Hip Instability following DHS Fixation Surgery for Unstable Four Part Per-Trochanteric Fracture Femur

Yashwant J. Mahale¹, Vikram V. Kadu ¹, Abhijeet Deshmukh¹

Abstract

**Background:** In an ageing population, with resultant osteoporosis hip fractures are common indication for per-trochanteric fracture hip repairs. Various modalities of surgical treatment basically emphasis fracture reduction, fracture immobilization, and rehabilitation as a guide to treatment. Subluxation or dislocation following operative treatment of four part unstable per-trochanteric fracture with Sliding Hip Screw is rare and occasional cases have been reported.

**Material and Methods:** An observational prospective study carried out at tertiary care hospital from Jan 1997 – Dec 2014. Our operative experience of total 510 patients of which 480 underwent DHS fixation surgery for unstable four part per-trochanteric fracture showed 6 cases of instability as subluxation and dislocation.

**Results:** We report 6 cases out of 480 DHS fixation showing instability in 3 cases and subluxation and dislocation in 3 cases after 6 weeks of follow-up. These patients were offered arthroplasty and the follow-up results were evaluated after 8 months. Among 6 cases, four had instability after six weeks and remaining two developed dislocation after eight months which were associated with infection. 1 patient refused further investigations & treatment, 3 other died with due course of time, 1 lost to follow-up and One patient with infection underwent excision arthroplasty.

**Conclusion:** Hip instability following DHS fixation surgery for four part Per-trochanteric fracture femur is a rare complication. Cause of this complication could be mechanical factors (excessive collapse, rotational torque) and infection (superficial or deep) may serve as a contributing factor. Diagnosis was done mainly on the basis of clinical examination and investigations such as X-rays, USG and blood tests. Treatment for such complications consists of Hip arthroplasty. These complications can be prevented with the use of TFN or cemented bipolar prosthesis primarily for treating these type of fractures.

**Keywords:** Intertrochanteric fracture, hip instability, surgical fixation

**Introduction**

Per-trochanteric (4 Part) fractures of femur are commonest in elderly people. The incidence is expected to increase in the coming years, with an ageing population resulting in a greater number of traumatic injuries in patients with osteoporotic bone. DHS fixation is gold standard modality for treatment of such fractures. Various implants used for such fractures are 1) DHS Sliding compression screw and plate devices 2) Intra-medullary devices such as TFN and PPN 3) Enders Nail, 4) Bi-axial plate, 5) External fixator 6) Jewett nail and SP nail. Various Complications of DHS implant are as follows: 1) Implant Failure: a) Cut out of screw b) Proximal or distal migration of screw c) Breaking of plate and screws, 2) Uncontrolled medialisation of distal fragment and collapse at fracture site, 3) AVN with collapse of head, 4) Infection: Superficial or Deep infection [1]. However, Hip Instability: Subluxation and Dislocation is very rare [2].

We report, six cases of Hip instability following 480 cases of DHS fixation surgeries for unstable four part Inter-trochanteric fracture.

**Materials and Methods**

This is a prospective study conducted at our hospital since 1997. We reviewed patients with inter-trochanteric fracture femur treated with various implants. We performed 510 surgeries for Pertrochanteric fracture femur with different modalities DHS (n=480), TFN (n=13), Biaxial Plate (n=15), SP nail (n=1), and Enders Nail (n=1). We found six cases who developed hip instability only after DHS fixation. All available clinical notes and X-rays of these patients were studied to get the relevant information. Of the six cases three were male and two female patients, four had right sided fracture and one had left sided fracture, 4 had infection and 2 had mechanical problems, 1 patient refused further investigations & treatment, 3 other died in due course of time due to unrelated disease complications. 1 lost to follow-up and 1 patient with deep infection underwent excision arthroplasty. Radiological findings of these patients are shown in table 1 and 2.

**Case 1:**

A 60 yrs old male was admitted to our hospital with history of domestic fall on
Figure 1: pre-operative X-ray showing IT fracture femur right side

Figure 2: immediate post-operative X-ray showing good, stable fixation

Figure 3: At 6 weeks follow-up, X-ray showed subluxation of hip joint

Figure 4: fracture reduced and Abduction brace was provided to maintain the reduction

Figure 5: pre-operative X-ray showing IT fracture femur right side

Figure 6: immediate post-operative X-ray showing good, stable fixation

Figure 7: At 10 months follow-up, X-ray showed subluxation of hip joint

Figure 8: intra-operatively pus was present at the operative site and the head was completely deformed

Figure 9: At 6 weeks follow-up after excision arthroplasty
Right hip. X-Ray Pelvis with both Hips AP View showed four part pertrochanteric fracture of femur (Fig. 1). Patient had previous history of myocardial infarction. He was treated with DHS and 135 degree 5 hole plate. Early post-operative period was uneventful. Immediate Post-operative X-Ray (Fig. 2) showed relatively acceptable valgus fixation, greater trochanter fragment was not fixed. At 6 weeks follow-up, patient complained of gradual onset deep pain and difficulty in mobilising right hip. There was no history of recent fall, trauma, fever. On examination, limb was shortened, adducted and internally rotated. Patient had no evidence of infection, movements were limited and painful in all direction. X-Ray Pelvis with both Hips AP View (Fig. 3) showed subluxation of hip joint with DHS implant in situ, excessive collapse at fracture site, rotated femoral head, medialisation of shaft with displaced greater trochanter. Routine Blood examination reports WBC counts - 17,000, ESR - 88, CRP - 1:32 (Reactive). Patient was admitted for further investigations and management but patient developed Septicaemia and diabetic keto-acidosis and died.

Case 3:
70 year old female, known case of hypertension, presented to our hospital with gradual onset deep pain, difficulty in mobilization, discharging sinus from operative site in left hip since last two months. She suffered a domestic fall on Left hip 6 months back. X-Ray left Hip Ap View showed Unstable four part pertrochanteric fracture of femur. She was treated with DHS and 135 degree 5 hole plate. Immediate post-operotive X-Ray was satisfactory. Early post-operative period was uneventful. She was mobilized with walker and then full weight bearing at 4 months. After 6 months, She had discharging sinus and limitation of range of movement of left hip for which she was referred to our hospital. On examination, limb was shortened, adducted and internally rotated, local temperature was raised, operative site was discharging pus with granulation tissue. X-Ray left Hip Ap showed dislocation of hip joint with widely displaced greater trochanter and excessive collapse at fracture site with medialisation of distal fragment. Routine Blood examination reports WBC counts - 13,500, ESR - 70, CRP - 1:32 Reactive. Patient was not willing for further treatment and lost to follow up.

Case 4:
70 years old female known hypertensive presented to our hospital with history of domestic fall on Right hip. X-Ray Pelvis with both Hips AP View showed Unstable four part pertrochanteric fracture of femur. She was treated with DHS and 135 degree 5 hole plate. After 6 months, She had discharging sinus and limitation of range of movement of left hip for which she was referred to our hospital. On examination, limb was shortened, adducted and internally rotated, local temperature was raised, operative site was discharging pus with granulation tissue. X-Ray left Hip Ap showed dislocation of hip joint with widely displaced greater trochanter and excessive collapse at fracture site with medialisation of distal fragment. Routine Blood examination reports WBC counts - 13,500, ESR - 70, CRP - 1:32 Reactive. Patient was not willing for further treatment and lost to follow up.

Case 5:
75 yrs old male referred to our hospital with gradual onset deep pain, difficulty in mobilization since 15 days. He had history of domestic fall on Right hip 8 weeks back. X-Ray right Hip Ap View showed four part pertrochanteric fracture of femur. He was treated with DHS and 135 degree 5 hole plate. Immediate Post-operative X-Ray showed stable fixation with DHS implant in situ. Now the patient complained of pain and limp while walking. On examination, limb was shortened, adducted and internally rotated. Patient had infection at operative site and bed sore. Movements were limited and painful in all direction. X-Ray Pelvis with both Hips AP View showed dislocation of hip joint with DHS implant in situ, excessive collapse at fracture site, rotated femoral head, medialisation of shaft with displaced greater trochanter. Routine Blood examination reports WBC counts - 17,000, ESR - 88, CRP - 1:32 (Reactive). Patient was admitted for further investigations and management but patient developed Septicaemia and diabetic keto-acidosis and died.

Case 6:
70 yrs old female referred to our hospital with gradual onset deep pain, difficulty in mobilization since 15 days. She had history of domestic fall on Right hip 6 months back. X-Ray right Hip Ap View showed four part pertrochanteric fracture of femur. She was treated with DHS and 135 degree 5 hole plate. After 6 months, She had discharging sinus and limitation of range of movement of left hip for which she was referred to our hospital. On examination, limb was shortened, adducted and internally rotated, local temperature was raised, operative site was discharging pus with granulation tissue. X-Ray left Hip Ap showed dislocation of hip joint with widely displaced greater trochanter and excessive collapse at fracture site with medialisation of distal fragment. Routine Blood examination reports WBC counts - 13,500, ESR - 70, CRP - 1:32 Reactive. Patient was not willing for further treatment and lost to follow up.

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### Table 1: Table showing radiological findings at the diagnosis of instability.

<table>
<thead>
<tr>
<th>Cases ↓</th>
<th>Findings →</th>
<th>Avulsion of GT</th>
<th>Excessive Medialisation</th>
<th>Lateral wall</th>
<th>Valgus Reduction</th>
<th>Excessive collapse</th>
<th>Subluxated/Dislocated</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 1</td>
<td>Yes</td>
<td>No</td>
<td>Deficient</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Subluxated</td>
</tr>
<tr>
<td>Case 2</td>
<td>Yes</td>
<td>No</td>
<td>Deficient</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Dislocated</td>
</tr>
<tr>
<td>Case 3</td>
<td>Yes</td>
<td>Yes</td>
<td>Deficient</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Subluxated</td>
</tr>
<tr>
<td>Case 4</td>
<td>No</td>
<td>Yes</td>
<td>Deficient</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Dislocated</td>
</tr>
<tr>
<td>Case 5</td>
<td>Yes</td>
<td>No</td>
<td>Intact</td>
<td>No</td>
<td>Yes</td>
<td>Yes</td>
<td>Subluxated</td>
</tr>
<tr>
<td>Case 6</td>
<td>No</td>
<td>Yes</td>
<td>Deficient</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
<td>Dislocated</td>
</tr>
</tbody>
</table>

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### Table 2: Table showing radiological of collapse

<table>
<thead>
<tr>
<th>Findings →</th>
<th>Pre-op</th>
<th>Collapse in immediate post – op</th>
<th>Collapse At time of dislocation/subluxation</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 1</td>
<td>12 mm</td>
<td>3 mm</td>
<td>9 mm</td>
</tr>
<tr>
<td>Case 2</td>
<td>21 mm</td>
<td>5 mm</td>
<td>10 mm</td>
</tr>
<tr>
<td>Case 3</td>
<td>14 mm</td>
<td>4 mm</td>
<td>9 mm</td>
</tr>
<tr>
<td>Case 4</td>
<td>13 mm</td>
<td>3 mm</td>
<td>9 mm</td>
</tr>
<tr>
<td>Case 5</td>
<td>14 mm</td>
<td>3 mm</td>
<td>8 mm</td>
</tr>
<tr>
<td>Case 6</td>
<td>14 mm</td>
<td>4 mm</td>
<td>7 mm</td>
</tr>
</tbody>
</table>

*Pre-op measurement was done by drawing a straight line from Greater to lesser trochanter n then from the mid point up to the head of femur.

* Collapse of the fragment was calculated from lateral blade plate up to the screw that has back-out.

* The average collapse in the above mentioned cases was 9 mm which was found to be excessive as compared to the distance of lag screw backout with a mean length 8.8 mm. (11)

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### Table 3: Patients demographics indicating age, sex, type of fracture, associated injuries, causative factors and fixation used.

<table>
<thead>
<tr>
<th>S No.</th>
<th>Age</th>
<th>Sex</th>
<th>Fracture side</th>
<th>Type of fracture</th>
<th>Primary Implant used</th>
<th>Infection / Mechanical Factors</th>
<th>Second procedure</th>
</tr>
</thead>
<tbody>
<tr>
<td>Case 1</td>
<td>60 yrs</td>
<td>M</td>
<td>R</td>
<td>Four Part IT fracture</td>
<td>135 DHS</td>
<td>Mechanical factors</td>
<td>Abduction brace</td>
</tr>
<tr>
<td>Case 2</td>
<td>74 yrs</td>
<td>M</td>
<td>R</td>
<td>Four Part IT fracture</td>
<td>135 DHS</td>
<td>Infected</td>
<td>-</td>
</tr>
<tr>
<td>Case 3</td>
<td>70 yrs</td>
<td>F</td>
<td>L</td>
<td>Four Part IT fracture</td>
<td>135 DHS</td>
<td>Infected</td>
<td>-</td>
</tr>
<tr>
<td>Case 4</td>
<td>62 yrs</td>
<td>F</td>
<td>R</td>
<td>Four Part IT fracture</td>
<td>135 DHS</td>
<td>Mechanical factors</td>
<td>-</td>
</tr>
<tr>
<td>Case 5</td>
<td>65 yrs</td>
<td>M</td>
<td>L</td>
<td>Four Part IT fracture</td>
<td>135 DHS</td>
<td>Infected</td>
<td>Excision arthroplasty</td>
</tr>
<tr>
<td>Case 6</td>
<td>55 yrs</td>
<td>M</td>
<td>L</td>
<td>Four Part IT fracture</td>
<td>135 DHS</td>
<td>Infected</td>
<td>-</td>
</tr>
</tbody>
</table>
degree 5 hole plate. Intra-operatively, femoral head was found to be rotating during reaming and screw insertion. Early post-operative period was uneventful. At 6 weeks follow up Patient presented with gradual onset deep pain and difficulty in mobilising right hip. There was no history of recent fall, trauma, fever, discharging sinus. On examination, patient had no superficial or deep tenderness, movements limited and painful in all direction. X-Ray Rt. hip AP showed dislocated hip with DHS implant in situ, excessive collapse at fracture site, rotated femoral head and medialisation of shaft. Routine Blood examination reports WBC counts - 8300, ESR- 22, CRP - Non-Reactive. Patient was admitted for further management but died due to Cerebrovascular accident.

**Case 5:**
65 years old male, came to our hospital with history of fall over right hip. X-Ray Pelvis with both Hips AP View showed Unstable four part inter-trochanteric fracture of femur (Fig. 5). He was treated with 135 degree DHS with 5 hole plate. Immediate post - operative X-Ray was satisfactory (Fig. 6). The patient came regularly for follow-up. Weight bearing was started at 6 weeks. At 10 months follow-up, the patient presented with discharging sinus. On examination, limb was shortened, adducted and internally rotated. Patient had superficial and deep tenderness, movements were restricted and painful in all direction. X-Ray Pelvis with both Hips AP View at 10 months showed subluxation of femoral head with DHS implant in situ, excessive collapse at fracture site, rotated femoral head, with subluxation of the femoral head (Fig. 7). Routine Blood examination reports WBC counts - 9,800, ESR – 80, CRP - Non-Reactive (1:32). USG was done which reported collection in proximal thigh with extension into the hip joint S/O Joint effusion. Hip aspirate was done and pus aspirated was sent for culture. The hip was reduced. Patient was not willing for further treatment so was treated by giving abduction brace. The patient died with due course of time due to comorbid conditions.

**Discussion**
Hip subluxation / dislocation is very rare complication after DHS surgery for four part inter-trochanteric fracture. The present series revealed incidence of 1.04% of 480 DHS surgeries performed. On review of literature occasional case reports of hip instability have been reported [1,2,3,4,5]. Our patients did not undergo further management after making diagnosis of instability for various reasons (3 died, 1 lost to follow up, 1 refused for further management, 1 underwent Excision arthroplasty); (see table no. 3). Various etiopathologies of dislocation / subluxation are on the basis of clinical examination, X-ray, Investigations and review of literature. In these cases it appeared that the factors responsible for instability could be mechanical factors but in some cases presence of pyogenic infection states that infection can be a major contributing factor. Four part per-trochanteric fracture is generally caused by direct fall on the greater trochanter. This direct force as well as the muscular avulsion force leads to the damage of the capsule, surrounding soft tissues and ligaments and also greater and lesser trochanter are separated making the head rotate freely without any attachment left to it. It is well accepted practice of extraction of femoral head during hemi-arthroplasty procedures. While doing DHS we found out that the femoral head undergoes rotational torque at least three times (during reaming, tapping and screw insertion ) specially when derotation wire is not used. In all the above mentioned cases the derotation wire was not used. This may cause damage to the remaining soft tissue attachments leading to instability. In right-sided fractures, the screw insertion causes the head fragment to rotate clockwise causing the head fragment to rotate into an extended position at the hip joint. Whereas, in left-sided fractures, the screw insertion causes the head to rotate clockwise leading to head and neck fragment into flexion at the hip and extension of the fracture site leading to potentially unstable construct [8], thereby increasing the soft tissue damage. Lateral wall plays a key role in stabilisation of unstable pertrochanteric fractures by providing buttress for proximal fragment and its deficiency leads to excessive collapse(6), (table no.2) almost complete resorption of neck causing head to be stabilised against most lateral support which may force femoral head out of acetabulum. Therefore, maintaining the integrity should be important objective in all stabilisation procedures. In patients with four part pertrochanteric fracture femur, if there is gross comminution of posterior & medial cortex, in such patients, femoral head may go into retroversion and varus after fixation due to excessive collapse which may lead to posterior and lateral subluxation of head with progressive weight bearing or stress, finally resulting into dislocation of such hip. Thus lateral wall...
deficiency, excessive collapse, valgus fixation and postero-medial comminution plays a vital role in determining the instability of the femoral head. All the above mentioned factors are seen in our case series. (table no. 1 and 2).

Patient factors such as mental retardation, poor patient compliance, alcoholic patients, infection and neurogenic causes may lead to dislocation [7].

In our study, 3 cases had infection of which 2 had early and 1 late infection. In early stages of acute infection [4] instability of femoral head may be accounted because of destruction of soft tissue, such as capsule, ligaments and spasm of the adductors. In late stages i.e. chronic infection; the head is damaged asymmetrically in addition to above mentioned factors leading to instability [3] as seen in case 5.

This complication has not been reported with SP nail plate, Jewett nail, TFN, Biaxial plate etc. This may be because rotational torque is not required in fixation of fractures with these implants. However, in case of enders nailing 1 case report has been found leading to dislocation which they claimed was because of perforation of the capsule due to migration of nails in the posterior joint capsule [2]. And the other case in which internal fixation of femoral neck fracture was done, concluded that possibly some rotation of the proximal fragment was inadvertently caused, when the fracture was reduced, resulting in twisting of capsule previously torn by trauma [1] suggesting that capsular damage also plays a vital role in instability of hip. Once dislocation develops; clinical examination of patients, and investigations such as X-rays, CBC, ESR, CRP should be carried out to find out the causes. MRI / CT [10] is not advisable due to implant in situ and may not give the desired result. USG may help to show collection followed by aspiration leading to the diagnosis of infection. Hip arthroplasty would be appropriate option for such complications (Partial, Total, Excisional) depending upon the willingness, associated medical co-morbidities and financial status of the patients.

All the 6 cases who suffered complication were treated with DHS. Mechanical problem during fixation of DHS, loss of lateral femoral wall integrity are definite indicator of DHS implant failure with infection playing a major contributing role. With such fractures, role of DHS must be guarded, augmented with trochanteric stabilisation plate or intra medullary fixation such as TFN or cemented bipolar prosthesis should be considered. While reaming, tapping and screw insertion, additional derotation guide wire must always be used. Greater trochanter should be fixed and head should not rotate intra-operatively after fixation.

References

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