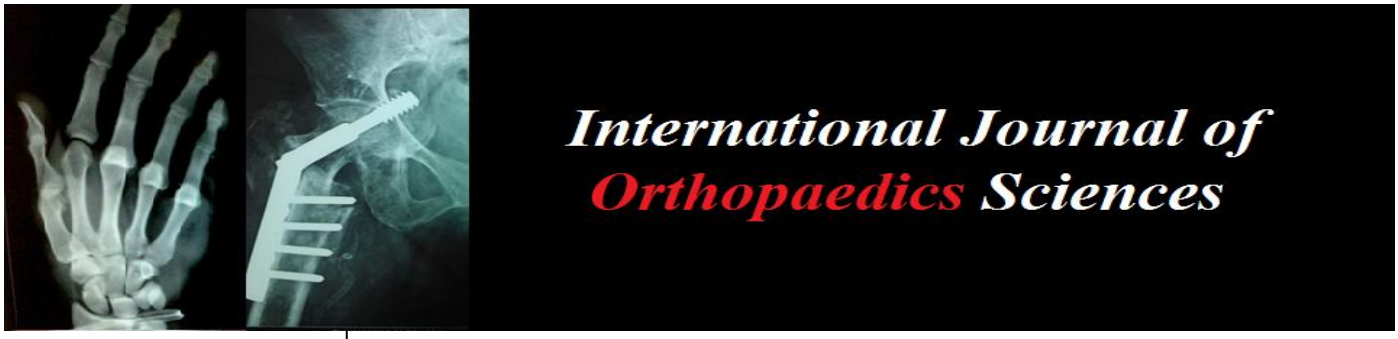

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A study of surgical management of peritrochanteric fracture of femur with proximal femoral nail

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Abstract
Peritrochanteric fractures are devastating injuries that most commonly affect the elderly population and also the young. Peritrochanteric fracture is a leading cause of hospital admissions in elderly people. The number of such admissions is on a raise because of increasing life span and sedentary habits. Conservative methods of treatment results in malunion with shortening and limitation of hip movement as well as complications of prolonged immobilization. This study was done to analyze the surgical management of Peritrochanteric fractures using Proximal Femoral Nail.
This is a retrospective study of 20 cases of trochanteric and subtrochanteric fractures admitted to R.L. Jalappa Hospital and Research Centre, S.D.U, M.C, Kolar, between July 2009 to October 2011. Patients with Peritrochanteric fracture above the age of 18yrs were included while pathological fractures and patients with associated co-morbidities posing a risk for surgery were excluded from the study. In our series of 20 cases, excellent results were seen in 50% cases, good in 33.3% cases, fair in 16.7% in trochanteric fractures. In subtrochanteric fractures, excellent results were seen in 64.3%, good in 21.4% cases and fair in 14.3%. From this sample study, we consider that PFN is an excellent implant for the treatment of Peritrochanteric fractures. The terms of successful outcome include a good understanding of fracture biomechanics, proper patient selection, good preoperative planning, accurate instrumentation, good image intensifier.

Keywords: PFN, Peritrochanteric, subtrochanteric, trochanteric

1. Introduction
Peritrochanteric fractures are devastating injuries that most commonly affect the elderly and also in young, have a tremendous impact on both the health care system and society in general. Peritrochanteric fractures mainly comprise of fractures of trochanter and subtrochanteric region. Despite marked improvements in implant design, surgical technique and patient care, peritrochanteric fractures continues to consume a substantial proportion of our health care resources.
Trochanteric fractures are common in the elderly people. The frequency of these fractures has increased primarily due to the increasing life span and more sedentary life style brought on by urbanization. Trochanteric fractures occur in the younger population due to high velocity trauma, whereas in the elderly population it is most often due to trivial trauma.
The incidence of trochanteric fractures is more in the female population compared to the male due to osteoporosis. In a Swedish study of more than 20,000 patients, the incidence of hip fractures in women doubled every 5.6 years after the age of 30 years. The trochanteric fractures can be managed by conservative methods and there is usually union of the fracture. If suitable precautions are not taken the fracture undergoes malunion, leading to varus and external rotation deformity at the fracture site and shortening and limitation of hip movements. It is also associated with complications of prolonged immobilization like bedsores, deep vein thrombosis and respiratory infections. Since this fracture is more common in the elderly patients, the aim of treatment should be prevention of malunion, and early mobilization. Taking all the factors into consideration surgery by internal fixation of the fracture is ideal choice.

There are various forms of internal fixation devices used for Trochanteric fractures; of them the most commonly used device is the Dynamic Hip Screw with Side Plate assemblies. This is a collapsible fixation device, which permits the proximal fragment to collapse or settle on the fixation device, seeking its own position of stability. The latest implant for management of trochanteric fractures is proximal femoral nail, which is also a collapsible device with added rotational stability. This implant is a centro-medullary device and biomechanically more sound.

It also has other advantages like small incision, minimal blood loss. Pertrochanteric and subtrochanteric fractures of femur posses clinical, structural, anatomical and biomechanical characteristics that distinguish them from intra-capsular fractures. Subtrochanteric fractures comprise about 10 to 34% of hip fractures [1].

Subtrochanteric fractures are complicated by malunion and delayed or nonunion. The factors responsible for these complications in subtrochanteric fractures are high stress concentration, predominance of cortical bone and difficulties in getting biomechanically sound reduction because of comminution and intense concentration of deforming forces [2].

The present choice of treatment of subtrochanteric fractures is open reduction and internal fixation. Many internal fixation devices have been recommended for use in subtrochanteric fractures, because of high incidence of complications reported after surgical treatment with each implant. A lack for satisfactory implant in surgical treatment of subtrochanteric fractures has led to series of evolution in design of a perfect implant. Subtrochanteric femoral fractures are associated with high rates of non-union and implant failure, regardless of the method of fixation. Only recently has a better understanding of biology, reduction techniques and biomechanically improved implants allowed for subtrochanteric fractures to be addressed with consistent success.

In spite of the advances in anesthesia, nursing care and the surgical techniques, hip fractures remain a significant cause of morbidity and mortality in the elderly population. In view of these considerations, the present study of Surgical Management of Peritrochanteric Fractures is taken up.

2. Materials and methods

The present study consists of 20 adult patients of peritrochanteric factures of femur satisfying the inclusion criteria, who are treated with Proximal Femoral nail in R. L. Jalappa Hospital and Research Centre, attached to Sri Devaraj Urs Medical College, Tamaka, Kolar. The study is carried out from July 2009 to October 2011.

2.1 Criteria for selection of patients

2.1.1 Inclusion criteria

1. Patients with age more than 18 years.
2. Post traumatic peritrochanteric fractures of femur (intertrochanteric and subtrochanteric).

2.1.2 Exclusion criteria

1. Pathological fractures.
2. Patients with associated co-morbidities posing a risk for surgery.

2.2 Data collection

After the patient with subtrochanteric or trochanteric fracture was admitted to hospital all the necessary clinical details were recorded in proforma prepared for this study. After the completion of the hospital treatment patients were discharged and called for follow up at outpatient level at regular intervals for serial clinical and radiological evaluation.

The patients were followed up till fracture union and function recovery after surgery at regular interval and if necessary subsequent follow up was done.

2.3 Operative Techniоue: Standard operative procedure was followed.

Post-operatively, antibiotics were continued in the post operative period. Analgesics were given as per patients compliance. Blood transfusion was given depending on the requirement. Sutures were removed on 10th postoperative day.

Patients were encouraged to sit in the bed after 24 hours after surgery. Patients were taught quadriceps setting exercises and knee mobilization in the immediate postoperative period. Patient was taught gait training before discharge from the hospital.

Only in very unstable fracture patterns weight bearing was not advised. Rest of the patients were encouraged to weight bear partially with axillary cruthes or walker depending on the pain tolerability of individual patient.

2.3.1 Discharge

Patients were discharged from the hospital when independent walking was possible with or without walking aids.

2.3.2 Follow up

All patients were followed up at an interval of 6 weeks till the fracture union isnoted and then after once in 3 months till 1 year.

At every visit patient was assessed clinically regarding hip and knee function, walking ability, fracture union, deformity and shortening.

Modified Harris Hip scoring system was used for evaluation. X-ray of the involved hip with femur was done to assess fracture union and implant bone interaction.

3. Results

The following observations were made from the data collected during this study of proximal femoral nail in the treatment of 20 cases of Peritrochanteric fractures of proximal femur in the Department of Orthopaedic Surgery, R.L. Jalappa Hospital and research centre attached to Sri Devaraj Urs Medical College, Tamaka, Kolar between July 2009 to October 2011.

1. Age Distribution

In our series, majority of the cases i.e.12 (60%) were in the age group of 20-50 years. The youngest patient was 23years old and eldest patient was 90 years. The mean age was 50.3 years.

2. Sex Distribution

In the present series, males were more commonly involved. Majority of the patients were males – 15 cases (75.0%) and 5 cases (25.0%) were females.

3. Nature of violence

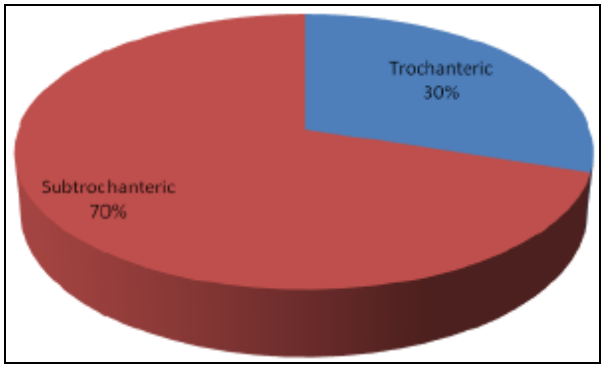
5 cases (25%) affected were due to Slip and Fall, 14 cases (70%) due to RTA, and 1 case (5%) due to Fall from height. RTA was the most common mode of injury.

4. Side Affected

Right side was involved in 12(60%) cases and left in 8 (40%), right side was more commonly involved than left side.

5. Type of fracture

In our study 6 cases were Trochanteric and 14 cases were subtrochanteric fractures.



Graph 1: Type of fracture

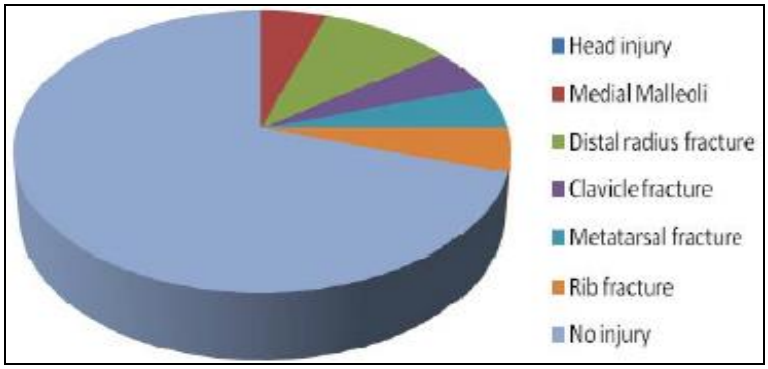
6. Boyd and Griffin classification

In the present study, majority of the cases i.e. 5 (25%) had type 2, followed by 1(5%) case had type 3 Boyd and Griffin type.

7. Seinsheimer Classification

Table 1: Subtrochanteric fractures are classified according to Seinsheimer Classification

Type of fracture	Number of cases	Percentage
Type I	1	5
Type IIa	3	15
Type IIb	4	20
Type III A	3	15
Type IV	2	10

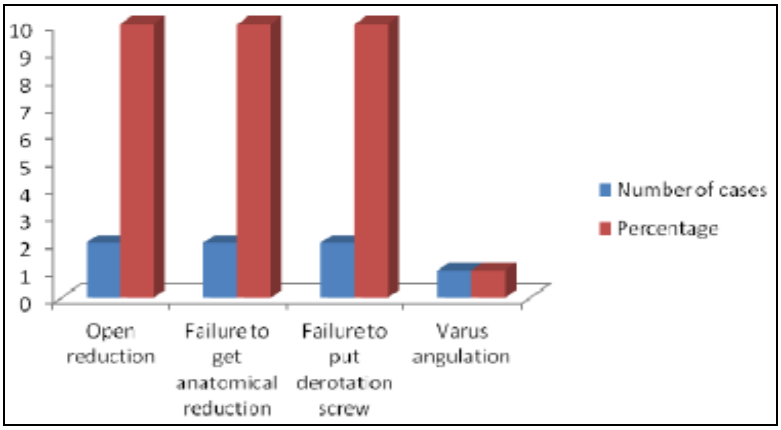


Graph 2: Associated injuries

3.1 Intraoperative complications

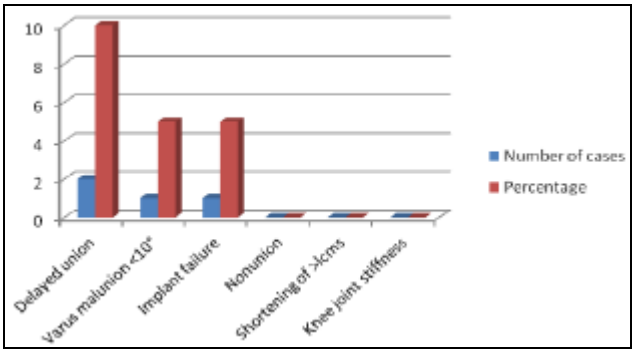
In our study, we encountered certain complications intraoperatively. Most of these complications occurred in the first few cases.

- In two of our patients we had to do open reduction due to comminuted fracture.
- In two cases we failed to achieve anatomical reduction due to posteromedial fragment.
- In two patients we failed to put derotation screw due to zig mismatch.
- We had one case of fixation of fracture in varus angulation.



Graph 3: Intra operative complications

3.2 Delayed Complications



Graph 4: Delayed Complications

In our study the average duration of hospital stay was 20.67 days. The mean time for full weight bearing was 16.3 weeks.
All patients enjoyed good range of hip and knee range of motion. Post operative mobility was aided in immediate post operative period but later allpatients were ambulatory independently with or without walking aid after 6 weeks.

3.3 Follow up
All patients were followed at 6 weeks, 12 weeks, 6 months and some patients up to one year and further if necessary.
At each follow up radiograph of operated hip with upper half femur was taken and assessed for fracture union and implant failure and screw cut out.

3.4 Anatomical Results
Anatomical results were assessed by presence or absence of deformities, shortening, hip and knee range of motions. In our study, one patient had varus malunion<10 degrees.

3.5 Functional Results
In our series of 20 operated cases, 1 case was lost for follow up. Functional and anatomical results are assessed taking into consideration using Harris Hip Scoring System.

Table 2: Functional results of Peritrochanteric fractures

Functional results	Number of cases	Percentage
Excellent	12	60
Good	5	25
Fair	3	15
Total	20	100

In our study, mean time of full weight bearing is 16.3wks. Excellent results were seen in 50% cases, good in 33.3% cases, fair in 16.7% introchanteric fractures. In subtrochanteric fractures excellent results were seen in64.3%, good in 21.4% cases and fair were seen in 14.3%. We had no case with poor results.

4. Discussion
The treatment of pertrochanteric fractures of the proximal femur is still associated with some failures. The reasons are: disregard for biomechanics, overestimation of the potentials of new surgical techniques or new implants or poor adherence to established procedures. High stress concentration that is subject to multiple deforming forces, slow healing time because of predominance of cortical bone, decreased vascularity, high incidence of complications reported after surgical treatment compels the surgeon to give a second thought regarding selection of the proper implant.

The most common current modes of fixation are Blade plate systems, Sliding screw systems and Intramedullary devices. From the mechanical point of view, a combined intramedullary device inserted by means of minimally invasive procedure seems to be better in elderly patients. Closed reduction preserves the fracture haematoma, an essential element in the consolidation process. Intramedullary fixation allows the surgeon to minimize soft tissue dissection there by reducing surgical trauma, blood loss, infection, and wound complications.
PFN is a novel, modern intramedullary implant based on experience with the gamma nail. The currently used gamma nail as an intramedullary device also has a high learning curve with technical and mechanical failure rates of about 10%.Thegamma nail is susceptible to fail at its weakest point, the lag screw-implant interface.
The Arbeitsgemeinschaft furosteosynthesefragen (AO ASIF) in 1996, therefore developed the proximal femoral nail with an antirotational hip pin together with a smaller distal shaft diameter which reduces stress concentration to avoid these failures. Proximal femoral nail has all advantages of an intramedullary device, such as decreasing the moment arm, can be inserted by closed technique, which retains the fracture haematoma an important consideration in fracture healing, decrease blood loss, infection, minimizes soft tissue dissection and wound complications.
In an experimental study, Gotze *et al*. (1998) [19] compared the loadability of osteosynthesis of unstable per and subtrochanteric fractures and found that the PFN could bear the highest loads of all devices.

4.1 Comparison of Results
Simmermacher *et al* (1999) [18], in a clinical multicentric study, reported technical failures of PFN after poor reduction, malrotation or wrong choice of screws in 5% of cases. A cut out of the neck screw occurred in 0.6% cases but we did not encounter such complication in our study. Anatomical fracture reduction was found in 86% of the patients. In our study acceptable anatomical reduction was obtained in 90.0% cases but we did open reduction for two fractures.
W. M. Gadegone & Y. S. Salphale, In 2007 [34], reported a study on Proximal femoral nail - an analysis of 100 cases of proximal femoral fractures with an average follow up of 1 year. Postoperative radiographs showed a near-anatomical fracture reduction in 88% of patients. The fracture consolidated in 4.5 months. Our study showed similar results. We had 90% near normal anatomical reduction. One case of implant failure (breakage of screw) was observed.
Metin Uzun *et al*, in 2009 [36], In a study of 35 patients reported secondary varus displacement in nine patients (25.7%). Secondary varus displacement was due to cut-out of the proximal screws (n=2), screw loosening due to collapse of the fracture site (n=2), and reverse Z-effect (n=5). In our study we had 1 case of varus malunion.
Over all 85% (Harris Hip Score) of our cases had excellent to good results and fair in 15%. We had no case with poor results. Our results are comparable with other studies.

5. Conclusion
From this sample study, we consider that PFN is an excellent implant for the treatment of Peritrochanteric fractures. The terms of successful outcome include a good understanding of fracture biomechanics, proper patient selection, good preoperative planning, accurate instrumentation, good image intensifier.

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