



Case report

Lumbar chance fracture after direct anterior total hip arthroplasty

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ABSTRACT

This report describes a patient with ankylosing spondylitis (AS) who underwent total hip arthroplasty (THA) by the direct anterior approach and sustained a L4-5 extension fracture dislocation with neural deficits. A magnetic resonance imaging revealed an epidural hematoma at the site of the fracture causing critical stenosis. The patient was taken to the operating room for a L3-S1 posterior decompression with L2-pelvis posterior spinal fusion. AS and diffuse idiopathic skeletal hyperostosis create a stiff spine that predisposes to fractures because of the larger moment arms experienced than normal spines. The arthroplasty surgeon performing THA should be aware and take precautions to reduce stress on the spine.

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Introduction

Patients with ankylosing spondylitis (AS) have a 25%–50% occurrence of hip arthropathy and typically have a younger age of onset of their hip involvement [1]. AS and diffuse idiopathic skeletal hyperostosis (DISH) disease progression makes the spine susceptible to fracture and neurologic injury even after low energy injuries [2–4]. Long-term results of total hip arthroplasty (THA) have been well described in patients with AS with 70% survival at 30 years [1], and with high function and good self-reported outcomes [5].

Recent studies have shown lower immediate postoperative pain and improved functional recovery when the direct anterior approach (DAA) is compared with the posterior approach [6–9]. The use of special tables can assist with this approach by allowing independent manipulation of the leg to facilitate exposure and

insertion of the femoral stem. To our knowledge, there are no studies specifically looking at DAA THA in AS and DISH patients.

This paper describes a 68-year-old male patient with AS who underwent a THA through the DAA with the use of a Hana table (Mizuho, OSI, Union City, CA). Although there were no apparent intraoperative complications, the patient was diagnosed with a L4-5 extension-distraction fracture with neurologic injury that was subsequently treated with decompression and fusion. The purpose of this article is to report this unique complication.

Case history

A 68-year-old male with a significant history for AS underwent left THA. The patient had normal preoperative neurosensory examination and lumbar spine films taken 1 year prior that revealed extensive ankylosis without fracture (Fig. 1). The anterior THA operation with the use of a special table proceeded without complication with a noncemented acetabular and hydroxyapatite coated stem (Fig. 2). The patient had postoperative pain in his left hip on postoperative day (POD) 1, but was able to ambulate with physical therapy. Physical therapy was limited on POD 2 when the patient reported paresthesias and poor proprioception. The patient's pain continued to worsen and began to report progressive low back pain and weakness in L4 nerve distribution bilaterally during ambulation. Because of worsening of symptoms, lumbar films were taken on POD

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Figure 1. Preoperative images of the patient. (a) Lateral lumbar spine, (b) anteroposterior (AP) lumbar spine, (c) AP left hip, and (d) lateral left hip.

8, which revealed an unstable L4-5 chance fracture (Fig. 3a). An orthopaedic spine consult was obtained, computed tomography/magnetic resonance imaging revealed an epidural hematoma and severe stenosis within the canal. Once medically cleared, the patient returned to the operating room for an L2-S1 decompression and L2-pelvis posterior spinal fusion. The patient tolerated this operation well and had improved strength and sensation, but with residual

weakness in the tibialis anterior bilaterally. While in rehabilitation, he developed back pain and radiographs revealed loss of fixation from the L2 and L3 pedicle screws (Fig. 3b and c). The patient underwent posterior spinal fusion from T10–pelvis with decompression at L1–L3 (Fig. 3d and e). The patient followed-up with minimal pain, but residual weakness in the L4 nerve root distribution bilaterally. His postoperative films were stable at 5 and 8 months (Fig. 3f). At the

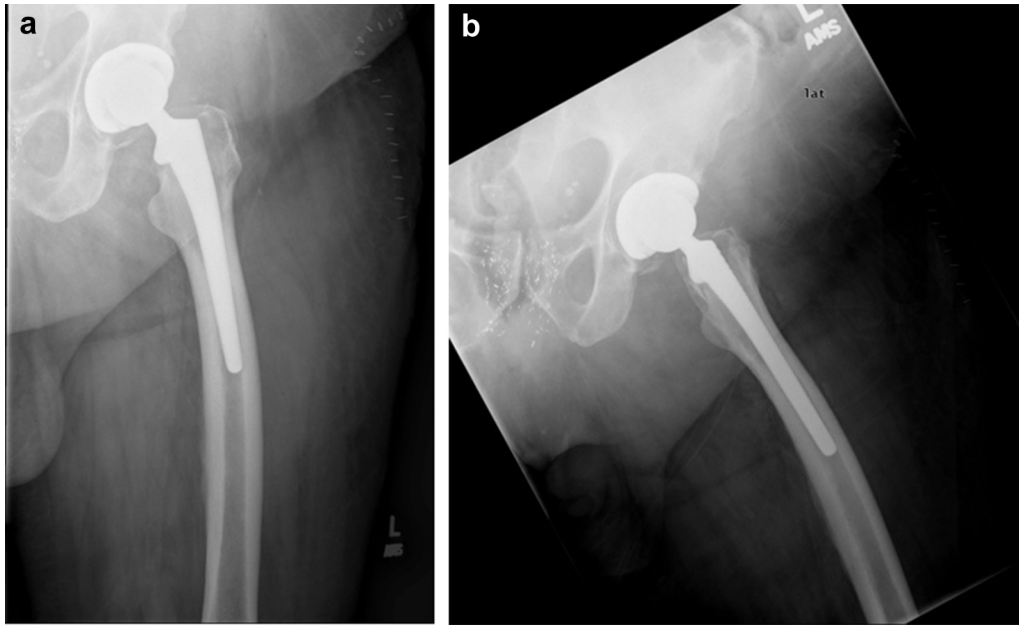


Figure 2. Postoperative radiographs: noncemented acetabular and femoral components. (a) AP and (b) lateral.

most recent follow-up, the patient has a pain free hip with full range of motion, but ambulates minimally.

Discussion

This case illustrates a patient with AS who was found to have a severe lumbar fracture after DAA THA. This patient had known AS treated with corticosteroid injections in the past, but without any known neurologic deficits. It remains unclear when this fracture occurred or what contributed to its cause. The senior surgeon uses spinal anesthesia, with the patient positioned supine on a specialized table. The senior author uses a specialized table in which the operative leg is typically extended to help with femoral exposure and release. We have hypothesized that the hip extension performed with the use of the specialty table could have imparted an extension force to the spine and contributed to this fracture. The patient's slow mobilization, pain and eventual paresthesias, and weakness led to the diagnosis of the spine fracture.

The long-term results of THA in patients with AS and DISH are promising [1,5,6]. Very few cases of vertebral fracture after THA have been reported in the literature. Danish et al. [10] was the first to report on two morbidly obese patients with AS who underwent THA via Hardinge approach and suffered T11 hyperextension fractures with incomplete cord injuries. In the operating room, no complications were noted; but in the immediate postoperative period, weakness in the bilateral lower extremities was noted. Both patients underwent decompression and posterior spinal fusion surgeries and their neurological examinations were stable at the latest postoperative visit. Mahesh et al. [11] described a 25-year-old woman with AS who had 70° hip flexion contracture and kyphotic deformity of her spine that underwent cementless THA through a posterior approach. This patient did well until the morning of the second POD when the patient reported numbness and decreased strength in her bilateral lower extremities. She developed cauda equina syndrome and diagnosed with a L2-3 fracture dislocation. The patient was taken emergently to the operating room for a decompression and posterior spinal fusion. The patient never recovered neurological function; and at the last follow-up, her hip was dislocated. The authors attributed the fracture to the rapid correction of the hip flexion

contracture while traction forces across the leg applied distraction forces and compression forces across the anterior and posterior columns, respectively, leading to the fracture dislocation. Finally, Königshausen et al. [12] most recently reported a case of a 57-year-old female with DISH who suffered a T11 hyperextension fracture after undergoing a THA and corrective femoral osteotomy through a lateral approach. Immediately in the recovery room, the patient had decreased motor function, but intact sensation which was initially felt to be due to anesthesia. The neurological symptoms remained on POD 1 and imaging revealed a T11 fracture with contusion of the cord at this level. An urgent decompression and fusion from T10-L1 was performed. The hospital course was complicated with sepsis and eventually a tension pneumothorax which despite intensive care and thoracic surgery resulted in the patient's mortality 2 months after the initial index operation.

Patients with AS are at increased risk of fracture and it was Trent et al. [13] who acknowledged that placing AS patients with kyphotic deformity places them at risk of vertebral fracture and neurologic complication. Minor trauma or even activities of daily living can produce fractures in these patients. Fractures should be considered when these patients present with acute onset of back pain regardless of severity of trauma. A systematic review reported that 67% of AS patients and 40% of DISH patients who suffered spinal fractures had neurological deficits and a 3-month mortality rate of 17.7% and 20%, respectively [14]. Surgeons should be aware that patients with AS and DISH are at risk for iatrogenic spine fracture and subsequent neurological deficit, therefore it is imperative to recognize and attempt to prevent these complications. Further concerns with THA in AS patients is that because of their hyperextension of their pelvis, there is a tendency to exaggerate anteversion of the acetabular component leading to increased anterior dislocation [15].

Summary

This case is the first case to our knowledge to demonstrate a vertebral body fracture in a patient with AS or DISH to have a DAA THA with the use of a specialized table. Although it is clear from the published results that this complication can occur with any approach to the hip in THA, it is possible that hip extension during the anterior



Figure 3. (a) Postoperative day 7 lumbar films revealing an L4-5 extension distraction injury. (b) Postoperative films revealing loss of L1 and L2 pedicle screws lateral lumbar spine and (c) AP lumbar spine. (d) AP postoperative revision spine, (e) lateral postoperative revision, and (f) stable hip films at 8 months postoperative.

approach can create a moment on the relatively inflexible spine creating an extension-distraction injury to the lumbar spine. This moment may not occur with a standard table, but it is difficult to draw any definitive conclusions. Given that the hip is disarticulated at the time the leg is extended, it is not clear how much force is transmitted to the spine during this maneuver. Regardless, surgeons performing a THA by the DAA on patients with AS and DISH should be aware of this possibility. Simple modifications such as lowering the operating room table or placing the patient in reverse Trendelenburg may reduce the moment produced on the lumbar spine with hip extension and may lower the possibility of fracture.

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