

Chronic Refractory Osteomyelitis Treated with Hyperbaric Oxygen Therapy

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ARTICLE INFO

Received Date: November 14, 2018

Accepted Date: December 12, 2018

Published Date: December 14, 2018

KEYWORDS

Chronic osteomyelitis
Hyperbaric oxygen
Staphylococcus aureus
Limb salvage

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Citation for this article: Allison GM, Berenson M, McCabe S, Dileo F, Poole M, Fares M, Watson K, Shernoff C, Turkette M, Serrano A and lafrati M. Chronic Refractory Osteomyelitis Treated with Hyperbaric Oxygen Therapy. Annals of Orthopaedics, Trauma and Rehabilitation. 2018; 1(3):125.

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ABSTRACT

We present a case of 30 years of chronic osteomyelitis of the femur with a draining sinus, refractory to multiple surgeries and multiple courses of antibiotics. Three orthopedic surgeons were consulted regarding operative management, but could only offer curative leg amputation which was not acceptable to the patient. We added hyperbaric oxygen to the patient's regimen. At the time of treatment initiation, patient's pain was 6/10 and her quality of life was limited. At the end of hyperbaric treatment, her pain was 0/10 and she was walking 2 miles per day without assistance. Hyperbaric oxygen maybe an important adjunctive therapy to source control and antibiotics, and may assist in limb-sparing strategies in refractory chronic osteomyelitis.

INTRODUCTION

Chronic Refractory Osteomyelitis (CROM) – Chronic bone infection that has not responded to conventional surgery and antibiotics - leads to significant morbidity, mortality, and negatively impacts patient quality of life with pain and decreased function. It is important to consider all effective treatment modalities to improve patient function and limit pain.

The Underwater and Hyperbaric Medicine Society (UHMS) recommends HBO as an adjunctive therapy for CROM, using a standard protocol of 100% oxygen at 2.5 atmospheres of pressure (ATA) for 90 minutes per session, generally for 40-60 sessions [1]. A recent systematic review compiling treatment outcomes of over 450 patients with CROM found that more than 70% of patients with refractory CROM were successfully treated when CROM was added to their treatment regimen [2]. Success is highest when bone debridement and antibiotics tailored to microbial susceptibilities are used in conjunction with HBO. HBO increases activity of many antibiotics via hyperoxia [3]. During HBO treatment, plasma oxygen concentrations increase up to 20 times normal, resulting in wound healing via enhanced angiogenesis, increased fibroblast activity, neutrophilic killing of pathogens, and decreased oxygen free radicals [4]. The Undersea Hyperbaric Medicine Society Guidelines give CROM a Class II recommendation [1]. Despite this favorable recommendation, HBO is infrequently employed in this challenging disease, perhaps in part because it is not

well-known or available to orthopedists generally. In this report we present a case of CROM of more than 30 years duration in which the patient received significant benefit from Hyperbaric Oxygen (HBO) therapy.

CASE

Patient is a 56 year old female, originally from a resource-constrained country. She sustained a penetrating deep anterior left thigh injury as teenager. She developed osteomyelitis of the left femur with draining sinus and subsequently underwent multiple surgeries and antibiotics in her native country that were non-curative (records not available). When we first encountered the patient at her initial wound center evaluation, she endorsed left anterior leg pain 6/10 with sinus drainage for more than 30 years. Prior to the wound center evaluation, she consulted with three orthopedists at three medical centers in the Greater Boston, MA area who said the only definite cure would be a high above knee amputation. She is otherwise well, is not diabetic, and does not smoke. Allergy history is notable for anaphylaxis with penicillin. Exam – a febrile, no acute distress, left thigh has multiple scars and a draining sinus present at anterior thigh but no erythema or fluctuance.

RADIOLOGY

Magnetic resonance imaging demonstrates the draining sinus (Figure 1) as well as the 14 cm bone abscess along the bone shaft (Figure 2). Expansion of femur (Figure 2) demonstrates a longstanding process, gadolinium enhanced periosteum, no definite soft tissue mass, and mild edema of the left quadriceps muscle. The extensive involvement of cortical bone while maintaining bone stability corresponds to Stage 3 osteomyelitis by the Cierny-Mader system [5].

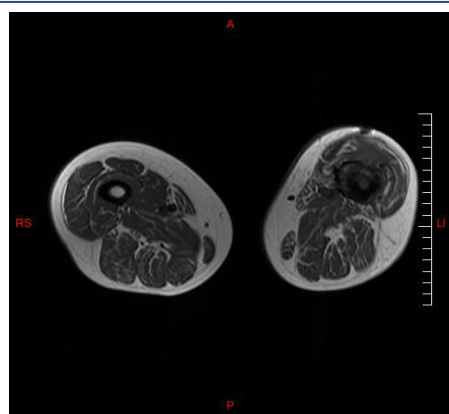


Figure 1: Magnetic resonance imaging demonstrates sinus tract of left anterior thigh (upper right image).



Figure 2: Magnetic resonance imaging demonstrates bone abscess with femur expansion.

RESULTS

A bone biopsy performed by Interventional Radiology grew Methicillin Sensitive Staphylococcus aureus. Her prior antibiotics were administered in her country of origin, and we did not have access to those records. Intravenous antibiotics were declined by the patient, so she initiated oral clindamycin although eventually her cultures became resistant. She was then switched to oral trimethoprim-sulfamethoxazole (Bactrim) 1 double strength tablet twice daily. Dose was weight-adjusted for 50 kg weight. Patient was treated with hyperbaric oxygen for CROM at 2.5 ATA for 90 minutes with two 10 minute airbrakes per usual protocol (UHMS). During the course of her treatment, she had two small bone fragments that came to the surface of the sinus tract and were removed in the office with local anesthetic. By 20 HBO therapy sessions, her pain was reduced to 3/10, and by 40 she was pain free. Unfortunately the patient experienced a minor set back by sustaining trauma to the leg resulting in a hematoma that needed to be drained in the clinic. In order to maximize her non-operative care, we therefore extended her course to 60 treatments. One year after completing 60 HBO treatments, her draining sinus remains closed, she remains pain free, and is walking five miles per day.

DISCUSSION

Data regarding HBO for CROM is limited by lack of randomized trials. However, a systematic review of published

case series of hyperbaric oxygen for refractory osteomyelitis showed >85% cure rates (Goldman). Although this cure rate reported in this systematic review is impressive, the magnitude of treatment effect of HBO is difficult to determine. Our case is remarkable for the duration of CROM – more than 30 years – in contrast to most case series where duration of osteomyelitis prior to HBO had a median duration of 3-7 years [6]. While the patient's extensive bony disease means infection control is the goal as opposed to cure, HBO was the only NEW therapy applied to this very chronic and debilitating situation and was associated with a remarkable improvement in pain-free activity. Our case underscores the potential of HBO to provide a non-surgical option to improve quality of life after decades of suffering. Highly bio available oral antibiotics such as clindamycin and trimethoprim-sulfamethoxazole have a demonstrated history of use for osteomyelitis [7].

CONCLUSION

In summary, we present a case of CROM of 30 years duration where the patient became pain-free after 60 treatments with HBO, limited office-based debridement, and highly available oral antibiotics. Orthopedists partnering with wound healing centers with HBO can provide additional resources to patients and improve their outcomes.

ACKNOWLEDGEMENTS

We are grateful to the patient and her family for their support of this case report.

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