

TOPICAL WOUND PRESSURIZED OXYGEN THERAPY – NEW APPROACH IN TREATMENT OF DIABETIC FOOT ULCERS?

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Introduction

Topical wound oxygen therapy (TWO2) is therapeutic modality that delivers humidified pressurized oxygen (O₂) directly to the specific body part to achieve tissue penetration and increased oxygen levels to the open ischemia wound. O₂ is vital in the synthesis of collagen, enhancement of fibroblasts, angiogenesis, leukocyte function, energy metabolism and the inhibition of microbial growth. TWO2 raises tissue O₂ levels to a depth of 2 mm within the wound bed, stimulates new blood vessel formation, supports synthesis and maturation of collagen deposition, leading to wound closure. TWO2 therapy has showed effectiveness as an adjunctive therapy for the management of acute and chronic diabetic foot ulcers, venous stasis ulcers, pressure ulcers and mixed ulcers.



TWO vs Hyperbaric oxygen therapy (HBO)

Full Body HBO	Topical Wound Oxygen
	
2,500 mbar Constant to whole body	0 - 50 mbar Cyclical Topical only
Intact vasculature needed	Topical application
Limited to HBO facilities	Treatment at virtually everywhere possible
Specialists needed	Easy to use
Variety of contraindications	Little contraindications

Materials and methods

Inclusion criteria were: ≥ 18 years of age, an ankle-brachial index (ABI) $\geq 0,5$ in the affected limb and diabetic foot ulcer (DFU) with a grade ≥ 2 -A according to the University of Texas wound Classification system (UTI). Treatment consisted of TWO2 60 minutes daily, Monday through Friday for 6 weeks. Saline gauze dressing was applied following treatment and silver – based dressing was applied for the weekend. Wound size measuring, microbiological samples collection and digital photography of the wound were done once weekly. Wounds were debrided prior to therapy by the vascular surgeon, who assessed the wound every 7-10 days and debrided it if necessary. If infection was present antibiotics were given according to the antibiogram.

Results

Five male patients aged 65,8 years in average with chronic DFU-s and average ABI of 1,4 were treated with TWO2. At the beginning of treatment two wounds were classified as 2-B, one as 2-C and two as 2-D. Wound area was 8,86 square cm in average, and 4 ulcers were infected.



Characteristics	At the beginning	After 6 weeks
Age (years)	50-77 (65,8)	
ABI	0,75-2,41 (1,4)	
Wound duration (months)	1-7 (2,8)	
Wound stage (UTI)		
0-A	0	1
1-A	0	4
2-B	2	0
2-C	1	0
2-D	2	0
Wound area (cm ²)	2,18-28,81 (8,86)	0,6-8 (2,54) (reduction for 77,5%)
Infection	Present* (n=4), Colonisation** (n=1)	Absent (n=4) Colonisation** (n=1)
Antibiotics	n=4 (i.v./2 weeks)	None

*Pseudomonas aeruginosa, Enterobacter cloacae, Morganella morganii, E. coli, Klebsiella oxytoca, Proteus mirabilis; ** Acinetobacter baumannii, Pseudomonas aeruginosa

After 6 weeks four ulcers were classified as 1-A and one as 0-A. The average wound area was 2,54 square cm. Only one wound had microbiological isolate but with no signs of infection, therefore it was considered as colonization, and the other 4 were sterile. There were no adverse events.



Conclusion

Although TWO therapy is approved for use and current studies have shown its effectiveness in treatment of DFU-s and venous ulcers, there are still many questions that we need to ask to maintain a high standard of care. There are no standardized protocols for TWO2 therapy because of the variations in protocols and dosing methods (from 60 minutes daily to 120 minutes daily and the duration of treatment varies from 2 to 12 weeks). Although studies have suggested that topical pressurized oxygen therapy is cost effective and that improves quality of life, there have been no specific cost effectiveness studies completed and no studies found that show improved quality of life for patients receiving TWO. Randomized control studies are needed to increase the evidence around the use and effectiveness of topical pressurized oxygen therapy and to establish optimal parameters for use (such as protocols and dosing).



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