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## Novel technique in fixation of complex peritrochanteric femur fracture: Case report

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### Abstract

Peritrochanteric fracture among adult are very rare among adults, which needs to be reduced fractures and fixed appropriately for optimum outcome. Comminuted unstable peritrochanteric fractures are challenging injuries that can cause many complications. The current study presented a novel technique for reduction and fixation using a proximal femur locking plate and augmented by long distal tibia medial locked plate, which was placed anteriorly. As we know there is a lack of scientific literatures studied this augmented method as primary method of fixation.

A 25-year-old male patient was brought to the emergency department having left hip pain and he was unable to bear his body weight since 12 hours after sustaining a high velocity gunshot injury to his left hip. Physical examination revealed stable hemodynamically status. Upon local physical examination of his affected limb revealed external rotation deformity and shortening of the limb approximately 2cm than healthy contra-lateral limb as shown in figure no.(1). There were two penetrated wounds, the first wound was in anteromedial proximal thigh 3cm length \* 2 cm width, second wound was 10cm length \*3cm width in posterolateral proximal thigh. Neurovascular examination was normal. Past medical history was irrelevant and no any medical comorbidities. Laboratory tests revealed WBC and CRP within normal range. Imaging including pelvic, hip and lower limb x-rays and CT- scan showed complex comminuted peritrochanteric femoral fracture with comminution of greater trochanters. Because of lack of precise classification grade for this pattern of fracture, we diagnosed the fracture "open complex comminuted peritrochanteric femur fracture". Due to the instability and complexity of the fracture, several discussions were conducted to figure out what the best strategy available for definitive fixation. The preoperative plan was to remove the external fixator and perform the internal fixation at the same sitting using a proximal femur locking plate and augmented by anteriorly placed long distal tibia medial locking plate. Postoperative follow up period was uneventful. At eight months postoperatively, patient was able to walk without any walk assist such crutches and patient return to his preinjury condition. Peritrochanteric femur fracture is rare, specifically in young adult. The complex peritrochanteric fracture is challenging fracture pattern which may associated with high complications such as nonunion, delayed union, malunion and implant failure. The optimal surgical treatment is controversial. We consider that treatment of this kind of fracture with augmented locking implants allowed achieving satisfactory reduction with stable fixation that permitted patient's early functional rehabilitation which were the main goal of management.

**Keywords:** femur fracture, peritrochanteric femur fracture, proximal femur locking plate, augmented plating fixation

### Introduction

Peritrochanteric femur fractures can be treated with conventional orthopaedic implants successfully such as sliding hip screws, cephalomedullary nails, angular blade plates and in few cases by a hip replacement. In contrast, comminuted and unstable fractures or and combined with intra-capsular fractures are challenges injuries that may cause many complications in some patients [1]. Obtaining adequate reduction is crucial, as peritrochanteric hip fractures with poor reductions are more than three times likely to progress to failure [2]. The main target of management is to achieve satisfactory reduction with stable fixation to allow early functional rehabilitation.

Peritrochanteric unstable fractures treated with a dynamic hip screw or dynamic condylar screw has a high complication rate, for example, varus collapse, implant failure, and limb shortening [3]. Also, A high incidence of hardware failure of cephalomedullary nails and proximal femoral locking plate was noted specifically in case of missing posteromedial support in unstable peritrochanteric femur fractures [3,4].

The current study presented a novel technique for reduction and fixation using a proximal femur locking plate and augmented by long distal tibia medial locked plate, which was placed anteriorly.

This study hypothesized that this augmented long distal tibia locked plate could be used in primary stabilization of highly comminuted of peritrochanteric fracture as augmented implant to the lateral proximal femur locking plate. Consequently, this could minimize overload on proximal femur locking plate as compared to using proximal femoral locking plate alone. As we know there is a lack of scientific literatures studied this augmented method as primary method of fixation.

**Case report**

A 25-year-old male patient was brought to emergency department with left hip pain and inability to bear his body weight since 12 hrs after sustaining a high-velocity gunshot injury to his left hip. Physical examination revealed stable hemodynamically status, injury isolated to the left lower limb. Upon local examination of the affected limb revealed external rotation deformity and shortening of the limb approximately 2cm than healthy contra-lateral limb as shown in figure no. (1). There were two penetrated wounds, the first wound was in anteromedial proximal thigh 3cm length \* 2 cm width, second wound was 10cm length \* 3cm width in posterolateral proximal thigh. Neurovascular examination was normal. Past medical history was irrelevant and no any medical comorbidities.

**Investigation**

Laboratory tests revealed WBC and CRP within normal range. Imaging including pelvic, hip and lower limb x-rays and CT- scan showed complex comminuted peritrochanteric femoral fracture with comminution of greater trochanters as shown in the figure no. (2). Because of lack of precise classification criteria, we diagnosed patient’s fracture as open complex comminuted peritrochanteric femoral fracture.



**Fig 1:** Clinical photo shows the external rotation attitude and shortening of affected left leg



**Fig 2:** CT scan shows complex comminuted peritrochanteric femoral fracture of with comminution of greater trochanters

**Surgical technique and perioperative management**

On emergency department, symptomatic treatment and antibiotic in form amikacin 500mg and cefuroxime 1500mg were given to the patient. crystalline penicillin was added to the patient because patient injured in rural area. Affected limb was temporary immobilized, then followed by preparation the patient for surgery on same day. Surgical debridement and the two large fragment of greater trochanteric fractures were reduced and fixed by two 4.5mm partial threaded screws. Then the fracture was fixed temporarily using monoplanar external fixator. Antibiotic loaded bone cement (tobramycin 4gm plus vancomycin 4 gram) was prepared as small fashioned beads and was placed in the bone defect in posterolateral proximal femur to minimize risk of infection as shown in figure no. (3). Then patient followed clinically and radiologically. Postoperative antibiotic and anticoagulant prophylaxis were given to the patient. Next, patient was preparing for definitive procedure within next 10 days after optimizing patient general condition any excluding any signs of infection locally and systemically through clinical and inflammatory marker assessment.



**Fig 3:** AP x-ray shows the fracture fixed by temporarily monoplanar external fixator

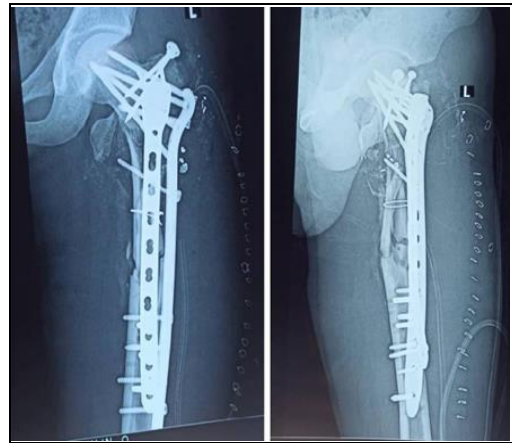
Due to the instability and complexity of the fracture, several discussions were conducted to figure out what the best strategy available for definitive fixation. The preoperative plan was to remove the external fixator and perform the internal fixation at the same sitting using a proximal femur locking plate, figure no. (4, 6) and augmented by anteriorly placed long distal tibia medial locking plate, figure no (5, 6). In operative theater, the patient was positioned in supine position on traction table; them prep, drape and antibiotic prophylaxis (second generation cephalosporin) were done. Anterolateral surgical approached for both left hip and femur shaft was used. Cement bone was removed then fracture was reduced by indirect technique aiming to restore the limb length and rotation. To achieve that the contralateral limb length and rotation profile were used as comparable guide. These confirmed by using intraoperative fluoroscopy. The fracture was bridging by using laterally plate proximal femur locking plate and augmented by anteriorly placed long distal medial locking plate. At the end of surgical procedure, the final assessment of limb length and rotation profile was obtained. Surgical wound was closed by layers and using vacuum drain.



**Fig 4:** A proximal femur locking plate used to fix the fracture on lateral side



**Fig 5:** A long distal tibia medial locking plate used as augmented device placed on anterior proximal femur



**Fig 6:** AP and lateral x-ray views shows the post-operative fixation of the fracture.

**Outcome and follow up**

Postoperative follow up period was uneventful. Postoperative protocol included pain medication, antibiotic intravenous for 70 hours, anticoagulant prophylaxis until full weight bearing, vitamin D supplement and calcium, toe touch weight bearing from second day, and physical therapy from third week. There were no any early complications, such as infection, limb shortening, or late complications such as delayed union, nonunion, or implant failure. At three weeks, x-ray showed well-lined fracture and there is signs of callus bridging the fracture posteriorly and medially as shown in figure no. (7), so the patient was advised to slowly increase weight bearing using two crutches over the next three months. At three months follow up, the x-ray showed abundant callus bridging the comminution fracture as shown in figure no. (8, 9), so patient was advised to fully weight bearing with using one crutch. At eight months postoperatively, patient was able to walk without any walk assist such crutches and patient return to his preinjury condition, see figure no. (10, 11, 12, 13, 14, 15).



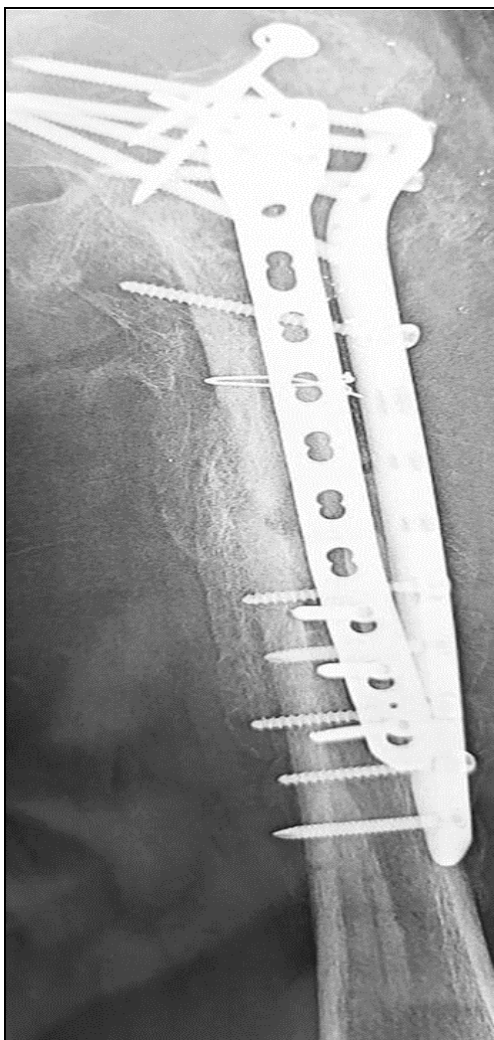
**Fig 7:** Plan AP x-ray shows signs of callus bridging the fracture posteriorly and medially at three weeks post operation



**Fig 8:** Plan AP x-ray shows abundant callus bridging the comminution fracture at three months post operation.



**Fig 10:** Plan AP x-ray shows abundant callus bridging the comminution fracture at eight months post operation.



**Fig 9:** X-ray shows abundant callus bridging the comminution fracture at three months post operation.



**Fig 11:** Clinical photo shows average range of motion after fracture became fully union.



**Fig 12:** Clinical photo shows there is equal lower limb length and no malalignment after fracture became fully union



**Fig 13:** Clinical photo shows average range of motion after fracture became fully union.



**Fig 14:** Clinical photos shows that the patient is able to walk without any walk assist and he can run after fracture became fully union



**Fig 15:** Clinical photos shows that the patient is able to walk without any walk assist and he can run after fracture became fully union

**Discussion**

Method of fixation for stable proximal femur fractures includes intramedullary fixation such proximal femur nail

and anti-rotation(PFNA) and extra-medullary fixation such as a proximal femur locking plate(PFLCP) [5]. Our reported case is represented by complex and highly unstable comminuted fracture pattern that rarely encountered in civilian injury. To our knowledge that literatures are insufficiently studied this topic.

**Problem**

The current fixation method and techniques raises several potentials concerns. One of the serious complication that can be occurred after surgical treatment of unstable peritrochanteric femur fractures is implant failure with high incidence 20% [6]. Implant failure usually require surgical revision or conversion to hip replacement [6]. Fore not, the additional surgical intervention itself can be has perioperative morbidity and mortality risks. Therefore, the predisposing risk factors of fixation failure should be identified for prevention [6].

There are many risk factors for early mechanical failure complications due to the fact complexity of fracture pattern, the trochanteric area involvement and or comminution sub trochanteric area are more susceptible to high varus and rotation stress [7, 8]. In our case, presence of high grade of comminuted peritrochanteric fracture type and greater trochanteric (GT) comminuted fracture were critical challenges to use greater trochanteric entry point for proximal femoral nail antirotational(PFNA) that will interfere with fixation of GT fracture. In other hand, treatment of peritrochanteric femur fractures using proximal femur locking plate were ongoing debate, some of the scientific papers reported that proximal locking plate might cause high complication rate. In addition, it can be used in highly selected pattern of peritrochanteric fractures when there is no other implant is deemed appropriate [9]. Another problem is using proximal femur locking plate alone for fixation such a complex and unstable fracture especially with loss of posteromedial calcar support leads to implant failure as mentioned by many studies [4]. So, patients must be consented about the possibility of revision surgery based on the inherent limitations of these devices [9]. So, adding an anterior plate to support and strengthening fixation and decrease failure rate of the implants failure. For the mentioned reasons, we preferred using augmented plating fixation using proximal femur locked plate and distal tibia locked plate. Anatomical reduction is an important goal case of young patient having peritrochanteric femur fractures [10]. In our case, indirect reduction was used to achieved satisfactory reduction without dis-stripping the surrounding soft tissue. Fracture healing was successfully achieved with this pattern of a complex peritrochanteric fracture using the current novel reduction and fixation method. The current study found using long distal tibia locked plate as augmented plate to treat complex peritrochanteric femur fracture was good option management. To augment or not was a matter ongoing debate, nevertheless, the benefits and important risks of an augmented plating fixation using long distal tibia plate should be addressed for such complex pattern of fracture or in case of presence of increasing risk of failure by using lateral proximal femur locking plate alone.

The limitation of this study was noted which is the rarity of the complex peritrochanteric femur fracture among young adult’s patients and lack of lack of published scientific papers discussed this method of fixation limit us to get more

in-depth discussion. Thus, future research will be needed to address these concerns.

### Conclusion

Peritrochanteric femur fracture is rare, specifically in young adult. The complex peritrochanteric fracture is challenging fracture pattern which may associated with high complications such as nonunion, delayed union, malunion and implant failure. The optimal surgical treatment is controversial. We consider that treatment of this kind of fracture with augmented locking implants allowed achieving satisfactory reduction with stable fixation that permitted patient's early functional rehabilitation which were the main goal of management.

### Learning points

1. Obtaining detailed perioperative planning is so critical in dealing with such a rare and highly complex peritrochanteric hip fracture.
2. We recommend using this novel technique of fixation in managing such a pattern of highly comminuted peritrochanteric fracture.
3. This report study leaves the place open for future scientific research to done.

### Conflict of interest

The authors declare that there is no potential conflict of interest for this case report.

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### Author's Contribution

Not available

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