The use of Transdermal Continuous Oxygen Therapy for the Treatment of Chronic Recalcitrant Sickle Cell Disease Ulcers

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INTRODUCTION

Leg ulcerations are common in homozygous sickle cell anemia (also known as SCD–Sickle Cell Disease). The rate of occurrence is believed to be between 8-10%, but rates as high as 50% have been reported. These ulcers can be disabling, severely painful, and often require analgesics. Additionally, healing of these ulcers is very slow, taking months or years, and if all. The average duration of chronic ulcers in SCD has been reported to exceed 3 weeks to 36 weeks. Once healed, approximately 97% of healed sickle cell ulcers will recur in less than 1 year. A single sickle cell leg ulcer is a predictor of increased additional wounds with a 23 fold increased risk factor of developing future ulcers while having an active ulcer carries a 14 fold increased risk.

Due to the chronic, recalcitrant nature of these wounds, patients can experience chronic pain, disfigurement, embarrassment, isolation and loss of income. There is a high degree of urgency in discovering a treatment for Sickle Cell Disease ulcers that is effective for long periods of time, or better still, a method for eliminating the recurrence and proliferation of these wounds entirely.

Venographic studies have revealed that unlike many other wound etiologies, venous insufficiency is not the primary cause of Sickle Cell Disease ulcers. Rather, it is deprivation of oxygen to the skin caused by arteriovenous shunting, which has been postulated as the principal cause of the ulcerations. In date, there has been little success for a single approach to treating these chronic Sickle Cell Ulcers. In light of the oxygen skin deprivation theory, an attempt to provide increased oxygenation through the wound bed is considered logical. In addition, other “wound bed” approaches for SCD ulcers, in the area of pain management, have been effective.

One approach of administering oxygen to the wound bed is by using a device that provides continuous oxygen. Oxygen plays a role in energy metabolism, neovascularization, collagen deposition, polymorphonuclear function, and fibroblast proliferation. Studies on Transdermal Continuous Oxygen Therapy (TCOT) suggests it may improve other components of ischemic healing, including granulation tissue and reepithelialization. Transdermal Continuous Oxygen Therapy (TCOT) is currently the only method that allows oxygen to be continuously supplied to the wound, and all other treatments to date have been regionally (topically) or systemically intermittent. The unit is marketed as EPIFLO® (by Ogenix, Beecroowood, Ohio). The small, 3 oz., portable fuel cell based oxygen concentrator provides near 100% oxygen at a rate of 3 ml/hour. The unit allows the patient to be ambulatory during the treatment and receive continuous oxygen delivery to the wound while they are away from the clinic or hospital.

METHOD

Three patients with long histories of recurring Sickle Cell Disease ulcers that would not heal with various conventional and/or other adjunctive wound healing modalities were treated with Transdermal Continuous Oxygen Therapy (TCOT).

SUBJECTS

The patients had recurring non healing wounds for 30 years, 21 years and 20 years respectively. All three patients healed or improved to near healing for treatment periods were treated with Transdermal Continuous Oxygen Therapy (TCOT).

CASE 1

A 51 year old male presented to clinic with a 20 year history of non healing ulcers on both legs. The patient was refractory to all therapies. Within 2 weeks, TCOT had greatly reduced the wounds size and the surface area of the ulcer was reduced by 50% and the depth by 40% (see chart). By week 12, the depth was negligible and the wound area reduced to a small pithole. “The patient has been ulcer free for 5 months (as of this writing) at the TCOT treated wound site”.

CASE 2

A 31 year old man with homozygous SS (HbSS) and chronic bilateral leg ulcer was referred for leg ulcer. Diagnosis of disease was made at 11 years of age. Recurred wound grafts in both legs at 44 years of age. After only 6 months, the graft was rejected. The patient has had 30 large wounds in 30 years and the ulcers have been consistent for the past ten years occurring with more regularity. During TCOT treatment, the patient also received Exchange Blood Transfusion (EBT) every 6 weeks and during the treatment period had 4 courses of DVT. Prior to TCOT the ulcers were treated with ven-dressing, Wound care, honey, and compression dressing. TCOT was used on the medial aspect of the foot below the ankle of the patient’s leg. Participant had TCOT concentrator changed every 15 days. The treatment ran for 36 weeks. Within 3 weeks, the wound area reduced from 6.4 cm x 6.4 cm to 3 cm x 3 cm and prolonging the depth by 40% (see chart). By week 12, the depth was negligible and the wound area reduced to a small pithole. “The patient has been ulcer free for 5 months (as of this writing) at the TCOT treated wound site”.

CASE 3

A 50 year old male with homozygous SS (HbSS) was presented. At time of treatment he had been on home care for one year. On average he had a blue or cyanotic lower limb above the knee. The ulcer was 5 cm x 5 cm and at the time of presentation was deepening and draining, suggesting an underlying infection. The patient had been on topical treatments and was intolerant of oral analgesics. The patient was non-adherent with oral analgesics. The patient was discharged from home care to the TCOT clinic for further management. The patient was treated twice weekly with TCOT for 26 weeks. At the time of publication of this poster there has been no reoccurrence of the ulcers and the patient has been ulcer free for 8 months.

CONCLUSION

TCOT has been shown to be a new effective way to treat patients with sickle cell ulcers. Since results of this method are typically noticeable within 4 weeks, this may be a very inexpensive adjunctive treatment modality to determine a possible favorable outcome with a very brief treatment period. With further studies, it may prove to be a primary method of choice for treating sickle cell ulcers and other ulcers and wounds caused by deprivation of oxygen to the wound site.

REFERENCES


TCOT device utilized in case study

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