

# Outcome Analysis Of Short Proximal Femoral Nail Fixation In Intertrochanteric Femur Fractures

Orthopaedics

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## Abstract:

**Background:** Intertrochanteric femur fractures are a leading cause of hospital admissions and most frequently operated fracture. Their number is on the rise due to increased life expectancy. Various modalities of treatment have been advised for treating such fracture, A0/ASIF introduced proximal femoral nail in 1996 for treatment of unstable per, intra and sub trochanteric fractures. The aim of this study is to evaluate the results of short PFN in intertrochanteric femur fractures and include evaluation of the mean operative time, amount of blood loss, complications.

**Material and Methods:** A prospective study of 32 patients admitted at Gandhi Medical College Bhopal with intertrochanteric femur fractures operated with short PFN during Jan 2011-2015. All patients were followed up for a minimum of 1 year, Clinical evaluation was done using Harris Hip Score and Kyle criteria, radiologically fracture was assessed for union, cut-out or lateral migration of the screws, shortening of the femoral neck length and varus angulations.

**Results:** In a follow up of 32 patients, all fractures have eventually healed with no case of non union, average intra-operative blood loss was 100 ml, closed reduction was done in 27 cases and 5 cases open reduction was done. Partial weight bearing was started in 29 cases at 1<sup>st</sup> postoperative day and full weight bearing within 8 weeks. Functional assessment using Harris hip score showed average score of 78, 80% of the patients had good or excellent outcomes as per Kyle criteria. 2 patients had superficial infection, 1 patient had deep infection which required debridement and eventually healed without any complications. Cutting out of the proximal screw was seen in 1 case and screw breakage was seen in 1 case both of which required screw removal.

**Conclusion:** With proper technique, proper patient selection, good preoperative planning, good instrumentation and understanding of the fracture biomechanics, short PFN gives excellent results in intertrochanteric femur fractures. With less blood loss, less soft tissue trauma, it leads to early mobilisation and reduced morbidity and early return to daily routine activities.

**Keywords:** Intertrochanteric femur fractures, Short Proximal femoral nail, Harris hip score

## Introduction:

Intertrochanteric femoral fractures are common in elderly patients<sup>1</sup> and are the most frequently operated fractures and has the highest morbidity and mortality rates.<sup>2</sup> Due to osteoporosis and poor bone quality, achieving stable fixation in elderly patients

is quite difficult.<sup>3</sup> Stable fixation and early mobilisation is the principle of treatment of such fractures.<sup>4,5</sup> Earlier mobilisation reduces various co-morbidities associated with such fractures. Various implants are available for treatment of intertrochanteric femur fractures. Sliding Hip screw with more blood loss, soft tissue dissection

may deteriorate the pre-existing morbidities.<sup>6</sup> Excessive medialisation of the distal fragment (unstable fracture), cutting out of the screw and collapse upon weight bearing are also major drawbacks<sup>7,8</sup>.

Numerous intramedullary devices has been devised. Gamma nail is also associated with cutting out of the screw, thigh pain and femoral shaft fractures.<sup>9-12</sup> Proximal Femoral Nail has been very promising in treatment of inter and subtrochanteric femur fractures. Shorter lever arm and more load sharing theoretically reduces the chances of varus collapse.<sup>13</sup> Also reduced surgical site incision, less blood loss, less soft tissue trauma significantly decreases morbidities associated with such fracture.<sup>13</sup> Short proximal femoral nail with length of 240 mm and proximal diameter of 15 mm was devised to reduce such complications associated with Gamma nail.

The aim of this study is to evaluate the results of short PFN in intertrochanteric femur fractures and include evaluation of the mean operative time, amount of blood loss, complications.

### **Material and Methods:**

This study was conducted in Gandhi Medical College and Hamidia Hospital Bhopal during January 2011 to January 2015, 38 patients admitted with intertrochanteric femur fractures and were treated with short proximal femur nail. Out of the 38 patients registered, 6 patients were lost to follow up so 32 patients were available for final follow-up. Out of 20 male and 12 female patients aged 56-80 (mean 70 years), 8 patients were classified as stable intertrochanteric fractures A1, 13 as unstable per-trochanteric A2, 11 as unstable intertrochanteric A3. Mechanism of injury was fall (n=20), high velocity accident (n=11), fall from height (n= 1).

Preoperatively, patients were kept on skin traction and routine haematological tests were performed. Patients were operated within 3-10 days (mean 5 days) depending on their fitness. A third generation cephalosporin was given preoperatively followed by 3 days of postoperative intravenous antibiotics and 5 days of oral cephalosporin. Patient were mobilised from 2<sup>nd</sup> postoperative day and weight bearing as tolerated was started. Postoperatively, suture removal was done on 11<sup>th</sup> postoperative day. Clinical and radiographic evaluation was done at 11<sup>th</sup> postoperative

day, at 3 weeks, 6 weeks, 3<sup>rd</sup> month, 6<sup>th</sup> month and 12<sup>th</sup> month. Clinical evaluation was done using Harris Hip Score and Kyle criteria. Radiologically, fracture was assessed for union, cut-out or lateral migration of the screws, shortening of the femoral neck length and varus angulation.

### **Operative Technique**

Closed reduction was done first, if not reduced open reduction was done. Skin incision was taken 5 cm proximal to the tip of greater trochanter in line with the femoral shaft. 2.8 mm threaded K wire was inserted at the tip of greater trochanter under C-arm control and was checked so that it is located in the middle of the shaft in both the views. The proximal part of the femoral shaft is reamed manually with a 17 mm reamer. After mounting the nail on the radiolucent insertion device, the nail can be introduced manually into femoral shaft. Via aiming arm, guide wire for the neck screw is first introduced into the femur neck in such a way that the screw will be placed into the lower half of the neck on the antero-posterior view and centrally on a lateral view. Thereafter, the guide wire for the anti-rotational hip pin is introduced. The hip pin is introduced first with the tip just about 25 mm medial to the fracture line and then the neck screw is inserted. Distal locking is done via the same aiming device.

### **Results:**

A total of 32 patients of intertrochanteric femur operated with short PFN were assessed at final follow-up at 12 month. The mean operative time was 60 minutes (mean 30-90). Closed reduction was successful in 27 patients and open reduction was done in 5 patients in which drainage tube was inserted intra-operatively, mean peri-operative drainage was 50 ml(30-100ml). Average hospital stay was 7 days (mean 5-11 days). Average intraoperative blood loss was estimated to be 100 ml. Partial weight bearing was started in all the patients except 3 in which intraoperative stability was estimated to be less and therefore weight bearing was delayed and full weight bearing was started within 8 weeks in 90% of cases. All fractures eventually healed, average bony union was 15 weeks (13-20 weeks) for A1 fractures, 18 weeks (15-22 weeks) for A2 fracture, 22 weeks (16-25 weeks) for A3 fracture types. Functional assessment using Harris hip score showed average score of 78 (range 58-96) with A1 fracture average score 86, A2

fracture averages 80 and A3 fracture type as 68. 6 patients .At the one year follow-up, 80% of the patients had good or excellent outcomes as per Kyle criteria.

Mean neck shaft angle achieved postoperatively was 129.4 degrees and at final follow-up was 127.3 degrees. Average shortening at final follow-up was 8mm with 2 patients with shortening of more than 2 cm. At the final follow-up, 22 patients were walking without the help of stick, 8 patients were using stick and 2 patients were using walker. 2 patients had superficial infection which responded to antibiotics and 1 patient had deep infection which required debridement and eventually healed without any complications. Cutting out of the proximal screw was seen in 1 case and screw breakage was seen in 1 case both of which required screw removal. None of the patients had distal femoral fracture or nail breakage. 3 patients complained of thigh pain at follow-up but they didn't show any implant failure and gradually improved with no intervention required.



Fig (i) Fig (ii) Fig (iii)



Fig (iv) Fig (v)

Radiographs of (i) Preoperative X ray of 70 year old male (ii) Postoperative X ray (iii) Follow-up X ray at 1 year showing good union (iv) Preoperative X ray of 65 year old male (v) Follow-up X ray at 6 months

### Discussion:

Outcome of intertrochanteric fracture depends on many factors, as most of the patients are elderly various pre-existing comorbidities and general health of the patient

are very important variable in functional outcome of intertrochanteric fractures.<sup>14</sup> Aim of surgery is to achieve stable fixation and earlier rehabilitation. Extra medullary devices such as Sliding hip screw is being the treatment of choice for stable intertrochanteric femur fractures.<sup>15,16</sup> SHS provides controlled compression at the fracture site but unstable fracture pattern, medial comminution, incorrect placement of the lag screw leading to screw cut-out are major concerns.<sup>8</sup> Also increased operative time, more blood loss, wound complications also add to the pre-existing comorbidities. Haidukewyeh<sup>17</sup> has reported failure of fixation in unstable pattern to be as high as 56%. Watson<sup>18</sup> et al and Wolfrang<sup>15</sup> et al have complications to be 14% and 38% respectively.

Intramedullary nails with trochanteric entry point are biomechanically stronger than extramedullary implants.<sup>19,20</sup> Intramedullary nails inserted in less invasive manner has shown better results in the elderly patients. Closed reduction preserves the fracture hematoma and minimal surgical incision allows the surgeon to minimise soft tissue trauma, wound complications, blood loss, and therefore reducing the morbidities associated with intertrochanteric femur fractures.<sup>21-23</sup> Gamma nail as an intramedullary device had complication rates of 8-15%.<sup>10,22-24</sup> (anterior thigh pain, fixation failure, cut-out of the screw and fracture of the femoral shaft distal to the tip of the nail), it is attributable to the implant design particularly due to the excessive rigidity and valgus in the nail as well as to the lack of anatomical profile which causes increased pressure on the medial cortex in subtrochanteric region and on the lateral cortex near the tip of the nail.

Domigo<sup>13</sup> et al evaluated 295 patients treated with PFN and had reported technical complications of 12% during operation, 27% in immediate postoperative period, and late complication in only 4%. Similarly, Simmermacher<sup>25</sup> had a failure rate of only 4.6% in a series of 191 patients; Al-Yassari<sup>26</sup> reported an 8% incidence of cut-out and 1 case of fracture around the tip of the nail after a second fall in a total of 76 patients. Boldin<sup>27</sup> et al in a series of 55 patients with unstable intertrochanteric fractures and subtrochanteric fractures followed up for 15 months on average had 3 cases with Z effect and 2 with reverse Z effect. Fogagnolo<sup>28</sup> et al in a series of 46 patients had an average rate of intraoperative technical and mechanical complications rate of 23.4%. They also reported “lateral protrusion” of the screws in 21.2% of the patients whereas 10.6% had intra-articular migration of the screws.

AO/ASIF introduced PFN whose biomechanical properties included greater implant length, less valgus, availability of smaller distal diameters and a flexible distal end that reduces stress concentrations, an additional antirotational screw in femoral neck. Gamma nail and proximal femoral nail have a proximal diameter of 17 mm which is larger for most of the Indian population femur<sup>29,30</sup>, also proximal femoral nail while crossing mid-diaphysis of the femur abuts against the anterior cortex of average Indian femur and may lead to intra-operative femur cortex break and thigh pain. The anterior curvature of the femur and less femoral diameter in Indian population affects the insertion of proximal femoral nail which may cause fracture angulation or cortical penetration if the mismatch between the nail and femoral curvatures is significant.<sup>30</sup> Short femoral nail due to smaller distal shaft diameter reduces stress concentration at the tip and may prevent femoral shaft fractures.

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