Association of hemoglobin A1c and wound healing with application of omega-3 fatty acid fish skin.

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Statement of Purpose

Chronic non-healing lower extremity wounds in the setting of poorly controlled blood sugars are dreaded complications in the diabetic population. Hemoglobin A1c (HbA1c) indicates glycemia over the course of 2 or 3 months and may also be a reliable biomarker for predicting wound healing rate diabetic foot ulcers (DFUs). The goal of this study was to investigate how hemoglobin A1c (HbA1c) affected the treatment course in wounds with elevated blood sugars while utilizing omega-3 fatty acid fish skin xenografts.

Level of Study

Level IV, Case Series

Introduction

Wound healing is a complex process often impaired in the setting of diabetic patients with elevated blood sugars. The relationship between hyperglycemia and self-repairing abilities is taken into consideration as these factors were reflected as possible mechanisms that delayed ulcers from wound healing. Literature shows rate and percentage of healing are decreased for each percentage above 6%.[1] Hyperglycemia decreases the potential capillary growth and other essential elements in wound recovery.[2,4] Use of xenograft, such as omega-3 fatty acid fish skin is now more frequently incorporated to improve wound healing due to its anti-inflammatory and anti-bacterial properties and have shown increased healing rates.[4]

Methods

22 subjects with a diagnosis of either type I or type II diabetes mellitus were evaluated in this study to assess HbA1c in relation to wound healing. Patients with any risk for or confirmed infection were treated prior to graft application. Those with underlying osteomyelitis were either treated with a course of 6 weeks of intravenous antibiotics post-operatively. All patients received identical wound care which consisted of serial debridements followed by fish skin xenograft applications every 3 to 4 weeks for a period of multiple weeks until wounds were completely healed. The xenografts were dressed with a non-adherent dressing and patients were to remain non-weightbearing to the affected limb in a post operative shoe or CAM boot during the entire duration.

Results

All 22 patients made progress toward wound healing with approximately 3 to 4 weeks between each omega-3 fatty acid fish skin xenograft application. The average duration of wounds present were 14.2 weeks. Average hemoglobin was 9.6% at the time of the first graft application. No patients developed wound reoccurrences once full epithelization took place. Overall, wound healing progression was seen at each follow-up.

Discussion

Management of lower extremity wounds complicated by pathophysiology remains challenging and multifactorial. Current standard of care for DFUs includes glucose control, adequate perfusion and routine debridement with local wound care, strict offloading, and efficient patient education. Lev-Tov et al conducted a blind study and showed that even with the best standard of care, approximately 30% of DFUs heal at 20 weeks.

Our case study demonstrated that there was overall success in utilizing fish skin xenografts with elevated hemoglobin A1cs while decreasing time to healing based on studied averages.. The acellular fish skin graft structure is porous rather than dense when compared to alternative amnion/chorion membrane products which facilitates cellular ingrowth in wound healing. [5,6] Healing rates were increased in comparison to tradition wound care and grafting techniques. Christman observed the daily healing rates of wounds decreased by 0.028 cm^2 for every 1% increase in HbA1c. Future studies should include randomized controlled trials and larger sample size to further confirm these findings.

References

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