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Case Report

Lessons from fixation failure in isolated greater trochanter fracture: A case report

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Abstract

Isolated fractures of the greater trochanter (GT) are rare and seen usually in the elderly population due to direct impact injuries and also in young athletes due to avulsion caused by the strong pull of the abductor muscles. They are generally identified on radiographs and confirmed with computed tomography or magnetic resonance imaging, the latter being the better modality in detecting intra-osseous fracture extensions. The management is determined depending on the extent of involvement of the intertrochanteric area. Historically, they were treated conservatively, but with recent advances, surgical management is preferred for early rehabilitation. We present a case of an elderly male diagnosed with isolated minimally displaced GT fracture with no intertrochanteric extension. He underwent a fully threaded cortico-cancellous screw fixation to stabilize the fragment but on follow up, the radiograph showed superior displacement of the GT fragment even though he was asymptomatic with return to daily activities. Therefore, our report stresses on proper pre-operative planning, decision on the surgical procedure while following the principles of reduction to prevent failure of implant.

Keywords: Fixation failure, Isolated greater trochanter fractures, Cortico-cancellous screws.

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1. Introduction

Among the uncommon variants of proximal femur fractures, isolated fracture of the greater trochanter (GT) management has always been controversial. They have to be differentiated from separation of the epiphysis, often encountered in adolescent age group. These fractures are called occult fractures with an associated intertrochanteric fracture that is not usually seen on plain radiographs.[1] They are seen predominantly in the elderly population and in young athletes, former being more in number. The mode of injury generally may vary from direct blow to the hip or an avulsion mechanism due to the pull of the abductors, i.e. gluteus medius and minimus muscles. The main modalities of investigations include radiographs, computed tomography (CT), magnetic resonance and imaging (MRI) and bone scintigraphy of which, MRI is deemed the gold standard due to its higher sensitivity and depending on the extension into the intertrochanteric (IT) region, the treatment plan is decided.[2] If there is no intertrochanteric extension with minimally displaced GT fragment, can be managed conservatively with traction and strict non-weight bearing but if not, then surgical management gives optimal results of which fixation with cortico-cancellous (CC) screw, tension band wiring (TBW) and suture anchor fixation being the most commonly done procedures. We report a case of a failed, isolated GT fracture fixation with fully threaded CC screws and how to prevent such complications.

2. Case Report

A 70-year-old male patient, farmer by occupation, presented to the casualty with alleged history of fall from height and sustained injury to his right hip region. Pain was sudden in onset, localized to the hip, aggravated on walking and relieved on lying supine. He was able to ambulate with a limp following trauma. On examination, tenderness and swelling was present over the right hip with painful abduction of the hip joint. There was no deformity or shortening of the limb. His Harris Hip Score (HHS) pre-operatively was 42 (Poor).

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Radiographs of the hip had showed a complete minimally displaced isolated greater trochanter of femur fracture. For further confirmation, computed tomography (CT) scan had been done which did not show any extension into the intertrochanteric region (**Figure 1**). Since the patient is an active individual, he had been planned for an operative management over conservative means and underwent open reduction and internal fixation with fully threaded cortico-cancellous screws. Initial two weeks following surgery, he was advised not to bear weight over the operated limb in order to prevent early collapse and displacement due to the osteoporotic nature of the bone, which was later progressed to partial and subsequently complete weight bearing by six weeks. Patient had been lost to follow up for the next six months, following which he had come to us with no pain and resumed his daily activities. On follow up radiograph, there was loss of reduction with superior migration of the greater trochanter, callus formation and peri-implant osteolysis was visualized (**Figure 2**). Since the patient was asymptomatic, hardware was not removed. He remains asymptomatic eleven months postoperatively with no gait abnormalities and HHS was 81 (Good).

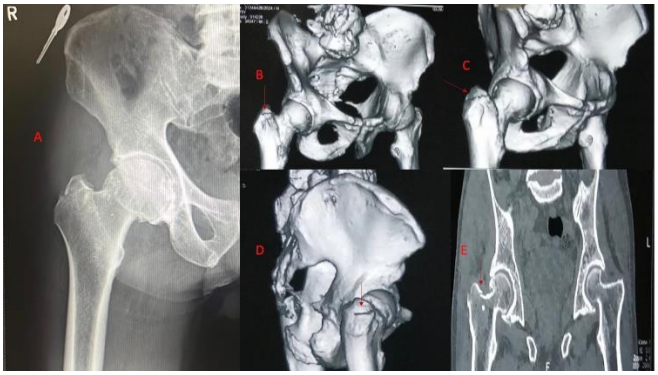

Figure 1: **A):** Image depicts the isolated minimally displaced GT fracture. **B, C, D & E):** Images depict the CT images of the fracture showing no extension into the intertrochanteric region

Figure 2: A comparison of pre-operative, immediate post-operative and six months later follow up radiographs of the fixation of isolated GT fracture

3. Discussion

Isolated GT fractures are less frequently encountered, hence proper pre-operative planning has to be done in order to arrive at a accurate definitive diagnosis and precise management for the same. Patients who have isolated GT fractures will usually be able to bear weight on the affected limb but due to the impairment of the abductor bio-mechanics, it can lead to subsequent abnormalities in the gait. Therefore, mechanism of injury is of prime importance, which mainly include fall from height, high velocity injuries, direct blow and sudden twist at the hip.

3.1. Selection of imaging modality

The imaging modality is the prima donna of the management which will guide the direction of treatment. Of all the modalities, MRI has the highest sensitivity and specificity. It not only shows the fracture extension but also the soft tissues and tears in the gluteus medius and minimus if any. Also, if the fracture line is found not crossing beyond 50% of the IT region, it is deemed as bio-mechanically stable.[3] In case of financial restrictions, CT scans are sufficient, but has only 53% sensitivity, can miss the trabeculae and hence, the fracture extension into the IT area.[2,3] In our case, CT scan had been done which did not show any extension, hence turned out to be a limitation.

3.2. Conservative versus surgical

Once the diagnosis is made, treatment is to be decided. Displacement of less than 1 centimeter with no IT involvement can be treated non-operatively with strict bed rest, limb in abduction and traction for about two weeks followed by protected weight bearing, where we allow the patient to progressively increase the weight from 30% to 50%, toe touching, to avoid knee locking, hence kept in slight flexion and walking with a walking aid for the following two weeks and by the end of six weeks, full weight bearing over the limb.[4,5] In a study which compares patients who had undergone conservative and operative management, in spite of having IT extension, there had been no significant difference seen in their outcomes.[5] Although, there were two interesting findings in one study where the operated patients had shorter duration of stay at the hospital and had better abductor strength compared to the non-operated group of patients.[1,3,6]

3.3. Implant selection with proper surgical approach

Depending on the recent literature, the indications for surgery include supero-postero-medial displacement greater than 2 centimeters, involvement of the IT region with fracture crossing more than 50% past the midline deeming it unstable and based on level of daily activity.[3,6,7] Various modes of operative management have been advocated of which CC screw fixation and TBW are most commonly done procedures. In case of CC screw fixation, partial threaded screws are preferred over fully threaded screws, as the former

is better at providing compression.[8] Also, the screw should pierce through the far cortex of the medial aspect of proximal femur (bi-cortical purchase) and use of a washer is advantageous. In our case, there was no far cortex purchase of the screws and hence a superiorly displaced GT fragment is seen with osteolysis along the screw borders in the follow up. In a case report with a similar fracture in a 25-year-old man, a K-wire was passed through the center of the fragment following which a single partially threaded CC screw with a washer was placed in-situ and gave satisfactory results.[9]

Also accounting for the osteoporosis of the bones in elderly, there are a few studies which show loosening of CC screws as one of the complications and as such, hook plates and TBW could have also been a better option with Kirshner (K) wires and stainless steel (SS) or titanium wires. According to Arbeitsgemeinschaft für Osteosynthesefragen (AO) principles, the positioning of the patient on a fracture table with the affected limb in abduction will help in indirectly reducing the fragment and for better reduction, collinear reduction clamps are used. Following which two 2-millimeter K-wires will be drilled from the GT fragment to the intact lesser trochanter (LT). Later, a drill is used to create a hole in the lateral cortex of the diaphysis of the femur antero-posteriorly followed by passage of a 18 gauge wire through it and is brought cephalic in a figure of eight manner, wound around the K-wires and will be tensioned on either sides in a helical pattern of at least four rotations. Repair of the abductor muscles can be done to augment the construct. TBW gives a better controlled compression in cases of osteoporotic bones, is easy to perform and is cost-effective.[10]

Another case report of isolated GT fracture in a weight lifter was found to have two GT fragments for which, firstly one suture anchor was placed in each fragment and later reduced to make a single fragment. Following this, two CC screws were passed through each fragment to the intact femur, with few tiger threads cerclage was done under the screw heads and tightened sequentially followed by tightening of the anchors and repair of the muscles. This technique showed better rehabilitation with regaining of strength in abductors and therefore resuming of activity by the end of six months.[11] In case of unstable complete IT fracture extending into the calcar region, dynamic hip screw (DHS) or proximal femoral nailing (PFN) is a better viable option.[12]

Therefore, selection of implants is of prime importance in order to provide the best results pertaining to the daily activity of the patients. For an instance, in case of young athletes who have to continue playing their sport, suture anchor fixation with abductor repair can be done as the rehabilitation is faster with adequate recovery of the abductor strength. In case of geriatric population, CC-screw or TBW fixation is better as the primary aim is for them to carry out their daily activities but here, it's not just their physical age that is to be taken into consideration, but also their physiological ages as well.

Proper post-operative rehabilitation in the initial months and radiographic follow up will help in prevention and earlier identification of complications respectively. In our case, since the patient was lost to follow up for up to six months played a significant role in the failure of fixation.

4. Conclusion

In the treatment of isolated GT fractures, surgical management is shown to be superior to conservative management in term of post-operative rehabilitation and functionality. Hardware failure post-surgical fixation is a serious complication that questions the benefits and henceforth, necessary precautions have to be taken in selection of implants and following proper techniques. Further research should aim for comparison between different available kinds of operative management for the same.

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None.

6. Conflict of Interest

None.

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