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Avascular Necrosis of the Femoral Head

Patrick Graham

Introduction

Avascular necrosis of bone (AVN), also known as osteonecrosis, ischemic necrosis, or aseptic necrosis, is a progressive pathological process in which compromise of bony vasculature results in death of osseous tissue and bone marrow cells (Jones & Mont, 2014; National Institutes of Health, 2015). This process eventually leads to bony collapse, destruction of the associated joint, and development of arthritis (Jawad, Haleem, & Scully, 2012; Jones & Mont, 2014; Karantanas, 2013; National Institutes of Health, 2015). Although the exact incidence and prevalence are unknown, it is estimated that up to 20,000 new cases of AVN are reported in the United States annually (National Institutes of Health, 2015).

Etiological factors associated with AVN are divided into traumatic and atraumatic. The most common traumatic incident related to AVN of the hip is femoral neck fracture (Jones & Mont, 2014; National Institutes of Health, 2015). Significantly complex fracture geometry and displacement have been identified as increasing the risk of developing AVN (Barquet, Mayora, Guimaraes, Suarez, & Giannoudis, 2014; National Institutes of Health, 2015). Even with optimal surgical management, a small percentage of patients will go on to develop AVN within 2 years of operation (Barquet et al., 2014).

Atraumatic causes include chronic alcohol abuse, cigarette smoking, chronic use of corticosteroids, sickle cell disease, systemic lupus erythematous, chronic renal failure, human immunodeficiency virus infection, pancreatitis, chronic hyperlipidemia, exposure to radiation, and thrombophlebitis (Jones & Mont, 2014; National Institutes of Health, 2015). Still others are idiopathic. Chronic alcohol abuse and use of corticosteroids are associated with approximately 80% of atraumatic cases (Jones & Mont, 2014).

Case Presentation

A 47-year-old man presented with "years" of gradually worsening left hip pain. He denied any injury or incident but did endorse two decades of alcohol abuse, noted as approximately "six to eight drinks" daily and "more sometimes" on the weekends. He described an aching, sometimes throbbing, sensation of the hip, which had been worsening for more than a year. He noted a progressive limp. He initially found relief with over-the-counter medications such as Advil (ibuprofen) and Tylenol (acetaminophen), but those were reportedly no longer effective. More recently, he was prescribed tramadol, with minimal relief noted. With this, it was recommended he be evaluated by orthopaedics.

Upon presentation, the patient was alert, oriented, and affect appropriate. He was in no apparent distress. His BMI (body mass index) was calculated at 37.2. He ambulated with an antalgic, Trendelenburg-type gait without use of an assistive device. He postured with a right trunk lean, offsetting his weight from the left, with hip coming into adduction. There was no appreciable deformity, discoloration, or swelling. He endorsed tenderness anterior as well as lateral. Range of motion was limited by pain and body habitus. Hip pain was noted radiating into the groin, with end-range flexion, abduction, and internal rotation. There was no appreciable instability. Strength was grossly equal, with noted gluteal weakness of both hips. The patient reported left hip discomfort with resisted motion. He was found to be distally neurovascularly intact. He displayed a positive c-sign, hip scouring, FABER, FADIR, anterior Stinchfield's with a negative straight leg raise.

Radiographs of the left hip were evident for CAM deformity, joint space narrowing, marginal osteophytes, and sclerotic changes (see Figure 1). These findings, in the context of the patient's age and reported alcohol abuse, were concerning for avascular necrosis of the femoral head. With this, it was recommended the patient have further evaluation by magnetic resonance imaging (MRI).

Magnetic resonance imaging is proven more sensitive for assessing the subtle osseous changes seen with AVN and is unanimously considered to be the gold standard for evaluating early-stage disease (Jones & Mont, 2014; Manenti, Altobelli, Pugliese, & Tarantino, 2015). It is also a validated method for imaging follow-up in those patients being treated conservatively (Manenti et al., 2015). This patient's magnetic resonance image displays the classic osseous changes associated with AVN, seen as a well-demarcated, focal lesion of the superior femoral head (see Figure 2).

Management

The management of avascular necrosis ranges from conservative to surgical depending on the severity of disease state and patient symptoms (Jones & Mont,

Patrick Graham, MSN, RN, ANP-BC, Department of Orthopedic Surgery, Northwestern Medicine, Chicago, IL.

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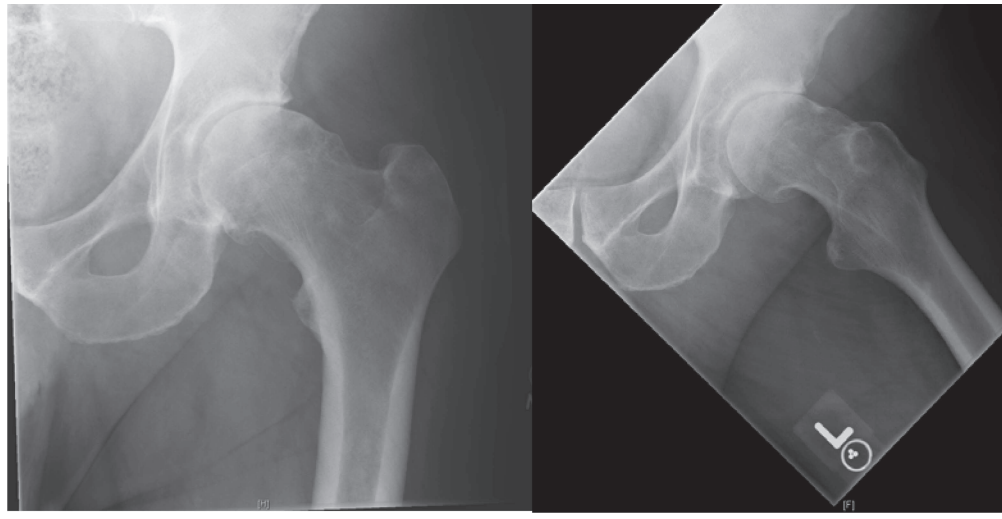

Figure 1. Anteroposterior and lateral views of the left hip showing CAM deformity, joint space narrowing, marginal osteophytes, and dense sclerotic changes.

2014; National Institutes of Health, 2015). Nonoperative/conservative interventions are primarily focused on symptom management and include weight-bearing precautions, activity modification with the avoidance of high-impact activities, stretching program, and use of analgesics and other pharmacotherapies such as bisphosphonates, statins, anticoagulants, and vasodilators (Jones & Mont, 2014; National Institutes of Health, 2015). Unfortunately, these measures are ineffective in halting the progression of disease, although they have shown promise in slowing progression while better managing the associated symptoms (Jones & Mont, 2014; National Institutes of Health, 2015).

Surgical management entails procedures that are joint preserving versus joint replacing. Joint-preserving procedures include core decompression, osteotomy,

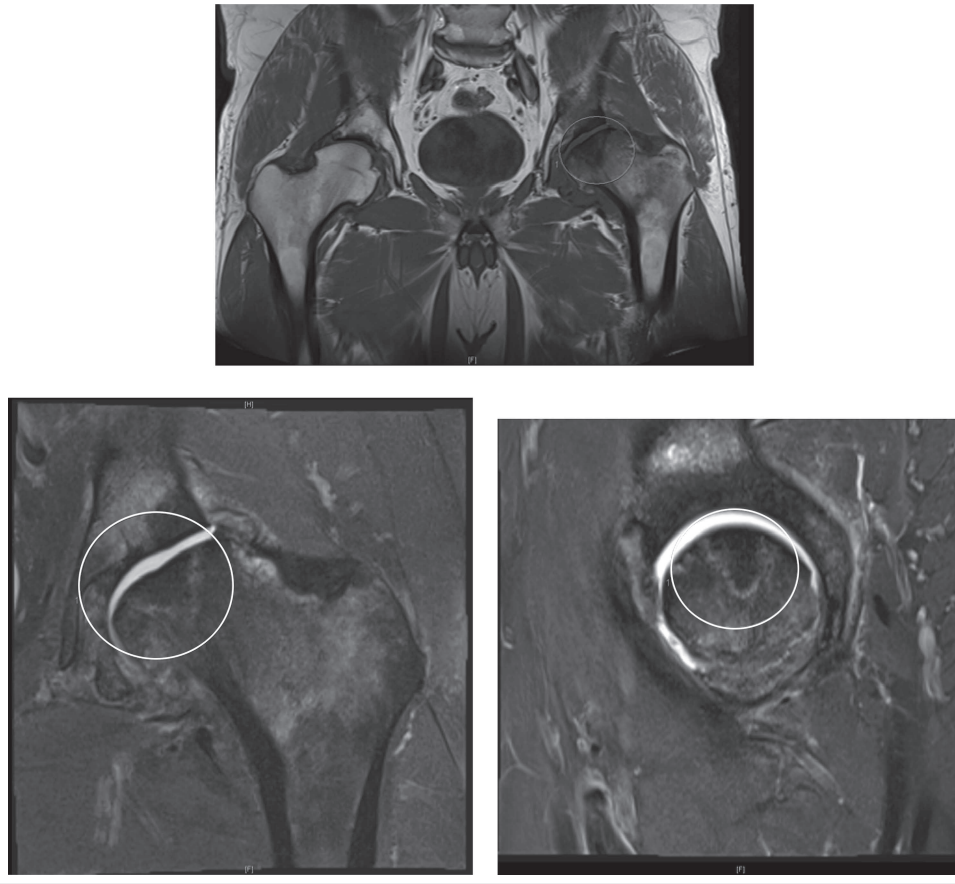

Figure 2. Coronal T1 of pelvis.

bone marrow grafting, various nonvascularized bone grafting techniques, as well as those incorporating vascularized fibula (Jones & Mont, 2014; Mohanty, Singh, Kundangar, & Shankar, 2016; National Institutes of Health, 2015). The primary goal in early stages of disease, especially in the younger population, is preserving the femoral head and native joint and thus is better treated with one of these interventions (Jawad et al., 2012; Mohanty et al., 2016). A lack of prospective randomized trials, as well as variable reported success rates of these surgical procedures, begs the questions as to the true efficacy or any superiority of the various techniques available (Jawad et al., 2012; Jones & Mont, 2014; National Institutes of Health, 2015).

The other surgical option is total hip arthroplasty, a joint-replacing procedure. Recent studies indicate excellent long-term results, as comparable with outcomes in patients with osteoarthritis, for those with AVN undergoing total hip arthroplasty (Jones & Mont, 2014; National Institutes of Health, 2015). The revision rate has decreased to about 3% and is most commonly associated with loss of fixation of the acetabular component secondary to wear (Jones & Mont, 2014; National Institutes of Health, 2015).

Discussion

Avascular necrosis of the femoral head should be considered in the differential for any patient presenting with hip pain and any of the reported risk factors. This case highlights the importance of collecting a thorough history and synthesizing information. When these risk factors are identified, it should direct the advanced practice orthopaedic provider to obtain appropriate imaging workup for accurate diagnosis. With improved MRI techniques, we are better able to investigate for radiographically occult findings seen in early-stage AVN, as well as evaluate for other potential causes of hip pain (Jawad et al., 2012; Jones & Mont 2014; Karantanas, 2013). Further investigation into the routine clinical use of advanced imaging techniques such as MRI, computed tomography, and nuclear medicine bone scan is still needed (Manenti et al, 2015). There is also lacking consensus as to an ideal classification system for early-stage AVN, an area that warrants further research (Jawad et al., 2012; National Institutes of Health, 2015).

References

Barquet, A., Mayora, G., Guimaraes, J. M., Suarez, R., & Giannoudis, P. V. (2014). Avascular necrosis of the femoral head following trochanteric fractures in adults: A systemic review. *Injury*, *45*(12), 1848–1858.

Jawad, M. U., Haleem, A. H., & Scully, S. P. (2012). In brief: Ficat classification: Avascular necrosis of the femoral head. *Clinical Orthopaedics and Related Research*, *470*(9), 2636–2639.

Jones, L., & Mont, M. (2014). Osteonecrosis. *UpToDate*. Retrieved from https://www.uptodate.com/contents/osteonecrosis-avascular-necrosis-of-bone

Karantanas, A. H. (2013). Accuracy and limitations of diagnostic methods for avascular necrosis of the hip. *Expert Opinion on Medical Diagnostics*, *7*(2), 179–187.

Manenti, G., Altobelli, S., Pugliese, L., & Tarantino, U. (2015). The role of imaging in diagnosis and management of femoral head avascular necrosis. *Clinical Cases in Mineral and Bone Metabolism*, *12*(1), 31–38.

Mohanty, S. P., Singh, K. A., Kundangar, R., & Shankar, V. (2016). Management of non-traumatic avascular necrosis of the femoral head—A comparative analysis of the outcome of multiple small diameter drilling and core decompression with fibular grafting. *Musculoskeletal Surgery*. Abstract retrieved from https://dx.doi.org/10.1007/s12306-016-0431-2

National Institutes of Health. (2015, October). *Questions and answers about osteonecrosis (avascular necrosis)*. Retrieved from http://www.niams.nih.gov/health_Info/Osteonecrosis/