



CLINICAL PRACTICE

Oxygen therapy and wound healing – topical oxygen is not hyperbaric oxygen therapy

Frans J Cronjé

The importance of blood and oxygen in wound healing is universally known.¹ The clinical challenge is how to improve the delivery of blood and oxygen to wounds when these are deficient.² Chronic vascular problems, in particular, do not always lend themselves to macrovascular repair. Accordingly, alternative therapies are frequently sought, with highly variable results.³

One method of increasing oxygen delivery to tissues is to supplement the dissolved oxygen fraction by breathing oxygen under high pressure – so-called hyperbaric oxygen (HBO₂) therapy. However, HBO₂ is relatively expensive and is not without risks. There is therefore an obvious incentive to find less expensive and elaborate therapies.

Topical oxygen therapy, sometimes also called topical hyperbaric oxygen therapy, has become increasingly popular in recent times. It involves inserting an affected limb into a gas-impermeable bag, securing the device to the limb with a tourniquet, and surrounding the affected limb with pure oxygen under slightly elevated pressure. There are several devices on the market, including O₂Boot, Topox, and the Advanced Hyperbaric Technologies, Inc. Topical Oxygen System. These have recently been introduced and are now actively promoted in South Africa. Unfortunately, although convenient and relatively inexpensive, topical oxygen is clinically ineffective. The amount of oxygen absorbed through intact skin is negligible and even through open wounds it is extremely small.⁴ In addition, wound healing depends on an oxygen and circulatory gradient from the periphery to the middle of the wound.⁵ This initiates and directs the normal wound-healing process. Even if topical oxygen could increase wound oxygen levels, it would create a reverse gradient, i.e. higher values in the wound than in the periphery. Unlike topical oxygen, systemically delivered hyperbaric oxygen

accentuates the normal gradient and induces angiogenesis and healing over time.⁶

Another feature of topical oxygen therapy is that it causes regional or differential pressurisation of the treated limb. This further reduces perfusion – as in compartment syndrome – which defeats the objective and may aggravate the condition. The application of the tourniquet to achieve an adequate gas-tight seal may further reduce circulation to the area. HBO₂, on the other hand, applies pressure evenly to the whole body with no net increase in regional tissue pressure.

Not surprisingly, the scientific support for topical oxygen is extremely limited. Although hyperbaric literature is often quoted when promoting topical oxygen devices, there are only two studies^{7,8} on the effect of topical oxygen as it is being promoted. Neither of these achieved statistical significance and could only conclude that topical oxygen therapy did not appear to be unduly detrimental. On the other hand, the evidence in favour of systemic HBO₂ is strong, particularly for diabetic wounds.⁹⁻¹¹ On the basis of these studies, the Center for Medicare and Medicaid Services (CMS) in the USA reimburses HBO₂ for hypoxic diabetic wounds. Topical oxygen therapy, on the other hand, is not reimbursed because of a complete lack of scientific evidence. Topical oxygen therapy is not HBO₂ therapy.

For more information, contact the South African Undersea and Hyperbaric Medical Association, a Special Interest Group of the South African Medical Association on (011) 254-1991/2.

Frans Cronjé qualified MB ChB at Pretoria University cum laude in 1991 and BSc Hons in Aerospace Medicine cum laude in 1997. He received an academic Fellowship in Diving and Hyperbaric Medicine at Duke University, Durham, USA, in 2003. He is President of the South African Undersea and Hyperbaric Medical Association (SAUHMMA) and the Wound Healing Association of Southern Africa (WHASA), President-Elect of the International Congress of Hyperbaric Medicine, serves as Executive Director of Divers Alert Network Southern Africa, and is in private practice in Pretoria.

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