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Case Report

Case report: A 10 years follow-up of periprosthetic femoral fracture after total hip arthroplasty in osteopetrosis

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ABSTRACT

Osteopetrosis is an inherited disorder characterized by increased bone density and brittle bone quality. Degenerative changes often occur after the age of 40 in patients with osteopetrosis. Operative intervention is the primary treatment option if the clinical manifestation of secondary osteoarthritis is severe. A 44-year-old male suffering autosomal dominant osteopetrosis and progressive unilateral hip osteoarthritis required a total hip arthroplasty. However, there were several technical challenges associated with this procedure including creating a femoral medullary canal and developing a Vancouver type B2 periprosthetic femoral fracture postoperatively. To afford some experience for the management of similar cases, we here present our technical solutions to these problems.

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Introduction

Osteopetrosis is a rare condition characterized by increased bone density as a result of osteoclast dysfunction, often demonstrating generalized osteosclerosis on radiographs.^{1,2} Later, three types of osteopetrosis were reported by Shapiro³: a malignant fetal form inherited as an autosomal recessive condition, an intermediate autosomal recessive form, and a benign autosomal dominant form. Gwynne et al⁴ subdivided the autosomal dominant osteopetrosis into two types: type 1 showing increased thickness of the cranial vault, diffuse osteosclerosis of the lumbar spine, pelvis and symmetrical long-bone; type 2 presenting more basal skull involvement. The latter type suffers a high risk of fracture, osteomyelitis, and early-onset osteoarthritis.

Reported by many authors, fracture is the most common complication of osteopetrosis. The osteopetrotic bone is consolidated by pathological callus without Haversian organisation. As Girard et al⁵ reported, femoral neck and subtrochanteric fracture often lead to coxa vara which may contribute to the degenerative process and secondary osteoarthritis. In these situations, operative intervention is the primary treatment option, and thus we resort to

operation, especially total joint arthroplasty for patients even without fracture if the clinical manifestation of secondary osteoarthritis proves severe.

Periprosthetic femoral fracture remains a severe postoperative complication subsequent to total hip arthroplasty (THA).⁶ Because of the high morbidity, treatment has evolved from traction and bracing in a cast to open reduction and internal fixation (ORIF), a revision procedure or even a combination of both.⁷ There are no reports, with follow-up study, of periprosthetic fracture in osteopetrotic patients who received cementless total hip arthroplasty. Therefore, we report an osteopetrotic patient who developed a periprosthetic femoral fracture after THA was managed nonoperatively.

Case report

A 44-year-old male, 167 cm in height, 50 kg in weight, with a type 2 benign osteopetrosis, presented a 2-year history of pain located in the left hip which progressively worsened in 2 months. His past orthopedic history included a fracture of the left distal femur when he was 12-year-old, which was healed by nonoperative treatment, and another left humeral fracture at the age of 15 treated again nonoperatively with a satisfactory outcome. His family history is noncontributory.

On physical examination, he had a marked antalgic gait to the left with a Harris hip score (HHS) of 42 out of 100. The initial laboratory investigations revealed no special findings. Radiographs

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showed extremely high density in bilateral femoral head, ilium, acetabulum and pubic symphysis. The femur was uniformly dense with narrow medullary canal, and the hip joint-clearance was narrow with some cystoid changes in the femoral head and acetabulum, indicating osteopetrosis and advanced osteoarthritis. The bone density of the left femur and the spine was remarkably higher than normal according to the bone density analysis. The preoperative pelvic X-ray film is shown in Fig. 1.

The patient was treated with left total hip arthroplasty in May 2004 via a posterolateral approach. The femoral neck was cut with an air-pressure oscillating saw at the level about 1 cm above the lesser trochanter. It was very hard to cut the femoral neck because of the dense sclerotic bone, after which the cut surface showed no medullary canal. When the femoral head and neck were removed, the articular cartilage of the acetabulum showed marked degenerative changes.



Fig. 1. Anteroposterior (AP) radiograph of pelvis showing signs of osteopetrosis, osteoarthritis in the left hip.

The acetabulum was reamed till uniform surface bleeding, and then a 50 mm acetabular component measured 28 mm, size E microstable HMWPE liner was inserted (Reflection, Smith & Nephew, Memphis, USA). The cup was press-fitted and fixed by 2 screws (2.5 cm in length, 6.5 mm in diameter, Smith & Nephew, Memphis, USA). The preparation of femoral canal was so difficult that the extended trochanter osteotomy (ETO) was used to help create a bony cavity for the femoral stem. The femur was then sequentially reamed with power reamer, oscillating saw and hand-held rasp. A size 8 uncemented femoral component (Synergy, Smith & Nephew, Memphis, USA) was inserted. The osteotomic part was secured by multiple cerclage wires. A standard 28 mm femoral head was chosen, and a reasonable arc of movement was established. During the 3.5 h operation, the estimated blood loss was 1000 ml with no intraoperative complications.

Four weeks after operation, the patient developed a femoral pain caused by a minor fall. Radiographs indicated a periprosthetic femoral fracture in distal osteotomy site with slight migration, but the stem seemed stable as no subsidence was found at that time, leading us to categorizing it into a Vancouver B1 fracture (Fig. 2). After a discussion with the patient about the treatment options, he refused to accept the operation of internal fixation considering the surgical complications and his previous fracture history. A conservative treatment was thus performed and the patient was required to have no weight bearing for at least 12 weeks.

After 8 weeks the X-ray film showed callus formation around the fracture, while the prosthesis subsided 5 mm by measuring the distance between the top of great trochanter and the center of femoral head, indicating potential stem loosening (Fig. 3). Since the patient admitted partial weight bearing on crutches for 4 weeks already, we recategorized the fracture into a Vancouver B2 fracture and suggested a revision. However, the patient declined it and insisted on conservative treatment. The patient was advised to keep bedridden for another 4 weeks and the follow-up X-ray film showed good callus formation and no further subsidence in 12

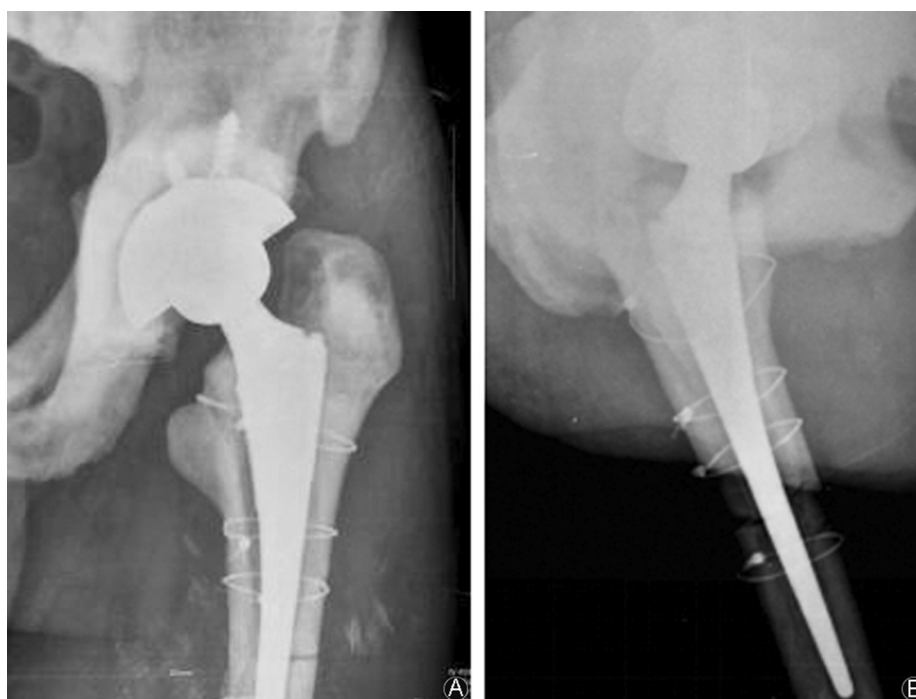


Fig. 2. A: AP radiograph of pelvis showing no subsidence of the prosthesis. B: Lateral radiograph of pelvis showing a periprosthetic fracture in distal osteotomy site with slight migration.

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