

Frequency of Infection in Open Fracture Shaft of Femur Treated by Reamed versus Unreamed Interlocking Nails

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ABSTRACT

Objective: To compare the frequency of infection in open fracture shaft of femur treated by reamed versus unreamed interlocking nails.

Study Design: Randomized control trial study.

Place and Duration of Study: This study was conducted at the department of Orthopaedics unit, Nishtar Hospital Multan from December 2016 to May 2017.

Materials and Methods: All the data was entered and analyzed using computer program SPSS version 21. Descriptive statistics were used to calculate mean and standard deviation for age and duration of fracture. Frequencies and percentages were calculated for gender, blood culture, open fracture and infection. Chi-square test was applied to test the hypothesis. Confounders and Effect Modifiers like age and gender were controlled by stratification of data. Post stratification chi square test was applied. P value ≤ 0.05 was considered significant.

Results: A total of 484 patients selected for this study and divided into two equal groups 242 in each group. That infection was detected in 5.4% patients (Table-2). When we correlate outcome variable (Infection) with groups, in group A, in 5 (2%) patients observed with infection and in 237 (98%) was not found infection, similarly when we correlate it in group B, 21 (8.6%) patients have infection and in 221 (91.4%) infection was not found. P value was 0.001 a significant value.

Conclusion: our results revealed that management of femoral shaft fracture with reamed intramedullary nail is better than undreamed intramedullary nailing because it aids fracture healing and have less infection rate.

Key Words: Intramedullary nailing, Reamed, Unreamed, Infection, Blood Culture.

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INTRODUCTION

Femoral shaft fractures have much variability in presentation like stress fracture, non-displaced or displaced fractures and soft tissue injury. Major causes of its fracture include multisystem trauma or high energy force hit by any object or road traffic accident. Some isolated injuries also associated with femoral shaft fracture such as primary bone tumours, metastatic disease and presence of metabolic bone disease¹. Its treatment options were modified and evaluated from last few decades, but traction and splinting considered as a favourable treatment. Among many treatment options intramedullary (IM) nailing accepted as a gold standard; it has different types like proximal or distal IM nailing which can normalize the longitudinal stability and rotational stability².

IM nail is an implant use to share weight of body and make the bone strong in early weight bearing in stable and unstable both types of fractures. In nail are more beneficial if locking screws are used after reaming the bone of fracture site^{3,4}.

Nail may be dynamic or static which are classified and their application decided by evaluating anatomical level of fracture, communication and plane or pattern of fracture^{5,6}. Fracture communication can be made on the basis of Winquist and Hansen, through which surgical intervention has been decided⁷. Interlocking of intramedullary nail is also an emerging intervention, its effectiveness accepted globally. To make it more effective its reaming was introduced recently with minimum blood loss, endosteal blood supply and outcome (union) is also better.

Literature favours the stabilisation of diaphyseal fracture of tibia much better than with IM nails, but in femoral shaft fractures efficacy of reamed and undreamed nails still under debate⁸. It was reported in previous literature that undreamed nails save endosteal blood supply due to which healing of fracture site is more rapid and complications are minimum. Farshid B et al.⁹ conducted a study on Clinical Outcome of Reamed Versus Unreamed Intramedullary Nailing for Femoral Shaft Fractures. In his study he include 34 patients divide them into two equal groups of 17 in each

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group. He reported infection rate in reamed group was 0.3% and in unreamed group was have infection rate of 3.3%.

The purpose of this study is to evaluate the outcome of infection in open fracture shaft of femur treated by reamed versus unreamed interlocking nails, so that we will be able to adopt a better technique to treat open fracture shaft of femur with less infection.

MATERIALS AND METHODS

This randomized control trial was conducted in the department of Orthopaedics unit Nishtar Hospital Multan from December 2016 to May 2017. The protocol of the research for the initials of the study was submitted to the ethical committee of the Nishtar hospital Multan. Sample size was calculated with WHO sample size calculator with CI 95 %, power of study 80% and P1 infection in reamed group 0.3% and P2 infection in unreamed group 3.3%. After the approval, the study was started. The patients with open fracture shaft of femur fulfilling the inclusion criteria were taken for consent for the surgical intervention and written consent was taken. All the agreed patients were enrolled for the trail. Open fracture shaft of femur (as per defined in operational definition), skeletally mature patients between 18 to 50 years of age, patients with surgical wound debridement performed within six hours of the trauma and patients with no systemic complications (no head injury, chest problem and cardio vascular problem) on clinical assessment were included in the study. Patients who failed to receive surgical debridement performed within six hours of the trauma, patients presenting systemic complications (head injury, chest problem and cardio vascular problem) and fracture other than femoral shaft were excluded from the study. Infection was diagnosed by pus discharge, presence of redness and swelling of wound area within one month of surgery and confirmed on the basis of positive blood culture that was turn media turbid. Open Fracture Clinically fracture in which bone was exposed and it was confirmed by x ray showing fracture line. Duration of fracture was evaluated from time of injury to the procedure in operation theatre. Positive Blood culture is considered as positive when same bacteria present on two different samples of a patient.

The patients/care takers were informed about clinical condition, procedures that was done and management of the fracture. All the patients were randomized into two groups (group A and group B) by lottery method. Patients in group A was operated with reamed and group B operated with unreamed technique. Patients were kept NPO before six hours of surgery and surgery was performed by orthopaedic surgeon having experience more than five years and he was blind to the study under standard anaesthesia. Preoperative short of antibiotics was given and fluid was administered. Post-

operative antibiotic course was completed in both groups equally and proper analgesia was given. All the recruited patients were observed for acute post-operative infection (2-30 post-operative days) at fracture site; in suspected cases the material from infected wounds was obtained for culture. The courses of the infections was analyzed and noted. All the information was recorded on a predesigned Performa. (Performa attach).

All the data was entered and analysed using computer program SPSS version 21. Descriptive statistics were used to calculate mean and standard deviation for age and duration of fracture. Frequencies and percentages were calculated for gender, blood culture, open fracture and infection. Chi-square test was applied to test the hypothesis. Confounders and Effect Modifiers like age and gender were controlled by stratification of data. Post stratification chi square test was applied. P value ≤ 0.05 was considered significant.

RESULTS

A total of 484 patients selected for this study and divided into two equal groups 242 in each group. In group A mean age of patients was 33.56 and SD 8.826 and in group B mean age was 33.94 and SD was 10.107, similarly mean duration of fracture in group A was 15.98 and SD 8.326, in group B mean duration of fracture was 15.57 and SD 8.399 (Table-1). As concern to the gender 242 (50 %) were male and 242 (50%) were female included in the study (Table-2). Positive blood culture was found in 26 (5.4%) patients and remaining 458 (94.6%) were having negative blood culture, so that infection was detected in 5.4% patients (Table-2).

Table No. 1: Association of Blood culture and Group of patients.

Blood culture	Group of patient		Total
	A	B	
Positive	5 (2%)	21 (8.6%)	26 (5.3%)
Negative	237 (98%)	221 (91.4%)	458 ((4.7%)
Total	242 (100%)	242 (100%)	484 (100%)
P Value	0.001		

Table No. 2: Association of Infection and Group of Patients.

Infection	Group of patient		Total
	A	B	
Present	5 (2%)	21 (8.6%)	26 (5.3%)
Absent	237 (98%)	221 (91.4%)	458 (4.7%)
Total	242 (100%)	242 (100%)	484 (100%)

When we correlate outcome variable (Infection) with groups, in group A, in 5 (2%) patients infection is

presented and in 237 (98%) was not found infection, similarly when we correlate it in group B, 21 (8.6%) patients have infection and in 221 (91.4%) infection was not found (Table-3). P value was 0.001 a significant value. Same ratio was found when we correlate groups with blood culture (Table-1).

DISCUSSION

In adult femoral shaft fracture intramedullary nailing is the gold standard of treatment, IM nails are made up of titanium or stainless steel. Both metals have their own healing properties, titanium alloy have elastic properties which is almost the nature of human bone, so it is biologically compatible with human body and response system as compared to stainless steel¹⁰. Insertion of IM nails promote the callus formation at fracture site and shortens the healing and union time. In concern to ream and undreamed nailing it was observed that reamed nails have larger diameter due to which stiffness is higher in those patients who were treated with reamed nails¹¹.

In our study we observed infection in infection was detected in 5.4% patients, in group A, in 5 (2%) patients infection is present and in 237 (98%) was not found infection, similarly when we correlate it in group B, 21 (8.6%) patients have infection and in 221 (91.4%) infection was not found. A similar study was conducted by Mohammad T et al¹² and reported 3.3 % superficial infection only fascia involved, and 6.6% have deep infection. In these patients culture was obtained after stopping antibiotics for 28 hours.

In 2013 Puri Set al¹³ conducted a study on comparison of reamed and undreamed nails and reported only one case of post-operative infection which was later treated with external fixator percentage of infection in his study is much less than our study. This infection case was found in undreamed group, results of his study were also comparable with our results.

Chun-xiao Li et al¹⁴ conducted a study and reported reamed nailing is better in outcomes than undreamed but infection rate is not significantly different in both groups $P = 0.27$, $RR = 0.38$, 95% CI: (0.01, 7.87). Results of his study were contradicted to our findings as we found less infection in reamed group as compared to undreamed.

Smith et al¹⁵ found in his study rate of infection 33% in tibial fracture treated with intramedullary nailing with reaming technique, in these fracture major number include soft tissue injury. Klemm and Borner et al also¹⁶ reported 6 infections when grade I open fractures treated with intramedullary nailing technique after reaming process. Bone and Johnson et al also¹⁷ reported 2 infections after treatment of grade II and grade III fractures when treated with reamed IM nailing. Kaltenecker et al¹⁸ reported in his study no infections when 66 patients were treated with reaming

nail technique and reported that reaming nail is highly effective and have less complication rate.

CONCLUSION

Our results revealed that management of femoral shaft fracture with reamed intramedullary nail is better than undreamed intramedullary nailing because it aids fracture healing and have less infection rate.

Author's Contribution:

Concept & Design of Study:	Saeed Ahmad
Drafting:	Saeed Ahmad
Data Analysis:	Maria Maha Naeem
Revisiting Critically:	Mahnoor Fatima Shah
Final Approval of version:	Saeed Ahmad

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