

ORIGINAL ARTICLE

Compare the Results of Closed Interlocking Nail Shaft of Femur Versus open Interlocking Nail

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ABSTRACT

Objective: Aim of current study is to compare the outcomes between closed vs open interlocking nail among patients had femur shaft fracture.

Study Design: Retrospective cohort study

Place and Duration: Orthopedics department of Mardan Medical Complex and Muhammad Medical College and Hospital, Mirpurkhas during the period from 16th June 2020 to 15th July 2021.

Methods: One hundred and twenty eight patients with ages 25-70 years were included in this study. All the patients had femoral shaft fracture. Patients' age, sex, body mass index and cause of fracture was calculated after taking informed written consent. Included patients were equally divided in two groups. Group O received open interlocking nail and closed interlocking nail technique was used in group P group. Post-operatively radiological and surgical outcomes among both groups were assessed and compared in terms of union, non-union and delayed union. Prevalence of infection among both groups was also calculated. Flynn's criteria were used to assess functional outcomes. We used SPSS 23.0 edition to analyze all of the data.

Results: Majority of the cases were males 80 (62.5%) and 48 (37.5%) were females. There was no any significantly difference among both groups related to age and body mass index. High impact of collision was the most common cause found in 75 (58.6%) followed by RTA 35 (27.3%) and fall found in 18 (14.1%) cases. Mean duration of surgery in group O was 92.34±5.23 minutes and in group P was 62.12±3.33 minutes. Mean union time in closed group was lower 19.14±5.45 weeks as compared to open group 28.7±6.19 weeks. Frequency of union in group P was higher among 64 (96.9%) as compared to group O 52 (81.3%) cases. Delayed union in group O found among 14 (21.9%) cases and in group P was among 7 (10.9%) cases. According to Flynn's criteria, closed interlocking nail showed significantly excellent and good results with pp value <0.05 as compared to open technique. Rate of complications were also lower in closed group with p value <0.05.

Conclusion: In this research we concluded that closed interlocking nail for femur shaft was effective and useful as compared to open interlocking nail in terms of good radiological and functional outcomes. Except this, post-operative complications were also noticed lower in patients who received closed interlocking nail.

Keywords: Closed/Open interlocking nail, Surgery, Femur Shaft, Outcomes, Complications

INTRODUCTION

High-energy trauma, such as a car accident, generally causes a femoral shaft fracture. According to a recent epidemiological study, 10 to 21 of these fractures occur in 100,000 person-years [1,2]. 40.5 percent of all injuries are caused by road traffic crashes and falls from a height, and femoral fractures are a regular occurrence [3]. Femoral shaft fractures can be reduced using intramedullary nailing (IMN), which has good clinical and functional outcomes [4]. Fakhry et al. found that early surgical stabilisation reduces complications and death [5]. In order to provide support for a broken bone, an intramedullary nail is a metal rod placed into bone's medullary cavity and over the fracture site [6]. Early functional use of the leg, a shorter hospital stay, and an early union of the fractured bone are some of the benefits.[7]

The IMN of the femur has established closed nailing procedures [8]. The open nailing fixation methods, on the other hand, are recommended if they fail to achieve desire decrease. Open IMN of a close shaft of femur fracture has been linked to a variety of complications, including infection

of the metalwork, non-union as a result of fracture hematoma rupture, and wound and deep tissue infections [9]. Surgeons prefer open and closed nailing procedures, depending on the co-morbid, the availability of operative room equipment such as a C-arm and a fracture table, the fracture pattern and accompanying traumas (i.e., spinal damage, floating knee injury, simultaneous acetabular fracture). The open intramedullary nailing fracture takes longer to heal than the closed intramedullary nailing fracture [10]. According to Schell et al., less tissue damage and less disruption of the fracture haematoma result in faster healing time with close nailing [11].

To avoid the danger of malalignment in infraisthmic femur fractures, intraoperative imaging should be offered for LMICs only. There are various issues that arise when IMNs are performed without intraoperative fluoroscopy.[12] These include difficulties in assessing reduction quality and in preventing typical intramedullary nail interlocking techniques.[12] Surgical implants like the SIGN intramedullary nail can help surgeons in low- and middle-income countries (LMICs) overcome these difficulties.

Intramedullary SIGN screws are confined to two proximal and two distal screws, all orientated in a single plane unlike current retrograde femoral nail designs used in HICs. The SIGN nail interlocking screws can be inserted without image intensifier by using an external targeting arm jig[12] (lateral to medial). Even though the SIGN nail is frequently utilized in LMICs[13] with high union rates[12], no one knows the relative benefits of antegrade versus retrograde procedures in infraisthmus fractures. In the absence of fluoroscopy, it may be more difficult to achieve appropriate distal fixation of infraisthmus femur fractures nailing using an antegrade approach, an issue that is compounded.

No prior studies comparing the antegrade and retrograde techniques in infraisthmus fractures treated with the SIGN nail have been conducted, to our knowledge at least. Even more concerning is the fact that existing trials of non-SIGN implants generally followed patients for less than a year and didn't employ equipment that had been well tested. Additional studies are needed to fill this knowledge gap, especially in low- and middle-income countries (LMICs), where femur fractures are common[14] and SIGN nails are commonly used.

To compare the results of closed versus open interlocking nails in treating femur fracture shaft fractures in terms of union, nonunion, and infection rate, our study set out to do just that.

MATERIAL AND METHODS

This Retrospective cohort study was conducted at Orthopedics department of Mardan Medical Complex and Muhammad Medical College and Hospital, Mirpurkhas during the period from 16th June 2020 to 15th July 2021. The study comprised of 128 patients. Patients' age, sex, body mass index and cause of fracture was recorded after taking informed written consent. Patients less than 25 years of age, severe medical illness i.e. kidney failure, cardiovascular disease, poly-trauma, multiple fractures, segmental fractures, bilateral femoral fractures, floating knee patients, pathological fractures and those did not give any written consent were not included in this study.

Age of the patients was between 25-70 years. Included patients were equally divided in two groups. Group O received open interlocking nail and closed interlocking nail technique was used in group P group. Winquist and Hansen defined fractures radiologically as proximal, middle, and distal thirds. 16 Each patient's post-operative antibiotics, follow up and rehabilitation treatments were found to be consistent in the medical record. All patients were operated on while lying on a traction table and were given general or spinal anaesthesia while being monitored with an image intensifier. Depending on the fracture's position and comminution, an antegrade interlocking nail was introduced into the piriformis fossa and locked either statically or dynamically. The interlocking nail was either done near to the fracture site, or after the guide wire failed to pass the fracture site, by opening up the fracture. Isometric quadriceps exercises were performed on the first post-operative day, followed by partial or full weight-bearing, depending on the individual fracture pattern and manner of dynamization and the formation of callus on the affected area. Final evaluation

and comparison of surgical outcomes for both groups were performed at one year after final evaluation and comparison of surgical outcome for duration of surgery, average union time, delayed union (inadequate callus at 14th week post operatively), dynamization, fracture union and complications.

We used SPSS 23.0 edition to analyze all of the data. Chi square test was used and p value <0.05 was considered significant. Flynn's criteria were used to assess functional outcomes.

RESULTS

In this study majority of the cases were males 80 (62.5%) and 48 (37.5%) were females.(figure 1)

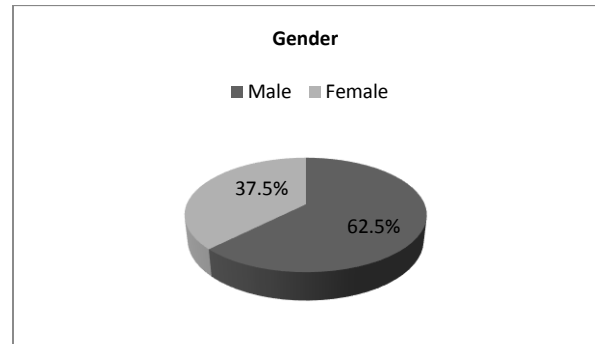


Figure 1: Gender distribution of enrolled cases

High impact of collision was the most common cause found in 75 (58.6%) followed by RTA 35 (27.3%) and fall found in 18 (14.1%) cases.(fig 2)

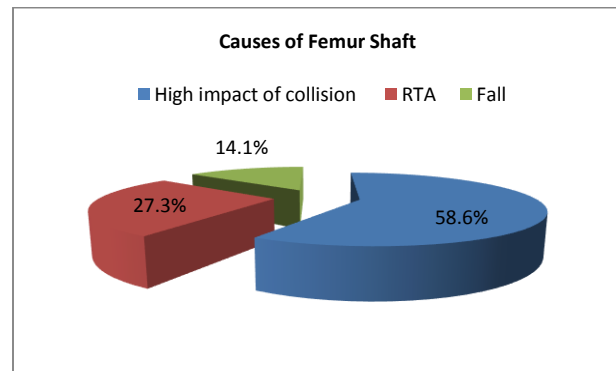


Figure 2: Causes of femur shaft

There was no any significantly difference among both groups related to age and body mass index. Mean duration of surgery in group O was 92.34±5.23 minutes and in group P was 62.12±3.33 minutes.(table 1)

Table 1: Baseline details of enrolled cases

Variables	Group O	Group P
Mean age (years)	29.7±4.21	29.7±8.44
Mean BMI (kg/m ²)	24.9±6.31	24.4±7.34
Mean Surgery time (minutes)	92.34±5.23	62.12±3.33

Mean union time in closed group was lower 19.14±5.45 weeks as compared to open group 28.7±6.19

weeks. Frequency of union in group P was higher among 64 (96.9%) as compared to group O 52 (81.3%) cases. Delayed union in group O found among 14 (21.9%) cases and in group P was among 7 (10.9%) cases.(table 2)

Table 2: Post-operative surgical outcomes among both groups

Variables	Group O	Group P
Mean Union time (weeks)	28.7±6.19	19.14±5.45
Radiological Outcomes		
Union	52 (81.3%)	64 (96.9%)
Delayed Union	14 (21.9%)	7 (10.9%)
Non-Union	12 (18.7%)	2 (3.1%)

According to Flynn’s criteria, closed interlocking nail showed significantly excellent and good results with pp value <0.05 as compared to open technique.(table 3)

Table 3: Comparison of functional outcomes among both groups

Variables	Group O	Group P
Flynn’s Criteria		
Excellent	40 (62.5%)	55 (85.9%)
Good	12 (18.7%)	7 (10.9%)
Poor	12 (18.7%)	2 (3.1%)

Rate of complications were also lower in closed group with p value <0.05.(table 4)

Table 4: Post-operative comparison of complications among both groups

Variables	Group O	Group P
Complications		
Yes		
Superfacial Infection	9 (14.06%)	3 (4.69%)
Deep Infection	5 (7.81%)	2 (3.13%)
No	50 (78.1%)	59 (92.2%)

DISCUSSION

Motor vehicle accidents, automobile-pedestrian collisions, gunshot wounds, falls from great heights, and plane crashes are all common causes of femoral shaft fractures. They can be fatal in some cases, and they are common in individuals who have been harmed multiple times. The ability to continuously achieve union, as well as maintaining a normal, functional range of motion in the hip and knee, are all treatment goals. To allow the patient to ascend stairs comfortably, the sum of hip and knee range of motion and flexion should be at least 160°. [14,15]

In our study majority of the cases were males 80 (62.5%) and 48 (37.5%) were females. There was no any significantly difference among both groups related to age 29 ears and body mass index 2kg/m². High impact of collision was the most common cause found in 75 (58.6%) followed by RTA 35 (27.3%) and fall found in 18 (14.1%) cases. Our results were comparable to the studies conducted in past.[16,17] Mean duration of surgery in group O was 92.34±5.23 minutes and in group P was 62.12±3.33 minutes.[18] Mean union time in closed group was lower 19.14±5.45 weeks as compared to open group 28.7±6.19 weeks.In our study, the relatively long healing period in the open nailing group is consistent with other findings in the literature.[19]

Seetharmaiah and colleagues [19] compared 57 closed interlocking nail femurs with 49 open nailing femurs and found that the average radiological union time was 22.6 weeks in closed nailing versus 24.21 weeks in open nailing, with shortening in 7(12.2%) patients in closed versus 5(10.2%) in open nailing and 4(8.1%) patients with superficial infection in each group. They used Thoreson’s criteria to assess functional outcomes and found excellent in 68.4 percent of patients, good in 24.5 percent, and fair in 7% of patients with closed nailing. In 55.1 percent of patients, open nailing resulted in an outstanding functional outcome, 28.5 percent in a good functional outcome, and 16.3 percent in a fair functional outcome.Tahririn [17] used a tiny incision (2.5cm) at the fracture site to treat 23 patients with closed nailing and 24 patients with open nailing. In closed nailing, the average union time was 132.4 seconds, while in open nailing, it was 17.72.3 seconds (P value 0.001). One of the patients in the open nailing group did not union, which was the sole problem. Patients with polytrauma and centres without a fracture table or an image intensifier can be efficiently treated with open nailing utilising a tiny incision, according to these investigators. However, we were unable to determine the size of the incision at the fracture site in our investigation, thus we presumed that an incision of sufficient length was utilised for fracture reduction and guide wire passage. In our study frequency of union in group P was higher among 64 (96.9%) as compared to group O 52 (81.3%) cases. Delayed union in group O found among 14 (21.9%) cases and in group P was among 7 (10.9%) cases. According to Flynn’s criteria, closed interlocking nail showed significantly excellent and good results with pp value <0.05 as compared to open technique.

Rascher et al. discovered that closed intramedullary fixation restored normal anatomy in 42 femoral fractures [20]. There are various research on the closed method in the literature review, however there are few comparison studies between open and closed techniques. The benefits of closed nailing over open nailing are still up for debate; Rokkanen et al. claim that closed nailing produces marginally better outcomes than open nailing [21]. Leighton, on the other hand, undertook a two-year follow-up research to compare open and closed nailing techniques. He discovered that there was no significant difference in clinical outcomes between patients who used a closed method and those who used an open approach [22]. In current study rate of complications were also lower in closed group with p value <0.05.[24]Salawu et al. [23] looked at how closed femoral shaft fractures fared following open intramedullary nailing. Malunion, fractured nails (4.7 percent), infection, loosening of the distal screw, and limb length disparity occurred in two patients, with a time to radiological fracture union of 14.0 1.2 weeks (2.3 percent each).

CONCLUSION

In this research we concluded that closed interlocking nail for femur shaft was effective and useful as compared to open interlocking nail in terms of good radiological and functional outcomes. Except this, post-operative complications were also noticed lower in patients who received closed interlocking nail.

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