of oxygen. Oxygen is needed for metabolism of cells and to maintain the walls of the blood vessels to prevent them from leaking¹. More oxygen is also needed for some of the repair processes involving white blood cells. When there is leakage of plasma (the liquid part of blood) from the blood vessels the tissue effectively becomes water logged, a condition known as oedema. Oxygen is poorly soluble in water and so the tissue is deprived of

oxygen just when more is needed to produce new blood vessels and to initiate repair.² The leakage of proteins from blood also causes inflammation with the release of substances which make the blood vessels leak even more, causing a vicious circle¹. Without sufficient oxygen the strength of the tissue repair is much weaker than normal.³

High Dosage Oxygen Treatment

Unfortunately oxygen is a gas and not available as a pill or injection. To dissolve more oxygen in the blood it is necessary to breathe a higher concentration. The maximum dose that can be given at ordinary atmospheric pressure is from breathing 100% but, by using a pressure chamber, the equivalent of 300% can be used for short periods in the treatment of life-threatening disease and 200% for several hours a day. The principle is the same as dissolving carbon dioxide to put the fizz into drinks – it is necessary to use more pressure. Unfortunately it is commonly argued, even by doctors, that the blood is saturated with oxygen just breathing air. This just refers to the saturation of haemoglobin, but sufficient oxygen can be dissolved in plasma to support life without red blood cells.⁴ Another objection raised is that oxygen is toxic but at the doses that are used in high dosage oxygen therapy for sports injury, toxicity is unknown.

Even when 100% oxygen is given at normal atmospheric pressure insufficient oxygen is dissolved in the blood to deliver enough to

swollen, waterlogged areas. Oxygen controls blood vessels – less and the diameter gets bigger - more they get smaller. By giving the high concentrations of oxygen possible in a chamber, the blood flow to the damaged area can be reduced but the supply of oxygen can paradoxically be increased. This *unique* property of oxygen is a major factor in reducing tissue swelling and returning the tissue to normal. However it is important to recognise that the term hyperbaric simply refers to the method used to deliver the oxygen - the oxygen itself is just the same as the oxygen in the air. The use of high dosage oxygen treatment is not mainstream medicine in the UK, despite the fact that most of the early studies were undertaken in Glasgow and Oxford and there are many thousands of publications on the use of oxygen at high pressure including many from military sources. In March 1989, the American journal *Military Medicine*⁵ published an article entitled Hyperbaric oxygen therapy and combat casualty care: a viable potential.

“Extreme interest exists among the United States and Soviet military forces regarding the efficacy of hyperbaric oxygenation for the treatment of wartime casualties. Specific areas of potential usefulness include the treatment of chemical agent exposure, crush injuries and burns with HBO. Future direction dictates immediate scientific and medical support for the use of this powerful treatment modality.”

As combat casualties are likely to be more severely injured than sportsmen, clearly the potential exists to treat their injuries very successfully. The studies completed to date indicate that the treatment will at least halve the normal time to heal.

A Protocol for Sports Injury Therapy

High dosage oxygen treatment should be used with other physiotherapy techniques in sports injuries to maximise the benefit. It is important for treatment to begin **as soon as possible** and in the first pilot study of football injuries, the player was treated within an hour of the injury. This does not mean that treatment given later will not be successful; it is simply that early treatment is vital to limit the tissue swelling and reperfusion injury.⁶ In fact some injuries have responded well after several months. The pressure used should ideally be 2ATA (equivalent to 33' of seawater) for 60 minutes and a 5 minute break can be used to split the session into two. It can be repeated twice a day for two weeks without problems. A space of at least one hour should be given between sessions to maximize the benefit. Clearly treatment can be stopped when there is no additional benefit from further sessions. Careful assessment before and after each session should allow this point to be determined.

References

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WOLFSON HYPERBARIC MEDICINE UNIT

High Dosage Oxygen Treatment

For

Sports Injuries



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