BALANCE RESORT MEDICAL CENTER LENTI

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Sports Injuries and HBOT

Athletes are always striving for their next 'victory', whether they are professionals or weekend warriors. In doing so, they face numerous challenges: fatigue and injuries are certainly formidable opponents.

It always matters how long recovery takes, how long they're sidelined from training, the extent to which their fitness level drops, the amount of muscle loss due to inactivity, or the strain placed on the compensating side. And then there's the team, all the hard work put in, and the dreams. When will I step back onto the court, onto the track, into the pool, back into the saddle, pick up a racket, a dagger, a shovel, a javelin or a ball, or lace up my trainers or ice skates?

Reducing the rehabilitation time for elite athletes is significant not only psychologically but also financially.

The number of articles published in the medical literature in this field has increased in recent years, but the number of HBOT studies relating to sports injuries remains lower than for other, more traditional indications (e.g. stroke, soft tissue and bone inflammation, non-healing wounds, long COVID, tissue damage following radiation therapy).[1],[2] This is not necessarily due to doubts about the method's efficacy, but rather to the fact that scientifically evaluable results stem from a sufficient number of studies featuring heterogeneous control groups. The nature, incidence and acute nature of sports injuries do not lend themselves to such studies, and elite athletes rarely disclose publicly the true background to their rapid recovery.

The effects of hyperbaric oxygen therapy (HBOT) on sports injuries

Hyperbaric oxygen therapy (HBOT) has become an integral part of sports medicine over the last decade. An increasing number of clinical and randomised trials are being published, providing objective evidence of the accelerating effect of HBOT on the healing of sports injuries.[1–12]

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The mechanism of action of hyperbaric oxygen therapy

Hyperbaric oxygen therapy exerts both short-term and long-term physiological effects on injured tissues.

Immediate effects include a several-fold increase in oxygen levels, a rapid reduction in oedema and concomitant pain relief. It optimises neutrophil phagocytic function, reduces the risk of infection and mitigates reperfusion injury.[3]

Over a longer treatment period – with intermittent and repeated administration – HBOT activates the so-called 'hyperoxia–hypoxia paradox'. As a result, capillary neoformation is accelerated, collagen production by fibroblasts is stimulated, connective tissue and bone formation are enhanced, the activity of osteoblasts increases, the number of stem cells entering the circulation rises, and the body's endogenous antioxidant capacity improves.[3] [4]

Muscle and soft tissue injuries

Muscle and soft tissue injuries can occur during any form of intensive training. Muscle soreness arises not only from the accumulation of lactic acid but also from microscopic tears in the muscle fibres. Inflammation develops at the site of these microtears, causing pain and oedema.

The first observational reports, involving small numbers of cases, are now regarded as historical curiosities in the fields of sport and HBOT; in these, physiotherapists merely estimated that, with HBOT, players lost far fewer days than would have been expected based on previous experience.

Based on today's randomised, controlled trials, hyperbaric oxygen therapy may promote the early recovery from muscle injuries: With HBOT, serum markers of muscle damage (creatine phosphokinase, myoglobin) decline more rapidly, and improvements in pain and muscle strength are measurable sooner than in athletes not receiving HBOT.[1]

A review and several controlled trials suggest that HBOT may have a beneficial effect on delayed onset muscle soreness (DOMS) and micro-injuries caused by muscle contraction.[2] [5]

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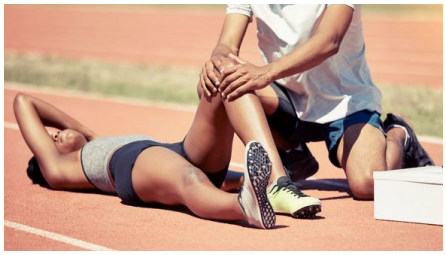
Sprains



These are the most common sports injuries. Hyperbaric oxygen therapy is particularly effective in tissues where capillary circulation is inherently lower than in other tissues – such as tendons and ligaments. It improves oxygen supply and reduces oedema.[3]

In a randomised, double-blind trial, hyperbaric oxygen therapy was compared with a placebo in patients with acute ankle sprains. HBOT treatment was administered at a pressure of 2.0 ATA on multiple occasions over the first two days. Ankle function – as measured by a functional score – was better in the HBOT group during everyday activities, although there was no clear, significant difference in the overall recovery time.[2]

In acute sprains, HBOT may be considered as an adjunct to conservative treatments.[2]

Cruciate ligament injury and ACL reconstruction

ACL (anterior cruciate ligament) injury is one of the most common knee ligament injuries in athletes. During ACL reconstruction, the torn ligament is replaced with an implanted tendon graft, and the healing of the tendon-bone interface is critical for long-term stability and a return to sport.

The integration of the ACL graft is a multi-phase process lasting several months (early healing, proliferation, maturation), during which the graft must become firmly anchored in the bone and partially ‘ligamentise’. The effect of hyperbaric oxygen therapy on ACL reconstruction was first investigated in animal models: Compared with the control group, HBOT was associated with improved graft maturation, tighter tendon–bone integration, reduced bone tunnel widening and more favourable biomechanical parameters (greater tensile strength and stiffness).[6]

More recent experimental and early clinical data suggest that, with HBOT, ACL graft healing may also be more favourable, as measured by MRI, in the first few months following surgery. The authors emphasise that HBOT has the potential to reduce the risk of graft failure following

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ACL reconstruction, may promote functional recovery, and, overall, appears to be a safe and promising adjunctive method for supporting the healing process of tendons and ligaments.[6],[7]

Bones and fractures

Bone is a dynamically changing tissue in the body, in which continuous processes of formation and resorption take place. Localised oxygen deprivation is one of the main limiting factors in the healing of bone fractures: during a fracture, not only is the bone structure damaged, but microcirculation and venous return are also impaired, leading to tissue haemorrhage, bone oedema and swelling.[3]

At higher oxygen concentrations, the activity of osteoblasts (bone-forming cells) increases, which accelerates the process of mineralisation and improves bone quality around the fracture site.[3],[4]

Hyperbaric oxygen therapy appears to be a promising option for the treatment of complicated fractures, particularly in cases involving infection or poor healing.[8],[9]

Concussion, post-concussion syndrome

The effectiveness of hyperbaric oxygen therapy in cases of traumatic concussion has been proven; it has a Type III indication and Level C evidence. [13]

Concussion – a milder form of traumatic brain injury – is a significant problem amongst athletes. Concussions sustained during sport in young adulthood can have adverse neurocognitive effects in the long term, even decades after the injury.[10]

In approximately 10–20 per cent of mild concussions, ‘post-concussion syndrome’ develops: difficulties concentrating, mood swings, headaches, dizziness and memory problems may occur, which can persist for a long time. Treatment is usually conservative and symptomatic, such as regulating sleep and lifestyle, drinking plenty of fluids, rest, painkillers and targeted rehabilitation.[11] Hyperbaric oxygen therapy accelerates and complements the healing process.

Boussi-Gross and colleagues investigated the efficacy of HBOT in patients with chronic post-concussion syndrome. They employed a partial crossover design in an attempt to rule out the possibility of spontaneous improvement and the placebo effect. HBOT treatment led to significant symptomatic improvement, better cognitive performance and quality of life, whilst no such improvement was observed during the inactive control period.[11] This suggests that

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HBOT may improve cerebral oxygenation, the functioning of neuronal networks and mitochondrial function in mild, chronic traumatic brain injury.[11],[12]

Summary

Scientific reports indicate that hyperbaric oxygen therapy may be particularly promising for injuries where the blood supply to the damaged tissue is inherently low – such as in the case of tendons, ligaments and bones. According to clinical data to date, healing time may be reduced by 20–40% in certain cases; however, the extent of the effect and its clinical significance vary depending on the indication and patient group, and definitive results await larger, well-controlled studies.

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Safety and Guarantee

Treatments are always carried out using the pressure and oxygen parameters employed in scientific research, i.e. we provide 100% oxygen at 2.5 atmospheres.

Our hyperbaric oxygen therapy chamber complies with the requirements of the European Parliament's Medical Devices Regulation (MDR) (Regulation (EU) 2017/745) for Class IIb medical devices.
Its operation complies with the best practice guidelines for hyperbaric oxygen therapy, as set out in the European Code of Good Practice for Hyperbaric Oxygen Therapy published by the European Committee of Hyperbaric Medicine (ECHM).

Our staff's training complies with the requirements set out in the ECHM-EDTC Educational and Training Standards for Physicians in Diving and Hyperbaric Medicine and those of the European Baromedical Association for nurses, operators and technicians.
In accordance with these regulations, treatments are always carried out by a team of three staff members working simultaneously, with a qualified hyperbaric medicine specialist present at all times.

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The supply of 100 per cent medical-grade oxygen for breathing is provided from liquid oxygen tanks and 200 bar oxygen cylinders supplied to hospitals by a medical gas distributor, not via the generation unit located in the treatment room, which produces compressed oxygen from the ambient air on site.
We are equipped with the prescribed preventive, sensor and fire safety equipment required for high-pressure oxygen treatment.

In Hungary, the operation of healthcare providers offering medical hyperbaric (high-pressure) oxygen therapy is regulated; their equipment and staffing requirements are set out in the National Public Health Centre's professional minimum criteria (Decree No. 2/2004. (XI. 17.) EüM), which Balance Medical Centre complies with in every respect and for which it holds an operating licence.

Compliance with all these regulations and adherence to the associated safety standards significantly distinguishes our medical hyperbaric oxygen therapy from the low-pressure hyperbaric treatments available elsewhere, and renders it suitable for therapeutic purposes.

We recommend that you always seek thorough information and only commence therapy at a certified facility if recovery from an illness is at stake.
Health is precious – let's look after it!

Please contact the Balance Medical Centre to arrange a consultation