



TREATMENT OF SUBTROCHANTERIC FEMUR FRACTURES WITH PROXIMAL FEMORAL NAILS: A PROSPECTIVE STUDY

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ABSTRACT **Introduction:** Present study was conducted to study the modes of injury in Subtrochanteric fractures of femur and to know the outcome of Proximal Femoral Nail in the treatment of Subtrochanteric fractures of femur. **Material & Methods:** A prospective observational study was conducted on a total of 30 cases of subtrochanteric fractures of femur. All patients were radiographed at an interval of 6 weeks after nailing, till evidence of union. The patient followed up for one year after the surgery at regular interval. Clinically, union of fracture was assessed and also examination for shortening and deformity was done. Functional outcome was assessed based on Modified Harris Hip Score. **Results:** Out of 30 cases, 24 cases gave history of road traffic accidents and 6 cases gave history of slip and fall. Full range of flexion of hip at 12 weeks post-operative was observed in 80% of cases and about 20% of patients showed minimally limited flexion. On a whole, all the patients had a satisfactory range of movements post operatively. Our study showed 80% of patients showed full range of movements and 20% showed minimally limited movements at 12 weeks post-operative. On a whole the range of knee movements was satisfactory. **Conclusion:** Proximal Femoral Nail is a relatively easy procedure and a biomechanically stable construct allows early weight bearing. It offers the advantages of high rotational stability of the head-neck fragment, an unreamed implantation technique and the possibility of static or dynamic distal locking. Thus, the Proximal Femoral Nail is a suitable implant for treatment of all Subtrochanteric fractures.

KEYWORDS : Functional Outcome, Proximal Femoral Nail, Range Of Motion, Subtrochanteric Femur Fractures

INTRODUCTION

Subtrochanteric fractures of the femur are sustained by the elderly from trivial trauma such as slipping from the stairs or fall in the toilet and in younger patients they are caused due to high energy trauma [1]. Despite marked improvement in the implant design, surgical technique and patient care, hip fractures continue to consume a substantial proportion of our health care resources.

The incidence of Subtrochanteric fracture femur has been on a rise due to the high energy trauma. They account for about 7% to 35% of all femoral fractures. Petrochanteric and Subtrochanteric fractures comprise about 7% to 10% of the hip fractures. 17% to 35% of all the Subtrochanteric fractures are pathological fractures.

Subtrochanteric fracture femurs are complicated by Malunion, delayed union or nonunion. The factors responsible for these complications are high stress concentration, predominance of cortical bone and difficulty in getting biomechanically sound reduction due to comminution. Apart from gender and age other risk factors for proximal femoral fractures include race, osteoporosis, nutrition, previous hip fractures, physical inactivity, and low body weight, use of certain medications, excessive alcohol consumption, high caffeine intake, smoking, dementia and other medical co-morbidities especially those affecting mental status, sensory perception, balance, locomotion and cardiovascular diseases such as stroke [1].

Increased incidence of these fractures in elderly patients is exacerbated by several factors including poor vision, decreased muscle power, decreased reflexes, labile blood pressure, and vascular diseases and co-existing musculoskeletal pathologies. In younger patients, Subtrochanteric fractures are usually the result of high energy physical trauma like high speed motor vehicle accidents or fall from height.

Many implants have been recommended for the use in Subtrochanteric fractures of femur but a high incidence of complications has been reported after surgical treatment with each implant. A lack of satisfactory implant in surgical treatment of Subtrochanteric fracture femur has led to continuous evolution in design of a perfect implant. Numerous implants have been used in the past for the treatment of Subtrochanteric fractures. Each implant having its own disadvantages leading to the development of newer fracture fixation device [2].

Proximal Femoral Nail is a third generation cephalomedullary nail, developed by AO/ASIF in 1996 for the treatment of unstable

Petrochanteric and Subtrochanteric fractures. Locking the nail above and below the fracture site produces immediate fracture stability and therefore allows early mobilization of patients [3].

Present study was conducted to study the modes of injury in Subtrochanteric fractures of femur and to know the outcome of Proximal Femoral Nail in the treatment of Subtrochanteric fractures of femur.

METHODOLOGY

Study Area: The present study was conducted at Sri Siddhartha Medical College & Hospital, Agalakote, which is a tertiary level centre.

Study Design: A prospective observational study

Study Participants: All cases of Subtrochanteric fractures of femur coming to our hospital.

Sampling Technique and Sample Size: Consecutive type of non-probability sampling was used for selection of study subjects after taking prior informed consent from the parents. A total of 30 cases of Subtrochanteric fractures of femur were included in the study.

Inclusion criteria: To be included in this study, patients were supposed to be, cognitively intact and willing to participate in the study. Clinical records and radiographs were reviewed to identify the subtrochanteric fractures. Patients were identified at the time of hospital admission and information was collected.

Exclusion Criteria: Patients with pathologic fracture, polytraumatic patients associated with ipsilateral pelvis fracture (floating hip) or knee injuries, severe systemic diseases that could prevent the operation.

Surgical Technique: As soon as the patient with a suspected Subtrochanteric fracture was brought to the casualty, he/she was applied traction to the affected limb after preparation. Traction was maintained during radiological examination to minimize the pain. Routine investigations were carried out i.e., blood for Hb%, grouping, cross matching, urine for albumin, sugar and microscopic examination, fasting blood sugar, blood urea, serum creatinine, BT, CT, PT, HbsAg, HIV and ECG. All patients were referred to the physician and medical problems treated if any. Associated injuries

were treated simultaneously. We did not operate any case as an emergency or with avoidable anesthetic risk. Once the fracture was reduced, a sharp, guide wire inserted percutaneously along the femoral neck. Using the image intensifier, its position was checked to ensure it lies parallel to the femoral neck. The first step was to pass the reamer guide wire from the entry point, the trochanter, into the shaft of the femur, across the fracture site. Guide the cannulated 15 mm reamer over the guide wire through the protection sleeve and ream manually with the T-quick coupling cannulated handle as far as the stop on the protection sleeve. Remove protection sleeve and guide wire. Flexible reamers were used to ream the shaft of the femur in stages starting from 8mm diameter and increasing in 0.5mm increments. Care was taken with flexible reamers to ensure that the guide wire was not displaced laterally during reaming. This could lead to resection of more bone on the lateral side of the wire, which in turn would lead to an offset position for the nail. Reaming was continued until the reamer starts to bite/catch the endosteal surface. A nail size of 1 mm less than that of the last reamer used was selected. In order to accommodate the proximal end of the nail, the trochanteric region was reamed upto 16mm irrespective of the distal diameter chosen. The selected nail was assembled into the introducer jig, ensuring that the locating peg slots in to the corresponding notch; it was held by the Nail holding bolt, and tightened using the socket wrench. The introducer handle, was now fitted. Using anterior-posterior screening the nail was inserted by hand; (Care Was Taken to Avoid Force or a Hammer). Until the lag screw holes were lined up with center of the femoral head in the lateral plane. Reaming guide wire was removed using the Jacob's chuck, ensuring that the jig was supported to prevent movement of the nail. With the nail now inserted to the correct depth, the targeting device, corresponding to the nail angle of the selected nail was assembled into the side of the introducer, ensuring that the locating pins engage the locating holes of the introducer. The jig handle is removed first and then replaced after the targeting device has been slotted. Next, the guide sleeve for the lag screw is assembled, and passed through a small incision made down to the bone. Patients were discharged when independent walking was possible with walking aids, with the advice to follow up in the out patients department regularly.

Outcome Analysis: All patients were radiographed at an interval of 6 weeks till evidence of union. Those who could not follow up answered the questionnaire on phone. The patient followed up for one year after the surgery at regular interval and if necessary subsequent follow up was done. Clinically, union of fracture was assessed and also examination for shortening and deformity was done. Functional ability of the patients with respect to ambulatory status, ability to squat, sit cross legged and walk for varying distance was assessed based on Modified Harris Hip Score [4].

Statistical Analysis: All the data was entered in Microsoft Excel sheet and then transferred to SPSS software ver. 17 for statistical analysis. Appropriate tests were applied according to type and distribution of data and a p-value of less than 0.05 was taken as significant.

RESULTS

The following observations were made from the data collected during this study of surgical management of Subtrochanteric fractures of femur with Proximal Femoral Nail. In present study the maximum aged patient was 70 years. Most of the patients were in the age group of 21 to 40 years, with mean average of 41.3 years (Table 1). In our study 25 patients were males and 5 were females. This shows preponderance of males over females. Out of 30 cases, 24 cases gave history of road traffic accidents and 6 cases gave history of slip and fall (Table 2). In our series road traffic accidents contributed to 80% of the injuries and the mean time to union was 14.7 weeks (Table 3). In our study full range of flexion of hip at 12 weeks post-operative was observed in 80% of cases and about 20% of patients showed minimally limited flexion. On a whole, all the patients had a satisfactory range of movements post operatively (Table 4). In our study showed 80% of patients showed full range of movements and 20% showed minimally limited movements at 12 weeks post-operative. On a whole the range of knee movements was satisfactory (Table 5).

DISCUSSION

A prospective observational study was conducted with the aim to study the modes of injury in Subtrochanteric fractures of femur and to know the outcome of Proximal Femoral Nail in the treatment of Subtrochanteric fractures of femur.

A total of 30 consecutive cases of Subtrochanteric fractures of femur

dissectomy coming to our hospital were included in the study. The mean age for Subtrochanteric fractures was 41.3 years, males outnumbered females, which can be attributed to males being more involved in physical strenuous work and right side fractures were seen to be more common, right side being the dominant side in maximum.

High velocity injuries due to road traffic accidents were the main cause of these fractures seen in present study, similar cause has been observed in the study of Kakkar et al. [5]. In the present study group, majority (46.67%) of fractures belonged to class IIIA of Seinshemier's classification, and the mean period of hospital stay was 7.63 days. Shortening was seen in three patients of whom two patients had shortening of less than 2cms and one patient had shortening of 2cms which is comparable to the studies of Hotz et al. [6], Fogagnolo et al. [7] and Kakkar et al. [5].

Postoperative quadriceps exercises were started on second day in all cases and full weight bearing was allowed early i.e., 13.63 days which was found to be statistically significant in the present study. Time to union observed was 14.73 weeks. Our results were in accordance with Herrera et al. [8] and Boldin et al. [9], they also observed complete union in 13 and 15 days in their studies.

After fracture union, range of movements in all patients was good at both hip and knee. The mean range of flexion at hip was 126.66°. The mean range of knee flexion was 119.16°. Mean range of hip extension and knee extension was equal to normal side. The mean range of abduction was 28.66° and adduction was 25.33°. Internal rotation was 29.16° and external rotation was 34.33°. Similar movement range has been observed by Hotz et al. [6] in a similar study.

None of the patients in present study experienced non – union, implant failure or fat embolism, only 1 patients had superficial infection. No mortality was seen in our series, 3 patients had shortening in our series. Similar outcome is reported by Robinson et al. [10]

Overall we had 70% excellent results and 30% good results.

Summarizing the impression about the device used, we feel that all Subtrochanteric fractures can be treated by close reduction and internal fixation with Proximal Femoral Nail.

CONCLUSION

Proximal Femoral Nail is an excellent minimal invasive implant for Subtrochanteric fractures, if closed reduction is possible. The terms of successful outcome include a good understanding of fracture biomechanics. The number and severity of complications may be reduced by observing proper principles of reduction and exact surgical technique. It is a relatively easy procedure and a biomechanically stable construct allowing early weight bearing. Proximal Femoral Nail offers the advantages of high rotational stability of the head-neck fragment, an unreamed implantation technique and the possibility of static or dynamic distal locking. Thus, the Proximal Femoral Nail is a suitable implant for treatment of all Subtrochanteric fractures.

CONFLICT OF INTREST

Authors don't declare any conflict of Interest.

TABLES

Table 1. Age distribution of study cases

AGE GROUPS	NUMBER OF CASES	PERCENTAGE
0-20	1	3.3%
21-40	14	46.6%
41-60	12	40.0%
>61	03	10%

Table –2. Mode of Injury

MODE OF INJURY	NUMBER OF CASES	PERCENTAGE
Road traffic accident	24	80.0%
Slip and fall	06	20.0%

Table 3: Time to union from trauma

TIME TO UNION IN WEEKS	NO. OF CASES	PERCENTAGE
12 - 15	24	80%
16 - 20	04	13.3%
21 - 24	02	6.66%

Table 4: Range of movements of hip joint at 12 weeks post-operative

RANGE OF MOVEMENTS OF HIP JOINT	NO. OF CASES	PERCENTAGE
Flexion		
Full Range (Above 1210)	24	80%
Minimally limited (101 to 1200)	06	20%
Grossly limited (81 to 1000)	-	-
Non-ambulatory (Below 80°)	-	-
Extension		
Full Range (Above 100)	24	80%
Minimally Limited (5 to 10°)	6	20%
Grossly Limited (below 5°)	-	-
Non-ambulatory (no extension)	-	-
Adduction		
Full Range (Above 260)	11	36.3%
Minimally Limited (16 to 25°)	19	63.3%
Grossly Limited (15° below)	-	-
Non-ambulatory (no adduction)	-	-
Abduction		
Full Range (300 and above)	20	66%
Minimally Limited (21 to 29°)	08	26.7%
Grossly Limited (11 to 20°)	2	6.6%
Non-ambulatory (10° & below)	-	-
Internal Rotation		
Full Range (Above 260)	06	20%
Minimally Limited (16 to 25°)	24	80%
Grossly Limited (15 & below)	-	-
Non-ambulatory (No Internal Rotation)	-	-
External Rotation		
Full Range (Above 300)	21	70%
Minimally Limited (21 to 30°)	07	30%
Grossly Limited (11 to 20°)	-	-
Non-ambulatory (10° & below)	-	-

Table 5: Range of movements of knee at 12 weeks post-operative

RANGE OF MOVEMENTS OF KNEE	NO. OF CASES	PERCENT
Flexion		
Full Range (1200 and above)	22	73.3%
Minimally limited (100 to 1190)	08	26.6%
Grossly limited (70 to 990)	-	-
Non-ambulatory (700 and below)	-	-
Extension		
Full Range (Full Extension)	30	100%
Minimally limited (<200 short of full extension)	-	-
Grossly limited (21 to 400 short of full extension)	-	-
Non-ambulatory (>400 short of full- extension)	-	-

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