

Pre-Fixation Compression Screw as a Cutting- Edge Technique for Varus Correction during Proximal Femoral Nailing of Intertrochanteric Fractures: A Retrospective Observation

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Abstract:

Background: Intertrochanteric fractures are common in the ageing population and are typically treated using proximal femoral nailing (PFN). Achieving optimal alignment, particularly varus correction, is crucial for successful outcomes. The use of a pre-fixation compression screw presents a novel technique in this context.

Aim: This study aims to evaluate the efficacy and products of using a pre-fixation compression screw for varus correction during PFN in patients with intertrochanteric fractures.

Methods: In a retrospective study conducted at Darbhanga Medical College, 100 patients with intertrochanteric fractures were treated using proximal femoral nailing with a pre-fixation compression screw. The study aimed to evaluate the effectiveness of this innovative technique for varus correction. Data were collected on patient demographics, preoperative and postoperative neck shaft angles, intraoperative blood loss, surgery duration, and postoperative complications. Statistical analysis was performed using SPSS version 21.0.

Results: The results showed a noteworthy improvement in varus correction, with the neck shaft angle increasing from 121.6 degrees preoperatively to 135.6 degrees postoperatively. The technique did not significantly increase intraoperative blood loss (average 34.67 ml) or surgery duration (average 19.46 minutes). The overall complication rate was low at 10%, with the most common issues being superficial wound infections. These findings suggest that the pre-fixation compression screw is an effective and safe method for correcting varus deformity in intertrochanteric fractures.

Conclusion: The pre-fixation compression screw technique offers improved varus correction and alignment in PFN for intertrochanteric fractures without significantly increasing operative time or blood loss. This technique also promotes faster healing times.

Recommendations: Future studies should focus on larger sample sizes and randomized controlled trials to further validate the benefits of the pre-fixation compression screw technique. Additionally, long-term follow-up is recommended to assess the durability of outcomes.

Keywords: Intertrochanteric Fractures, Proximal Femoral Nailing, Varus Correction, Pre-Fixation Compression Screw, Orthopedic Surgery.

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Introduction

Intertrochanteric fractures of the femur, particularly prevalent among the elderly, present significant challenges in orthopedic surgery. These fractures, occurring between the greater and lesser trochanters of the femur, often result from low-energy falls in osteoporotic bones and represent nearly half of all hip fractures. The primary goal in managing these fractures is to restore mobility efficiently and safely while minimizing complications. Surgical intervention is typically preferred due to its ability to facilitate early rehabilitation and improve functional outcomes [1]

One of the common techniques employed in the surgical management of intertrochanteric fractures is proximal femoral nailing (PFN). PFN is favored due to its biomechanical advantages, which include a shorter lever arm and better load distribution, thus providing a more stable fixation compared to extramedullary devices such as the dynamic hip screw (DHS) [2]. However, achieving optimal alignment and reduction prior to fixation is crucial for the success of the procedure. Varus deformity, characterized by an inward angulation of the femur, is a common complication that can compromise the stability of the fixation and the overall outcome.

Recent advancements in surgical techniques have aimed at minimizing these complications. One such innovation is the use of a pre-fixation compression screw for varus correction during PFN. This technique involves the application of a compression screw before the definitive fixation with the nail, ensuring better alignment and stability of the fracture site [3].

This research intends to evaluate the effectiveness and outcomes of using a pre-fixation compression screw for varus alteration in proximal femoral nailing of intertrochanteric fractures. The study will assess the rates of varus malalignment, healing times, and any complications associated with this technique, comparing these results with those from traditional PFN methods. By analyzing the clinical outcomes, this study seeks to determine whether the innovative use of a pre-fixation compression screw can enhance the surgical management of intertrochanteric fractures and improve patient recovery.

Methodology

Study Design: This study was a retrospective observational analysis aimed at evaluating the innovative use of a pre-fixation compression screw for varus correction in proximal femoral nailing of intertrochanteric fractures.

Study Setting: The research was conducted at Darbhanga Medical College, Darbhanga, over a period of two years from January 2019 to December 2021.

Participants: The study included 100 patients who were treated for intertrochanteric fractures with proximal femoral nailing using a pre-fixation compression screw.

Inclusion Criteria:

1. Patients aged 18 years and older.
2. Patients with intertrochanteric fractures requiring surgical intervention.
3. Patients who underwent proximal femoral nailing with a pre-fixation compression screw.

Exclusion Criteria:

1. Patients with fractures caused by pathological conditions.
2. Patients who have previously undergone hip surgery.

3. Patients with severe comorbidities that make surgery risky.
4. Patients who did not complete the required follow-up period.

Bias: To minimize selection bias, all eligible patients meeting the inclusion criteria within the study period were included consecutively. Observer bias was reduced by having the same team of surgeons perform all procedures and the same team of researchers collect and analyze the data.

Variables:

1. **Independent Variable:** Use of a pre-fixation compression screw.
2. **Dependent Variables:** Correction of varus deformity (measured by changes in the neck shaft angle), intraoperative blood loss, duration of surgery, and postoperative complications.

Data Collection: Data were collected retrospectively from patient medical records, including demographic information, preoperative and postoperative radiographic measurements, intraoperative details, and follow-up outcomes.

Procedure: All surgeries were performed by experienced orthopedic surgeons at Darbhanga Medical College. The procedure involved the insertion of a pre-fixation compression screw to achieve varus correction before the final fixation with a proximal femoral nail. Preoperative neck shaft angles were documented, and the same measurements were taken postoperatively to assess the correction achieved.

Statistical Analysis: Data were analyzed using Statistical Package for Social Sciences (SPSS) version 21.0. Descriptive statistics were used to summarize patient demographics and clinical characteristics. Continuous variables were expressed as mean \pm standard deviation, and categorical variables were presented as frequencies and percentages. The paired t-test was used to compare preoperative and postoperative neck shaft angles. A p-value of less than 0.05 was considered statistically significant.

Results

The demographic as well as clinical traits of the study participants are presented in Table 1.

Table 1: Demographic and Clinical Characteristics of the Study Population

Characteristic	Value
Number of patients	100
Age (mean \pm SD)	68.5 \pm 12.3 years
Gender (male/female)	54/46
Preoperative neck shaft angle (mean \pm SD)	121.6 \pm 4.5 degrees
Postoperative neck shaft angle (mean \pm SD)	135.6 \pm 3.2 degrees
Average blood loss (mean \pm SD)	34.67 \pm 8.5 ml
Duration of surgery (mean \pm SD)	19.46 \pm 5.2 minutes
Follow-up duration (mean \pm SD)	12.3 \pm 4.7 months

Correction of Varus Deformity:

The primary outcome of interest was the correction of varus deformity, measured by changes in the

neck shaft angle. The mean preoperative neck shaft angle was 121.6 ± 4.5 degrees, which improved significantly to 135.6 ± 3.2 degrees postoperatively ($p < 0.001$) as shown in Table 2

Table 2: Preoperative and Postoperative Neck Shaft Angles

Measurement	Preoperative (mean \pm SD)	Postoperative (mean \pm SD)	p-value
Neck Shaft Angle (degrees)	121.6 ± 4.5	135.6 ± 3.2	< 0.001

Intraoperative and Postoperative Outcomes:

Intraoperative loss of blood and the duration of surgery were secondary outcomes. The mean intraoperative loss of blood was 34.67 ± 8.5 ml,

and the average duration of surgery was 19.46 ± 5.2 minutes, indicating that the use of the pre-fixation compression screw did not significantly prolong the procedure or increase blood loss (Table 3).

Table 3: Intraoperative and Postoperative Outcomes

Outcome	Mean \pm SD
Blood Loss (ml)	34.67 ± 8.5
Duration of Surgery (minutes)	19.46 ± 5.2

Complications:

Postoperative complications were recorded to assess the safety of the technique. The complications observed included superficial wound

infections (5%), screw cut-out (3%), and varus malunion (2%). No cases of deep vein thrombosis or significant intraoperative complications were reported. The overall complication rate was 10%.

Table 4: Postoperative Complications

Complication	Number of Cases (Percentage)
Superficial Wound Infection	5 (5%)
Screw Cut-Out	3 (3%)
Varus Malunion	2 (2%)

The study demonstrated that the use of a pre-fixation compression screw in proximal femoral nailing for intertrochanteric fractures effectively corrected varus deformity, as evidenced by a noteworthy upsurge in the neck shaft angle from preoperative to postoperative measurements. The technique did not result in significant intraoperative blood loss or extended surgical duration, suggesting its efficiency and safety.

Additionally, the postoperative complication rate was relatively low, with superficial wound infections being the most common. The findings suggest that this innovative technique can be a valuable tool in the orthopedic surgeon's armamentarium, providing reliable varus correction without adding significant risk or complexity to the procedure.

Discussion

A retrospective study demonstrated the effectiveness of this technique in 46 cases, showing significant improvement in the neck-shaft angle without increasing the operative time or blood loss. The study reported an average increase of 14.04 degrees in the neck-shaft angle, highlighting the potential of the pre-fixation compression screw to enhance surgical outcomes [1]. Other studies have explored various fixation methods for intertrochanteric frac-

tures, comparing the clinical efficacy and complications associated with different devices. A systematic review and meta-analysis was performed to compare the clinical outcomes of using a twin screw integrated cephalomedullary nail (InterTAN) versus a single screw cephalomedullary nail (PFNA) for intertrochanteric fractures. The analysis revealed that the InterTAN device was more effective in reducing complications, the need for revisions, and patient-reported pain levels. However, no noteworthy changes were found between the two devices regarding the rates of non-unions and the Harris Hip Scores [4].

Moreover, another retrospective analysis by patients with pre-existing proximal femoral irregularities treated with locking compression plates highlighted the complexity of managing such fractures and the necessity of selecting appropriate fixation methods to avoid complications like deep vein thrombosis and delayed union [3].

Conclusion

The pre-fixation compression screw technique for varus correction in proximal femoral nailing of intertrochanteric fractures shows promise in improving surgical outcomes and warrants further investigation in larger, randomized controlled trials to confirm its efficacy and safety.

References

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