Atypical Avascular Necrosis treated with Hyperbaric Oxygen Therapy

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Introduction/Background:

Hyperbaric oxygen therapy (HBOT) is used to treat Avascular Necrosis (AVN) with good results when applied early in presentation, typically FICAT stage I or II. HBOT is hypothesized to reduce local hypoxia, edema, and inflammation, as well as stimulate angiogenesis, thus increasing micro-circulation. Literature supports the use of HBOT as an adjunct therapy for AVN of the femoral head, but less is studied in other locations.

Patient Case:

40 year old male with hypothyroidism and tobacco use presented after injuring his right knee while lifting a keg of beer at work six years prior. He completed a course of physical therapy, but continued to have pain and required a cane for ambulation. He was found to have bilateral peripheral artery insufficiency secondary to arteriovenous malformation, which was corrected with stenting. His pain greatly improved, and he no longer required a cane for ambulation. However, he continued to have nagging pain and decreased range of motion to that knee. A MRI showed multifocal bone infarcts within the distal femur and proximal tibia, and he was referred to Hyperbaric medicine for avascular osteonecrosis.

Results:

Our patient was initially approved for 40 outpatient HBOT treatments. He received treatments daily Monday -Friday with 100% oxygen at 2.4 ATA with two, 5-minute air breaks for 110 minutes. Unfortunately he was only able to complete 35 treatments prior to the initial insurance time deadline. An extension was filed, but he had about a two week break prior to resuming therapy while awaiting approval. After the initial 35 HBOT treatments, he reported continued improvement in pain and symptoms. He was able to perform most of his activities of daily living (ADLs) and job functions as a bartender without pain, but was not completely back to baseline. Specific activities, most notably bending and lifting objects greater than 20 pounds, would still cause pain. After 41 treatments, he underwent repeat x-rays of the right knee that showed mild degenerative changes, unchanged from prior x-rays. He also had a follow up with orthopedic surgery, with no further interventions planned given his symptomatic improvement. He agreed to 20 additional HBOT treatments, and completed 59 total prior to insurance expiration. At the completion of all dives, he states he can now walk much further without pain, can bend knee fully to pick items up, and overall said he "feels like a new man." He had follow-up scheduled with Physical Therapy (referral was placed prior to completion of HBOT), and continued to work with therapy to build functional strength and flexibility in his right lower extremity. Repeat MRI imaging of the right knee was obtained approximately six weeks after completion of 59 HBOT treatments (image) that showed no further progression of his disease.

Summary/Conclusions:

HBOT could be beneficial for AVN in atypical sites other than the femoral head. Typically 20-40 HBOT treatments is a standard course for AVN, but extensions up to 60 treatments may be warranted if symptomatic improvement has not yet plateaued. When used early in the disease course, HBOT may delay, or even reduce, the need for surgical interventions such as total joint replacements.