CASE REPORTS

Complex Treatment of a High-Energy Proximal Femur Fracture in a Young Adult – a Case Presentation

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Abstract

High energy fractures involving the proximal femur pose difficulties regarding their treatment, as they are often highly comminuted and associated with other lesions.
We present the case of a 27-year old male patient which was treated for such a fracture over the course of 30 months, including several different implant types. The conclusion of this case focuses on the need of trying to obtain a more manageable fracture with each surgical procedure in the long term, as well as developing new implants with more suitable biomechanics for such cases.

Keywords: fracture, proximal femur

Rezumat

Fracturile de energie înaltă ce implică femurul proximal adesea pun probleme în ceea ce privește tratamentul, datorită naturii adesea intens cominutive și a leziunilor asociate în astfel de cazuri. Prezentam cazul unui pacient de 27 de ani și sex masculin, care a urmat tratamente pentru o astfel de fractură timp de 30 de luni, incluzând diferite tipuri de implanturi. Concluziile cazului se axează pe necesitatea obținerii unui tip de fractură mai ușor de tratat pe termen lung cu fiecare intervenție chirurgicală, precum și pe necesitatea creării unor tipuri noi de implant cu proprietăți biomecanice mai adaptate unor astfel de cazuri.

Cuvinte cheie: fractură, femur proximal

INTRODUCTION

Highly comminutive proximal femur fractures in young healthy adults often occur after high energy trauma, such as traffic accidents[1].

The classification of fracture type poses a difficulty, as highly comminuted fractures don't necessarily respect the anatomical regions of the proximal femur, but rather affect the area as a whole[2,3].

Treatment of such kind of fractures should always be done in a dedicated trauma centre, as this kind of lesions are associated with other life-threatening conditions, due to the high energy involved[4].

Given the diversity of fracture types there is currently no standardized procedure of treatment and the surgeons experience and preference often dictate the type of implant and procedure used for osteosynthesis. Options include intramedullary nailing, bone plates,

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external fixation and functional treatment including continuous trans-osseous traction[5,6,7,8].

CASE PRESENTATION

We present the case of a 27-year-old male (G.C.), victim of a motorcycle traffic accident who was transferred to our clinic from a regional hospital. At the time of admission, the patient was hemodynamically stable and after medical imaging examinations the following diagnostics were revealed: Left haemopneumothorax, left anterior arches costal fractures C2, C3, comminutive fracture of the left femur and non-displaced fracture of the left scapula.

Classification of the proximal femur fracture posed difficulties, as the comminution included both the trochanteric and subtrochanteric regions. The closest related AO/OTA classification would be a 32-C3.1 type fracture (Figure 1).

The patient underwent emergency surgical procedures, including closed reduction and internal fixation of the proximal femur fracture using a Strykerâ Gamma Nailâ 3 420 mm x 11 mm with 125 degrees angulated 110 mm lag screw and 2 distal locking screws (Figure 2).

After a 3-week hospitalization, the patient was transferred back to the regional hospital where he continued the rehabilitation program. The patient was allowed non-weight-bearing mobilization until 3 months postop.

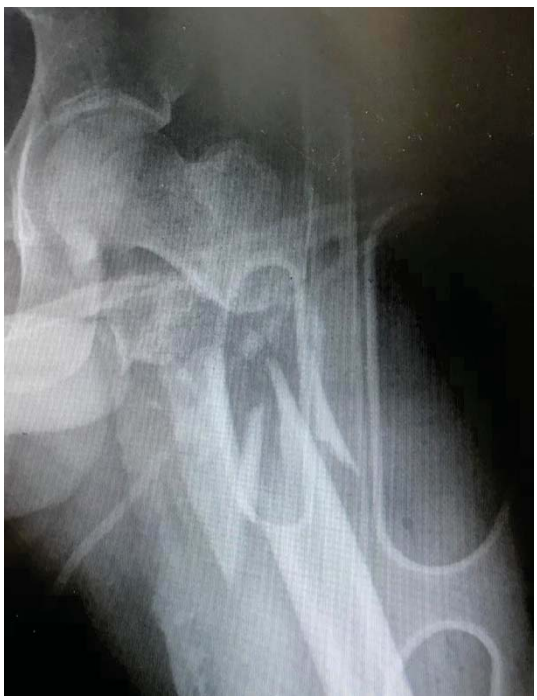

Figure 1. Initial X-Ray imaging of the left proximal femur fracture.

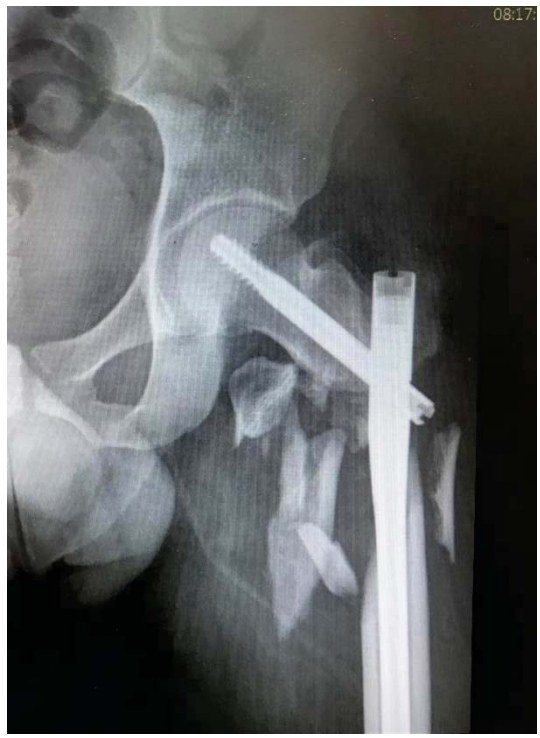

Figure 2. X-Ray imaging after initial surgery showing the Gamma Nail and fracture fragments.

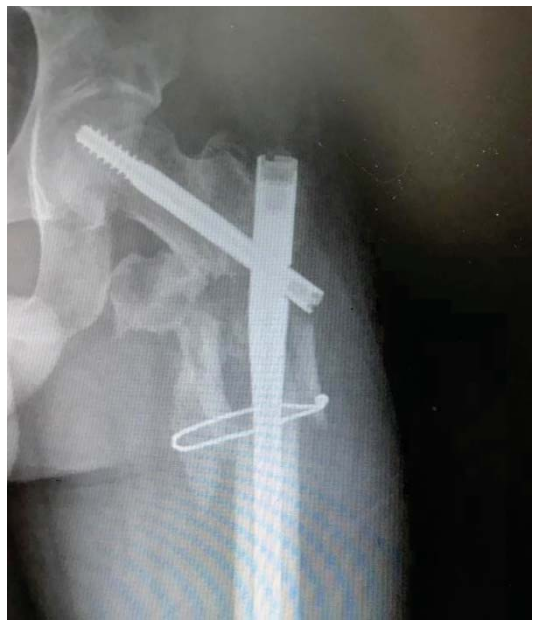

Figure 3. Postop imaging after re-intervention showing cerclage wire implantation.

At the 2-month follow-up, there were no signs of fracture consolidation, so a re-intervention was decided. The patient underwent the second surgical procedure including debridement of the fracture site, grafting with an allograft, open reduction of the medial wedge fragment and stabilization with a cerclage wire (Figure 3).

The patient was discharged at 7 days postop and underwent a rehabilitation program in his hometown, including non-weight-bearing for another 3 months.

At 3-month follow-up, there were some signs of bone healing and the patient was allowed partial weight-bearing for one month with full weight-bearing afterwards.

The patient presented again at 9 months after the initial surgery, accusing pain in the left hip after a minor traumatism. X-ray scans revealed a fracture of the Gamma Nail at the lag screw site (Figure 4).

A new surgical procedure was planned in order to replace the damaged implant with a new one. The use of a Dynamic Hip Screw was preferred after Gamma Nail failure. After extraction of the centromedullary nail, the fracture site was debrided once more, the cerclage wire was removed, the fracture was reduced and stabilized with an 8-hole DHS with a 135-degree angulation.

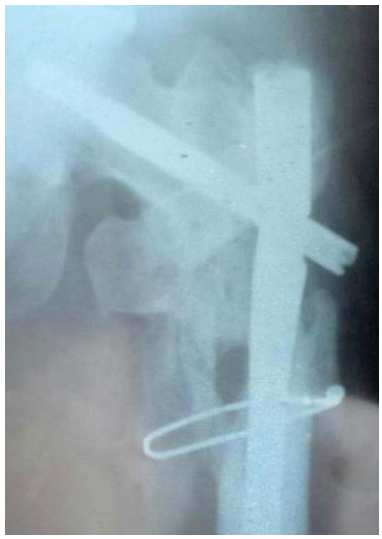

Figure 4. X-ray scan showing Gamma Nail implant failure at the lag screw site.

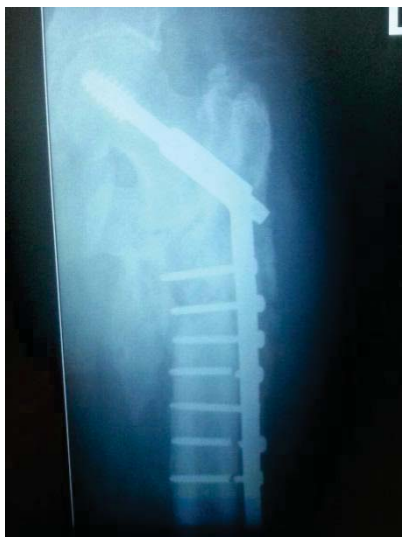

Figure 5. X-Ray scan showing hypertrophic callus and breakage of cortex screws in the DHS system.

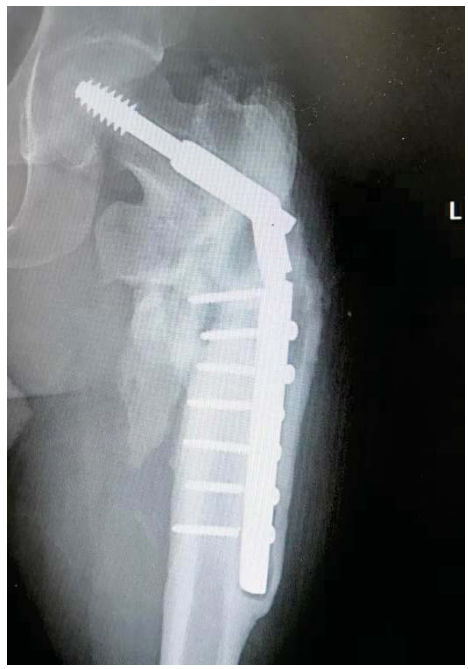

Figure 6. X-ray showing DHS failure.

Figure 7. 30 months after fracture.

3 and 6 month follow-ups revealed signs of callus formation at the fracture site and the patient was allowed weight-bearing.

The 12 moth follow up X-Ray scans showed screw breakage in 3 cortex screws and a hypertrophic callus (Figure 5). The patient was advised to remove the implant, but did not comply.

At 18 months after DHS implantation and 27 months after initial surgery, at a control X-Ray scan, breakage of the DHS plate was evident and the patient was once more advised to schedule the removal of the implant (Figure 6).

The broken plate was removed from under a hypertrophic callus and stability of the fracture site was tested, with no evident movement. Initially the use of another centromedullary nail was considered, but due to the lack of blood transfusions and after consulting the anaesthesiology team, the surgeons decided not to use another implant.

At 3-month follow-up after DHS removal and 30 months after initial surgery, the patient was full weight-bearing, pain-free and resumed his normal activity. The X-Ray scans showed further callus formation with no signs of non-union (Figure 7).

DISCUSSION

For polytrauma patients, minimally invasive procedures are preferable in order to avoid destabilizing the patient, to minimize surgical risks, such as infection, and to be able to mobilize the patient as early as possible.

Closed reduction and internal fixation was preferred to an open reduction procedure in this case, because of the high-energy nature of the traumatism, to preserve remaining vascular support and to promote healing. External fixation was avoided in order to minimize the risk of infection, taking into consideration that surgical trauma was not significantly higher using the intramedullary nail.

The presented case is of great complexity, because of the number and displacement of fracture fragments which made obtaining a proper reduction very difficult by closed means.

The first surgical procedure focussed solely on stabilizing the fracture and the main fragments. Open reduction and fragment stabilization using a cerclage wire was considered, but finally avoided due to the polytraumatic nature of the case.

At the first follow-up visit after surgery, as no signs of bone healing were evident on X-Ray scans, it was decided to re-intervene to properly reduce the fragments and to improve the bone stock with debridement and cancellous allografts. Due to the fibrotic lesions at the proximal femur, an anatomical reduction was impossible and it was tried to gather the fragments as much as possible to induce bone healing.

Although there was no satisfactory healing per-primam, it should be noted that from a highly comminuted fracture with very displaced fragments, a more stable unifocal non-union in the trochanteric region and a better bone stock for subsequent interventions was obtained by the time the Gamma Nail failed.

Subsequent DHS implantation was preferred to other implants, such as DCS or PFN, in order to use the same lag-screw hole as the Gamma Nail, to preserve femoral head vascular support through the neck and to use the higher angulation of the DHS plate 135 vs 125 degrees in the Gamma Nail, to obtain a biomechanically more satisfactory femoral neck angle (valgus deformity) to promote compression in the fracture site.

Although the DHS system failed eventually, it promoted bone formation which resulted in a hypertrophic stable non-union which healed even after implant failure.

CONCLUSIONS

High energy proximal femur fractures are very difficult to treat even in trauma centres with experienced surgical teams, due to the diversity of fracture patterns and the lack of specific implants and procedures. Therefore, every polytrauma case has its own particularities, which must be taken into consideration during orthopaedic treatment.

Emergency surgery will not always result in satisfactory fracture reduction and primary bone healing, but should aim to obtain stabilization by the means of a proper length and alignment of the limb with minimal negative interventions on the bone stock. Also, minimally invasive procedures are preferable in this kind of polytrauma patients, in order to allow early mobilization.

Currently all available implants for the proximal femur focus on load sharing rather than load-bearing, with a negative impact on burst-fractures with large bone defects as in the presented case, because of the lack of suitable biomechanics.

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