Early Conclusions Concerning the Simultaneous Application of Negative Pressure Wound Therapy with a Transdermal Continuous Oxygen Therapy System

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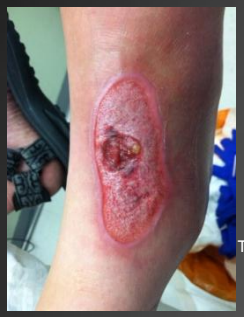

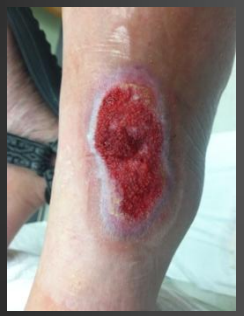

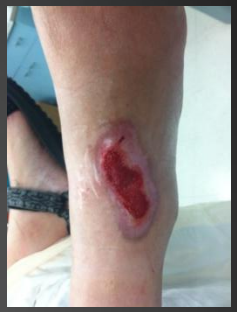

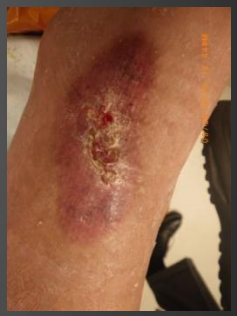

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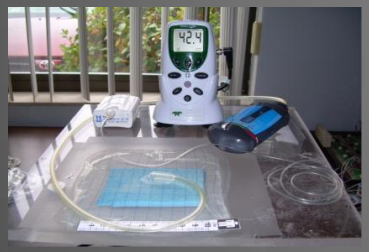
Overture

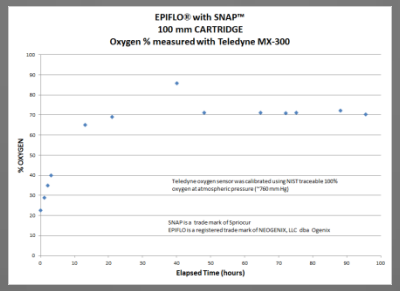
The concomitant use of negative pressure wound therapy (NPWT) with transdermal continuous oxygen therapy (TCOT) has never before been investigated. It is a likely hypothesis that any change in the oxygen percentage produced by the oxygen delivery device would be nullified (or even completely eradicated) by the negative pressure device. The simultaneous application of these treatment modalities is presented in a retrospective review and further validated with original research corroborated with and contributed by Ogenix.

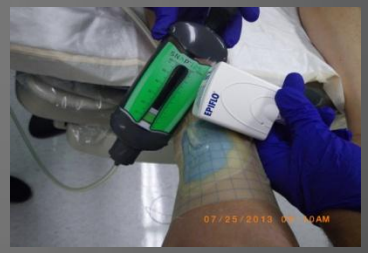
Why We Should Care

Wound fluid from a moderate to heavily exudating wound consists primarily of neutrophil elastase and is 40x higher in a chronic wound (Rovee and Maibach). As such, the prudence of determining a patient's neutrophil count prior to placement of advanced bioengineered tissue (or other expensive adjunct therapies) becomes appreciable. This can be accomplished with a routine CBC w/ differential, but better accomplished through a punch biopsy allowing actual visualization and quantification. Neutrophil elastase directly degrades alpha 1 anti-trypsin and fibronectin; fibronectin and collagen are the primary components of a wound's provisional matrix. Given this, achieving granulation tissue without the bond between fibronectin and collagen is *impossible*. Subsequently, NPWT is an appropriate and suggested approach to managing / removing this burden to wound closure.

Most of the critical components to wound closure are dependent on oxygen availability. Oxygen plays an essential role in energy metabolism, and is important for polymorphonuclear cell function, infection control, expression of growth factors, neovascularization, fibroblast proliferation, and collagen synthesis and deposition (Sarangapani et al). Often, lack of oxygen availability is a rate-limiting factor to wound healing. Presently, most patient populations carry some degree of vascular insufficiency or ischemia.







Materials & Methods

In the clinical setting, patient was evaluated weekly for placement of bioengineered tissue as well as wound vac dressing changes and replacement of the EPIFLO canister and cannula. Measurements of wound volume were also taken weekly to ascertain the appropriateness of continuing an advanced wound care regimen.

In the laboratory setting at Ogenix, two holes were drilled (one to accommodate the oxygen sensor from Teledyne and the other to input oxygen from EPIFLO) in a 0.5 inch Lucite sheet. The foam dressing from the SNaP kit was then mounted on the top surface of the Lucite sheet. The apparatus was connected to the Teledyne MX-300 to quantify the oxygen concentration. The sensor had been previously calibrated with pure oxygen (100%) and air (20.9%). The 100 mmHG SNaP cartridge was used for the experiment and applied in typical fashion. The fact a satisfactory seal had been achieved was validated both by the green color of cartridge plunger and also by the shrunken appearance of the blue foam itself. Readings were taken at periodic intervals and a graph of oxygen concentration vs. time was then able to be constructed.

Results / Further Considerations

The flattened out oxygen percentage level indicated that equilibrium had been reached and the two devices were working in tandem well. Although the concentration of oxygen stabilizes around 71%, it is probably much higher on a patient model given 1) SNaP would be pulling exudate along with the gas – therefore the suction throughput of gas would be less (higher gas volume available) than in the bench experiment and 2) the wound itself would be consuming oxygen – thus competing with SNaP for oxygen.

These results supply scientific verification of the ability to use the two devices simultaneously. SNaP has the capacity to remove 60cc's of solution (or air) in approximately 2.5 days, equating in 1cc/hr. EPIFLO generates 3cc/hr. Therefore, 2cc's/hr of residual oxygen are available for the wound to consume.

Conclusions

Based on the results of this study, it is clear the SNaP Wound Care System and EPIFLO device can be used together to produce a dramatic response in the wound healing process.

References: Rovee, David, and Howard Maibach. *The Epidermis in Wound Healing.* CRC Press, 2003.