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Functional outcome of proximal femoral nailing in intertrochanteric fractures: A prospective study

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Abstract
Background: The study was conducted to assess clinical and functional outcome of Proximal Femoral nailing in intertrochanteric fractures and to determine the rate of union, complications, operative risks and co morbidities associated with intertrochanteric fractures.
Intertrochanteric fractures form around half of the total hip fractures in the elderly and pose a number of management dilemmas depending on the fracture configuration and status of the bones. There are numerous implants available for the internal fixation of these fractures ranging from dynamic hip screw which can be combined with trochanteric stabilisation plate; locking plates; intramedullary implants such as proximal femoral nail (PFN), trochanteric femoral nail (TFN) and Gamma nail.
Materials and Methods: The fractures were classified according to BOYD and GRIFFIN classification system. 40 patients of intertrochanteric fractures fulfilling the inclusion and exclusion criteria, were managed surgically using Proximal Femoral Nail. The results were analyzed according to age, type of fracture, operative details and functional outcome using KYLE's criteria.
Results: Totally 40 patients with intertrochanteric fractures were operated with PFN and were included in the study. The mean age of the patients was around 68 years with minimum age being 52 years and the maximum being 88 years. The mean duration of operation was recorded to be 54.59 min. Complications in this study were seen in 3 patients (8%). Complication was surgical site infection 2 patients (5%), greater trochanteric fracture 1 patient (2.5%).
Conclusion: The proximal femoral nail acts as a buttress to prevent medialisation of the shaft & provides more effective load transfer. It has a chance of failure in the comminuted and severely osteoporotic fractures. It is superior implant for both stable & unstable fractures. It also has advantages of having decreased blood loss, decreased operating time, decreased complication rates.

Keywords: Proximal femoral nailing, intertrochanteric fractures, clinical and functional outcome

Introduction
Intertrochanteric fractures are a major cause of morbidity and mortality in the world in view of huge population, high road traffic accident rate and increasing age of population [1]. These fractures can occur in two different age groups one being the old osteoporotic fractures and the other high velocity injuries in young. Due to high complication and mortality rates associated with conservative management [3], these fractures are now managed surgically to achieve a stable fixation which allows early mobilization of patients, thus avoiding complications of prolonged immobilization.
While both extramedullary and intramedullary implants can be used to treat these fractures, intramedullary implants allow more biological fixation and are load sharing devices. Extramedullary devices are always under stress because of bending strain which is not good for fracture whereas intramedullary devices are under axial strain which cause compression and thus helpful for fracture union [4].
Proximal femoral nail demands technical expertise but is used widely for treating unstable intertrochanteric fractures because of its advantages of being inserted through small exposure, preservation of hematoma and less blood loss.
The study was conducted to assess clinical and functional outcome of Proximal Femoral nailing in intertrochanteric fractures and to determine the rate of union, complications, operative risks and co morbidities associated with intertrochanteric fractures.

Materials and methods

Type of study

A prospective study.

Inclusion Criteria

Patients with age equal to or more than 50 years and patients with type II, III and IV Boyd and Griffin classification were included in the study.

Exclusion Criteria

Patients with age less than 50 years, patients with type I Boyd and Griffin classification and patients who are unfit and not willing for surgery were excluded from the study.

A total of 40 patients with intertrochanteric fractures operated with proximal femoral nail were followed up at the immediate post op period and at the end of 1st, 2nd, 3rd, and 6 months and evaluated for functional outcome using Kyle's criteria.

Proximal femoral nail(PFN)of basic design invented by AO having 8 mm lag screw, 6.4 mm derotation neck screw, 4.9 mm distal interlocking bolts were used. Intraoperative data (type of reduction, closed reduction, duration of surgery and intra-operative complication) were recorded.

All patients were initiated with active and passive exercises within 48 hours of surgery. All the patients were advised to completely bear weight after 4-8weeks of post operative period.

Results

Table 1: Age distribution

Age in years	Total number of patients	Percentage
51-60	6	15%
61-70	24	60%
>70	10	25%

Table 2: Distribution of cases according to sex

Sex	Total number of patients
Male	40%(16)
Female	60%(24)
Total	40

The most common mode of injury was self fall (n=22, 55.00%), followed by road traffic accident (n=13, 32.5%) and the least was fall at work place (n=5, 12.5%).

Table 3: Type of fracture

Boyd and Griffin classification	Total number of fracture	Percentage
Two Part	18	60%
Three Part	6	20%
Four Part	6	20%

The mean duration of operation was recorded to be 54.59 min, which included the time from incision to suturing back the skin. We noted that the experience of the surgeon with the instrumentation, played a single major role in the reduction of the duration of the surgery.

The mean radiological union of unstable intertrochanteric fractures were 13.98 ± 4.09 weeks.

Table 4: Functional outcome using Kyles criteria

Kyles criteria	Number of patients	Percentage
Excellent	28	70%
Good	8	20%
Fair	2	5%
Poor	2	5%

Table 5: Complications

Complication	Number of patients	Percentage
Surgical site infection	2	5%
Greater trochanteric farcture	1	2.5%

Discussion

Intertrochanteric fractures are very common in elderly patients, and the outcome may be extremely poor if there is prolonged immobilization. The aim of treating these fractures is to achieve stable surgical fixation, promote faster healing, early mobilization, & restore pre-fracture functional status in the

shortest possible time. Surgical fixation of unstable fractures of the proximal femur is often technically demanding and poor surgical technique may lead to failure of primary fixation [5].

Common causes of fixation failure include fracture instability, osteoporosis, lack of anatomic reduction, implant failure, and incorrect placement of the lag screw in the femoral head leading to cutting out of the screw [6]. Intramedullary implants inserted in a less-invasive manner are better tolerated by the elderly. PFN has all the advantages like decreasing the moment arm, it can be performed by closed technique, preserving the fracture haematoma which is an important consideration in fracture healing. It also decreases blood loss, infection risk, minimizes soft tissue dissection and wound related complications [7].

PFN reduced the distance between the hip joint and the implant, which diminishes the bending moment across the implant fracture construct. Thus, more stability is provided. Early mobilization after surgery could reduce complications such as pneumonia, thromboembolic complications and pressure sores [8]. Due to its position close to the weight-bearing axis, the stress generated on the intramedullary implants is negligible. The PFN implant also acts as a buttress in preventing the mediatization of the shaft. The entry portal of the PFN through the trochanter limits the surgical insult to the tendinous hip abductor musculature, only unlike those nails which require entry through the pyriformis fossa [9].

Domingo *et al*. [10] conducted a study on 295 patients for intertrochanteric fracture fixation with PFN and obtained overall results were comparable with those of other fracture systems, authors tell that technically surgery is not complex and numbers of recoded complications were acceptable. [11] Uzun M *et al*. evaluated radiographic complications occurring after treatment of unstable intertrochanteric hip fractures with the Proximal Femoral Nail (PFN) and their effect on functional results on 35 patients. The Harris hip score results were excellent in 11 patients (31.4%), good in 15 patients (42.9%), and fair in seven patients (20%). The functional outcome after intramedullary PFN were also studied by Sachin S *et al*. and Asad K *et al*. The modified harris hip score was excellent in 24.4% and 28.6% respectively [12, 13]. Good score was seen in 42.2% and 45.1% respectively along with a poor score seen in13.3% and 9.9% of the patients respectively. The kyles criteria in the present study was comparable to above mentioned studies.

The average age incidence in our study was 68.8 years, which was comparable to study by Wasudeo M *et al*. of 67 years [14].

In studies conducted by R C Gupta [15] right sided fractures were more common, where as in studies made by Kenzora *et al*. [16] and Cleveland *et al*. [17] left sided fractures were more common.

In our study, 70% in TFN group had excellent outcome, 20% had good outcome, according to KYLE's criteria, which is comparable to Wasudeo *et al*.

Complications like Z effect, reverse Z effect, cut-out or breakage of antirorational screw has been reported by Himanshu *et al*. [18] We did not encounter any case of screw cut-out or 'Z' effect which compares well in studies of Kumar M *et al*. [19]

The limitation of this study was the lack of a control group, less sample size, shorter followup period.

Conclusion

There are various factors which decide the success of the treatment of intertrochanteric fractures like bone quality, patient age, general health, interval from fracture to treatment, treatment adequacy, comorbidities, fracture reduction and fixation stability. The proximal femoral nail acts as a buttress to prevent medialisation of the shaft & provides more effective load transfer. It has a chance of failure in the comminuted and severely osteoporotic fractures. It is superior implant for both stable & unstable fractures. It also has advantages of having decreased blood loss, decreased operating time, decreased complication rates.

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