



UNIVERSITY of MARYLAND SCHOOL OF NURSING

Hyperbaric Oxygen Therapy as Adjuvant Treatment in the Care of Diabetic Foot Ulcer

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Background and Significance

- Diabetes foot care is an ongoing health issue in our communities.
- Impossibility of receiving proper treatment put diabetic patients at a higher risk of diabetes-related foot conditions like neuropathy, arthropathy, vasculopathy, and ultimately diabetes foot ulcers (DFUs).
- Delay in healing makes these ulcers get bigger, deeper, infected, necrotic and consequently they end in toes, feet, or even part of the limb amputated.
- In 2016, there were 4.9 lower-extremity amputations per 1,000 adults 18 years or older with diagnosed diabetes.³
- About 130,000 diabetes-related hospital discharges involved a lower-extremity amputation.³
- From 2005 to 2014, there was an increase of 9.07% in lower-extremity amputations in Maryland.¹
- The average cost per treatment with HBOT ranges from \$250-\$600 depending on how many sessions the patient needs.⁷
- The average cost for each foot amputation is over \$70,000.⁶

Objective

The purpose of this evidence review is to evaluate the effect of the HBOT used as adjuvant treatment to standard DFU versus the use of standard DFU care alone.

Methods

Databases: CINAHL, PubMed

Keywords: Ulcer, Foot Ulcer, Hyperbaric Oxygen

Limitations: Published between 2017-2023, only English language, randomized controlled trials.

Exclusion criteria: Literature not relevant to the target population, not relevant to the question formulated, and not relevant to the effect of the therapy.

Results: The final selection included 5 studies. These articles were selected due to randomization of the study, included target population, and being relevant to the information presented in the PICOT question.

Bibliography

References



Evidence Synthesis

Author	Level of Evidence (Melnik & Fineout-Overholt)	Type of Study	Sample Size	Overall Quality ¹⁰	Results (Intervention group vs standard care alone)	Additional Comments
Bajuri et al. (2017)	2	Randomized Controlled Trial	n = 60	B	26 patients (86.7%) in HBOT group achieve complete ulcer healing as compared to 18 patients (60%) in the control group (p < 0.001).	Reduction of infection markers were seen in both groups.
Salama et al. (2019)	2	Prospective Randomized Controlled Trial	n = 30	B	Significantly greater % of HBOT-treated wounds (33.3%, 5/15) achieved complete closure than conventional therapy-treated wounds (0%, 0/15; P = .014).	The significant difference was maintained during the 8 weeks of follow-up.
Chen et al. (2017)	2	Prospective, Randomized, Open-label, Controlled Study	n = 38	B	Complete DFU closure was achieved in 5 patients (25%) in the HBOT group (n = 20) versus 1 participant (5.5%) in the routine care group (n = 18) (P = .001). The amputation rate was 5% for the HBOT group and 11% for the routine care group (χ ² = 15.204, P = .010).	Also statistically significant improvements in inflammation index, blood flow, and health-related quality of life.
Rahman et al. (2019)	2	Randomized Controlled Trial	n = 58	A	Means of wound size over time points (Day 0, 10, 20 and 30) among pts under HBOT group were statistically significantly different [F(1,61)=30.86, p<0.001]] compared to conventional therapy group.	HBOT group had nearly 44 times higher odds to achieve at least 30% wound size reduction within the study period (95% CI: 7.18, 268.97, p<0.001).
Kumar et al. (2020)	2	Randomized Double-blind Controlled Trial	n = 54	A	The diabetic ulcers in 78% pts in intervention completely healed without any surgical intervention while no pt in controlled group healed w/o surgical intervention (P = 0.001).	Two patients in the intervention group required amputation versus 3 in the controlled group.



A diabetic patient was referred for HBOT of his grade III DFU which was non-healing after one year, with amputation planned within 24 hours

After three weeks (26 HBOT sessions) his wound considerable healing

After 50 completed HBOT sessions healing is evident

Implications and Role of the Clinical Nurse Leader

- Evidence-based practice use: knowing and understanding the necessity of a HBOT as an essential adjuvant treatment in the care of DFU based on data from literature.
- Leader of health care outcomes in the process of HBOT DFU care.
- Lateral integration of the multidisciplinary team to ensure they work synchronously to support the treatment and the patients with DFU.
- Use of feed-back to improve future measurements and establishment of new treatment protocols.
- Coaching and mentoring the team to ensure that everybody understand the new protocol including the HBOT as adjuvant treatment in the DFU.
- Leading teams to improve the quality of DFU care in the microsystem.⁹

Summary

- In the five literatures there were a significant improvement in the DFU time healing.
- Other aspects like reduction of white cell count (WCC), C-reactive protein (CRP), reduction in number of amputations, better mental health, and better health-related quality of life improved as well.²
- Reduction of level of inflammation index and blood flow improvement were also studied and the results were positive supporting the HBOT as an adjunctive treatment to standard care of DFU.⁴
- At least 20 HBOT sessions are required to be effective.⁴

Conclusions

- The use of HBOT is an adjunctive therapy essential in accelerating wound healing and providing the patients with better quality of life in the recalcitrant chronic non-healing diabetic foot ulcer.²
- Based on the therapy nature and the results obtained in the literature it should be included in all the DFU treatment protocols.
- More randomized controlled studies are recommended with a larger number of participants and the evaluation of different treatment regimens.

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