RESEARCH ARTICLE

COMPARISON OF CLOSED VS OPEN INTERLOCKING NAILING OF FEMUR IN TERMS OF DURATION OF SURGERY AND RATE OF INFECTION

Raja Adnan Ashraf[1], Kamran Asghar[2], Ahmed Javed[3], Sohail Iqbal Sheikh[4]
Syed Moosa Haider[5], Muhammad Salim[6]

[1] Assistant Professor, Department of Orthpaedics, Pakistan Railway General Hospital, Rawalpindi, Pakistan
[2] Assistant Professor, Department of Orthopaedics, Fauji Foundation Hospital Rawalpindi, Pakistan
[3] Medical Officer, Department of Orthopaedics, Pakistan Railway General Hospital, Rawalpindi, Pakistan
[4] Professor, Department of Orthopaedics, Pakistan Railway General Hospital, Rawalpindi, Pakistan
[5] House Officer, Department of Orthopaedics, Pakistan Railway General Hospital, Rawalpindi, Pakistan
[6] Professor, Department of Orthopaedics, Fauji Foundation Hospital Rawalpindi, Pakistan

ABSTRACT

Objective: *To compare the duration of surgery and frequency of infection in closed vs open interlocking nailing of femoral fractures.*

Study design: *comparative quasi-experimental study*

Place and duration: *The study took place from 10th October 2021 to 10th April 2022 in the admitted patients of the orthopedics department, Pakistan Railway General Hospital, Rawalpindi.*

Methodology: *Out of 80 patients, 40 were managed using a closed technique and the other 40 were treated with open surgery. It was approved from the college ethics committee. Femur fractures were classified using Winquist Hansen criteria and were managed respectively. Postoperative radiographs were obtained and OPD follow-ups were done at 06 weeks. The patients were evaluated for post-operative infections and followed further by phone calls.*

Results: *Thirty five percent (n=28) of the patients were female while 65% (n=52) male, 5% (n=4) of the patients got infected, 3 had had open surgery and 1 was managed using closed technique. The mean duration of surgery using closed technique interlocking nail was 160.5 minutes (120 to 180 minutes) while that of open interlocking nail surgery was 84.05 minutes (65 to 105 minutes).*

Conclusion: *The closed technique interlocking nailing of femoral shaft fractures is preferred due to a lower infection rate and less morbidity. However, due to non-availability of fluoroscope, open surgical technique for interlocking nailing is superior.*

Keywords: *Closed Nailing, Femur Fracture, Intramedullary Nailing*

INTRODUCTION

Femoral shaft fractures are the most common long bone fractures.[1] One-1.33 of 10,000 people per year present with femoral shaft fractures.2 In extremes of ages however, under 25 and older than 65 years, the incidence is found to be 3 per 10,000 people annually.[3,4] The injuries are usually associated with road traffic accident and gunshot wounds.[1,5,6,7,10] 30 working days are lost from a person's life on an average.[8]

Correspondence:
Dr. Kamran Asghar
Department of Orthopaedics
Fauji Foundation Hospital, Rawalpindi
Email: drkamranasghar@gmail.com

Most are managed using open techniques due to less chances of malunion.[9] Intramedullary nailing are standardized procedure for fixation of femur fractures.[10] During open surgery techniques, the fracture site is often repaired using retrograde intramedullary nailing. Closed techniques can be used as well for the management of femur fracture especially when associated with trochanteric fractures.[11] Closed technique intramedullary nailing is particularly useful for managing delayed fractures of the femoral shaft because they provide better control of limb length and circulatory stabilization.[12,13] We aimed to compare the differences in open and closed techniques and determine which technique is superior.

METHODOLOGY

We conducted a quasi-experimental study from the 10th of September 2021 to 10th of April 2022 in indoor patients of the orthopedics department of Pakistan Railway General Hospital, Rawalpindi. Patients from the ages 15 to 60 with femur fractures were admitted through the Accidents and Emergency department of Pakistan Railway General Hospital, Rawalpindi. Each patient was then evaluated using careful history taking, examinations and radiography. Inclusion criteria included closed fracture of shaft of femur, ages 15-60, and patients consenting to be part of the study, while those who had open fractures, were minors, elderly or did not consent were not included. Only traumatic fractures were considered for our study while pathological were excluded. Patients were then allocated into two groups, A and B, randomly by the lottery method after obtaining written informed consents.

Group A patients were managed using interlocking intramedullary nail through closed technique without opening the fracture site under the guidance of an image intensifier. Group B patients were managed by open technique. The operations were performed by a designated team of orthopedic surgeons under spinal anesthesia. The durations of the surgery were kept under strict observations.

Patients were discharged after 48 hours with oral antibiotics for seven days and followed up in the OPD after two weeks for stitch removal. A second follow-up was done at six weeks using clinical and radiological assessment to check for union and any evidence of infection. The final follow-up was conducted 12 weeks after surgery.

Data was analyzed using SPSS. Frequencies, percentages, mean and standard deviation, were calculated separately. P-value was considered significant at < 0.05.

RESULTS

All patients (n=80) were divided into two equal groups of 40 patients each. Sixty five percent (n=52) of the patients were male, and 35% (n=28) females, 5% (n=4) patients developed infections, out of which 3 were managed using open and 1 with closed technique as shown in Table I.

Mean duration for closed interlocking nailing was 160.50 minutes (range 120 to 180 minutes) with a standard deviation of 11.682. Meanwhile the mean duration for open interlocking nailing of femoral shaft fracture was 84.05 minutes (range 65 to 105 minutes) with a standard deviation of 8.265 as shown in Table II.

TABLE I: Frequency of infections

		Frequency	Percent	Valid Percent	Cumulative Percent
	Yes	4	5.0	5.0	5.0
	No	72	95.0	95.0	100.0
	Total	80	100.0	100.0	

TABLE II: Duration of surgery (minutes)

Type of surgery	Mean	N	Std. Deviation
Open	84.05	40	8.265
Closed	160.5	40	11.682
Total	124.60	80	40.365

DISCUSSION

Femur is a commonly fractured long bone. Different techniques of managing femoral shaft fractures have been suggested.[9] Closed techniques were developed after the invention of image intensifier. Unfortunately, in third world countries image intensifiers and great surgical expertise are not readily available therefore, open nailing with proximal and distal locking should be considered a superior priority. During open surgical technique, specially designed instrument used for proximal locking screw and different crude techniques like jigs, open the distal locking screw site and drill multiple holes to identify the site for distal locking screw used that increase the surgical time significantly.

Deep tissue infections with either technique, are a major hurdle in the complete recovery of patients. Infection rates are slightly higher in open surgery however, studies report similar infection rates with open reduction with intramedullary fixation and closed technique interlocking nailing.[13] The risk of infections is directly related to the extent of stripping of soft tissue and debridement, medullary canal reaming and irrigation, and the level of contamination.[16,17] Attempts to minimize soft tissue stripping were made and the area washed with great amounts of normal saline after reduction.

Preoperative antibiotics with sterile and good operative techniques are essential.[14,15] We gave preoperative antibiotics cefazolin 1 g to both groups. We reported infection in 1 patient managed with closed technique and 3 managed with open techniques 1.25% and 3.75%

respectively. The number of people in the operation theatre were also limited to prevent the chances of post-operative infections.

The duration of surgery is a vital parameter of measuring effectiveness of management. The mean operative time for closed techniques was 113.2 minutes with a standard deviation of 34.725 while that for open reduction was 132 minutes with a standard deviation of 35.670 minutes according to a study.[18] Our initial operative time was longer but with the course of this study it was shortened due to experience with the techniques. Mean time for open surgery in our study was 160.56 minutes (120 to 180 minutes) and 84.05 minutes (range from 65 to 105minutes) for closed method.

Achieving reduction both anteroposterior and lateral views during closed technique is difficult, however, essential. Both segments of the distal proximal fracture can be replaced with the help of a T-shaped end of the hand connectors. In some cases, a pin with a small diameter can be used to treat the nearest part of the fracture during the descent. These guidelines were used while deploying the closed technique during our study.

Salawu et el. reported that open surgery had lower complication rates however we observed less infection rates with closed techniques.[19] Ensuring good traction is pivotal during reduction in both techniques and prevents from angular deformities.[20] We did not observe any angular deformities in our study.

Limitations:

Even though we ensured uniformity of the staff the time of surgeries varied due to experience in techniques over time and external variables like temperature, microbiome, surgical devices and implants could not be uniformed.

CONCLUSION

The closed technique interlocking nailing of femoral shaft fractures is preferred due to a lower infection rate and less morbidity. However, due to non-availability of fluoroscope, open surgical technique for interlocking nailing is superior.

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