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Study of the Outcome of Inter Trochanteric Fractures of the Femur Treated with Proximal Femoral Nailing

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Original Research Article

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Abstract: The incidence of fractures in the trochanteric area has risen with the increasing numbers of elderly persons with osteoporosis. The treatment of unstable trochanteric femoral fractures is still challenging, and the proximal femoral nails are becoming more commonly used. Apart from the nail design, the surgical technique is also important for the successful outcome. The aim of the present study was to evaluate and analyze the outcome of the surgical management of Intertrochanteric fractures of the femur by using Proximal Femoral Nail. The present study was done in Department of Orthopedics, RIMS ADILABAD. Patients with the diagnosis of Intertrochanteric fracture from Aug 2013 to Feb 2016. The total numbers of cases operated in 2.5 years were 187 and the patients were informed about the study in all respects and informed consent was obtained from each patient. Patients admitted with Intertrochanteric fracture were examined and investigated with X-ray pelvis with both hips AP and Lateral view (whenever possible). All fractures were treated using a proximal femoral nail. There were 80 females and 107 males in the study. Domestic fall and road traffic accident were the modes of injury in all the patients. The fracture was reduced anatomically by closed means in 165 patients and 22 were reduced by limited open reduction during surgery. Results of treatment according to Kyle's Criteria were Excellent in 117 cases, good in 55 cases, fair result in 10 cases and poor in 5 cases. There were 3 cases of implant failure. In all the 3 cases the 'Z'- an effect of implant failure was seen. Early weight bearing, Severe osteoporosis, severe posteromedial communication were the causes of this failure. From the present study we conclude that PFN is an excellent implant for the treatment of Intertrochanteric fractures. The successful outcome also depends upon proper patient selection, the good understanding of fracture biomechanics, good preoperative planning, accurate instrumentation, good image intensifier and exactly performed osteosynthesis.
Keywords: Femur, Inter Trochanteric Fractures, Proximal Femoral Nailing.

INTRODUCTION

Fractures of Trochanteric area are on an increase there are two main types of implants available for the treatment of those fractures, namely extramedullary and intramedullary implants. The most widely used extramedullary implant is the dynamic hip screw, which consists of a sliding neck screw connected to a plate in the lateral femoral cortex. Intramedullary devices such as the gamma nail and the proximal femoral nail provide a biomechanical advantage due to their shorter lever arms and the diminished deforming forces across the implant by minimizing soft tissue dissection. The treatment of unstable trochanteric femoral fractures is still challenging, and the proximal femoral nails are becoming more commonly used. Apart from the nail design, the surgical technique is also important for the successful outcome. The standard treatment for intertrochanteric fractures of the femur is the sliding hip screw and plate [1]. However, mechanical and technical failures continue to occur in as many as 6% to 18% of cases [2-6]. Because of the magnitude of the problem regarding quality of the life, an improvement in the treatment of intertrochanteric fractures is required.

Various operative procedures with different implants have been described for the treatment of intertrochanteric fractures. Earlier active treatment was usually delayed for as long as 3 to 4 weeks which lead to secondary complications. The primary goal of the treatment has to be early mobilization to avoid secondary complications, which can be achieved by open reduction and internal fixation. Intertrochanteric femur fractures may be repaired with either a sliding hip screw or a trochanteric nail. The hip screw has been considered the device of choice because fracture union predictably occurs. A problem with sliding hip screws is the collapse of the femoral neck, leading to loss of hip offset and shortening of the leg. Although some such sliding is expected, too much shortening is

detrimental to hip function. Therefore a new intramedullary device – Proximal Femoral Nail was designed in 1996 which gives an advantage of minimally invasive surgery [7].

Initial reports showed that the gamma nail to be useful but suggested specific recommendations for insertion [8-10]. However, randomized controlled trials comparing the dynamic hip screw versus the Gamma nail showed a high incidence of femoral shaft fracture in groups treated with the Gamma nail [11-14]. On the bases of these studies, a new system of Intramedullary nailing with biomechanical modifications compared to an existing system is introduced in the form of the proximal femoral nail in an attempt to minimize the technical complications. The purpose of this prospective study is to observe the surgical outcome of the proximal femoral nail in the intertrochanteric fractures of the femur.

MATERIALS AND METHODS

The present study was done in RIMS Adilabad, Department of Orthopaedics with the diagnosis of Intertrochanteric fracture from Aug 2013 to Feb 2016. The No of cases operated in 2.5 years was 187 and the patients were informed about the study in all respects and informed consent was obtained from each patient. Following inclusion and exclusion criteria were used.

Inclusion criteria

- The patient who has been diagnosed as having Intertrochanteric fractures.
- Patients more than 20 years of age.

Exclusion criteria

- Skeletally immature individuals.
- Those patients who were unable to walk before an injury.
- Patients with pathological fractures.
- Patients admitted for re operation.
- Patient not given written consent for surgery.

Patients admitted with Intertrochanteric fracture were examined and investigated with X-ray pelvis with both hips AP and Lateral view (whenever possible). Skin traction was applied to all cases. Blood and urine examinations were ordered as required for the operative process. Physician opinions were taken as to the fitness of patient before surgery as and when necessary. X-ray was reviewed again and classified with using Orthopaedic Trauma Association (OTA) classification. All fractures were treated using a proximal femoral nail.

The patient was given spinal, epidural or general anesthesia and shifted to a radiolucent fracture table in a supine position. An operative leg was put on traction. Opposite limb was put in a full abduction as to give space for the C-arm in between the legs. The reduction was achieved by traction and internal rotation primarily and adduction or abduction as required. The reduction was checked in a C-arm with an anterior-posterior and lateral view. The limb was scrubbed, then painted and draped under sterile condition. A 5cm incision was taken above the tip of the greater trochanter and deepened to the gluteus medius muscle. Insertion of the guide pin on tip of the greater trochanter at the virtual meeting point of the line drawn in the center of the neck and a line drawn in the femoral shaft 6º lateral. Guide wire 2.8mm guide wire was inserted into the femoral shaft and across the fracture site in 6º of valgus. Reaming of the proximal femur is done with the reamer provided with the set. The nail is fixed on the jig and the alignment is checked. Then the nail is inserted into the femur. The position of the holes for the hip screws is checked in the C arm for the depth of the nail. The guide wire for the screws: Guide wires for the screws are inserted via the jig and the drill sleeve.

First, the 8 mm hip screw is inserted after reaming over the distal wire and then the 6.5mm cervical screw. The hip screw should be 5mm away from the sub-chondral bone. And the cervical screw 10mm away from the sub-chondral bone. Or both the screw tip should make one horizontal line when joined.

Distal screws one or two static or dynamic 4.9mm interlocking bolts are inserted via the Jig into the distal part of the nail. Out of which one is a static and another is a dynamic hole. It should be done after removing the traction along with the tightening of the proximal screws. The final position of the nail was checked in the C-arm in both views and the wound was closed in layers without putting the drain. The patient was given the IV broad-spectrum cephalosporins, one dose pre-operatively and followed BID dose till 48 hrs depending on the condition of the wound and patient. The pts were kept under observation in the recovery room until active ankle and toe movements were possible and then shifted to ward.

- IV antibiotics were given for first 48 hours and then were shifted to oral doses till suture removal.
- Suction drainage was removed after 48 hours in case of open reduction.
- Static quadriceps exercises were started on the zero postoperative days.
- Active quadriceps and hip flexion exercise were started on the 1st postoperative day.
- The dressing was done on 2nd and 5th post-operative day.
- Sutures were removed on 10th post-operative day.
- Patients were advised weight-bearing walking with the help of the walker as soon as tolerable usually after suture removal.
- Partial weight bearing walking was started at about 6-9 weeks post operatively.
- Full weight bearing walking was allowed after assessing for the radiological and clinical union.

All patients were assessed by using Kyle's criteria at the follow-ups. Performa specially made for the study was used. Data collected at the end of the study was statistically compared and analyzed.

RESULTS

This study involved 187 confirmed cases of Intertrochanteric fractures of the proximal femur of either sex. All the cases were treated with Intramedullary fixation-"Proximal femoral nail". The study involved patients above 20 years of age. The age distribution was from 20 to 95 years. The average age was 62.2 years and the largest group of patients being from 61 to 70 years age group.

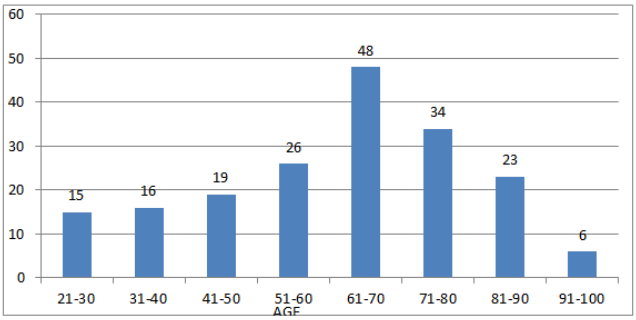

Fig-1: Showing the age distribution of patients

Table-1: Showing the sex distribution of the patients.

SEX	No. of cases	percentage
MALE	107	57.22
FEMALE	80	42.78
TOTAL	187	100

Table-2: Showing Singh's Index for osteoporosis

GRADE	NO OF PATIENTS	%
I	15	8.0%
II	38	20.0%
III	54	28.9%
IV	37	19.8%
V	21	11.3%
VI	22	11.9%
Total	187	100

The patients were evaluated by Singh's Index for Osteoporosis [15]. The patients in this study were mostly categorized in the Singh's index III i.e. 28.9%, 20 % of patients had a Singh's index as II, 19.8% patients had an index of IV, 11.9% patients had an index VI, 11.3% patients had an index of V and 8 % patients had an index of I (Table 2)

Table-3: showing fracture pattern according to Orthopedic Trauma Association (OTA) [16] classification

FRACTURE PATTERN	NO OF PATIENTS	%
31A1 (Stable)	54	28.8%
31A2 (unstable)	117	62.5%
31A3 (unstable reverse oblique)	16	8.5%
Total	187	100

All the fractures were classified as per Orthopedic Trauma Association (OTA) classification [16]. In which 31A1 were considered stable fractures. 31A2 and 31A3 were unstable fractures (table 3) Average operating time was 65mins (32min-95min) after Anaesthesia. Blood loss was counted intra operatively by the number of mops used during the surgery. One mop equals to 50 ml blood loss approximately. The average blood loss was 1.41 mops so around 70 ml (50-150ml) 54 patients required pre-operative blood transfusion as there Haemoglobin was less than 10 mg%. None required blood transfusion post-operatively.

Table-4: showing the method of reduction done

Reduction Type	No Of Patients	Percentage
Closed Reduction	165	88.24 %
Limited Open Reduction	22	11.76
Total	187	100

Table-5: Post-operative results according to Kyle's Criteria

Results	No. of patients	percentage
Excellent	117	62.56
Good	55	29.41
Fair	10	5.3
Poor	5	2.6

The post-operative results were excellent in 62.56% of patients and good in 29.41% of patients, and fair in 5.3% and poor in only 2.6% of patients based on Kyle's Criteria [5] (table 5). There were 2 cases of non-union in my study. The cause of nonunion was implant failure due to the known causes. There were 2 cases of infection seen in the study. Infection was treated with antibiotics and dressings; one required implant removal and was associated with implant failure and non-union and the other one healed well.

DISCUSSION

The most common mode of injury in our study was domestic fall 70%, This was also affected by the age as the older the patient more likely he/she getting the fracture by domestic falls. In our study, 28.8% were stable fracture pattern and remaining was unstable. Osteoporosis was measured by the Singh's index [15]. More osteoporosis was present in the older patient and post-menopausal females. Results were evaluated by Kyle's criteria [5]. In our series of 187 cases, we had 62.5% excellent, 29.4% good, 5.3 % fair and 2.6% poor results. It was similar to WM Gadegone *et al*. [17] and Pavelka *et al*. [18] that the use of PFN may have a positive effect on the speed at which walking is restored. In the series of 295 patients with trochanteric fractures treated with PFN by Domingo *et al*; [19] the average age of the patient was 80 years, which possibly accounted for 27% of the patients developing complications in the immediate postoperative period. The success of proximal femoral nail depended on good surgical technique, proper instrumentation, and good C-arm visualization. All the patients were operated on the fracture table. In our study, 8 % patients required limited open reduction which was comparable to Christian Boldin *et al;* as they required in 9%.[20] The entry point of the nail was through the tip or the lateral part of the greater Trochanter centralized in both the planes.

Dynamic hip screw introduced by Clawson in 1964 [21] remains the implant of choice due to its favorable results and low rate of complications. It provides control compression at the fracture site. Its use has been supported by its biomechanical properties which have been assumed to improve the healing of the fracture [22]. But Dynamic hip screw requires a relatively larger exposure, more tissue trauma, and anatomical reduction. The common causes of fixation failure are instability of the fractures, osteoporosis, lack of anatomical reduction, failure of the fixation device and incorrect placement of the screw [23,24]. We found a Proximal femoral nail to be more useful in unstable and reverse oblique patterns due to the fact that it has better axial telescoping and rotational stability. It has shown to be more biomechanically stronger because it can withstand higher static and several fold higher cyclical loading than the dynamic hip screw. So the fracture heals without the primary restoration of the medial support. The implant compensates for the function of the medial column [18].

The gamma nail is associated with specific complications [25] like anterior thigh pain, fracture at the tip of the nail. But proximal femoral nail is long and it has a smaller diameter at the tip which reduces the stress concentration at the tip [13]. Its position is near to the weight bearing axis so the stress generated on the implant is negligible. Proximal femoral nail also acts as a buttress in preventing the medialization of the shaft. The entry point of the proximal femoral nail is at the tip of the greater trochanter so it reduces the damage to the hip abductors [26], unlike the nails which have entry through pyriformis fossa [27]. The hip screw and the anti-rotation cervical screw of the Proximal femoral nail adequately compress the fracture, leaving between them adequate bone block, for further revision should the need arise.

CONCLUSION

From the present study, we conclude that PFN is an excellent implant for the treatment of Intertrochanteric fractures. The fixation of Intertrochanteric fractures with a PFN markedly reduces the morbidity and mortality in the elderly individuals in whom the fracture is more common. The successful outcome also depends upon proper patient selection, a good understanding of fracture biomechanics, good preoperative planning, accurate instrumentation, good image intensifier and exactly performed osteosynthesis.

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