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Case Report OMICS International

Total Hip Arthroplasty in Severe Osteoporosis - Technical Tips to Avert Complications Prophylactic Locked Plating Along With Total Hip Arthroplasty for Severe Osteoporosis with Intramedullary Nail *In Situ*

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Abstract

Patients with osteoporosis requiring orthopedic procedures have more adverse outcomes. We present a case of 72 years old severely osteoporotic female with one-year-old neglected fracture neck of femur. She also had an intramedullary nail *in situ* done for fracture lower end of ipsilateral femur 20 years back.

At the time of presentation the lower end of nail was penetrating the anterior femoral cortex. The femur was fixed preemptively with distal femoral locking plate followed by cemented total hip arthroplasty. We also discuss the surgical principles along with the tips and pearls adopted in this case.

Keywords: Osteoporosis; Total hip arthroplasty; Intramedullary nail; Femoral fractures; Arthroplasty

Introduction

Osteoporosis is a common condition in elderly population. Adverse outcomes like periprosthetic fractures, osteolysis and implant migration are more likely in patients with osteoporosis [1]. Cemented fixation of prosthesis is an accepted protocol for the older patients requiring hip arthroplasty as these patients are more likely to have poor bone quality and are at a greater risk for implant migration [1].

However, if a patient has intramedullary hardware in the femur and sustains a hip fracture, implant removal and the subsequent hip arthroplasty is performed in same sitting and there is likelihood of sustaining iatrogenic fracture shaft of femur. Periprosthetic femoral fractures may present many challenges ranging from minor injuries to catastrophic and non-reconstructable problems with detrimental effect on the functioning of patient [2]. The primary goal of early mobilization post arthroplasty these may not be achieved.

Case report

A 72 years old female with type II diabetes mellitus, hypertension and hypothyroidism presented with the chief complaints of pain and inability to bear weight on her right lower limb for last 6 months. She gave a history of injury to the right thigh 20 years back when she had sustained fracture lower third of the right femur for which she underwent closed reduction and internal fixation with a femoral interlocking nail. She recovered well and was able to perform her routine activities. One year back she slipped and injured her right hip. Despite the pain she did not seek any medical treatment and continued walking. For last six months she was bedridden due to pain and inability to bear weight. She had developed bedsores in her sacral region at the time of presentation.

On radiographic evaluation, she had fracture neck of the femur. The fracture margins were sclerotic with slight resorption of femoral neck on both sides suggestive of old fracture (Figure 1). The roentgenograph also showed severely osteoporotic bones and a malunited fracture of the lower third of the femur with interlocking nail *in situ* and localized pronounced osteopenia at the fractured site. The distal end of the nail was perforating the anterior femoral cortex (Figure 2). This stress riser was a risk factor for fracture following nail removal.

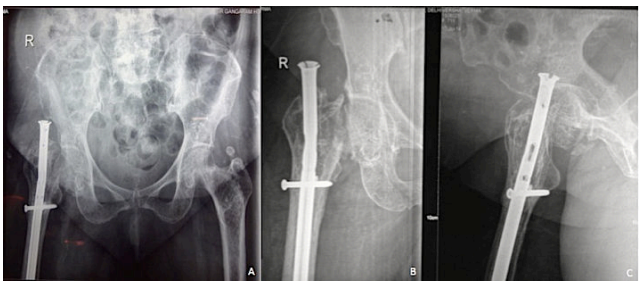

Figure 1: (A) Antero-posterior roentgenograph of both hips with pelvis showing fracture neck of the right femur (B) Antero-posterior roentgenograph of right hip in internal rotation (C) Antero-posterior roentgenograph of right hip in external rotation showing un-united fracture neck of femur.

Dual Energy X-ray Absorptiometry (DEXA) scan revealed the T-score of -4.3. On blood investigations, her serum Calcium, Phosphorus and Alkaline Phosphatase levels were 8.2 (Ref. 8.1-9.4) mg %, 3.4 (Ref. 2.5-4.5) mg % and 226 (Ref. 80-240 IU) respectively. The renal parameters were within the normal range. The 25(OH) Vitamin D level was in the insufficient range, i.e., 18 ng /ml (Ref. 30-74 ng/ml). Serum Parathyroid level was 31 pg/ml (Ref. 11-54 pg/ml).

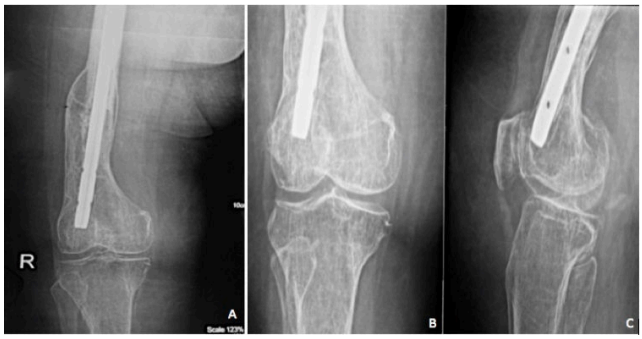

Figure 2: (A) Antero-posterior roentgenograph of the right knee with lower end of thigh showing the malunion and the distal end of nail (B) Antero-posterior roentgenograph of the right knee with lower end of thigh showing the lower end of nail (C) lateral roentgenograph showing the lower end of nail piercing the distal anterior femoral cortex.

She was started on high dose calcium and vitamin D supplementation as well as daily Injection of Teriperatide 20 µg subcutaneously. A Colour Doppler of both the lower limbs was done before the surgery to rule out Deep Vein Thrombosis in view of prolonged immobilization. The patient was planned for the surgery. The primary goal of the surgery was to mobilize the patient as early as possible. The surgical options available were as follows:

- Removal of the nail and uncemented THA
- Removal of the nail and cemented THA
- Removal of nail+cemented THA+augmentation of malunited site with strut allografts
- Removal of nail+Prophylactic plating of the malunited site +cemented THA

Surgical procedure

The patient was well motivated and an informed written consent was taken before taking up for surgery. Surgery was carried out in the following steps:

- The patient was cleaned and draped after positioning in left lateral decubitus.
- The interlocking screws of the nail were located under image and removed followed by the removal of the nail with the help of a universal nail extractor through the previous incision scar.
- A 5 cm incision was given on the lateral aspect of the distal thigh just below the level of malunion site. Subcutaneous tissue and fascia were incised in the same line.
- The periosteal surface of the bone was exposed by directly incising the Tensor Fascia Lata and the Vastus lateralis.
- A 16 hole anatomical locking plate was inserted and slid through the insertion site submuscularly passing over the malunion site. The length of the plate was checked under the image so that the upper end of the plate wouldn't hinder the femoral stem during THA. The plate was contoured so that it could fit over the lateral surface at the bulky malunion site.
- The plate was then fixed with locking screws under the image guidance (Figure 3). A hole was drilled for the use of a unicortical screw in the uppermost hole of the plate so as to allow the overlap at the tip of the femoral stem in the medullary canal. This screw was inserted when the cement was setting. The wound was closed in layers and dressed temporarily.

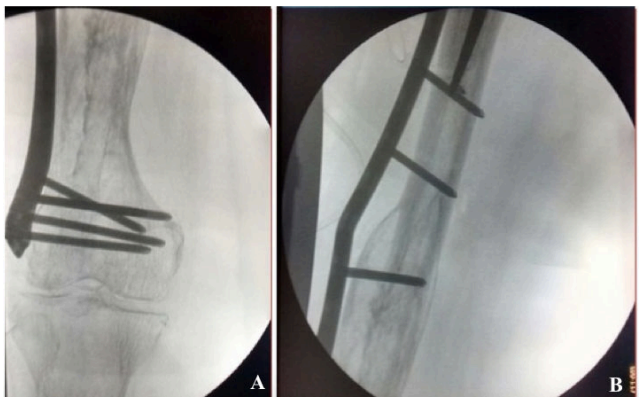

Figure 3: (A) Intraoperative roentgenograph showing distal femoral locking plate fixed to distal femur. Note the track of intramedullary nail, which was removed (B) Contouring of the plate at malunion site.

- Using the previous incision used for nail removal, the incision was extended proximally and distally to expose the hip. The proximal end was extended with a curve posteriorly so as to expose the joint via the Posterior (More's) approach. After capsulotomy fibrosis was seen around the joint. The fibrous tissue was removed and the fracture site identified. The internal rotation of the limb was done with great care so as the strain over the femur was minimum.
- Isolating the femur from rest of the head and neck in the acetabular cavity was difficult due to fibrosis and fear of excessive rotatory manipulation, which might have led to fracture. We resected the gluteus minimus and reflected head of rectus femoris to retract the femur anteriorly and expose the acetabulum.
- The femoral head and neck were removed with the help of cork screw clearing off the adhesions around the head with the help of diathermy.
- The femoral neck cut was made with the help of a neck-cutting guide and the femur was prepared with the broach size 0 which fitted into the canal.
- With the femoral broach *in situ* and the femur reflected anteriorly, the acetabulum was exposed, cleared off all the remaining fibrous tissues around and reamed till size 51. A cemented dual mobility cup size 49 was implanted.
- A trial reduction was done and the hip checked for its stability. As it was found to be stable, the trial femur and the liner with head were removed.
- The femoral stem (CPT II size 0) was fixed with cement and definitive reduction done with liner size 50 and metallic femoral head size 28.
- The wound was closed in layers and final dressings done at both the sites.
- The entire surgery took one hour and 55 min of single anesthetic setting with 650 ml blood loss. The patient was started on DVT prophylaxis with 40 mg Enoxaparin subcutaneously.

Postoperatively, the patient was made to sit by the side of the bed with legs dangling down on the evening of the surgery. She was mobilized and made to walk with the help of walker on the next day of surgery under the supervision of a physiotherapist. At the latest follow up of two years, the patient is walking well without any support, which she left after 6 weeks of surgery. The implants are well positioned *in situ* with no signs of migration or failure (Figure 4 and 5). However, she is continuing her anti-osteoporotic therapy.

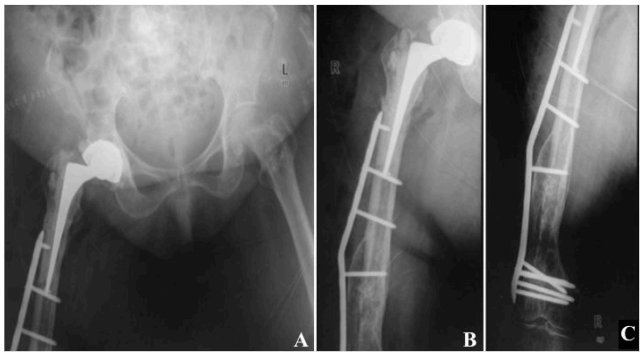

Figure 4: Immediate post-operative roentgenograph showing (A) Cemented total hip arthroplasty in right hip (B & C) Distal femoral locking plate applied prophylactically.

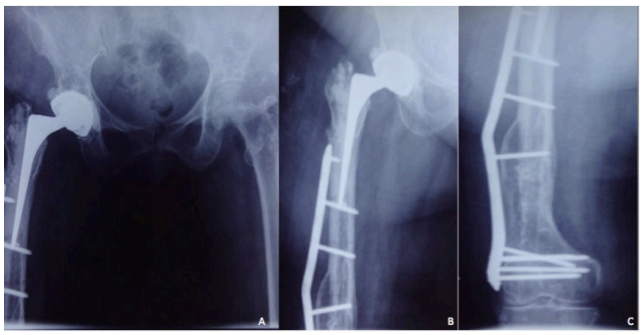

Figure 5: Roentgenograph at two years follow up (A) Antero-posterior view of both hips with pelvis (B) Antero-posterior view of right hip with upper thigh. (C) Antero-posterior view of right knee with lower end of thigh showing the plate protecting the malunited site.

Discussion

There is a paucity of literature regarding management of neglected fracture neck of femur with intramedullary hardware *in situ* in a patient of severe osteoporosis. Several possibilities and their consequences were taken into account before taking up the patient for surgery. However, the major concern was osteoporosis and its impact on the surgery.

Choice of technique

Incision mark from previous surgery was used for nail removal as well as hip arthroplasty. As the previous scar was more lateral, if the incision for posterior approach had been given within 7 cm, it would have created complications in wound healing although there is no clear consensus regarding the minimum gap between two incisions in hip surgery, we followed the principles mentioned in the orthopedic literature as per the AO manual [3].

We first fixed the femur prophylactically and went for total hip arthroplasty due to following reasons:

There was high risk of intraoperative fracture of the femur due to the marked osteopenia at the malunion site and at the lower end of the nail where it had pierced the anterior cortex. The other risk factors for fracture were female gender, history of previous fracture, hardware *in situ* and excessive post-surgery soft-tissue scarring [4-6].

Our primary goal was to mobilize the patient as early as possible. If the hip arthroplasty was done after nail removal, the mobilization of the patient with weak bone would have been difficult. There was a risk of fracture even during the rehabilitation period as she was already bed ridden for 6 months and had osteoporosis. If she had sustained any femoral fracture the choice of treatment would have been open reduction and internal fixation with a similar plate as used here. But after fracture fixation the patient could not have been mobilized well till union or would have been extremely difficult to walk non-weight bearing due to obesity and multiple comorbidities. Thus we would have literally pushed the patient back into the bed where she was since last 6 months. Hence, the best option was prophylactically fixing the bone before arthroplasty with a plate to provide a support to the bone, prevent the fracture and help in early mobilization.

The plate was chosen instead of strut allograft augmentation in this elderly patient considering the risks of extensive exposure, greater blood loss, infection and delayed incorporation [7-8].

Choice of implants

Cemented hip arthroplasty with fracture neck of femur is a common procedure in older population. Cemented hip arthroplasty is advocated in cases complicated by osteoporosis whereas total hip arthroplasty is recommended for an active elderly patient [9]. Cemented prostheses are associated with less pain and have an advantage of early mobilization when compared with cementless prostheses [10].

Dual mobility cup was used in the patient who according to the available literature decreases the risk of dislocation among the patients undergoing hip arthroplasty following fracture neck of femur [11-13].

Anti-osteoporotic treatment

Although the management of osteoporotic fracture neck of femur is cemented hip arthroplasty, the main stay of treatment is medical therapy. Teriperatide is an anabolic agent indicated for use in patients with osteoporosis at a high risk of fracture or patients with multiple risk factors for fracture [14].

Thus, prophylactic locked plate to bridge the region prone to fracture site combined with cemented hip arthroplasty is a rational option for fracture neck of femur if there is a risk of intraoperative fracture of shaft of femur.

Consent

An informed written consent was taken from the patient regarding publishing these clinical details and her X-rays.

References

1. Russell LA (2013) Osteoporosis and orthopedic surgery: effect of bone health on total joint arthroplasty outcome. Curr Rheumatol Rep 15: 371.
2. Schwarzkopf R, Oni JK, Marwin SE (2013) Total hip arthroplasty periprosthetic femoral fractures. A review of classification and current treatment. Bull Hosp Jt Dis 71: 68-78.
3. Sommer C, Ruedi T (2000) Tibia: distal (pilon). In: AO Principles of Fracture Management. Edited by Ruedi T, Murphy W. New York: AO Publishing, 539-556.
4. Van Flandern GJ (2015) Periprosthetic fractures in total hip arthroplasty. Orthopedics 28: s1089-s1095.
5. Talmo CT, Bono JV (2015) Preventing and managing intraoperative fractures and perforations in hip arthroplasty. Orthopedics 28: s1085-s1088.
6. Greidanus NV, Mitchell PA, Masri BA, Garbuz DS, Duncan CP (2003) Principles of management and results of treating the fractured femur during and after total hip arthroplasty. Instr Course Lect 52: 309-322.
7. Oryan A, Alidadi S, Moshiri A, Maffulli N (2014) Bone regenerative medicine: Classic options, novel strategies and future directions. J Orthop Surg Res 9: 18.
8. De Long WG Jr, Einhorn TA, Koval K, McKee M, Smith W, et al. (2007) Current concepts review: Bone grafts and bone graft substitutes in orthopaedic trauma surgery. J Bone Joint Surg AM 89: 649-658.
9. Leighton RK, Schmidt AH, Collier P, Trask K (2007) Advances in the treatment of intracapsular hip fractures in the elderly. Injury 38: S24-S34.
10. Parker MJ, Gurusamy K (2006) Arthroplasties (with and without bone cement) for proximal femoral fractures in adults. Cochrane Database Syst Rev 19: CD001706.
11. Bensen AS, Jakobsen T, Krarup N (2014) Dual mobility cup reduces dislocation and re-operation when used to treat displaced femoral neck fractures. Int Orthop 38: 1241-1245.
12. De Martino I, Triantafyllopoulos GK, Sculco PK, Sculco TP (2014) Dual mobility cups in total hip arthroplasty. World J Orthop 5: 180–187.
13. Mohammed R, Hayward K, Mulay S, Bindi F, Wallace M (2015) Outcomes of dual-mobility acetabular cup for instability in primary and revision total hip arthroplasty. J Orthop Traumatol 16: 9-13.
14. Riek AE, Towler DA (2011) The pharmacological management of osteoporosis. Mo Med 108: 118-123.