

Hyperbaric oxygen therapy in the treatment of diabetic foot syndrome

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Introduction

Diabetic foot syndrome (DFS) is one of the chronic complications of diabetes mellitus, causing significant morbidity and mortality. Damage to the vascular and nervous systems of the foot affects the blood supply to tissues and metabolic processes, and thus increases their susceptibility to infections and gangrene development.

It is estimated that the annual incidence of diabetic foot ulcers (DFU) or necrosis in patients with diabetes is **2-5%**. The lifetime risk of developing the condition is **25%**.

In addition to conventional basic therapy, there are adjuvant therapy methods such as hyperbaric oxygen therapy (HBOT).

Aim

The aim of the study is to present the current state of knowledge on the use of hyperbaric oxygen therapy in the treatment of diabetic foot syndrome.

Methods

The analyzed data is based on a systematic review from 2011-2021 on PubMed platform with the following key words combination: (hyperbaric oxygen therapy) AND (diabetic foot).

The search criteria were: clinical trial and randomized controlled trial publications.

The most appropriate articles regarding the topic of this work have been chosen. The overall number of reviewed articles was 8.

Conclusions

Diabetic foot syndrome is a major health concern for the growing population of diabetic patients worldwide.

The use of HBOT as a form of adjuvant treatment in the combined therapy of the DFU appears as safe and effective method in wound healing.

Additionally, this therapy also reduces the risk of amputation of the affected limb and improves the hematological and biochemical conditions by reducing glycemic and inflammatory levels.

HBOT plays an important role in the enhancement of wound healing for diabetic foot ulcers.

Results

Analysed studies assessed the efficacy of adjuvant, systemic HBOT in healing of diabetic foot ulcers, and also in the risk of amputation of the affected limb.

In study conducted by Chen et al. complete DFU closure was achieved in 25% of the patients in the HBOT group. The amputation rate was 5% for the HBOT group and 11% for the routine care group. Another prospective, randomized, controlled study showed greater ulcer size reduction in the HBOT group than in the control group ($42.4\% \pm 20.0\%$ versus $18.1\% \pm 6.5\%$). Authors suggested that HBOT treatment for 2 weeks may initiate a healing response in chronic DFUs. Additionally, randomized controlled trial conducted by Hisamuddin et al. indicated that HBOT significantly affected the wound size reduction in DFU when compared to the conventional wound care alone.

However, Fedorko's study did not demonstrate an advantage of HBOT combined with wound care compared with wound care alone in reducing indications for amputations.

Another randomized controlled trial showed that HBOT, supplemented with either lipoic acid or its R+ enantiomer had a better healing effect than HBOT alone in the treatment of chronic leg wound. Additionally, Irawan's team study proved that patients with DFU Wagner 3-4 may benefit from this therapy by decreasing HbA1c levels, leukocyte count, and serum creatinine levels.

Li's team study showed no significant relationship between HBOT and improved health-related quality of life. However, in the same study HBOT was related to fewer participants reporting mobility problems, pain or discomfort.



(A) Wagner grade 2 plantar ulcer before hyperbaric oxygen therapy (HBOT). (B) The same ulcer after 30 HBOT sessions showing significant ulcer area reduction.

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