

## An Outcome Assessment of Intertrochanteric Femur Fractures Treated with A Proximal Femoral Locking Compression Plate

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Received: 10-07-2021 / Revised: 15-08-2021 / Accepted: 28-09-2021

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Conflict of interest: Nil

### Abstract

**Aim:** Evaluation of functional outcome of intertrochanteric femur fractures treated with proximal femoral locking compression plate. **Methods:** A prospective study was conducted in the Department of Orthopaedics, NMCH, Patna, Bihar, India for the period of 1 year. A total of 50 patients with intertrochanteric femur fractures were studied. All the patients who were brought to casualty and outpatient department with intertrochanteric fractures were selected for the study. Adults with intertrochanteric fractures, patients willing to give consent to participate in the study, patients with isolated intertrochanteric fractures confirmed on radiographs, patients with fractures less than two weeks old and patients who were medically fit for surgery were included in the study. **Results:** Mean age in years was  $60.12 \pm 20.22$  years. The fractures were classified according to AO-OTA classification and most of the cases in our study belonged to 31A2-2 (24%) followed by 31A2-1 (18%). The mean duration of surgery was found to be  $88.36 \pm 20.39$  minutes. The average blood loss was  $212.5 \pm 21.51$  ml of blood. The average period of hospitalization was found to be  $11.02 \pm 2.14$  days in our study. Majority of the patients had no complications (82%). Complications seen were superficial infection (4%), varus collapse (6%), and screw cut-out (4%) and non-union (4%). The evaluation was done using the Harris hip score and 72% of patients had excellent outcomes, 16% patients had good outcome, 8% of patients had a fair outcome and only 4% of patients had a poor outcome. The mean Harris hip score at 1 month was  $70.38 \pm 5.30$ , at 3 months was  $78.69 \pm 6.55$  and at 9 months was  $88.6 \pm 6.96$ . The average time required for fracture union in our study was 15.76 weeks. **Conclusion:** Intertrochanteric femur fractures are one of the most common fractures seen by orthopaedic surgeons worldwide. Intertrochanteric femur fractures may be treated with DHS or intramedullary implants; however, they have several problems.

**Keywords:** Intertrochanteric, Femur Fractures, Locking Compression Plate.

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### Introduction

Intertrochanteric femur fracture is one of the most common fractures of the hip especially in the elderly with osteoporotic

bones, usually due to trivial trauma. Age of patient, osteoporosis, general health, associated co-morbidities are some of the key factors to be considered for the

successful treatment of these fractures[1,2]. Various types of implants are available for fixation. The ideal internal fixation device should be such that the patient can be mobilized at the earliest without jeopardizing the reduction, stability and union of the fracture. Recently intramedullary fixation devices have become increasingly popular because of its biomechanical advantage. The proximal femoral nail (PFN) is one of such implants which was developed by the AO/ASIF in 1996.<sup>3</sup> The main principle of this type of fixation is based on a sliding screw in the femoral neck-head fragment, attached to an intramedullary nail and this acts as a load sharing device unlike DHS which is load bearing device. Hence PFN i.e., intramedullary fixation device is biomechanically stronger implant.

Despite being technically demanding surgical procedure these implants are gaining wide acceptance in treating unstable intertrochanteric fractures because of its advantages of being inserted through small exposure, preservation of hematoma and less blood loss[4-7].

### Materials and Methods

A prospective study was conducted in the Department of Orthopaedics, NMCH, Patna, Bihar, India for the period of 1 year, after taking the approval of the protocol review committee and institutional ethics committee.

### Methodology

A total of 50 patients with intertrochanteric femur fractures were studied. All the patients who were brought to casualty and outpatient department with intertrochanteric fractures were selected for the study. Adults with intertrochanteric fractures, patients willing to give consent to participate in the study, patients with isolated intertrochanteric fractures confirmed on radiographs, patients with fractures less than two weeks old and patients who were medically fit for surgery were included in the study. Patients with

pathological fractures, patients with compound fractures, pediatric age group patients, patients with old, neglected fractures, patients medically unfit for surgery and patients not willing for surgical intervention were excluded from the study.

The procedure was carried out under spinal or epidural anesthesia (with occasional general anesthesia as per indication). Patients were positioned supine on fracture table and were appropriately painted and draped. Reduction was achieved, maintained and confirmed under image intensifier paying special attention to medial and posterior cortex.

### Surgical procedure

A 15 cm vertical incision was taken from tip of trochanter along the shaft of femur. Fascia lata was split in line with the incision and gluteus medius along with vastus lateralis were opened in line with the fibers. The fixed-angle guide wires were threaded to the proximal three holes of the plate and the plate was approximated to the proximal femur. First guide wire was inserted through the most proximal 95-degree hole, second through the 120-degree hole and third through the 133-degree hole making sure that the guide wires were in the center of the femoral head in anteroposterior and lateral views under the image intensifier. The screw lengths were measured using an indirect device over the guide wires and appropriately sized fully threaded screws (7.3 mm for proximal three screws and 3.5 mm for a small hole between second and third screws) were inserted. Distal screw fixation was then done. After completion of procedure, a thorough wash was given with normal saline and antiseptic solution. Wound was closed in layers over a suction drain and an adequate sterile dressing was done. Drain was removed after 48 hours. Alternate followed by complete suture removal was done on day 14. The patients were followed up according to the protocol and relevant data was collected at six weeks, three months, six months and nine months after operation with clinical and

radiographic assessment for the progress of fracture healing and other complications. The functional outcome was assessed by Harris hip score[7,8].

### Statistical software

The statistical software SPSS version 22.0 was used for the analysis of data. Microsoft word and excel were used for generation of tables, graphs. The data was represented as percentages and mean with standard deviation.

### Results

There was a male preponderance in the study. Male were 78% while females were 22% of the study population. Mean age in years was  $60.12 \pm 20.22$  years. There was a bimodal age distribution among young adults and older age group. Most of the cases belonged to the age group of more than 65 years. Right side was more commonly affected than left side.

**Table 1: Results.**

Parameters	Range	Mean $\pm$ SD
Age (in years)	30-88	60.12 $\pm$ 20.22
Duration of surgery (in minutes)	58-133	88.36 $\pm$ 20.39
Blood loss (in ml)	175-255	212.5 $\pm$ 21.51
Hospital stays (in days)	8-15	11.02 $\pm$ 2.14
Harris hip score (in months)		
1	51-77	70.38 $\pm$ 5.30
3	57-89	78.69 $\pm$ 6.55
9	63-97	88.6 $\pm$ 6.96
Union time (in weeks)	10-25	15.76 $\pm$ 3.87

In young adults the most common mode of injury was high velocity trauma and in old age it was due to domestic fall. The fractures were classified according to AO-OTA classification and most of the cases in our study belonged to 31A2-2 (24%) followed by 31A2-1 (18%). The mean duration of surgery was found to be  $88.36 \pm 20.39$  minutes. The average blood loss was  $212.5 \pm 21.51$  ml of blood. The average period of hospitalization was found to be  $11.02 \pm 2.14$  days in our study. Majority of the patients had no complications (82%). Complications seen were superficial infection (4%), varus collapse (6%), screw cut-out (4%) and non-union (4%). The evaluation was done using the Harris hip score and 72% of patients had excellent outcomes, 16% patients had good outcome, 8% of patients had a fair outcome and only 4% of patients had a poor outcome. The mean Harris hip score at 1

month was  $70.38 \pm 5.30$ , at 3 months was  $78.69 \pm 6.55$  and at 9 months was  $88.6 \pm 6.96$ . The average time required for fracture union in our study was 15.76 weeks.

### Discussion

Fractures of the upper end femur made up for more than half of hip fractures in old age[9]. A simple fall can result in such fractures in 6th-7th decade. We saw a bimodal distribution; in younger individuals it was due to road traffic accidents and in elderly it was due to simple fall and associated osteoporosis[10].

Conservative management had a very limited role in the management of intertrochanteric fractures in the modern age due to associated problems of conservative management like bedsores, DVT, hypostatic pneumonia[11]. The role of conservative management was only limited to patients who were medically unfit for surgery.

The fixation method ranged from dynamic hip screw (DHS) in stable fractures and intramedullary devices in unstable fractures which had some theoretical advantage over DHS because they didn't depend on the lateral cortex which was a problem in osteoporotic bones. The failure rates of these unstable fractures treated with DHS ranged from 6-30% [12-16]. Fogagnolo et al found that the intraoperative technical and mechanical complication rate to be as high as 23.4%.<sup>17</sup> Uzun et al reported non-union 5.7%, secondary varus displacement 25.7%, screw cut-out 5.7%, reverse Z effect 14.3% [18].

Many internal fixation devices had been used in treatment of intertrochanteric fractures because of high incidence of complications reported after using these surgical implants. There was a lack of a satisfactory implant in the surgical treatment of intertrochanteric fractures which had led to a series of evolution in the development of a perfect implant.

The 5.0 mm proximal femoral locking compression plate was a limited contact, angular stable construct which was specifically designed for fractures in the proximal femoral region [19]. The screw head locks into the PFLCP unlike conventional compression plate, thereby creating an angular, stable construct [20]. Thus, the proximal femoral locking plate did not fail at screw bone interface and provided a strong anchor in osteoporotic bones [21,22]. There were multiple locking screw holes in the plate and therefore various options were available to treat complex fractures. Close plate-to-bone contact was not needed and the PFLCP can also function as an internal external fixator which minimized the pressure on the periosteum enabling better biological healing [23,24].

In the present study, the mean operative time was found to be  $88.36 \pm 20.39$  minutes while Agarwal et al and Lee et al found it to be 93 and 151.6 minutes respectively [25,26].

In the current study we attempted to study, evaluate, document and measure our efficiency in the management of intertrochanteric fractures using PFLCP. This study was conducted on a total of 50 patients with intertrochanteric fractures treated with PFLCP.

In the present study, the mean age was found to be  $60.12 \pm 20.22$  years against  $55.3 \pm 17.9$  years and 59.6 years according to Prabhat et al and Shah et al respectively [27,28]. Our study also showed a bimodal distribution of patients. The first peak occurred in young age where patients had high velocity trauma and the second peak occurred in older age group where there was osteoporosis, and a simple fall could result in a fracture.

The fractures were classified according to AO-OTA classification and most of the cases in our study belonged to 31A2-2 (24%) followed by 31A2-1 (18%) whereas Hodel et al and Lee et al found it to be 31B2 and 29A2 respectively [25,29].

The mean blood loss in our study was found to be  $212.5 \pm 21.51$  ml as compared to 200 ml in the study by Govindasamy et al. [30] We measured the blood loss by mop counts, that is, each fully soaked mop containing 50 ml of blood.

The mean hospital stays for patients included in our study was  $11.02 \pm 2.14$  days against  $8.19 \pm 2.04$  days in study by Agarwal et al. [28].

Complications seen were superficial infection (4%), varus collapse (6%), screw cut-out (4%) and non-union (4%). The patients who had superficial infection were given prolonged antibiotics and the infection healed completely. Lee et al in his study mentioned that four patients (15.3%) had loosening of screws, two patients (7.69%) had delayed union and one patient (3.84%) had deep infection [27]. Agarwal et al in his study found that one patient (3.84%) had non-union, and two patients (7.69%) had superficial infection [28].

In the present study, the mean Harris hip score at 1 month was  $70.38 \pm 5.30$ , at 3 months was  $78.69 \pm 6.55$  and at 9 months was  $88.6 \pm 6.96$ .

The average Harris hip score found in studies by Agarwal et al, Lee et al and Ibrahim et al was 88.4,  $69.1 \pm 17.9$  and 84.5 respectively [25,28,31]. The evaluation was done using the Harris hip score and 72% of patients had excellent outcomes, 16% patients had good outcome, 8% of patients had a fair outcome and only 4% of patients had a poor outcome. We have used the radiological evidence of callus at the fracture site as the criteria of union. The mean time for fracture union was found to be  $15.16 \pm 4.16$  weeks as compared to 18.04 weeks and 17 weeks in the study by Agarwal et al and Sasnur et al respectively [26,28].

### Conclusion

Intertrochanteric femur fractures are one of the most common fractures seen by orthopaedic surgeons worldwide. Intertrochanteric femur fractures may be treated with DHS or intramedullary implants; however, they have several problems. PFLCP is a limited contact, angular stable build unlike ordinary plates and they also anchor osteoporotic bones.

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