



Transcutaneous Oximetry Identifying Hypoxia & Angiogenesis

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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.

TcpO₂ Study



The patient's 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 see 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.

During Treatment



Over the ensuing weeks the wound continued to progressively close.

Before Treatment



During Treatment



Progressive Closing



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.

After Treatment



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.

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.

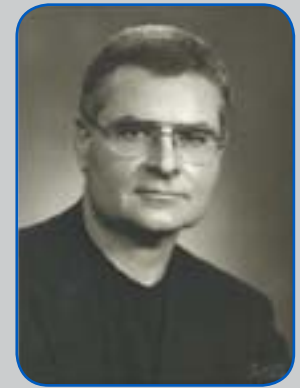
Questions or Comments?

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About the Author



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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