

An Experience with Titanium Proximal Femoral Nail in Comminuted Proximal Femoral Fractures



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Abstract

Fractures in the proximal femoral area are usually difficult to treat as they consist of hard cortical bone with an inherent slower healing rate than the metaphyseal area, and mechanically the deforming forces are high. Moreover, these fractures are usually the result of a high energy trauma and so the integrity of peri fracture soft tissue is seriously affected also. In the elderly osteoporosis makes such fractures more prone to fixation failure, mal-union and nonunion. Over the period of time various implants have been used to fix these fractures with variable results. However since the advent of minimally invasive surgery and implants like proximal femoral nails, gamma nails, reconstruction nails etc the shift seems to be towards these procedures rather open reduction and internal fixations.

On similar lines image assisted closed indirect reduction on a fracture traction table followed by fixation with proximal femoral nail (PFN) was done in our study to see the results of this mode of fixation. In twenty-eight patients (21 males: 7 females) and age range of 21-70 years, PF titanium nailing was carried out from Oct 2015 to July 2016 at CMH Rawalpindi. All patients were followed up clinic-radio logically for one year. The outcomes of this technique were retrospectively evaluated using the Harris hip score and variables like infection, nonunion, malunion and implant failure. Based on the results of our study we found proximal femoral nail a very useful device in high-energy comminuted proximal femoral fractures in providing a bio-mechanically stable fixation.

Keywords: Intramedullary nailing; Proximal femoral Nail; Proximal femoral Fractures

Introduction

Comminuted fractures of proximal femur account for 7 to 15% of all hip fractures [1] and are commonly seen in all groups. Etiology may differ but trauma is the most common cause of the fractures as seen in this area. The fractures in proximal area are usually difficult to treat because the mechanical deforming forces are high, cortical bone in this area is very hard with an inherent slower healing than the metaphyseal area [2]. High energy trauma also causes severe peri-fracture soft tissue damage. In the elderly patients osteoporosis predisposes such fractures to complications like debricolage or implant pull out, mal-union and nonunion [3]. C-arm assisted indirect reduction on a fracture table followed by minimal access intramedullary proximal femoral nail fixation has been found to prevent such unwanted outcomes [4]. Such fixation allows proximal fragment fixation with a large sliding screw traversing obliquely through the nail in to the neck of femur and distal fragment is stabilized in longitudinal and rotational axis by distal trans-implant screw fixation. This allows stress distribution along the length of the implant, minimal disturbance of the fracture hematoma and provision of effective bone graft in form of reamed

intramedullary bone dust [5]. The morbidity of procedure is markedly less because of minimal exposure. Infection was effectively prevented because of same reason.

Material and Methods

From Oct 2015 to July 2016 a total of 28 patients (21 males: 7 females) with closed complex femoral fractures ranging between ages of 21-70 years were included in the study. Proximal femoral titanium nailing was carried out in all patients at CMH Rawalpindi. Fracture classification was done according to Seinsheimer [6] system. The fracture patterns included traumatic intertrochanteric fracture with subtrochanteric extension, ipsilateral fracture neck and shaft of femur, subtrochanteric fracture of femur, and subtrochanteric fracture with fracture shaft of femur.

People with open or pathological or impending pathological subtrochanteric fractures of femur were excluded from the study. Prophylaxis against venous thromboembolism and infection was carried out Preoperative planning was done to choose the proper implant size. Fracture table was used in all

the cases. Image intensifier was used during the procedure. In all the cases entry point was made in the pyriform fossa. Static type IV nail locking was done in all cases. All patients were followed up clinic-radio logically for one year (12 months); 01 monthly for first three months and then 03 monthly for next nine months. No patient was lost during the study. The results were compiled against the criterion of fracture union, nonunion, malunion, time and quality, complications and hip-knee movements as per Harris score.

Results

All the patients were followed up for 1 year. On average the period of fracture union was 20 weeks. Two patients (1M (26 years): 1F (30 years) had pain in the proximal part of the thigh which progressively decreased when the fracture had consolidated (8 months average). One patient (M: 55 years) had delayed union of the fracture (11 months) due to diabetes. Loosening of proximal screw was seen in one patient (F: 43 years) and distal screws in 1 patients (above 60 years /osteoporotic patients). Patients were advised to adhere to partial weight bearing for three months. In two patients (1M (38 years: 1F (26 years) distal screw breakage was seen at 2 months (F) and 3 months (M). Broken screws were replaced. Infection or malunion, pulmonary embolism, cerebro-vascular, pneumonia, fat embolism or myocardial infarction was seen in no case.

The success of this technique was retrospectively evaluated and functional outcomes were assessed using the Harris hip score. According to Harris hip score out of all the patients (n=28) included in the study, in 17 sub trochanteric fractures 11 (8 males: 3 females) had excellent and 06 (5 males: 1 females) had good results. Out of 11 intertrochanteric fractures with sub trochanteric extension 08 had excellent (7 Males: 1 female) 2 had good results (1 male and 1 female) and there was 1 fair (female). We also noted that the use of titanium PF nail gave the advantage of doing a MRI if the need arises. Based on these results of it was concluded that proximal femoral titanium nail is a very useful device in high-energy comminuted proximal femoral fractures with minimal complications and the implant provided bio-mechanically stable fixation in all age groups.

Discussion

Comminuted proximal femur fractures pattern are encountered commonly in orthopedic practice. These complex patterns fractures are reputed for the unique challenges they pose to the treating surgeon to manage [4,7]. The management therefore becomes highly demanding so as to attain best fixation and stabilization. Most of these fractures also may have a multi trauma pattern. In such patients management of life-threatening conditions must take preference over the definitive fixation of these fractures [3]. Management of comminuted proximal femur fractures needs proper understanding of fracture patterns and mechanism of injury [6]. Non-operative treatment for such fractures is only indicated in the pediatric age group where

the potential of union is excellent if managed on conservative note, or for those adult patients who are unfit for anesthesia for a variety of reasons. Avoiding over distraction in the fracture site is another important factor to ensure good fracture healing. The choice of implant in these mostly shattered fractures has remained a bone of contention.

DCS has been a gold standard for fixation in these cases especially if applied with MIPO technique. However the dexterity of such a fixation and expertise is not available at all centers [8]. PFN and reconstruction nailing has emerged as a good alternative technique of fixation and results are comparable. Ante grade proximal femoral nailing has the advantage that the fracture is held at both the proximal and distal ends and satisfactory stabilization of the neck of femur is carried out by the same implant without the need for long fracture exposures, fragment mobilization and dissection which seriously affects the outcomes [9]. Moreover the fracture hematoma is retained which promotes fracture healing. Reamed bone dust acts a bone graft and unites the multi-fragmented fractures in proximal femur held by the PFN. This technique also gave good results in young patients with high energy comminuted fractures [9,10].

Proper entry of the nail through the pyriform fossa is a technically demanding step and maybe one of the main factors in deciding the ease of procedure and post-operative results. Too much lateralization of entry results in valgusization of the distal fragment with nail impingement on the medial cortex of the distal fragment/ diaphysis. Too much pressure on nail entry point in the proximal fragment can result in generation of stress risers and bone failure at entry point with cut through of the implant or implant breakage [11]. Length of the nail is of vital importance as it determines the stress on the distal screws and proper placement of the proximal recon screws in the neck of femur [8]. Since its advent the use of PFN as a prophylactic fixator in osteolytic tumors of proximal femoral lesions has also been done at various centers and with good outcomes [8]. However in cases of trauma patients some randomized control trials have resulted in an equivocal view about the outcomes whether DCS or PF nailing is used [12].

Few associated problems with use of PFN as seen in the literature include proximal lateral thigh pain due to the large proximal screw head especially seen when the hip under goes rotational movements. Distal screw breakage is seen when a single screw is used, hence necessitating that the distal locking be done with two screws. Rudolf M et al. [9] in their study found usage of large diameter proximal screw effectively reduces the chances of migration of implant. Importance technical tip is to ensure the placement of the proximal two screw in the supra calcar area. This not only allows good hold but also supports the broken calcar column thereby adding to stability of the implant and hold of the fragments [10].

In coronal plane the proximal screw should be in the central axis of the neck and head of the femur. The tips of the screws

should be approximately within 10mm of the articular surface of the head of femur [9,12]. Correct entry point is absolutely essential to get good results. If the entry point is posterior, the implant may cut out distally, especially in osteoporotic bone. If the entry point is medial or lateral, further iatrogenic comminution may be created during insertion of the nail [12,13]. C-arm assisted good pre interventional alignment of the fragments is of paramount importance. This results in good treatment outcomes as seen by D Raj et al. [14] in their series where overall excellent to good results were achieved in 32 patients (84%).

Conclusion

On basis of the results of our study we infer that closed reduction with proximal femoral titanium nail fixation for proximal femoral fractures has definite advantages. It minimizes the incidence of nonunion, malunion, infection and iatrogenic injury to the soft tissue which provides satisfactory fracture healing. Using a titanium nail also gives the added advantage to carry out MRI of the patient if the need ever arises. Expertise of the surgeon though remains the main deciding variable in results.

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