AN EXPERIENCE OF THE TREATMENT OF UNSTABLE INTER-TROCHANTERIC FRACTURES WITH THE AO/ASIF PROXIMAL FEMORAL NAIL

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ABSTRACT

Objective: *To evaluate the use of local-made proximal femoral nail in the treatment of unstable inter-trochanteric femoral fractures.*

Methodology: *This descriptive study was conducted in the Department of Orthopaedics, Lady Reading Hospital, Peshawar, from February 2009 to June 2010. Sixty-two patients with unstable inter-trochanteric femoral fractures, admitted through the Accident & Emergency Department were included in this study. All patients were treated with AO/ASIF proximal femoral nail and followed at least till fracture consolidation which takes minimum of 6 months.*

Results: *The mean age of the patients was 74.27± 5.84 years. Two patients died and thirteen patients were lost to follow-up. The results are thus based on a sample of 47 patients. There were no complications in 81% (n=38) patients and they achieved fracture consolidation within six months. Three patients underwent revision surgery due to non-union; two had lag screw penetration into the hip joint, three patients developed deep wound infection while one patient developed superficial wound infection. The mean pre injury mobility score was 6.8±2.5 while the mean post-operative mobility score was 6.48±2.7 (p=.000).*

Conclusion: *The advantage of immediate stability in difficult and unstable fractures, and the relatively few complications serve to recommend the wider use of AO/ASIF proximal femoral nail.*

Key Words: *Inter-trochanteric fracture, Proximal femoral nail (PFN), Dynamic Hip Screw*

INTRODUCTION

Since its introduction in the late 1970's, the Dynamic Hip Screw (DHS) had become a standard device for the fixation of all inter-trochanteric fracture of the femur[1]. However, in unstable fractures the DHS has performed less well with substantial rates of fixation failure, poor functional outcome and associated morbidity[2, 3]. The DHS has several modes of failure, the most common being cutting-out of the lag screw from the femoral head. It is due to increase bending moment across the implant/fracture construct. Because of the lack of lateral cortical support in unstable fractures, the femoral head can collapse if there is excessive medial displacement of the femoral shaft[4]. To overcome the difficulties encountered in the treatment of unstable fractures, trochanteric-entry intramedullary nails have been developed.

The main principle of trochanteric-entry nail fixation is based on a sliding screw in the femoral neck-head fragment, attached to an intramedullary nail. The nail has major advantages over a DHS from the bio-mechanical point of view; including a semi-closed procedure and a shorter lever arm giving greater stability and allowing rapid rehabilitation[5]. The Gamma nail was the first trochanteric-entry nail introduced in 1988, and was designed specifically for the treatment of unstable fractures[6]. It is cannulated with a proximal diameter of 17mm and a proximal valgus angle of 10°. It allows only static locking distally. However, the GN has been implicated with serious implant related complications such as iatrogenic femoral shaft fractures during nail impaction and, therefore, other intramedullary fixation devices has been introduced. The proximal femoral nail (PFN) was developed in 1997 with a redesigned tip that

decreases resistance during insertion and reduces bone stress significantly thereby decreasing the risk of intra and post operative fractures of the femoral shaft. It also incorporates two proximal screws to improve the rotational stability of the proximal fracture fragment. The PFN is a solid nail with a proximal diameter of 17mm and proximal valgus angle of 6°. It allows both static and dynamic locking distally and uses smaller diameter locking screws[6].

This study was undertaken to determine the outcome of AO/ASIF PFN in the treatment of unstable inter-trochanteric fractures of the femur. The AO (Arbeitsgemeinschaft fur Osteosynthesefragen)/ASIF (Association for the Study of Internal Fixation) is a Swiss base association for Orthopaedicians and is original designer of PFN.

METHODOLOGY

This descriptive study was conducted over a 16-month period between February 2009 to June 2010 at the Orthopaedics Department, PGMI Lady Reading Hospital, Peshawar. A total of sixty-two patients, 23 males and 39 females, admitted through the Accident & Emergency Department with AO type 31A2.1-3 and 31A3.1-3 inter-trochanteric fractures (Table 1) and age above 60 were included in the study. Exclusion criteria were inability to walk before the fracture, pathological fracture, other fractures interfering with rehabilitation and those having pre-existing systemic illness significant enough to result in increased morbidity or mortality.

Pre-operative assessment: Primary assessment included details about the patient's medical history and his/her mobility and activities of daily living. Mobility was assessed using the Parker & Palmer mobility score (Table 2)[7].

Operative technique: All patients received prophylactic cefuroxime 1.5 G immediately before commencement of surgery. The fracture was reduced by close means. Reduction was considered well if the cortical congruence at the calcar region was restored, and if the displacement between the fragments did not exceed 2mm in any projection. The ideal position for the screw in the femoral neck was defined as being central on the lateral radiograph and central or inferior on the AP radiograph[8]. Standard operative techniques, which are recommended in the literature, were used[9, 10].

Post-operative care: Cefuroxime 750mg three times a day and ceftriaxone 1g twice daily were given for 48 hours after surgery and appropriate prophylaxis against thrombo-embolism was also given in high risk patients. All patients were mobilized fully weight bearing on the 1st post-op day assisted by a physiotherapist. The wounds were inspected on the 2nd day and the patients were discharged at a mean of 3 days (1 to 10) post-operatively.

Follow-up: Patients were followed-up for 6-month post-operatively and the post operative mobility rating was calculated. The wounds were inspected on every visit and any oozing wounds

Table 1: AO classification of inter-trochanteric fractures

A1.1	Simple undisplaced fracture along trochanteric line passing above the lessor trochanter.
A1.2	Simple displaced fracture along trochanteric line passing above the lessor trochanter.
A1.3	Simple displaced fracture along trochanteric line passing below the lessor trochanter.
A2.1	Simple fracture along trochanteric line with detached medial cortical fragment.
A2.2	Comminuted fracture along trochanteric line
A2.3	Multifragmentory peri-trochanteric fracture
A3.1	Simple reverse oblique fracture
A3.2	Simple transverse fracture
A3.3	Reverse oblique fracture with detached medial cortical fragment

Table 2: Parker and Palmer mobility score (0 to 9)

	No Problem	With Aids	With help from another	Unable to perform
Able to get about the house	3	2	1	0
Able to get out of the house	3	2	1	0
Able to go shopping	3	2	1	0

were swabbed. Plain antero-posterior and lateral radiographs were taken at each visit and reviewed for technical failures and fracture union. Technical failures[11] were defined as penetration of the lag screw, excessive displacement, e.g. medialisation of the femoral shaft, breakage or loosening of the implant, intra- or post-operative fracture of the femoral shaft or non-union.

Data was analyzed using SPSS version 14.0 software.

RESULTS

The mean age of the patients was 74.27± 5.84 years. The overall patients' demographics are given in Table 3.Two patients died in the immediate post-operative period from cardio-vascular causes and thirteen were lost to follow-up. The rest of the results are thus based on a sample of 47 patients.

Surgical outcome: No complications were observed during the follow-up at six months in 38 patients. There were three (6.4%) cases of re-displacement who presented with severe pain at the hip making walking impossible. They underwent revision surgery. Two (4.2%) patients with penetration of the lag screw into the joint with healed fracture had the implant removed after ten months because of local pain. There was one (2.1%) patient with superficial infection which cleared with I/V antibiotics and three cases of deep infections (6.4%) which required surgical debridement and I/V antibiotics (Table 4).

Functional outcome: At six months 68% (n=32) of the patients had achieved their pre-injury activity level according to Parker and Palmer mobility Score. The mean pre injury mobility score was 6.8±2.5 while the mean post-operative mobility score was 6.48±2.7 (p=.000) (Table 5).

Table 3: Demographic characteristics of the sample (n=62)

Number of patients	62
Female	39
Male	23
Mean age in years (SD)	74.27 ± 5.84
Fracture type (%)	
A2	37
A3	25

Table 4: Post-operative complications and management (n=47)

S. No	Complication	No. of patients (%)	Management
1	Deep infection	3(6.4%)	D/D, I/V antibiotic
2	Re-displacement	3(6.4%)	Revision surgery
3	Lag screw penetration	2(4.2%)	Removal of implant
4	Superficial infection	1(2.1%)	I/V antibiotic

D/D: debridement and dressing I/V: Intravenous

Table 5: Functional outcome on Parker and Palmer Mobility Score (n=47)

	Mean Mobility Score	P-value
Pre Injury	6.8±2.5	.000
Post Operative	6.48±2.7	

DISCUSSION

The use of the PFN has become an attractive option now as locally manufactured implants and instruments are available in Pakistan. Because of our excellent experience with femoral and tibial inter-lock nailing and our increasing expertise in the technique, we began to use the new method of nailing more and more frequently during the last few years.

Immediate stability and early bony union were the most striking results from our study, which vindicated the overall efficacy of the close nailing technique and is in line with another study by Anglen et al[12]. Immediate stability had the concomitant advantage of restoration of full function of the extremity. This was demonstrated by the fact that 68% of our patients achieved pre-fracture mobility in the injured limb within six months. This is in line with other studies of the proximal femoral nail and Gamma nail, which reported a restoration of mobility in 40% to 70% of patients[12, 13]. It would seem that the improvement in mobility can be attributed to improved restoration of hip anatomy and biomechanics achieved by this new implant. Studies comparing the DHS with the PFN also found that patients who received a nail were 50% more mobile than those with a DHS, which had best results before AO/Asif PFN[14]. Our findings regarding mobility are in line with these studies.

The technical rate of failure in our study was somewhat high at 10.5%. It was most probably attributed to our inexperience in the earlier part of the study. The three revisions were due to excessive medialisation in patients with reverse oblique fractures.

One and a half to three percent incidence of post-operative deep wound infection has been reported in the literature[15]. A deep wound infection rate of 6.4% was a significant shortcoming in our study. Lady Reading Hospital, Peshawar is the oldest hospital of the city and is always over crowded. A sub-optimal environment for such operations was the reason that the wounds became infected with nocosomial bacteria that, however, resolved with energetic local care and antibiotics.

CONCLUSION

From our experience with the PFN, we conclude that although the method is technically demanding and requires special instrumentation, but the advantage of immediate stability in difficult and unstable fractures, and the relatively few complications serve to recommend it for wider use. At the same time further randomized control trials are recommended.

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