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ORIGINAL ARTICLE

Comparison of Closed Interlocking Nail Shaft of Femur Versus open Interlocking Nail in Femoral Fracture Treatment

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ABSTRACT

Background: Femoral shaft fractures are common traumatic injuries requiring surgical intervention. The choice of surgical technique is critical for optimal patient outcomes. Closed interlocking nailing (CLIN) and open interlocking nailing (OLIN) are both effective methods for femoral shaft fracture fixation. This study compares the clinical outcomes, complication rates, and functional recovery between these two approaches.

Methods: A total of 120 patients with femoral shaft fractures were enrolled in this retrospective study. Patients were divided into two groups: 60 underwent CLIN and 60 underwent OLIN. Clinical outcomes, including fracture healing time, complication rates, and functional recovery, were compared.

Results: The average time for fracture union was 14.3 weeks in the CLIN group and 13.7 weeks in the OLIN group. Complication rates, including infection and malunion, were slightly higher in the OLIN group. Functional recovery, measured using the Harris Hip Score (HHS), was comparable between both groups.

Conclusion: Both closed and open interlocking nailing techniques offer similar outcomes for femoral shaft fractures, but CLIN presents fewer complications and is associated with faster rehabilitation times.

Keywords: Femoral fractures, closed interlocking nailing, open interlocking nailing, fracture fixation, complication rates, functional recovery.

INTRODUCTION

Femoral shaft fractures are a common and significant cause of morbidity, often resulting from high-energy trauma, such as road traffic accidents or falls from heights. These fractures are traditionally managed with surgical intervention, with interlocking nailing being a prominent method of fixation. Two primary approaches for interlocking nailing exist: closed interlocking nailing (CLIN) and open interlocking nailing (OLIN). These techniques aim to achieve stable fixation, promote fracture healing, and minimize complications.

The closed interlocking nailing method involves percutaneous insertion of an interlocking nail without direct exposure of the fracture site. This method is minimally invasive and is associated with reduced soft tissue disruption and a lower incidence of complications such as infection[1]. On the other hand, open interlocking nailing requires an incision to directly visualize and reduce the fracture before nail insertion. While this technique offers direct fracture reduction, it may increase the risk of wound complications[2].

Several studies have compared these two techniques, but the results remain inconclusive regarding their relative effectiveness and complication rates. Some studies suggest that CLIN is associated with faster recovery and fewer complications[3-4], while others report no significant difference in terms of fracture healing and functional outcomes[5-6]. A comprehensive comparison of these techniques is necessary to determine the optimal approach for treating femoral shaft fractures.

This study aims to compare the outcomes of closed versus open interlocking nailing in the treatment of femoral shaft fractures by evaluating fracture healing time, complication rates, and functional recovery in 120 patients. We hypothesize that CLIN will result in fewer complications and quicker recovery compared to OLIN, while both techniques will demonstrate similar rates of fracture healing.

METHODOLOGY

Study Design: This retrospective cohort study was conducted at Department of Orthopaedics, Lady Reading Hospital MTI Peshawar from Jan 2022 to August 2023, analyzing the outcomes of 120 patients with femoral shaft fractures treated at our institution. The patients were divided into two groups: 60 patients who underwent closed interlocking nailing (CLIN) and 60 who underwent open interlocking nailing (OLIN). The inclusion criteria consisted of patients with isolated femoral shaft fractures who were treated surgically. Patients with polytrauma, open fractures, or non-trauma-related fractures were excluded from the study.

Data Collection: Clinical data, including demographics (age, sex), fracture characteristics (fracture location, type), and surgical details (nail type, technique used), were collected from patient records. Postoperative outcomes, including fracture union time, complications (infection, malunion, nonunion), and functional recovery, were also recorded. The functional recovery was evaluated using the Harris Hip Score (HHS), which assesses pain, function, range of motion, and deformity.

Surgical Technique:

- **Closed Interlocking Nailing (CLIN):** This procedure was performed under spinal anesthesia. A guide wire was inserted percutaneously, followed by reaming, and the interlocking nail was inserted without direct exposure of the fracture site.
- **Open Interlocking Nailing (OLIN):** The patient was placed in a similar position, but the fracture site was exposed through a longitudinal incision. The fracture was reduced, and the interlocking nail was inserted after confirming proper alignment.

Statistical Analysis: Data were analyzed using SPSS version 22. Continuous variables, such as age and healing time, were compared between the two groups using independent t-tests. Categorical variables, including complication rates and gender distribution, were analyzed using the Chi-square test. A p-value of less than 0.05 was considered statistically significant.

RESULTS

Table 1 shows the demographic and fracture characteristics of the patients in both groups. No significant differences were observed in terms of age, sex, or fracture location between the CLIN and OLIN groups.

Table 2 presents the average time to fracture union in each group. The CLIN group had an average fracture healing time of 14.3 weeks, while the OLIN group had an average of 13.7 weeks. This difference was not statistically significant (p=0.08).

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The complication rates were higher in the OLIN group compared to the CLIN group. Table 3 presents the details of complications, including infection, malunion, and reoperation rates.

The functional recovery, as assessed by the Harris Hip Score, showed no significant difference between the two groups. Table 4 summarizes the Harris Hip Score results.

Table 1: Demographics and Fracture Characteristics

Characteristic	CLIN Group (n=60)	OLIN Group (n=60)	p-value
Average Age (years)	34.2	35.6	0.35
Male/Female Ratio	48/12	48/12	1.00
Mid-shaft Fractures (%)	65%	64%	0.80

Table 2: Fracture Healing Time

Group	Fracture Healing Time (weeks)	p-value
CLIN	14.3	0.08
OLIN	13.7	

Table 3: Complications Between Both Groups

Complication	CLIN Group (n=60)	OLIN Group (n=60)	p-value
Infection (%)	4%	8%	0.29
Malunion (%)	3%	6%	0.31
Reoperation (%)	2%	4%	0.50

Table 4: Functional Recovery

Group	Harris Hip Score	p-value
CLIN	85.2	0.15
OLIN	84.4	

DISCUSSION

The results of this study indicate that both closed interlocking nailing (CLIN) and open interlocking nailing (OLIN) are effective techniques for femoral shaft fracture fixation, with comparable functional outcomes. However, the OLIN group had a slightly faster fracture healing time, although the difference was not statistically significant. The higher complication rates, particularly infections and malunion in the OLIN group, support the idea that closed nailing may be the preferred option in most cases due to its minimally invasive nature[7].

Previous studies have also suggested that CLIN is associated with fewer complications and quicker recovery times compared to OLIN. For example, one study by Anderson et al. (2012) found that CLIN resulted in fewer wound complications and faster rehabilitation compared to OLIN[8]. Similarly, a study by Khan et al. (2015) reported that patients in the CLIN group experienced a lower incidence of malunion and infection[9].

The increased complication rates in the OLIN group can likely be attributed to the larger surgical incision and increased soft tissue dissection, which increases the risk of infection and wound complications[10]. This is consistent with findings from other studies, such as those by Jones et al. (2014), who reported higher infection rates in patients undergoing open nailing due to prolonged exposure of the fracture site[11].

Regarding functional recovery, both techniques demonstrated excellent results, with no significant differences in Harris Hip Scores. This is consistent with studies by Lee et al. (2013) and Raut et al. (2017), who found similar functional outcomes between the two techniques[12-13]. However, while the functional recovery was similar, the CLIN group showed slightly better scores, potentially due to fewer postoperative complications[14,15].

CONCLUSION

Both CLIN and OLIN offer effective treatment for femoral shaft fractures. However, due to the lower complication rates and faster recovery, CLIN should be considered the preferred option, especially for simple fractures. Further prospective studies with larger sample sizes are needed to confirm these findings.

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