Section: Orthopaedics

Original Research Article

A STUDY OF FUNCTIONAL OUTCOME AND EASE OF DOING PFN/TFN IN LATERAL DECUBITUS POSITION IN MANAGEMENT OF PERITROCHANTERIC FRACTURES

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ABSTRACT

Background: Peritrochanteric fractures constitute a significant portion of hip fractures, especially in the elderly population. Surgical management typically involves intramedullary fixation devices such as Proximal Femoral Nail (PFN) or Trochanteric Femoral Nail (TFN), traditionally performed with the patient supine on a traction table. This position, however, presents various challenges including difficult identification of entry point and difficulty in fracture reduction due to flexion and abduction of the proximal fragments especially in subtrochanteric fractures. This study evaluated the functional outcomes and technical feasibility of performing PFN/TFN procedures in the lateral decubitus position as an alternative approach. **Material and Methods:** A prospective study was conducted on 22 patients with peritrochanteric fractures treated with PFN/TFN in the lateral decubitus position. Patient demographics, fracture characteristics (Boyd & Griffin classification), surgical details (implant type, reduction method, duration, blood loss), and postoperative outcomes were recorded. Functional assessment utilized the Harris Hip Score preoperatively and postoperatively. Complications and radiological outcomes were documented during follow-up. **Result:** The study included 12 males and 10 females, with most patients (54.5%) in the 51-60 years age group. Self-fall was the predominant mode of injury (81.8%). Type 3 fractures were most common (45.5%), followed by Type 4 (31.8%). Long PFN was the most frequently used implant (45.5%). The Harris Hip Score improved significantly from a preoperative mean of 15.45 to a postoperative mean of 92.68 ($p<0.001$). Subjective outcomes were excellent in 68.2%, good in 27.3%, and fair in 4.5% of patients. The complication rate was minimal (9.1%), with only one case each of screw backout and wound infection. **Conclusion:** PFN/TFN performed in the lateral decubitus position is a safe, effective approach for managing peritrochanteric fractures, providing excellent functional outcomes with minimal complications. This technique offers potential advantages over traditional positioning, including easier entry point identification, better visualisation and reduction of fracture fragments and elimination of traction table-associated complications, making it a valuable method in the surgical management of peritrochanteric fractures.

INTRODUCTION

The global incidence of hip fractures is projected to reach 6.3 million by 2050, with peritrochanteric fractures constituting a significant proportion of this number.[1]

Hip fractures are divided into two categories according to the anatomical location of fractures: intracapsular and extracapsular fractures. Femoral neck fractures are classified as intracapsular fractures and peritrochanteric fractures classified as extracapsular fractures which includes intertrochanteric and subtrochanteric fractures.[2]

Peritrochanteric fractures predominantly affect elderly individuals, with a female preponderance attributed to postmenopausal osteoporosis. These fractures typically result from low-energy trauma, such as a simple fall from standing height, in osteoporotic patients. In contrast, younger individuals typically sustain these injuries following high-energy trauma, such as road traffic accidents or falls from height.[3]

Multiple deforming forces act on both the proximal and distal fragments of these fractures to create a characteristic deformity. On the proximal fragment, the gluteus medius and gluteus minimus cause abduction, the iliopsoas causes flexion, and the short external rotators (piriformis, obturator internus, quadratus femoris, and the superior and inferior gemelli) cause external rotation. On the distal fragment, the gracilis and adductor muscles cause an adduction and shortening force.[4]

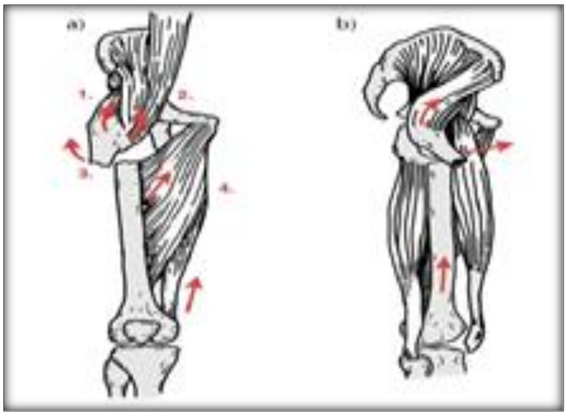

Figure 1: The deforming forces (red arrows) of the proximal and distal fragments in subtrochanteric fractures in the coronal (A) and sagittal (B) planes. The proximal fragment is abducted by the gluteus medius and minimus (1), flexed by the iliopsoas (2), and externally rotated by short external rotators (3). The distal fragment is adducted and shortened by the adductors and gracilis (4)

Boyd and Griffin described classification according to fracture line extension, comminution, subtrochanteric involvement and extension to the shaft.[5]

Two positioning strategies have been described for fixation of peritrochanteric femoral fractures: supine on a fracture table and the lateral decubitus position on a flat radiolucent table.[6]

Advantages of cephalomedullary nail fixation of intertrochanteric and subtrochanteric fractures of the femur with the patient in the lateral decubitus position include easier access to trochanteric and piriformis fossa entry points. The lateral decubitus position allows soft tissue to fall away from the surgical field by the force of gravity which can improve visualization, especially in obese patients.[7]

Disadvantages of supine position include difficulty determining the starting point, inability to accommodate obese patients and many complications that are particular to the fracture table such as pudendal nerve injury.[8]

MATERIALS AND METHODS

A 22 patients with peritrochanteric fractures from different hospitals of district Kalaburagi, Karnataka underwent PFN/TFN in lateral decubitus position, were followed for a period of 1.5 years prospectively. Peritrochanteric fractures are classified according to Boyd and Griffin classification.

Inclusion Criteria

1. Radiologically confirmed cases of peritrochanteric fractures.
2. Patients who are medically fit for surgery.
3. Patients of age group above 18 years of any gender.
4. Only closed fractures.

Exclusion Criteria

1. Pathological fractures.
2. Polytrauma cases.
3. Neurovascular injuries

Surgical Technique

Under appropriate anaesthesia (spinal or general), the surgical procedure was performed with patients positioned in the lateral decubitus position on a flat radiolucent table. The unaffected side was positioned downward with hip and knee at 90degree flexion, with the patient secured using adequate padding and supports. The C-arm was positioned to provide both anteroposterior and lateral views of the proximal femur.

Figure 2 & 3: Position of Patient and Position of C-Arm for AP View

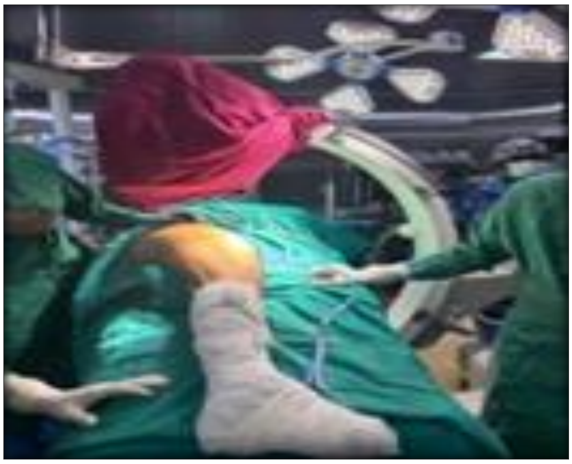

Figure 4: Position of C-Arm for Lateral View: With 10 Degree Carnio-Caudal & 15 Degree Tilt Towards Anterior for Anteversion view

Figure 5: Closed Reduction of Fracture Done with Sustained Manual Traction and Large Bolsters in the Inner Side of Thigh for Medial-Lateral Reduction and Antero-Posterior Reduction Manually

After achieving satisfactory reduction, a 5 cm skin incision was made in line with the femoral shaft axis, extending proximal from the tip of the greater trochanter in closed reduction and extending distally to expose fracture in open reduction. The fascia and gluteus medius muscle were split along the direction of their fibers to expose the tip of the greater trochanter. The entry point was established at the tip or slightly medial to the tip of the greater trochanter using a bone awl. A guide wire was inserted under fluoroscopic control, followed by sequential reaming of the proximal femur. An appropriate-sized proximal femoral nail (130° or 135° neck-shaft angle) was inserted over the guide wire.

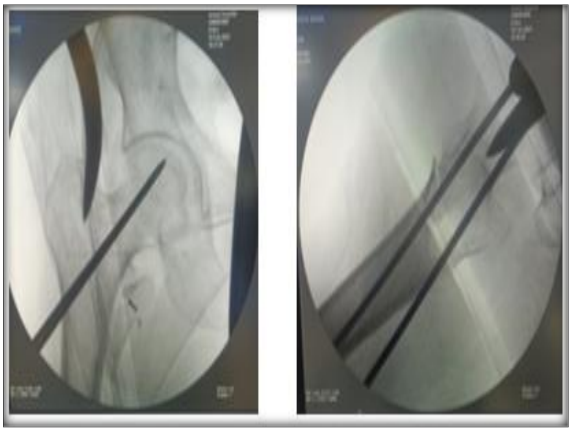

Figure 6 & 7: Entry Using Entry AWL in AP View and lateral view

The proximal locking was performed using the targeting device, with proper placement of lag and anti-rotation screws under fluoroscopic guidance. Distal locking was performed using the free-hand technique. Final assessment of reduction and implant position was done using the C-arm in both anteroposterior and lateral views. The wound was closed in layers, and sterile dressing was applied.

Figure 8: PFN Nail Insertion and Guide Pin Insertion

Figure 9 & 10: Proximal Screws Insertion in AP and Lateral View

EVALUATION

Perioperative data was meticulously collected, including operative time, blood loss, intraoperative complications, nail size, and screw position. Patients received appropriate antibiotics pre- and post-operatively along with analgesics and thromboprophylaxis as indicated.

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Postoperatively, early mobilization was encouraged, with patients being allowed in bed sitting from the first postoperative day. Non-weight-bearing mobilization with a walker or crutches was initiated from the second postoperative day as tolerated by the patient. Serial radiographs were performed at regular intervals to assess fracture healing and implant position. Partial weight bearing has started at 1st callus formation noted, followed by full weight bearing.

Patients were followed up at 6 weeks, 3 months, and 6 months postoperatively. At each follow-up, a thorough clinical assessment was conducted to evaluate pain, range of hip motion, walking ability, and any complications. Radiological evaluation was performed at each follow-up to assess fracture union, implant position, and any signs of implant failure. Functional outcome was assessed using the Harris Hip Score (HHS), which evaluates pain, function, absence of deformity, and range of motion(ROM). The ease of performing the procedure was assessed based on parameters such as operative time, blood loss, and any technical difficulties encountered during the procedure.

48 years/male

Figure 11: Pre OP Xray and Post OP Xrays

Figure 12: Functional Images

RESULTS

Fracture Classification (Boyd & Griffin)

The Boyd & Griffin classification system was used to categorize fracture patterns. Type 3 fractures were most common (45.5%, 10 patients), followed by Type 4 (31.8%, 7 patients). Type 2 fractures accounted for 18.2% (4 patients), while Type 1 was least common at 4.5% (1 patient). This distribution indicates that the study included predominantly more complex fracture patterns (Types 3 and 4), which typically present greater surgical challenges.

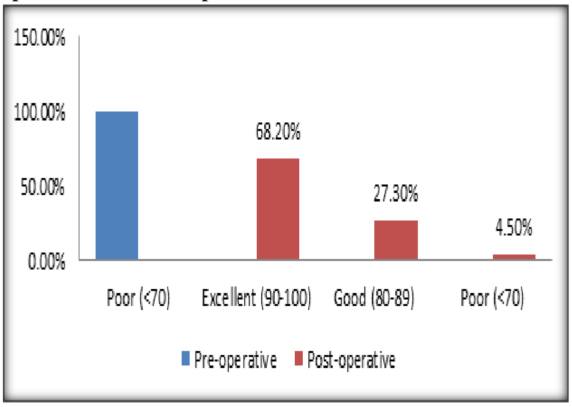
Intraoperative Blood Loss

The largest group of patients (36.4%, 8 patients) had blood loss between 201-300 ml, while 31.8% (7 patients) experienced blood loss between 501-600 ml. Equal numbers (13.6%, 3 patients each) had blood loss in the 301-400 ml and 401-500 ml ranges. Only 4.5% (1 patient) experienced blood loss greater than 600 ml. This study provide insight into the degree of surgical invasiveness and potential need for blood management strategies.

Duration of Surgery

Surgical duration varied, with the most common being 90 minutes (27.3%, 6 patients), followed by 70 minutes (22.7%, 5 patients). Equal numbers of patients (18.2%, 4 each) had surgery durations of 60 and 80 minutes, while 13.6% (3 patients) had the shortest duration of 45 minutes. These times reflect the varying complexity of the procedures, possibly related to fracture type and reduction method.

Functional Outcomes: Pre-operative and Post-operative Harris Hip Score



This graph demonstrates dramatic improvement in functional outcomes. Pre-operatively, all patients (100%) had poor Harris Hip Scores (<70). Post-operatively, 68.2% (15 patients) achieved excellent scores (90-100), 27.3% (6 patients) had good scores (80-89), and only 4.5% (1 patient) had a fair score (70-79). No patients remained in the poor category. The mean score improved significantly from 15.45 ± 5.096 pre-operatively to 92.68 ± 5.384 post-operatively ($p<0.001$), indicating statistically significant improvement in hip function.

Relationship Between Method of Reduction and Subjective Outcome

In this study, among patients with excellent outcomes, 53.3% (8 patients) underwent closed reduction and 46.7% (7 patients) underwent open reduction. The p-value of 0.420 indicates no statistically significant association between reduction method and subjective outcome, suggesting both approaches can yield good results when appropriately applied.

Relationship Between Implant Type and Subjective Outcome

This cross-tabulation examines whether implant type influenced subjective outcomes. Among patients with excellent outcomes, Long PFN was most common (46.7%, 7 patients), followed by Short PFN (33.3%, 5 patients) and TFN (20.0%, 3 patients). The p-value of 0.579 indicates no statistically significant association between implant type and subjective outcome, suggesting that all implant types performed comparably well.

Complications

The vast majority of patients (90.9%, 20 patients) experienced no complications. Only 4.5% (1 patient) experienced screw backout, and another 4.5% (1 patient) had wound infection. This low complication rate suggests that PFN/TFN in lateral decubitus position is a safe approach for managing peritrochanteric fractures.

Figure 13: Screw Backout

DISCUSSION

In terms of fracture classification using the Boyd & Griffin system, our study found that Type 3 fractures were most common (45.5%), followed by Type 4 (31.8%), Type 2 (18.2%), and Type 1 (4.5%). This distribution reflects the complexity of peritrochanteric fractures commonly encountered in clinical practice, with unstable fracture patterns (Types 3 and 4) constituting the majority. Similar fracture pattern distributions have been reported by Kumar et al., who found that unstable fracture patterns are more prevalent in the elderly due to osteoporotic bone quality.[9]

Implant Selection and Reduction Method

In our study, Long PFN was the most commonly used implant (45.5%), followed by Short PFN (40.9%) and TFN (13.6%). The selection of implant type was primarily based on fracture pattern, with longer nails generally preferred for more unstable fracture patterns to provide additional stability. This approach is supported by several studies that recommend long intramedullary nails for unstable peritrochanteric fractures to prevent subtrochanteric fractures and implant failure.[10]

The reduction method was evenly distributed between closed (50%) and open (50%) techniques. Our finding is consistent with studies by Sonmez et al., who demonstrated that the lateral decubitus position facilitates both closed and open reduction techniques without compromising fracture alignment or fixation quality.[11] The ability to readily convert to open reduction without significant repositioning is one of the advantages of the lateral decubitus position.

Operative Parameters and Advantages of Lateral Decubitus Position

The mean duration of surgery in our study ranged from 45 to 90 minutes, with most procedures (68.2%) taking 70 minutes or longer. Intraoperative blood loss was moderately low, with the majority of cases (63.6%) experiencing blood loss of 400 ml or less. These findings compare favorably with those reported by Turgut et al., who found that using the lateral decubitus position resulted in shorter setup times and operative times compared to the traction table approach.[12]

The operative parameters in our study reflect the technical advantages of the lateral decubitus position, which allows for easier identification of the entry point, improved access to the piriformis fossa and ease of manipulation of fracture fragments especially in subtrochanteric fracture. As noted by Ozkan et al., the lateral position allows soft tissue to fall away from the surgical field by gravity, improving visualization, especially in obese patients.[13]

Functional Outcomes

The Harris Hip Score (HHS) is a widely used tool for evaluating functional outcomes after hip surgery. In our study, all patients had a poor HHS score (<70) preoperatively. Postoperatively, a remarkable improvement was observed with 68.2% achieving excellent scores (90-100), 27.3% good scores (80-89), and 4.5% fair scores (70-79). The mean HHS improved significantly from 15.45 ± 5.096 preoperatively to 92.68 ± 5.384 postoperatively ($p<0.001$).

These excellent functional outcomes are comparable to those reported in the literature for PFN/TFN procedures performed in the lateral decubitus position. Murugan et al. reported average Harris Hip Scores of 75.37 and 78.85 in their PFN and PFNA groups, respectively.[14]

Complications

The complication rate in our study was remarkably low, with 90.9% of patients experiencing no complications. The observed complications included screw backout (4.5%) and wound infection (4.5%). Our low complication rate may be attributed to several factors associated with the lateral decubitus position, first this position allows better visualization of the entry point and improves access to the proximal femur, potentially reducing the risk of malreduction and implant malposition. Second, the avoidance of traction table-related complications such as pudendal nerve injuries contributes to reduced overall complication rates.[15]

Limitations

Our study has several limitations that should be acknowledged. First, the sample size of 22 patients is relatively small, which may limit the generalizability of our findings. Second, we did not have a control group undergoing the same procedure in the supine position on a traction table, which would have allowed for direct comparison of outcomes.

Additionally, we did not collect data on specific radiographic parameters such as tip-apex distance and neck-shaft angle, which are important predictors of implant failure. Including these measurements would have provided more comprehensive evaluation of the technical aspects of the procedure.

Strengths

Despite these limitations, our study has several strengths. First, all procedures were performed by the same surgical team, ensuring consistency in technique and minimizing operator-dependent variables. Second, we used validated outcome measures including the Harris Hip Score to objectively assess functional outcomes. Third, our detailed documentation of surgical parameters, implant types, and complications provides valuable information for surgeons considering adopting the lateral decubitus position for PFN/TFN procedures.

CONCLUSION

The treatment of peritrochanteric fractures continues to evolve with advances in surgical techniques and implant designs. Management of peritrochanteric fractures in lateral decubitus position reveals excellent functional outcomes, with 95.5% of patients achieving good to excellent results according to the Harris Hip Score, significant improvement from preoperative status ($p<0.001$), and minimal complications (9.1%).

The lateral decubitus position provides several distinct advantages, including easier identification of entry points, improved access to the proximal femur, decrease blood loss, better visualisation and reduction of fracture fragments and elimination of traction table-associated complications such as pudendal nerve injuries .

The even distribution between closed and open reduction methods in our study (50% each) highlights the versatility of this approach, allowing surgeons to readily convert to open reduction when necessary. Additionally, the balanced functional outcomes across different implant types suggest that the lateral decubitus position can accommodate various nail designs successfully.

In summary, PFN/TFN performed in the lateral decubitus position is a safe, effective, and technically feasible approach for the management of peritrochanteric fractures. This technique offers comparable or superior results to traditional methods while potentially reducing certain complications and technical challenges. Further prospective randomized studies with larger sample sizes are warranted to definitively establish the role of this approach in the treatment algorithm for peritrochanteric fractures.

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