Efficacy of proximal femoral nail in peritrochanteric femoral fractures of elderly patients

Harish Kumar*, Suresh Dhakar†, Manoj Sharma*, Mukul Jain‡, Hemlata Sharma*

*Assistant Professor, Department of Orthopaedics, Jhalawar Medical College, Jhalawar, Rajasthan, India.
†Senior Resident, Department of Orthopaedics, Jhalawar Medical College, Jhalawar, Rajasthan, India.
‡Assistant Professor, Department of Anatomy, Jhalawar Medical College, Jhalawar, Rajasthan, India.
§Assistant Professor, Department of Orthopaedics, Jhalawar Medical College, Jhalawar, Rajasthan, India.

Article Info

Keywords: Femur peritrochanteric proximal nail

ABSTRACT

BACKGROUND Peritrochanteric fractures of the femur most often occur in patients over 60 years of age. They are more common in women than in men, probably as a result of several factors. Women have wider pelvis with a tendency to coxa vera, are less active and develop osteoporosis earlier. Peritrochanteric fractures usually unite well if reduction and fixation are properly done. The aim of this study is to assess the efficacy of PFN in peritrochanteric fractures in patients above 60 years of age. Short operative time with less exposure and early weight bearing has made the PFN, popular within no time. Methods: patients above 60 years of age treated with proximal femoral nail for peritrochanteric femoral fractures, since June 2008 to March 2011 were included in this study, to evaluate the efficacy of proximal femoral nail. All patients were evaluated at regular follow ups clinically (by Kyle’s criteria), as well as radiologically for a period of minimum one year after surgery. Two patients who had unsatisfactory reduction and 2 patients lost to follow up were excluded from this study. Results: Sixty patients of peritrochanteric femoral fractures, treated with proximal femoral nail were followed up for 12 to 30 months (mean 15 months). Mean age was 72 years (range 60 to 100 years). Thirty seven were male & 23 were female patients. Twenty Seven patients were of 31 A1 type, 22 patients of 31 A2 type & 11 patients were of 31 A3 type of AO classification. Mean hospital stay time was 5 days (Range 3 to 9 Days). Mean union time was 12.9 weeks (range 10 to 18 weeks). Superficial infection in 3 cases, Z effect in 2 cases, breakage of screw in 1 case and non union in 2 cases out of 60 cases were noted. On clinical assessment with Kyle’s criteria, excellent results were found in 51.66%, good in 31.33 %, fair in 13.33 % and poor results in 3.33% cases. Conclusions: Proximal femoral nail provides good fixation of peritrochanteric fractures, thereby providing good results. Minimal exposure, short operative time, less blood loss during surgery, more biological and anatomical fixation and early return to preoperative status enhance the efficacy of treatment.

1. Introduction

Fractures of the proximal femur and hip are relatively common injuries in elderly. Several epidemiological studies, have suggested that the incidence of the fractures of proximal femur is increasing, which is not unexpected, because the general life expectancy of population has been increasing significantly.

Most proximal femoral fractures occur in elderly patients. Due to minimal or moderate trauma in young patients, they result from high energy trauma. High velocity injuries are more difficult to treat and are associated with more complications than low velocity trauma. Most peritrochanteric fractures occur in elderly patients above 70 years of age. Gold standard treatment of these fractures with dynamic hip screw (DHS) has been challenged now a days by proximal femoral nail (PFN), Sadowski C [1]. PFN designed by AO was first used in 1997. The goal of treatment should be rigid, stable internal fixation of peritrochanteric fractures with early mobilization and early return to preoperative functional state, so that potential complications are avoided, Pajarinen J et al [2], Efstathopoulos NE [3].

PFN is 24 cm long with proximal region diameter of 17 mm and distal region with 10, 11, 12 mm options, and 6 ° angles between proximal and distal parts. PFN is load bearing implant, whereas
DHS is load-sharing one. An additional antirotation hip pin to avoid rotation and collapse of the head neck segment and its special design to decrease stress concentration at tip distinguish PFN from other intramedullary hip screws, Simmermacher RK et al [4]. Schippar IB [5], PFN requires shorter operative time, fewer blood transfusions and shorter hospital stay as compared to those treated with DHS, Sadowski C [1].

2. Materials and Methods:

Sixty four patients with recent traumatic peritrochanteric femoral fractures in patients above 60 years of age, operated from June 2008 to March 2011 with PFN at SRG Hospital of Jhalawar Medical College were included in this prospective study. Bedridden, wheelchair bound and patients with previous implants with in fractured hip, were excluded from this study. Two patients with unsatisfactory reduction and 2 patients lost to follow up were also excluded from this study.

AO classification system, Muller ME [6], was adopted to classify the peritrochanteric fractures preoperatively. Group A1, simple two part fracture; group A2, fracture extends over two or more levels of medial cortex; group A3, fracture extends through lateral cortex of femur.

Proper clinical and radiological assessment was done. After thorough preanesthetic check up and fitness for spinal anesthesia, patients were posted for close reduction and internal fixation with PFN. Preoperative prophylactic antibiotic, first generation cephalosporin was given 12 hours prior to surgery and then regularly twice a day, for 72 hours after surgery. All patients were operated over standard fracture table under SA. Supine position with affected hip slightly up was used. Close reduction was done with manipulation by internal rotation of femur and traction. Affected limb was fixed in straight position with slight abduction to facilitate the insertion of nail. Opposite limb was positioned slightly flexed and fully abducted to accommodate the C – arm of IITV. Lateral incision was given over the tip of greater trochanter extending 4 to 5 cm proximally. Tip of trochanter reached via cutting the fascia and splitting the gluteus medius muscle. Entry hole prepared by awl and a beaded guide wire was passed through the entry hole crossing the fracture site, reaching the medullary canal of femur. Entry portal was reamed upto 17 mm for proximal portion of nail and canal wasreamed with gradually increasing sized reamers. Beaded guide wire was exchanged with unbeaded one. Appropriate size nail mounted on jig inserted over unbeaded guide wire. Nail was locked proximally with 8 mm cannulated Cancellous screw fixed in lower half of the neck in AP view and centrally on lateral view. A 6.5 mm antirotation pin was inserted proximal to 8 mm screw. By making the traction loose, both screws were tightened fully to achieve full compression at fracture site. Now distal locking was done with 4.9 mm cortical screw.

Static quadriceps exercises, active toe and ankle movements, knee bending exercises were encouraged as early as possible. Non weight bearing crutch mobilization started on next day of surgery. Weight bearing with crutches started after 2 weeks and normal activities were allowed gradually by completing 4 months after surgery. Postoperative reduction was evaluated by a criteria defined by Baumgaertner et al, which was modified by Fogagnolo et al. Baumgaertner MR [7], Fogagnolo F [8].

Table -1. Evaluation of reduction According to Baumgaether criteria modified by fogognolo et al.

<table>
<thead>
<tr>
<th>Criteria 1. Alignment</th>
<th>Criteria 2. Displacement</th>
<th>Assessment</th>
</tr>
</thead>
<tbody>
<tr>
<td>AP view normal cervico diaphyseal angle or slight valgus</td>
<td>More than 80% Overlapping in AP &amp; Lat. Planes less than 5 mm of Shortening.</td>
<td>Good</td>
</tr>
<tr>
<td>Excellent : Both Criteria met</td>
<td>Acceptable : Only one criteria met</td>
<td>Poor</td>
</tr>
<tr>
<td>Good : Only one criteria met</td>
<td>Poor : Neither criteria met</td>
<td></td>
</tr>
</tbody>
</table>

Table -2 - Outcome was assessed clinically by Kyle’s criteria. Zulfiqar et al (2010) *

<table>
<thead>
<tr>
<th>Excellent</th>
<th>Good</th>
<th>Fair</th>
<th>Poor</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. No or minimal limp</td>
<td>1. Mild limp</td>
<td>1. Moderate limp</td>
<td>1. Wheel Chair bound</td>
</tr>
</tbody>
</table>

3. Results

From June 2008 to November 2011, sixty four Patients above 60 years of age peritrochanteric fractures were operated with proximal femoral nail. In two patients reduction was unsatisfactory and two patients were lost to follow up. Remaining 60 patients were followed up regularly. Out of 60 patients 37 were male & 23 were females (M: F Ratio 1.6:1). Twenty four patients had right sided; where as 36 patients had left side involvement. Mean age was 72 years with minimum 60 and maximum 100 years. Nine out of 60 met road side accident trauma where as remaining 51 had domestic trauma.

According to AO classification 27 patients has 31 A1 type, 22 patients had 31 A2 type and 11 patients had 31 A3 type fractures. Mean time to surgery was 5 days (Range 3 to 9 days). Postoperative reduction was good 50 cases (83.33%) and acceptable in 10 cases (16.66%). Mean hospital stay was 9 days (range 7 to 12 days). First follow up was done after two weeks for stitch removal. Then regular follow ups were done at 1, 2, 3, 6, 12, 24 and 30 months for clinical and radiological assessments. Mean follow up period was 15 months (range 12 to 30 months).

Satisfactory union was confirmed by radiological evaluation, was found in 58 out of 60 patients (96.66%) and nonunion in 2
minimum as 10 weeks and maximum 18 weeks. Clinical outcome was assessed by Kyle’s criteria. Excellent results were found in 31 cases (51.66%). Good in 19 patients (31.66%), fair in 8 cases (13.33%) and poor results in 2 cases (3.33%).

### Table: 3 - Clinical outcome of Patients

<table>
<thead>
<tr>
<th>Variables</th>
<th>Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age</td>
<td>Mean 72 years (Range 60 to 100 years)</td>
</tr>
<tr>
<td>Gender M/F</td>
<td>M=37, F=23</td>
</tr>
<tr>
<td>Side involved</td>
<td>Right= 24, Left= 36</td>
</tr>
<tr>
<td>Mechanism of injury</td>
<td>Domestic trauma = 51, RTA = 9</td>
</tr>
<tr>
<td>AO fracture classification</td>
<td>A1=27, A2= 22, A3= 11</td>
</tr>
<tr>
<td>Follow up</td>
<td>Mean= 15 months (Range 12 to 30 months)</td>
</tr>
<tr>
<td>Postoperative reduction</td>
<td>Good = 50, Acceptable= 10</td>
</tr>
<tr>
<td>Bone healing period</td>
<td>Mean= 12.9 weeks (Range 10 to 18 weeks)</td>
</tr>
<tr>
<td>Clinical outcome</td>
<td>Excellent= 31, Good= 19, Fair=8, Poor=2</td>
</tr>
<tr>
<td>Complications</td>
<td>Superficial infection = 3</td>
</tr>
<tr>
<td></td>
<td>Z-effect = 2</td>
</tr>
<tr>
<td></td>
<td>Non union = 2</td>
</tr>
<tr>
<td></td>
<td>Breakage of screw = 1</td>
</tr>
</tbody>
</table>

1912

Harish Kumar Jain / Int J Biol Med Res. 3(3): 1910-1913

**Figure: 2** Follow up radiograph at 8 weeks and 6 months

Superficial infection was found in 3 cases (5%) which was treated successfully by oral antibiotics, nonunion in 2 cases (3.33%), Z effect (proximal screw migration towards hip joint) in 2 cases (3.33%) and breakage of anterotation screw in 1 case (1.66%) in which removal of implant was required.

**4. Discussion**

Peritrochanteric fractures particularly occur in elderly patients having osteoporotic bones due to low energy injuries. As these patients usually have additional systemic diseases, Long hospital stay may cause complications such as DVT, Pulmonary embolism, pneumonia, uremia, UTI and pressure sores which have a negative effect on prognosis and increases death rate. Therefore primary goal of treatment should be to achieve a stable fixation for early mobilization and to restore to the prefracture functional state in the shortest possible time. Pajarienen J [2], Baumgaertner MR [7], Madsen JE [10].

A long debate has been ongoing concerning the preferred implant for stabilization of peritrochanteric fractures. For operative treatment of this kind of fracture, 2 options exist: extramedullary or intramedullary stabilization. Because of biomechanical advantage and minimal invasion, Intramedullary devices such as Gamma nail, proximal femoral nail, proximal femoral nail antirotation are preferred in elderly patients. Pelet S et al [11], Adams CI et al [12], Liu Y et al [13].

In our prospective study M : F ratio was 1.6:1 and mean age was 72 years. This is somewhat lower than the mean age 81.5 years noted by Nuber S Schonweiss et al (2005) and Pavelka et al.

Domestic fall was the major cause of injury in our study. Average duration between injury and surgery was 5 days (Minimum 3 days to maximum 9 days). Main causes of delay in operation were (1) late reporting of patient to the hospital due to rural background and lack of transport facilities and (2) associated diseases. L J doming et al reported average time between injury and surgery was 4.5 days L J doming et al [14]. Post operative reduction was good in 50 cases (83.33%) and acceptable in 10 cases (16.66%). Metin et al in 2009 reported the same results. Metin et al [15].
Satisfactory clinical outcome (sum of excellent & good results as per Kyle’s criteria) was in 50 patients (83%). Almost similar results were reported by Zulfiqar et al in [9] D Raj et al in 2005 reported satisfactory results in 92 % cases. D Raj et al [16]. Superficial infection was most common complication in our series (5% cases). R. Goel et al in 2011 reported similar result. R Goel et al [17].

5. Conclusion

Proximal femoral nail proved to be a satisfactory implant for the management of peritrochanteric fractures in elderly patients. Considering the general condition, age, severity of osteoporosis and associated diseases in elderly patients, PFN is better choice as it requires less exposure for surgery, operative time, intraoperative blood loss as well as less hospital stay. PFN is more biological, anaesthetic friendly and can be done in elderly patients of peritrochanteric fractures with co morbidity.

Acknowledgments

I am grateful to Dr. Ashvini Mathur, Asso. Prof. of Orthopaedics for his kind guidance during this research work. I am also thankful to Dr. P.K. Gupta, Dean Jhalawar medical college, Jhalawar for his kind inspiration and present research work.

I want to pay thanks to Dr. Sushma pandey, Superintendent, Dr. P Jhanwar, Assistant Professor, (Orthopedics) Dr. Rakesh Bhargava, Ex. Professor & Head, Dept. of Ortho, S.M.S. Medical College, Jaipur, (Raj), who has given me good cooperation at each and every point during this study.

I want to pay thanks to Dr. Sushma pandey, Superintendent, Dr. P Jhanwar, Assistant Professor, (Orthopedics) Dr. Rakesh Bhargava, Ex. Professor & Head, Dept. of Ortho, S.M.S. Medical College, Jaipur, (Raj), who has given me good cooperation at each and every point during this study.

Abbreviations

DHS Dynamic Hip Screw
PFN Proximal Femoral Nail
AO Arbeitsgemeinschaft fur Osteosynthesfragen.
ITV Image intensifier television
AP Anteroposterior
ROM Range of motion
DVT Deep vein thrombosis
UTI Urinary tract infections
RTA Road traffic accident

6. References