

Challenges in Subtrochanteric Femur Fracture Management: A Case Report of Inappropriate Implant Choice Leading to Failure of Fixation and Update on Management Options

ABSTRACT

Subtrochanteric fractures of the femur remains one of the most challenging fractures faced by orthopaedic surgeons. They account for 10 to 15 % of all hip fractures. Subtrochanteric region of the femur is defined as the proximal femoral shaft located within 5 cm of the lesser trochanter. It is common in older patients after low energy trauma along with osteoporosis and in younger patients with high energy trauma. The management of subtrochanteric fractures is challenging because of the inherent instability of the fracture pattern. Fractures to this area can result in significant complications and poor clinical outcomes such as failure of fixation, shortening, malrotation and non-union if not managed properly and inappropriate choice of implant was used. We are presenting a case report of an elderly lady presented to us with history of alleged fall in bathroom at home and sustained closed left subtrochanteric femur fracture. She was initially planned for dynamic hip screw fixation however choice of implant was changed to interlocking femoral nail during preoperative census meeting. Patient underwent interlocking nail of left femur. Intraoperative reduction was satisfactory. However, on day 1 postoperative was noted that distal femur was externally rotated and proximal femoral fragment displaced valgusly. There was a failure of fixation and patient was counselled for operation in which patient's family declined and opted for conservative management. The purpose of this presentation is to highlight the challenges, examine the various treatment modalities and implant options in treatment of subtrochanteric femur fracture for optimal postoperative outcome.

Key Words: Subtrochanteric fractures, hip fractures, proximal femoral nail

1. INTRODUCTION

Hip fractures rank in the top ten of all impairments worldwide in terms of loss in disability-adjusted years for people over 50 years old [1]. Consequences of hip fractures are significant in terms of loss of life and the associated negative impacts on hip fracture patients' quality of life and level of functioning [2]. Subtrochanteric fracture of the femur is a variant of peritrochanteric fracture of the femur [3]. It lies in the area which is 5cm below the lesser trochanter and may extend proximally into the intertrochanteric area and distally up to the isthmus of the shaft of the femur [4]. A bimodal age distribution is noted where young patients (usually male) mostly present with high-energy injuries, and the elderly (usually female) present with osteoporotic low-energy fractures [5]. Subtrochanteric fractures of the femur remains one of the most challenging fractures faced by orthopaedic surgeons. The management of subtrochanteric fractures is challenging because of the inherent instability of the fracture pattern and this area experience high levels of stress due to large muscular deforming forces on the proximal and distal fragments which render reduction difficult. Fractures to this area can result in significant complications and poor clinical outcomes such as failure of fixation, shortening, malrotation and non-union if not managed properly and inappropriate choice of implant was used. However, the appropriate implant for the internal fixation of subtrochanteric fractures remains debatable. A multitude of different intra- and extramedullary devices for their surgical fixation have been advocated.

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2. PRESENTATION OF CASE

An 85 years old lady with no known medical illness presented to us with history of alleged fall in bathroom at home due to slippery floor. Post trauma she was unable to ambulate and weight bear. On examination left hip was swollen and limited range of motion due to pain. Distal pulses otherwise palpable and neurology of bilateral lower limbs were normal. X ray of pelvis showed left subtrochanteric femur fracture with oblique extension to lesser trochanter as shown in Figure 1. X ray of left femur showing subtrochanteric femur fracture with proximal fragment tilted anteriorly. She sustained closed left subtrochanteric femur fracture and was initially planned for dynamic hip screw fixation however choice of implant was changed to interlocking femoral nail during preoperative census meeting. Patient underwent interlocking nail of left femur and intraoperatively noted bone loss with short oblique fracture extending to the lesser trochanter. Reduction was satisfactory when checked with image intensifier intraoperatively. However, postoperatively after check x ray was done noted distal femur was externally rotated and proximal femoral fragment displaced in valgus direction as shown in Figure 3. There was a failure of fixation and patient was counselled for operation (Removal of implant and reverse dynamic condylar screw) in which patient's family declined and opted for conservative management. On day 5 postoperatively noted there was femoral nail backout a shown in Figure 4. Patient was again counselled for operation in which she refused. Patient was seen again in clinic 1 week after discharge and patient was bedridden and non-ambulatory since discharged. Patient is counselled back for operation in which patient and family refused. Patient is currently still under follow up to monitor her condition and wellbeing.



Figure 1: Plain radiograph of pelvis showing left subtrochanteric femur fracture with oblique extension to lesser trochanter.



Figure 2: Plain radiograph of left femur showing subtrochanteric femur fracture with proximal fragment tilted anteriorly.

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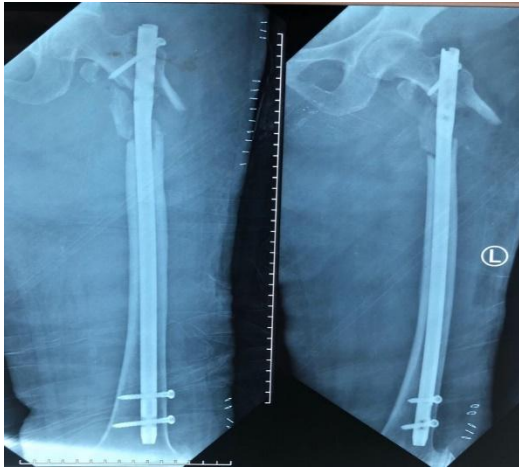


Figure 3: Plain radiograph taken on Day 1 postoperative showing distal femur was externally rotated and proximal femoral fragment displaced in valgus direction.



Figure 4: Plain radiograph taken on Day 5 postoperative showing femoral nail backout.

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3. DISCUSSION

89 Subtrochanteric fracture of the femur accounts for 10-15% of all hip fractures [6]. Subtrochanteric
 90 fracture occurs at the junction between the trabecular bone and the cortical bone where the
 91 mechanical stresses are highest in the femur. High compressive medial stresses and tensile lateral
 92 stresses were placed on fracture fixation devices. Therefore, a medial buttress is important to
 93 minimise implant stress and fatigue failure [7]. It is difficult to treat these fractures conservatively and
 94 surgical management is the current standard of care [8]. Surgical fixation maintains good anatomical
 95 alignment, limb length and avoids complications of prolonged bed rest as early mobilization and
 96 weight bearing are possible with the implants presently available. Basically, the implants include
 97 extramedullary and intramedullary devices. Extramedullary devices like the dynamic hip screw or the
 98 dynamic condylar screw has potential disadvantages of extensive exposure, more blood loss which
 99 then leads to nonunion and implant failure. Intramedullary device is a more biological fixation and has
 100 mechanical benefits over extramedullary fixation. Initially, standard femoral nail was tried in
 101 subtrochanteric fractures but the proximal fragments were usually not long enough for stable fixation
 102 which is what happened in this case. The direction of the proximal interlocking bolts which faces
 103 caudally doesn't allow engagement of the femoral neck and permits rotational instability. The
 104 reconstruction nail which changes the direction of the proximal interlocking bolts, has greatly
 105 expanded the indication of intramedullary fixation for subtrochanteric fractures. Cephalo-medullary
 106 proximal femoral nail (PFN) prevents the rotation and collapse of the head-neck fragment and smaller
 107 diameter of distal shaft of nail results in less stress concentration at the tip of the nail. The
 108 antirotational screw at the proximal aspect of nail increases the biomechanical stability of the fracture
 109 fixation. PFN also gave a better control of the length and proximal purchase. The load shearing nature
 110 of this implant which allowed compression at the fracture site and even in the osteoporotic bone and
 111 its cephalomedullary location had decreased moments as compared to the plate [9].

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4. CONCLUSION

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In conclusion, subtrochanteric fractures of the femur remains one of the most challenging fractures faced by orthopaedic surgeons. Fractures to this area can result in significant complications and poor clinical outcomes such as failure of fixation, shortening, malrotation and non-union if not managed properly and inappropriate choice of implant was used. Intramedullary devices are better compared to extramedullary devices in treating this type of fracture. PFN is a good implant for subtrochanteric

121 fracture of the femur. The advantages include minimal exposure (closed technique), better stability
122 and early mobilisation. PFN is implant of choice in treating subtrochanteric fractures especially in
123 elderly since it allows early and stable mobilization.

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126 **CONSENT AND ETHICAL APPROVAL**

127 Informed consent was taken from the patient and no ethical clearance is required.

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130 **COMPETING INTERESTS**

131 Authors have declared that no competing interests exist.

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134 **REFERENCES**

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