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Original Research Article

TO COMPARE THE RESULTS OF UNREAMED VS REAMED INTERLOCKED INTRAMEDULLARY NAILING (IMN) IN TERMS OF FRACTURE UNION AND INFECTION RATE AMONG PATIENTS WITH OPEN TIBIA FRACTURES

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ABSTRACT

Background: In emergency orthopedics services, it is very common to find cases of tibia shaft fractures. It happens mostly in men in their economically productive age and usually occurs after high energy trauma. Some surgical therapeutic alternatives are ender nails, reamed or unreamed nailing, external fixation, plating, and llizarov fixation. Interlocked intramedullary nailing (IMN) of diaphyseal fractures of tibia is the preferred form of treatment for both closed shaft fractures and open tibia fractures. In almost 80% of the patients, interlocked intramedullary (IM) nailing is considered as a safe procedure for open tibial shaft fractures. There are good clinical outcomes seen in about 85% of the cases. **Objective:** To compare the results of unreamed vs reamed interlocked intramedullary nailing (IMN) in terms of fracture union and infection rate among patients with open tibia fractures. **Study design:** A prospective comparative research. **Duration and place of study:** This study was conducted at Sandeman Provincial Hospital Quetta Pakistan from January 2025 to January 2026.

Materials and Methods: This research was performed at the Department of Orthopaedic Surgery. All the patients who were included in this research were presented in the ER department of the hospital. There were a total of 120 patients included in this study. All the participants were having Gustilo & Anderson Type II and IIIA open fractures of the tibia. Along with this, patients who were operated within 24 hours of injury were made a part of this study. All the patients were divided into 2 groups having an equal number of participants in each group (60 patients in each group). One group was treated by an unreamed intramedullary interlocking nail (Group A) and the other group was treated by reamed IMN. Follow-up was done at 2nd week, 6th week, 12th week, and 6 months after the treatment. SPSS version 25 was used to analyze the data. To compare mean scores of both the groups, t-test was applied. A P-value of less than 0.05 was considered significant.

Results: There were a total of 120 patients involved in this study, being divided into 2 groups having 60 patients in each group. There were a total of 93 males and 27 females. In terms of fracture union, 48 patients in group A had complete union as compared to 57 patients in group B. There was a significant difference seen between both the groups in terms of rate of fracture union (p-value = 0.037). In both the groups, the majority of the participants had Southampton Grade 0 wounds. The mean age in group A was 36.9 ± 8.30

years while it was 35.8 ± 8.60 in group B. Duration of surgery and estimated blood loss was less in group A.
Conclusion: Reamed IM nailing provides better fracture union and no significant difference in infection rates.
Keywords: tibia shaft fractures, high-energy trauma, nails, reamed or unreamed nailing, external fixation, plating, and llizarov fixation.

INTRODUCTION

In emergency orthopedics services, it is very common to find cases of tibia shaft fractures. It happens mostly in men in their economically productive age and usually occurs after high energy trauma.[1,2] If we look over different research studies, it is found that open fractures are more likely to have high-energy trauma.[3,4] Moreover, open fractures need long term care and experience higher rates of sequelae in comparison to closed fractures. Open tibial shaft fractures are one of the most serious orthopaedic injuries.[5] Some surgical therapeutic alternatives are ender nails, reamed or unreamed nailing, external fixation, plating, and llizarov fixation. Interlocked intramedullary nailing (IMN) of diaphyseal fractures of tibia is the preferred form of treatment for both closed shaft fractures and open tibia fractures.[6] To treat open fractures of the lower limb, secondary nailing is considered as an effective method. This method leads to positive functional and radiological results. The study of Bhandari et al. compared closed Treatment with unreamed IMN (interlocked intramedullary nailing) versus reamed IMN.[7]
According to the study of Ahmad et al., the patients included were those who had Gustilo and Anderson type III fracture, 30% of the patients had wound infection.[8] In almost 80% of the patients, interlocked intramedullary (IM) nailing is considered as a safe procedure for open tibial shaft fractures. There are good clinical outcomes seen in about 85% of the cases.[9] However, there is still a debate going on related to the superiority of reamed versus unreamed methods. Reamed nails are favoured by many surgeons because there is greater biochemical stability due to reamed nails in both open and closed tibial shaft fractures.[10] However, there is still uncertainty about whether reaming should be routinely performed in open tibial shaft fractures. Therefore, we conducted this study to understand this better and compare the results of unreamed vs reamed interlocked intramedullary nailing (IMN) in terms of fracture union and infection rate among patients with open tibia fractures.

MATERIALS AND METHODS

This research is a prospective comparative study which was performed at the Department of Orthopedic Surgery. All the patients who were included in this research were presented in the ER department of the hospital. There were a total of 120 patients included in this study. Non-probability convenient sampling was used followed by randomization to detect sample size. All the participants were having Gustilo & Anderson Type II and IIIA open fractures of the tibia. Along with this, patients who were operated within 24 hours of injury were made a part of this study, irrespective of age and gender. Patients were informed about this study and their consent was obtained. The Ethical Review Committee approved this study.
Exclusion Criteria: Individuals who were having pathological fracture were not a part of this study. Moreover, patients who were previously operated on the same tibia were also excluded. Furthermore, poly traumatized patients, medically unstable patients, and those with uncontrolled diabetes were also not made a part of this study.
All the patients were divided into 2 groups having an equal number of participants in each group (60 patients in each group). One group was treated by an unreamed intramedullary interlocking nail (Group A) and the other group was treated by reamed IMN (Group B). The fractures were categorized according to the Gustilo and Anderson categorization system.[11] When patients were presented in the emergency, sterile dressing was applied. Normal saline was used to extensively irrigate the wound and the limb was splinted. After this, analgesia, an IV injection of either Cefoperazone or Sulbactum 2 gm, and tetanus vaccination was given to the patient. All of this was administered every 12 hours. The researcher himself examined the patients and follow-up was taken. Results were noted on the proforma. 3 days after the operation as soon as the pain permitted, physiotherapy was started. Proper walking aids were used.
Follow-up was done at 2nd week, 6th week, 12th week, and 6 months after the treatment. The primary outcome variable was Radiographic Union Scale for Tibial fractures (RUST) score. It is a radiological scoring system used to assess fracture healing on X-rays, especially in tibial shaft fractures. The secondary outcome variables were blood loss, operation time, hospital stay, and complications. SPSS version 25 was used to analyze the data. Chi-square test was used to compare antegrade and retrograde nailing. To compare mean scores of both the groups, t-test was applied. A p-value of less than 0.05 was considered significant.

RESULTS

There were a total of 120 patients involved in this study. All the patients were divided into 2 groups

having an equal number of participants in each group (60 patients in each group). The majority of the patients were males in this study. There were a total of 93 males and 27 females. In terms of fracture union, 48 patients in group A had complete union as compared to 57 patients in group B. Wound infection was observed in 2 patients in group A while it was in 5 patients in group B. In both the groups, the majority of the participants had Southampton Grade 0 wounds. 48 patients from Group A and 55 patients from Group B had Grade 0 wounds. Table number 1 compares the clinical and demographic parameters of both the groups based on fracture union.

Table 1: ?

Parameters	Group A (n=60)		Group B (n=60)	
	Fracture Union		Fracture Union	
	Yes	No	Yes	No
Gender				
• Male	36	10	45	2
• Female	12	2	12	1
Mechanism of injury				
• Fall	11	4	14	1
• Sports	5	-	6	-
• RTA	30	8	34	1
• Direct below	2	-	3	1
Side				
• Right	26	8	27	1
• Left	22	4	30	2
Wound infection				
• Yes	0	2	2	3
• No	48	10	55	0
Southampton Score				
• Grade 0	48	10	55	0
• Grade I	0	1	0	1
• Grade II	0	1	-	-
• Grade III	0	0	1	1
• Grade IV	0	0	1	1
Knee Pain				
• Mild	48	10	55	0
• Moderate	0	2	1	2
• Severe	0	0	1	1

Table number 2 compares the clinical and demographic parameters of both the groups based on fracture union in terms of mean and SD. The mean age in group A was 36.9 ± 8.30 years while it was 35.8 ± 8.60 in group B. Duration of surgery was less in group A (40.0 ± 5.12 mins).

Table 2: Comparison of Metabolic and Insulin Resistance Parameters Between Groups

Parameters	Group A (n=60)	Group B (n=60)	p-value
Age (yrs)	36.9 ± 8.30	35.8 ± 8.60	0.484
Duration of Surgery (mins)	40.0 ± 5.12	60.2 ± 5.50	<0.001
Estimated Blood Loss (ml)	155.1 ± 12.73	388.1 ± 19.33	<0.001
Interval Between Injury And Surgery (hrs)	12.1 ± 6.01	11.6 ± 6.14	0.646

Table number 3 compares the fracture union and RUST score between both the groups along with p-value.

Table 3: Serum Adiponectin Levels and Correlation with Metabolic Parameters (n = 80)

	Group A (n=60)	Group B (n=60)	p-value
Fracture Union			0.037
• Yes	48	57	
• No	12	3	
RUST Score	11.2 ± 1.74	11.9 ± 0.61	0.013

DISCUSSION

The findings of this study revealed that reamed IM interlocking nails were significantly linked with higher union rates in patients having open tibial fractures of the shaft. The majority of the patients were males in this study. All the participants were having open fractures of the tibia. All the patients were divided into 2 groups having an equal number of participants in each group. One group was treated by an unreamed intramedullary interlocking nail (Group A) and the other group was treated by reamed IMN (Group B).

To manage open tibial shaft fractures, there are still many challenges involved. High-energy trauma usually causes these types of injuries and there are certain complications linked with it. The complications include infection, non-union,

malunion, and amputation (in severe cases) [12]. The risk of these complications increased because the tibia has relatively poor blood supply and limited soft tissue coverage. Some wound coverage methods and improvements in fixation devices have reduced these problems. However, there is still room for evolution of the optimal treatment strategy for open tibial shaft fractures.

Mainly 2 important factors are associated with the outcome of tibial shaft fractures. Severity of the fracture is the first factor. According to the classification of Nicoll, the severity of fracture includes comminution, degree of displacement, and extent of soft tissue injury.[13] The other factor is the condition of the tibial blood supply. Due to soft tissue damage and periosteal stripping, both periosteal and endosteal blood circulation can be compromised. This negatively affects the healing of the fracture.

To manage open tibial fractures, plaster casting has been used traditionally but there are certain limitations to it. According to the study of Nicoll, there was a 15% infection rate reported among 140 open tibial fractures which were treated with casting.[13] Moreover, the study of Brown and Urban reported that 63 open tibial shaft fractures were managed with a cast and 27% of them healed with more than 10 mm shortening.[14] Similarly, a 12.5% rate of malunion was reported in 24 open tibial fractures in the study of Puno et al. who used plaster casting.[15] Therefore, it is recommended to use plaster casting only for fractures where there is minimal soft tissue damage.

In closed tibial fractures, good results have been seen by using intramedullary IM locking nails. This led to use of them in open fractures as well. Literature suggests that reamed IM nailing is widely used to treat open fractures.[16] However, it has some risks such as it may increase soft tissue and vascular damage. This leads to an increase in the risk of infection and delayed union. In terms of fracture union, 48 patients in group A had complete union as compared to 57 patients in group B. This shows that the difference was statistically significant (p=0.037). According to the study of Huang et al., higher union rates were seen with reamed nailing.[17] Moreover, Xue et al. found significantly lower non-union rates in the reamed group (p=0.008).[18] Our results are being supported by these studies that reamed IM nailing is linked with higher fracture union rates. If we talk about infection rate after the treatment, our study showed wound infection in 2 patients in group A while it was in 5 patients in group B. This difference was not statistically significant (p=0.240). Similar to our study, the study of Shobha and Punith found no significant difference in infection rates between both the groups.[19] 10.8% infection rate was observed in the reamed group of Omrani et al.'s study while it was 22.7% in the unnamed group.[20]s There was no statistical difference seen here as well. Overall, the results of our study are similar to other international and local studies which says that reamed IM nailing provides better fracture union and no significant difference in infection rates. Therefore, it is preferred that open tibial shaft fractures should be treated with reamed IM nailing.

Our study has some limitations. The first limitation is that it was a single centered study which included limited patients. Thus, the results cannot be generalized. The second limitation is that the follow-up period was short due to which long term results could not be assessed. The third limitation is that only patients with open tibial fractures were involved. Hence, we cannot comment on patients with closed tibial fractures and other fractures.

CONCLUSION

Reamed IM nailing provides better fracture union and no significant difference in infection rates.

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This study was conducted without receiving financial support from any external source.

Conflict in the interest

The authors had no conflict related to the interest in the execution of this study.

Permission

Prior to initiating the study, approval from the ethical committee was obtained to ensure adherence to ethical standards and guidelines.

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