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Rapidly destructive osteoarthritis of the hip following intra-articular steroid injections: A case report

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Abstract
Case: A patient presented with rapidly destructive osteoarthritis (RDO) of his left hip following high dose steroid injection. He experienced rapid deterioration of his condition less than six months after his second injection. Prior to this, the patient had a two-year history of left groin pain treated conservatively without adequate symptomatic relief.
Conclusion: This is believed to be one of the few documented cases of RDO caused by high dose steroid injections. It demonstrates a need for further research on the risks of these injections for joint osteoarthritis and for the development of standardized guidelines for disease management.

Keywords: Intra-articular steroid injection, rapidly degenerative hip disease, hip osteoarthritis, total hip arthroplasty, glucocorticoid injection

Introduction
Rapidly destructive osteoarthritis (RDO) of the hip is an idiopathic disease that was first described in 1957 but still remains poorly understood [1]. In 1970, a standardized definition was proposed, including either 50% narrowing of the joint space or greater than 2 mm of femoral head destruction in a 1 year timeframe, in the absence of any identifiable destructive arthropathy [1]. Since then, additional pathologic features of this disease have been described, such as flattened femoral heads, joint effusions, absence of articular cartilage, and subchondral bone destruction [2-5]. The pathophysiology still remains unclear, but risk factors such as age, osteopenia, labrum inversion, and female sex have been described and continue to be a source of debate [2-5].
Recently, intra-articular glucocorticoid injections have been implicated as a proposed mechanism for the development of RDO in the setting of preexisting osteoarthritis [6-9]. A recent study demonstrated that as high as 21% of patients with primary hip osteoarthritis who received intra-articular glucocorticoid injections developed rapidly destructive hip disease [9]. Glucocorticoid injections are widely used as a nonsurgical treatment method for patients with osteoarthritis, and there currently exists strong evidence that intra-articular steroid injections improve function and reduce pain in the short-term for patients with symptomatic hip osteoarthritis [10]. However, recent reports of glucocorticoid-related RDO and concerns regarding the potential risk of accelerated osteoarthritis from these injections raise questions about the safety of this approach. We present a case of a 55-year-old patient with proposed glucocorticoid injection-related RDO of the hip.
The patient was informed that the data concerning his case would be submitted for publication and was agreeable to this.

Case Report
The patient is a 55-year-old male with a past medical history of gastrointestinal reflux disease and hyperlipidemia. He originally presented to his primary care physician in April of 2018 with complaints of achy left groin pain, worsened by internal and external rotation of his left hip and ascension of stairs. X-rays at this time revealed mild to moderate superior joint space narrowing with mild sclerosis in the superior acetabulum. At this time the patient chose to treat with non-opioid analgesics and presented again over a year and a half later with worsening groin pain aggravated by motion and relieved by non-opioid analgesic use. The patient subsequently chose to pursue outpatient physical therapy for symptomatic relief.

After a month of physical therapy with no symptomatic improvement, the patient received repeat x-rays of his left acetabulum, which revealed mild to moderate joint space narrowing of the left hip which was more pronounced superiorly with associated subchondral sclerosis as well as subchondral cysts within the lateral acetabular roof (Figure 1). At this time, he was referred to orthopedics for further evaluation and management.

He presented to the orthopedic surgery service with continued non-radiating left hip pain that was worse with flexion and internal rotation. His physical exam was unremarkable and demonstrated normal strength in his bilateral lower extremities. He was diagnosed with osteoarthritis of the left femoroacetabular joint and surgical and non-surgical interventions were offered. At this time, the patient decided to pursue non-surgical interventions and was referred to interventional radiology for a fluoroscopic guided steroid injection. He received a high-dose steroid injection of 3 ml of 0.5% Marcaine with 80 mg of Kenalog to the left femoroacetabular joint in May of 2020 with a repeat injection in November of 2021 under fluoroscopic guidance (Figure 2).

After his second injection, the patient received no symptomatic relief and began rapidly deteriorating. He reported severe pain that woke him from sleep and he reported difficulty with daily ambulation. He was unable to obtain pain relief at this time with multiple non-opioid analgesics. He returned to the orthopedic clinic less than a year after his last steroid injection. New plain radiographs were obtained and revealed severe joint space narrowing, deformation and ascension of the femoral head with a relative lack of osteophytes (Figure 3). The patient elected to undergo total hip arthroplasty (THA) on 9/6/2022. Intraoperative findings demonstrated a flattened weight bearing surface, articular cartilage erosion, subchondral bone destruction, and multiple geodes which were filled with fibrous tissue. The surgery was completed uneventfully, and immediate post-operative x-rays showed a well-positioned left hip arthroplasty with no evidence of fracture or dislocation (Figure 4). The patient followed up most recently in the office on 9/7/2023. His exam demonstrated a well-healed incision with intact left lower extremity sensation and hip flexion from 0-90 degrees. He had complete resolution of his symptoms to baseline with no postoperative complications. Imaging at this time demonstrated the left hip prosthesis in good anatomic alignment and position as expected with no complicating features noted (Figure 5).

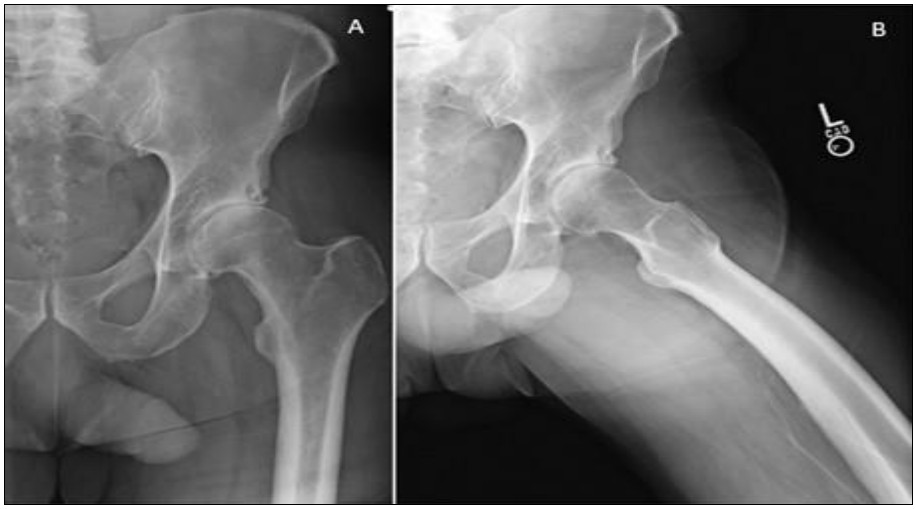

Fig 1: Anteroposterior (AP) (A) and Lateral (B) views of left hip in 2019. Radiographs demonstrate mild to moderate joint space narrowing of the left hip which is more pronounced superiorly with associated subchondral sclerosis as well as subchondral cysts within the lateral acetabular roof.

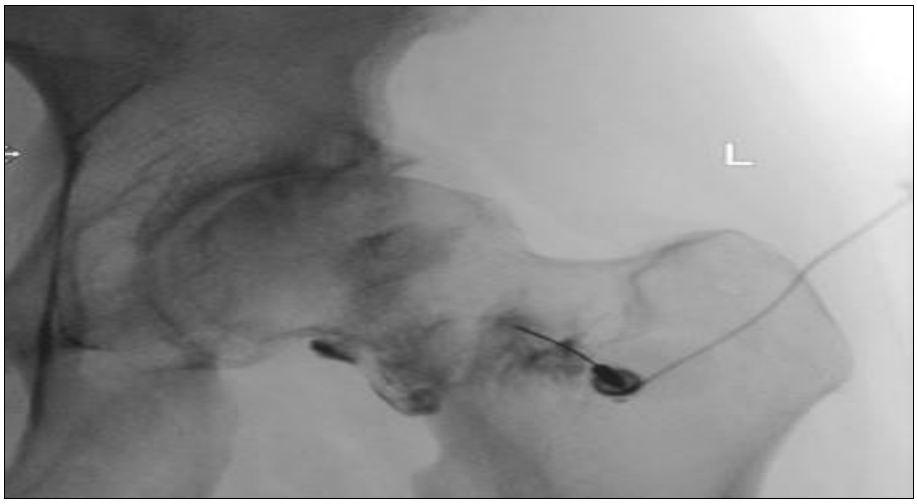

Fig 2: Anteroposterior (AP) view of left hip in 2021 during fluoroscopic guided joint injection. Radiographs demonstrate mild to moderate superior joint space narrowing with mild sclerosis in the superior acetabulum. No significant osteophytes, erosions, or abnormal bone lesions.

Fig 3: Anteroposterior (AP) (A) and Lateral (B) views of left hip in 2022. Radiographs demonstrate severe sclerosis involving weight bearing aspect of the left femoral head with near complete loss of joint space and marginal osteophytosis. Findings suggest severe arthrosis. Flattening and collapse of the femoral head suggests avascular necrosis and possible free osseous fragment. Visualized bones are aligned with no fractures

Fig 4: Anteroposterior (AP) view of left hip status post total hip arthroplasty (THA) from 9/6/2022. Radiograph demonstrates left total hip arthroplasty in proper anatomical alignment with no evidence of periprosthetic fracture or other complications.

Fig 5: Anteroposterior (AP) view of left hip status post total hip arthroplasty (THA) obtained at 1-year follow-up on 9/7/2023. Radiograph demonstrates left total hip arthroplasty in proper anatomical alignment with no evidence of periprosthetic fracture or other complications

Discussion

RDO is an exceedingly rare disorder characterized by the rapid destruction and degeneration of the involved joint space [1-9]. When involving the hip, destruction of the femoral head and acetabulum characteristically takes place over a 6-12 month period [2, 4, 7, 9]. The destruction is classically unilateral in 80-90% of cases and presents in elderly women normally in the 7th-8th decades of life [7-9]. It initially presents with classic signs and symptoms of hip osteoarthritis, but leads to rapid destruction of the involved joint resulting in debilitating pain and impaired mobility [7-9]. It has been postulated that the combination of mechanical stress, degeneration of cartilage and the bone's response to this stress are key features that play a role in the pathogenesis of this condition [7]. The combination of rapid degeneration of the joint cartilage and lack of osteophyte formation by the bone results in the expedient arthritis that is seen [7]. Histologically, RDO is characterized by the presence of granulomatous foci consisting of fragmented bone and cartilage debris located in the marrow space [2]. These lesions are believed to be a result of the rapid bone destruction and failure of normal bone resorption [2]. There have also been reports showing an increased number of osteoclasts and bone resorptive enzymes found in the hips of these patients suffering from RDO of the hip [5]. This is believed to be a result of recruitment of osteoclast precursors by the vascular endothelium to the area of bone resorption [5].

It has been suggested that intra-articular steroid injections can result in chondrolysis and destruction of the injected joint [6-9]. Further, research has shown that a dose dependent risk exists, with multiple high dose corticosteroid injections increasing the risk of the development of RDO [11]. Okike *et al*. recently demonstrated that while the risk of RDO following a single low dose (defined in their study as <40 mg triamcinolone) injection is low, the risk is much higher following high dose (defined as >80 mg) and multiple injections. In our current case, this patient received both multiple and high dose injections, which may have contributed to his development of RDO. Unfortunately, the mechanism behind this rapid chondrolysis and subsequent joint destruction is not well understood. Once diagnosed, RDO of the hip is typically treated with total hip arthroplasty (THA) [7-9]. However, due to the severe bone loss in this patient population, the operative repair tends to be more challenging. Common difficulties associated with THA in these patients include increased blood loss, longer operative times and the need for more specialized implants due to the severity of the osseous destruction [5, 7-9]. The elevated blood loss seen in these patients during operative management is believed to be a result of the surrounding tissue edema or subchondral fractures of the bone due to rapid destruction [5]. Conservative management with the use of non-steroidal anti-inflammatory drugs, bisphosphonates or vitamin D analogues can be used for pain control, but rarely will slow disease progression [5]. Due to the rarity of this disorder and the low percentage of patients receiving treatment for it, there remains a lack of treatment guidelines or preventative measures to decrease a patient's overall risk.

In summary, we present a case of RDO of the hip following multiple and high dose intra-articular steroid injections in a young patient. Although infrequently reported in the literature, RDO has recently been proposed as a possible complication of intra-articular steroid injections. In particular, high dose (>80 mg) and multiple injections have recently been associated with a significantly increased risk of the development of RDO. While intra-articular steroid injections may play an important role in the nonsurgical treatment of patients with symptomatic osteoarthritis, physicians should understand the possible risks associated with their use and counsel patients appropriately prior to choosing this treatment modality. The limitations of this case report and other studies that have been conducted is the low population size of involved patients and inability to draw conclusions that could represent the entire patient population. Further studies are warranted to gain a more concrete understanding of this disorder and its associated pathophysiology as well as ways to reduce a patient's risk of future development.

Conclusion

In conclusion, Rapid Destruction Osteoarthritis (RDO) of the hip, though rare, poses significant challenges in diagnosis and management. This case highlights the potential association between RDO and multiple high-dose intra-articular steroid injections, suggesting a need for caution when considering this treatment modality, especially in younger patients. While total hip arthroplasty remains the primary treatment option, the complexity of operative repair underscores the importance of careful preoperative planning and specialized implants. Further research is necessary to elucidate the pathophysiology of RDO and develop effective preventive measures. Physicians should be aware of the potential risks associated with intra-articular steroid injections and counsel patients accordingly, emphasizing the need for vigilance in monitoring and exploring alternative treatment options when appropriate.

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