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ORIGINAL ARTICLE

Clinical outcome of closed intramedullary interlocking nailing in comminuted fractures of the femur.

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ABSTRACT… Objective: To determine the clinical outcome of closed intramedullary interlocking nailing in comminuted fractures of the femur. **Study Design:** Retrospective Study. **Setting:** Department of Orthopaedics & Spine Centre, Ghurki Trust Teaching Hospital, Lahore. **Period:** January 2022 to December 2022. **Methods:** The study included 50 patients who fulfilled the inclusion criteria. Patients with Gustillo Anderson Class I fractures, patients with pathological fractures, and patients aged 18 to 65 years of both sexes were included in this research. Patients with serious injuries were not included. The data was gathered via non-probability, sequential sampling. The patients had spinal anaesthesia for their operations after providing written informed permission. Three months after surgery, patients were evaluated again to determine the functional result using modified Klaus & Klemm criteria. SPSS version 25.0 was utilized for doing statistical analysis. Using stratifications, effect variables such as age, gender, and injury manner were controlled. A chi-square test after stratification was used to examine their impact on the result; A p-value is considered significant if it is less than 0.05. **Results:** The results indicate that the majority 90% were male patients and only 105 cases were females with the mean age of patients 33.34±13.87 ranging from 18 to 60 years. Road Traffic Accidents (RTA), comprising 64.0% of the total sample. Falls were the mode of injury for 8 cases, accounting for 16.0%. Other modes of injury were reported in 10 participants, representing 20.0%. According to clinical outcome, 33(44%) cases found with excellent functional outcome, 18(36%) with good, 8(16%) with fair and 1(2%) with poor outcome. Only the mode of injury was significantly associated with the clinical outcome as p<.05. **Conclusion:** The best treatment for comminuted long bone fractures in lower limbs is closed intramedullary interlocking nailing, which increases the chance of bone union and reduces disruption to the fracture pieces' blood supply. Other advantages of interlocking nails include a reduced length of hospital stay, early weight bearing, early muscle rehabilitation, early joint mobilization, and—above all—an early return to employment and pre-fracture status.

Key words: Fracture, Intramedullary, Interlocking, Long Bone.

INTRODUCTION

One of the most frequent fractures seen in orthopaedic practice involves the femur shaft. The femur is one of the primary weight-bearing bones in the lower extremities and the most prominent bone in the body. If fractures occur, treatment is necessary to prevent protracted morbidity and severe impairment. Since high-intensity trauma is typically the cause of these fractures, one needs to be highly vigilant for any consequences or related injuries. Femoral shaft fractures are frequently caused by increased road traffic accidents (RTAs) in emerging nations. Patients with similar injuries have historically been managed by orthopedists with problems including limb shortening and malalignment, as well as contractures in the knee after extended immobilization.[1]

The management of these injuries has changed from traditional nonoperative care of femoral shaft fractures to the newest intramedullary nail fixation techniques. Closed intramedullary nailing of femur fractures has many more indications now that interlocking nails are available. It has been demonstrated that early mobilization after femoral shaft fractures significantly improves joint mobility and has a positive economic impact. The application of interlocking nails very successfully achieves these goals.[2]

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The use of a closed intramedullary interlocking nailing method lowers the ris k of infection, nonunion, rotational deformities, early patient rehabilitation, and postoperative sequelae.[3] Since interlocking nails are done beneath image intensifiers, radiation risks continue to be a problem that needs to be resolved. A more profound comprehension of the issues surrounding femoral shaft fractures is required, as is an analysis of the benefits, drawbacks, and limitations of intramedullary nailing as a therapeutic option.[4-5]

The literature review contributed to a better understanding of this issue, which helped establish treatment goals. These goals included early restoration of extremity function, rapid progress out of the supine position, and subsequent restoration of hip and knee motion and strength. After reviewing several methods, closed intramedullary nailing was the only one close to achieving this objective.[6]

61% of patients mediated the functional prognosis of diaphyseal fractures of the femur treated with locked intramedullary nailing as outstanding, 22% as good, 11.11% as fair, and 5.5% as poor, according to research by Kumar et al.[6]

This study will assist us in producing evidence-based medicine from our demographic, as there is a dearth of literature from our region of the world. Due to this study, we can predict our patients' outcomes and improve our ability to teach them. Determining the clinical consequence of closed IMN nailing in femur comminuted fractures is the aim of this investigation.

METHODS

A retrospective study was performed at the Department of Orthopaedics & spine Centre, Ghurki Trust Teaching Hospital, Lahore, from January 2022 to December 2022. Approval from the Ethical Review Board (Ref no: 2022/01/R-04; Dated: 01-01-22) of the hospital was obtained. 50 patients meeting the inclusion criteria were enrolled in the study. Patients aged 18 years up to 65 years of either sex, Gustillo Anderson Class I fractures, and patients with pathological fractures were included in this study. Critically injured patients were excluded. Non-probability, consecutive sampling was used to collect the data. After written informed consent, the patients were operated on under spinal anaesthesia. Standard operating procedures were followed in all cases, and a standard AO femoral intramedullary interlocking nail was used to close the fracture under an image intensifier. The consultant orthopaedic surgeon—who has at least three years of post-fellowship experience—performed every treatment. Following surgery, patients were monitored for three months to evaluate the functional result using the modified Klaus & Klemm criterion 7. A predetermined proforma was used to record the study findings and patient demographic information.

Modified klaus & klemm Certeria7
Excellent
Normal radiographic alignment
Full hip and knee motion
No muscle atrophy
Good
Angular deformity <5
Slight loss of hip and knee motion
Muscle atrophy <2cm
Shortening <2cm
Fair
Angular deformity 5 -10
Moderate (25%) loss of hip and knee motion
Muscle atrophy >2cm
Shortening >2cm
Poor
Angular deformity >10
Marked loss of hip and knee motion
Marked muscle atrophy
Marked Shortening

SPSS version 25.0 was utilized for doing statistical analysis. Age-related mean and standard deviation were computed. For each gender and injury mode, the frequency and percentage were calculated. Using stratifications, affect variables such as age, gender, and injury manner were controlled. A post-stratification chi-square test was applied to determine their impact on the

result, with a p-value of < 0.05.

RESULTS

The table shows that there were 45 male cases, constituting 90.0%. There were 5(10%) female cases.

The mean age of patients was 33.34±13.87, ranging from 18 to 60 years. There were 28 cases in the 18-30 age group, making up 56.0% of the total sample, and 44% were found in the>30 age group. Road Traffic Accidents (RTA) were the most common, comprising 64.0% of the total sample. Falls were the mode of injury for 8 cases, accounting for 16.0%. Other modes of injury were reported in 10 participants, representing 20.0%. According to clinical outcome, 33(44%) cases found with excellent functional outcome, 18(36%) with good, 8(16%) with fair and 1(2%) with poor outcome. Only mode of injury was significantly associated with clinical outcome as p<.05.

Parameters	n	%	M±SD Range
Gender	0		
Male	45	90.0	
Female	5	10.0	
Age (years)			33.34±13.87(18-60)
18-30	28	56.0	
>30	22	44.0	
Mode of Injury			
RTA	32	64.0	
Fall	8	16.0	
Others	10	20.0	

Table-I. Distribution of participants by gender and age

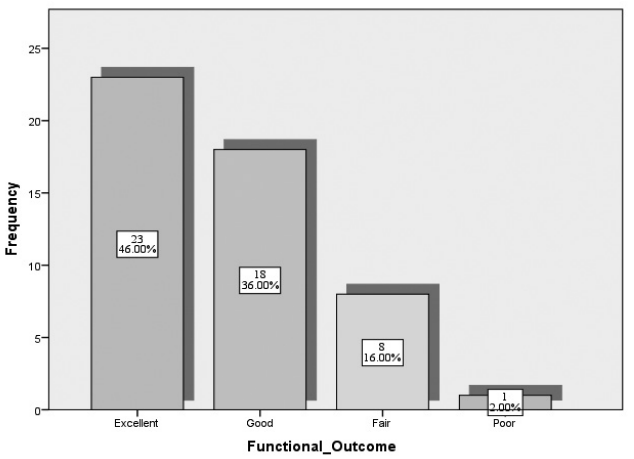

Figure-1. Distribution of outcome of patients using modified Klaus & Klemm criteria

DISCUSSION

Over time, there has been a significant advancement in the art and science of fracture care. The treatment of fractures has influenced the surgical discipline, from the Hippocratic era's use of external splints to more modern, sophisticated equipment. The work of the Rush family in the United States and Sir Gerhard Kuntscher[7] in Germany is primarily responsible for the intramedullary procedures widely used today. Without a doubt, Kuntscher is the originator of reamed intramedullary nailing. The current gold standard for treating femoral shaft fractures is intramedullary nailing.[1,7-10] Since there were no disruptions to the periosteal blood supply, there was no fracture hematoma, and the fracture healed quickly with a lower risk of issues like as infection, shortening, and nonunion, this type of fixation has been widely used since the advent of intramedullary nail technology. A drawback was the lack of axial length and rotational stability in this method of fixing comminuted diaphyseal fractures. The range of femoral shaft injuries that can be evened out with intramedullary treatment has expanded with the outline of interlocking nailing. The frequency of rotational, angular, and leg length disparities is reduced when interlocking nails are used.

Because of its proximity to the femur's center, the intramedullary nail can withstand bending and torsional stresses more readily than plates, and its locking mechanism produces less tensile and shear stress. One load-sharing device is the intramedullary interlocking nail. It is not as stressed as load-bearing plates, which results in less cortical osteopenia of stress shielding. The closed-nailing approach is chosen because the biological environment around the fracture is barely disturbed, and no harm is done to the extraperiosteal soft tissue. The possibility of early patient ambulation, which lowers the risks of extended bed rest, is another crucial aspect of the closed intramedullary interlocking nail.[1,2,10,11]

The average patient age is 27.4 years, the mode of injury (road traffic accident, 83.34%), the side involved (right > left), the level of the femur fracture shaft (middle third, 56.66%), the average

length of surgery (120 minutes), postoperative complications such as infections, the incidence of delayed union (6.6%), and the shortening (13.33% cases) are all among the factors that are comparable with literature reports.[1,2,3,11,14,15] In our investigation, the M: F ratio was 4:1. Ten days of antibiotic treatment, five of which are administered intravenously and five of which are administered orally, significantly reduces the likelihood of deep-seated infections, according to the scientists. Because our study's mean nail size was 10 mm, the sample was less similar to other sets.[13,16,17] The Indian skeleton is a little thinner than the Western population. According to the authors, this is probably why nails with a smaller diameter were utilized in the study.

Our study's linked injury percentage (43.33%) matched those of previous studies. Neurosurgeons handled head injury cases.[5,12,13,18] Most related fractures that needed surgical intervention were treated in the same operating room. In our study, the average duration for the bony union was 16.5 weeks, and the union rate was 96.6%, comparable to the previous series.[3,6,8,11,11] Our study's high union rate can be attributed to early surgical intervention, early mobilization, weight-bearing, and the closed approach to preserving fracture hematoma.

The number of femur fractures brought on by auto accidents is rising. Through our research, we propose and confirm that closed IM nailing is now the preferred therapy for adult patients with closed diaphyseal femur fractures, particularly those with severe comminution, long spiral fractures, and segmental fractures. Regarding femoral shaft fractures, intramedullary nails offer additional benefits over plating. These benefits include the ability to restore anatomical length and position of comminuted fractures, high union rates due to biological fixation, reduced failure rates during fatigue, strength in all three loading planes, early joint mobilization, and early muscle rehabilitation, lowers the risk of problems such as infection, cortical osteopenia, malunion, and nonunion; most crucially, it allows for an earlier return to work and a pre-fracture state. Furthermore, intramedullary nail fixation is supported by the femur's structure and the loading circumstances caused by muscular, ligamentous, and gravitational forces. Regarding age, gender, level, and fracture pattern, there is no discernible shift in the union rate.

CONCLUSION

Closed intramedullary interlocking nailing is the recommended treatment for comminuted fractures of long bones in the lower limbs because it reduces damage to the fracture fragments' blood supply and raises the possibility of bone union. Other advantages of interlocking nails include a shorter hospital stay, early weight bearing, early joint mobilization, early muscle rehabilitation, and early return to work and pre-fracture status.

CONFLICT OF INTEREST

The authors declare no conflict of interest.

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AUTHORSHIP AND CONTRIBUTION DECLARATION	
1	**Anas Ilyas:** Conceptulization & fram work research.
2	**Rehman Ali:** Draft of study.
3	**Ajay Kumar:** Draf writing, discussion section.
4	**Iqra Ilyas:** Data collection.
5	**Haseeb Elahi:** Data collection.
6	**Sadaf Saddiq:** Data analysis.