Abstract
Clinically we can indirectly identify the reversal of tissue hypoxia secondary to hyperbaric oxygen therapy. Transcutaneous oximetry gives us a direct measurement of increased oxygenation in a hypoxic wound environment. This increased oxygenation is due to an increase in capillary density (angiogenesis).

Patient History
This is a 73 year old non diabetic who developed a combination arterial insufficiency and chronic venous ulcer on the medial aspect of his left leg. He had two prior arterial bypasses to this extremity along with sclerosis of multiple dilated veins in the area of the ulcer. He also had a failed STSG to the ulcer. His last arterial work up revealed no repairable arterial lesions. He was referred to our clinic for wound care and possible hyperbaric oxygen therapy.

Work Up
Initial transcutaneous oximetry revealed reversible local tissue hypoxia. Tissue hypoxia being defined as a pO2 of less than 40 mmHg in a non diabetic patient.

Treatment
Patient was started on hyperbaric oxygen therapy. Transcutaneous oximetry was performed in the chamber at 2 ATA.

The patients pO2 rose to over 1,200 mmHg. This number demonstrated that an adequate amount of oxygen was being delivered to support the metabolism of wound healing. The patient was retested after 14 hyperbaric treatments. This revealed a marked increase in pO2.

Despite this increase in pO2. The patient showed no sign of new skin growth for approximately 2 months after his hyperbaric oxygen therapy was completed. This increase in oxygenation of the periwound skin revealed that angiogenesis had started but was not yet sufficient to support new skin growth. At about two months post hyperbaric oxygen therapy, we began to seen new skin growth. In the picture below there is new skin filling in the space at 5 - 6 o'clock and new island of skin at 12 o'clock.

Over the ensuing weeks the wound continued to progressively close.
The primary care physician should refer the patient for advanced wound care in a wound healing center if the patient:

- Has a wound that persists for more than 30 days after treatment
- Has a wound and Reynaud’s phenomenon
- Has purpura
- Has a wound and hypertension
- Has gangrene or necrotic tissue in a wound
- Has a wound and diabetes

Conclusion

Transcutaneous oximetry is a valuable tool in identifying hypoxia as a cause of non-healing. It also gives us direct evidence that angiogenesis occurs after successful treatment with hyperbaric oxygen therapy.

We repeated a transcutaneous oximetry study about six months after the patients last hyperbaric treatment. The pO2 both above and below the previous ulcer site was now within normal range. The fact that the wound healed only after the addition of hyperbaric oxygen therapy was indirect evidence that there was an increase in oxygenation of the tissues and that angiogenesis occurred. The transcutaneous oximetry studies which showed low pretreatment pO2’s and the follow up studies demonstrating increased pO2’s provides more direct evidence of increased perfusion of the patients previously ischemic tissues.

About Precision Health Care

Precision Health Care is a comprehensive wound healing and hyperbaric medicine service organization dedicated to the development of state-of-the-art hyperbaric and wound healing centers through partnership and collaboration with our affiliate hospitals.

Community-based and patient-focused, we are driven by this mission philosophy: To provide select hospitals safe, comprehensive, compassionate wound healing and hyperbaric services for patients in need.

Questions or Comments?

Contact us:
at Precision Health Care:
1-888-Hyper Heal (497-3743)

About the Author

Charles D. Rice, M.D., F.A.C.S., U.H.M. is the Medical Director of the Center for Wound Healing & Hyperbaric Medicine at Mount St. Mary’s Hospital in Lewiston, N.Y., with Board Certifications in Surgery and Hyperbaric Medicine. He has over 20 years experience in General and Vascular Surgery. Since 2003, his practice has been devoted solely to Wound Healing and Hyperbaric Medicine.