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Original Article

Functional outcome of intramedullary nailing of the femoral shaft fracture

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ABSTRACT

Background & Objective: A common fracture is a femoral shaft fracture. The advantages of intramedullary interlocking nails make them the method of choice for treating femoral shaft fractures. These benefits include a small incision, minimal dissection, decreased rates of infection, nonunion, and malunion, shorter hospital stays and rehabilitation periods, excellent union, rotational stability and length maintenance, rapid recovery, and early weight-bearing. Therefore, the aim of this study was to analyze the functional findings from femoral shaft fracture intramedullary nailing.

Material and Methods: This was a hospital-based, longitudinal, observational study. All patients with femoral shaft fractures admitted at UCMS-TH, Bhairahawa from the Emergency Department managed surgically from October 2019 to March 2020 were included in the study. Femoral shaft fractures with age ≥ 16 years were included while open fractures (Gustalio and Anderson type 2 and 3), pathological fractures, congenital anomaly of the affected limb, previous fracture of the affected limb were excluded. All the patients were managed surgically and followed for at least 6 months. The outcome was measured by the Thoresen scoring system at the end of 6 months.

Results: In this study of 30 cases, the mean age was 30.47 years, male and female ratio of 2:1, the left side was affected in 18 cases, RTA was the most common mode of injury. Most of the cases were Winquist and Hansen type 2 and AO type 32B. In the majority of the cases, 27 cases (90%) had no complication while superficial infection in 2 cases and shortening was seen in 1 case. We found excellent results in 86.7% cases, good in 10% cases and fair in 3.3% cases.

Conclusion: The excellent functional outcome in terms of alignment and range of motion obtained in this study in the majority of patients makes this technique more reliable. The method of choice for femoral shaft fracture in adults was due to its low complication rate, high incidence of union, shorter hospital stay and early mobility.

Keywords: Femur, Femoral shaft fracture, intramedullary nailing

INTRODUCTION

Femurs are the heaviest, longest, and strongest bone among all human long bones [1]. In orthopedic practice one of the common injuries seen is femoral shaft fracture. They might be life-threatening, because of open wounds, hemorrhagic shock, fat embolism, ARDS, or multiple organ failure [2]. The average annual incidence of femoral fractures range from 0.1 to 3% (up to 37 per 100000 patient-years), with a peak incidence in young adult males [3-7]. Among different mechanisms of injury, road traffic incidents are the most common cause of femoral shaft fractures in low and middle-income countries. These fractures are nearly 10% of all nonfatal traffic-related injuries [8]. It is one of the main load-bearing bones in the lower extremity, femoral shaft fractures are associated with considerable mortality and morbidity whether they are caused by high- or low-energy trauma [9].

The treatment of femoral shaft fractures has evolved from the historical non-operative methods to the most recent methods of intramedullary nail fixation. Interlocking nails have greatly widened the indications for closed intramedullary nailing of femoral fractures. Early mobilization following fractures of the femoral shaft has a significant advantage in both joint mobility and economic impact [9]. The intramedullary fixation with a thick intramedullary nail of diaphyseal fractures of the femur gives a fixation stable enough for the extremity for weight-bearing, at least partially, before healing of the fracture has taken place. The most important aim in the treatment of fractures is to restore the function of the injured extremity to the maximum. This aim is achieved by active exercise, during the healing process, of as many joints and muscle groups as the fixation methods allow [10].

Malrotation can occur after closed intramedullary nail fixation of femoral shaft fractures. If malrotation causes abnormalities of alignment or joint orientation or both at the knee joint, eccentric stress on the articular cartilage occurs which can cause degenerative osteoarthritis if the rotatory deformity remains uncorrected. Alteration of the weight-bearing axis in the sagittal plane may be the cause of gait abnormalities [11]. The technique of interlocking of bone and nails was developed to overcome the rotational and longitudinal malalignment of long bone fractures as in comminuted fractures, very proximal and distal fractures, long spiral fractures, and fractures with bone loss. Reduced rates of infection, nonunion, and malunion, shorter hospital stay, and rehabilitation periods are advantages of intramedullary interlocking nails over the conventional non-locking intramedullary nails [12].The design concept of a straighter radius of curvature of the nail is to assist in 3-point fracture fixation. The anteroposterior bow helps to facilitate fracture reduction, as well as externally guided distal cross locking [11]. In comparison to plate intramedullary nail, can withstand bending and torsional loads better than plates and the locking mechanism provides less tensile and shear stress than plates. The intramedullary interlocking nail is a load-sharing device but less loaded than plates causing less cortical osteopenia of stress shielding, which is a feature of the load-bearing plates [9]. The bending moment on a nail is less than that on a plate because the force is applied over a shorter distance. The load shared over the mechanical and anatomic axis is stronger for a nail than for a plate as an intramedullary device [13].

Intramedullary nailing of the femur has a satisfactory union rate and other advantages under stable biomechanical circumstances. Nowadays, closed reduction and internal fixation with an interlocking nail for fracture of the femoral shaft is accepted as a standard treatment. Its use has been extended to nearly all shaft fractures from the proximal to the distal femur [14]. It requires a small incision and minimum dissection, which gives excellent healing of the fracture and rapid recovery. Interlocking provides rotational stability and maintains length which favors an early return to full weight-bearing and union of the fracture [15]. It has allowed reliable, reproducible rates of union and mechanical stability which allows early mobilization and improved function [13]. Moreover, intramedullary interlocking nailing is the method of choice in the treatment of most acute femoral shaft fractures in adults [16]. Therefore, the study was designed to evaluate the functional outcome of intramedullary nailing of femoral shaft fracture.

MATERIAL AND METHODS

Study period and design

This hospital-based observational, longitudinal study was done from October 2019 to march 2020.

Study Population

All patients with femoral shaft fractures admitted at UCMS, Bhairawaha from the emergency department managed surgically in the study period.

Sample size

All the adult cases above 16 years of age with femoral shaft fractures during the study period. The sample size is calculated as

$n=z^2pq/d^2$

n=required sample size

p=prevalence of disease

q=100-p

z=1.96 taken at 95% confidence interval

d=allowable error taken as 5%

P= 2q=98

The sample size calculated by the above formula is approximately 30.

Inclusion criteria

All patients who gave their willful consent to participate in the study and willing for follow-up study , with age ≥ 16 years, medically fit patients, fractures middle third femur and closed, and open (GA type 1) displaced or unstable fractures were included.

Exclusion criteria

Open fractures (GA type 2 and 3), pathological fractures, fractures proximal and distal femur fracture, medically unfit patients, neuromuscular problems, polytrauma patients and head injury patients were excluded.

Ethical Consideration

Ethical clearance was obtained from the Institutional Review Board of UCMS- TH (Ref: UCMS/IRC/204/19).

Data Collection and Sampling procedure

All cases of femoral shaft fracture who presented in the emergency department meeting the inclusion criteria were included in the study.

Initial management of fractures Emergency Management

Airway, Breathing and Circulation assessment according to ATLS protocol was followed. Head injury and other major injuries were ruled out. Intravenous fluids were started in hypotension due to blood loss. Detailed history was taken and thorough clinical examination was performed. Associated orthopedic and other systemic injuries were assessed and managed accordingly. Immobilization of the affected limb with skin or skeletal traction was done. X-rays view taken in 2 planes, AP and lateral including an x-ray of ipsilateral hip and knee joints and special view if required. Analgesics, antibiotics, tetanus toxoid and blood transfusion were given as needed. Management of open fractures was done by urgent wound debridement under antibiotic coverage and temporary stabilization.

All preoperative investigations like complete blood count, renal function test, random blood sugar, bleeding & clotting time, serology (HIV, HbsAg, HCV), ECG, Chest x-ray anteroposterior view & echocardiography (if required) were sent, 2 pints of whole blood after blood grouping & cross-matching were kept on standby before surgery & the patient was shifted to ward & planned for surgery as soon as the patient's condition stabilized & patient got clearance on the pre-anesthetic check-up.

Preoperative preparation

Written informed consent was taken from the patient's party. The patient was kept nil per oral for 6-8 hours before surgery. An adequate amount of compatible blood after grouping and cross-matching was kept ready for any eventuality. Clinically the length of the nail was measured from the tip of the greater trochanter to the upper pole of the patella (on the normal side). Diameter of the nail was measured at the isthmic level on the x-ray. Nails of 1 size above and below the measured length were kept ready. Also, intraoperatively a nail of known length was held to the anterolateral side of the normal thigh, then an anteroposterior image on c-arm was seen to confirm the nail size. A systemic antibiotic usually 2nd generation cephalosporin was administered 1 hour prior to surgery.

Preoperative planning

Type of anesthesia

The decision regarding the type of anesthesia to be used was given to the Anaesthesia Department.

Surgical procedure

Figure 1: Anterograde intramedullary interlocking nailing set

Patient positioning

In antegrade nailing, patient was positioned supine on a fracture table. Traction was applied to the foot, which was secured in a boot. The non-injured leg was kept in a hemilithotomy position, widely abducted**.** C-arm was positioned at the unaffected side of the patient.

Figure 2: Positioning and draping

Reduction

Femoral length can be obtained by using a fracture table. Percutaneously placed half pins can be used to facilitate reduction which allows correction of both angular and rotational deformities simultaneously. The fracture reduction was maintained during a guide-wire passage, reaming, and nail passage.

Incision

An oblique incision (6 to 8cm) proximal to the greater trochanter that is in line with the femoral canal was made. Superficial, deep fascia and gluteus medius split along the skin incision allowing placement of all instrumentation for the nailing procedure.

Figure 3: Incision

Entry point

Piriformis fossa was palpated. An awl was used and its position was confirmed fluoroscopically on the AP and lateral views. The entry point was made and the medullary cavity was perforated, after confirming under C-arm.

Figure 4: Entry point

Guidewire insertion

After the starting hole has been made, a ball-tipped guidewire was passed through the proximal fragment and under C-arm guidance. The fracture was reduced and guide wire was inserted into the distal fragment. The position was confirmed under the C-arm in AP and lateral plane and the tip of guidewire was hammered into the subchondral bone.

Figure 5: Guidewire insertion

Reaming

Reaming of a medullary cavity was started with a 7mm diameter reamer. Subsequent reaming was done by 0.5mm increments. To make nail passage easier 1mm diameter larger than the chosen nail upto the occurrence of cortical chatter at the level of the isthmus was made. The fracture was maintained in a reduced position during the passage of each reamer to minimize eccentric bone removal. The proper nail diameter for a snug fit is therefore 1 to 1.5 mm smaller than the largest reamer used, a width that also correlates to the diameter of the isthmus**.** The ball-tipped guidewire was then exchanged for a straight (non ball-tipped) guidewire using a flexible exchange tube.

Nail insertion

The selected nail was then confirmed, and the nail was attached to the proximal locking jig and placed over the guidewire inserted. The nail was advanced to the level of the fracture. At this point, the length, alignment, and rotation of the femur were corrected accurately then the nail was advanced across the fracture, and the reduction parameters were confirmed. The nail was then driven distally to the appropriate depth. The position of the nail was then checked both in AP and lateral views with C-arm and the guidewire was removed.

Figure 6: Nail insertion

Distal locking

Distal locking was done with a free hand technique under C-arm guidance. A drill bit was used to make a track in the centre of the screw hole. The screw length was measured with a depth gauge and the interlocking screw was inserted. The correct position of screw was assured with guide wire sounding technique and C–arm. Distal locking was preferred first in most cases. Reverse jamming through the jig was done for further compression of fracture when fracture distraction was noticed

Figure 7: Distal locking

Proximal locking

Proximal locking was done through a proximal jig. A drill sleeve was then passed into the guide sleeve and with a 3.5 mm drill bit, a drill hole was made through both the cortices, the length of the screw needed was determined using a depth gauge and the screw was inserted through the guide sleeve. The second screw was placed in similarly.

Removing the jig

Finally, the whole length of the nail, reduction, proximal, and distal locking screws were checked under C-arm. The jig was removed. The incised wounds were washed with normal saline and a vacuum drain was inserted. The skin was closed in layers. The dressing was done and a compression bandage was applied.

Postoperative Protocol

The patient was kept nil per oral for 6 hours. Intravenous fluids, blood transfusions were given as needed. Intravenous antibiotics were continued for 3 days and then switched over to oral antibiotics for next 5 days in accordance to wound status. Analgesics were given according to patient needs. Postoperative hemoglobin was sent after 24 hours of surgery. Postoperative radiographs in AP and lateral view were taken. Quadriceps strengthening and active-assisted range of motion of hip and knee started on the first postoperative day. Drain removed on the second or third postoperative day depending on status and amount of drain. The dressing was done on alternate days after surgery depending on the condition of the wound. Total suture removal was done on the 14th postoperative day & on the 21st postoperative day in cases of delayed wound healing. The patient was discharged depending upon the condition of the wound &

the extent of swelling or other associated conditions. Weight-bearing and mobilization with crutches or walker were started once the patient tolerated pain. Static quadriceps and hamstring exercises were encouraged.

Follow up

The patients were followed up at two weeks for suture removal & then at six weeks, twelve weeks, & six months. Standard anteroposterior and lateral X-rays of the affected thigh were done on each follow-up after the second week. The clinical, radiographic results were recorded during each follow-up to ensure that no loss of reduction has occurred, evidence of callus formation and consolidation of fracture. A functional assessment using the Thoresen scoring system [17] was done at 6 months. Any complications such as infection or hardware complications that occurred were recorded.

satisfactory in the measurement of pain. The addition of descriptive terms produces a graphic rating scale [18]. According to the visual analogue scale [19] scores were taken and compared to the previous follow-up that is at 6 weeks, 3 months, and 6 months.

Data collection

The data was collected by interviews using the preformed Proforma. Data collection was done by the researcher.

Research instruments

The Proforma included general history, clinical & radiological findings regarding the case, its management & regular follow-up.

Data Analysis

Data were entered in a master sheet with the coding of the variables and analysis was done using SPSS version 21. Paired t-test, Chi-Square test was used for statistical analysis.

Table 1: THORESEN SCORING SYSTEM [17]

Variable	Result			
	Excellent	Good	Fair	Poor
Malalignment				
Varus / Valgus	5	5	10	>10
Procurvatum / Recurvatum	5	10	15	>15
Internal Rotation	5	10	15	>15
External Rotation	10	15	20	>20
Shortening (in cm)	1	2	3	>3
Range of Motion (Knee)				
Flexion	>120	120	90	<90
Extension deficit	5	10	15	>15
Pain or Swelling	None	Sporadic, minor	Significant	Severe

*A significant deformity was defined as limb shortening of more than 1cm, varus or valgus deformity more than 10 degrees, rotational malalignment more than 15 degrees.

Pain assessment

Pain assessment was done using a visual analogue scale at each follow-up. Visual analogue scales have been proved to be

The Means, standard deviations were calculated & statistical tables & graphs were drawn.

RESULTS

Table 2 shows the patients ranged from a minimum age of 18 years and maximum age of 65 years. The mean age was 30.47 years & with a standard deviation of 11.132 years. Out of a total of 30 patients in this study, there were 20 males (66.70%) and 10 females (33.30%). The male to female ratio was 2:1.

Table 2: Age and sex distribution of patients (N=30)

Age(in years)	**n(%)**
15-25	13 (43.3)
26-35	10(33.4)
36-45	3(10)
46-50	3(10)
51-65	1(3.3)
Total	30(100)
Sex	
Male	20(66.70)
Female	10(33.30)
Total	30(100)

Table 3 depicts that the major cause of fracture was road traffic accidents (70 %) followed by fall injury (23.30 %). In our study left side was affected in 18 patients (60%) and the right side in 12 patients (40%). In this study of 30 cases, 16 cases (53.3%) were of Winquist and Hansen Type 2 followed by Winquist and Hansen Type 3 in 11 cases (36.7%) and Type 1 in 3cases (10%) In this study type A was 26.6%, type B was 74.4. In this study, 21 cases (70%) were operated within 7 days of trauma while 8 cases (26.7%) were operated between 7 to 14 days and 1 case (3.3%) were operated in >14 days with a mean of 5.43 days between trauma & surgery, a standard deviation of 4.651 days. In this study maximum duration of surgery was 110 minutes and the minimum duration was 60 minutes. The majority (86.6%) of surgeries were completed within 60-90 minutes. The mean duration of surgery was 77.27 minutes with a standard deviation of 11.286 minutes.

Table 3: Other findings among patients

Mode of injury	**N(%)**
Road traffic accident	21(70)
Fall injury	7(23.30)
Other	2 (6.70)
Total	30(100)
Side affected	
Right	12(40)
Left	18(60)
Total	30(100)
Types of fracture	
Winquist and Hansen	
Type 1	3(10)
Type 2	16(53.3)
Type 3	11(36.7)
Total	30(100)
AO/OTA Classification	
32A2	4(13.3)
32A3	4(13.3)
32B1	2(6.7)
32B2	11(36.7)
32B3	9(30)
Total	30(100)
Duration between trauma & surgery in Days	
< 7 days	21(70)
7-14 days	8 (26.7)
>14 days	1(3.3)
Duration of surgery(minutes)	
< 60 min	2(6.7)
60- 90 min	26(86.6)
> 90 min	2(6.7)
Duration of Hospital Stay	**Frequency**
<10 days	4(13.3)
11-20 days	11(36.7)
21-30 days	9(30)
Fracture union(weeks)	
12-14	13(43.3)
15-17	12(40)
18-20	5(16.7)
Total	30(100)
Complications	
None	27(90)
Shortening	1(3.3)
Wound infection	2(6.7)
Total	30(100)
Total	30(100)

In this study, the maximum duration of hospital stay was 39 days & the minimum was 7 days. The mean was 21.07 days and the standard deviation was 9.642 days. In this study maximum duration of fracture union was 19 weeks and the minimum duration was 12weeks. The mean duration of fracture union was 15.10 weeks with a standard deviation of 2.171 weeks. In this study, the majority of the cases, 27 cases (90%) had no complication while superficial infection in 2 cases (6.7%) and shortening was seen in 1 case (3.3%). No other major complications were found.

In this study of 30 cases, all the patients were evaluated for pain with Visual Analogue Scale in each follow-up at 6week, 3 months, and 6 months as shown in Table 4 and Table 5.

In this study of 30 cases followed up for 6 months postoperatively, the outcome was evaluated according to the Thoresen scoring system measured at the end of 6 months. We found excellent in 86.7% cases, good in 10% cases and Fair in 3.3% cases as shown in Table 7.

Table 7: Functional outcomes (N=30)

Functional outcome	n(%)
Excellent	26(86.7)
Good	3(10)
Fair	1(3.3)
Total	30(100)

Table 4: VAS score

		Mean	N	Std. Deviation	Std. Error Mean
Pair 1	VAS@6wks	1.13	30	.346	.063
	VAS@3months	.57	30	.728	.133
Pair 2	VAS@3months	.57	30	.728	.133
	VAS@_6months	.30	30	.466	.085

Table 5: Paired Samples Test

		Paired Differences					T	Df	Sig. (2-tailed)
		Mean	Std. Deviation	Std. Error Mean	95% Confidence Interval of the Difference				
					Lower	Upper			
Pair 1	VAS@6wks - VAS@3months	.567	.504	.092	.378	.755	6.158	29	.000
Pair 2	VAS@3months - VAS@_6months	.267	.583	.106	.049	.484	2.504	29	.018

Table 6: Type of fracture (Winquist and Hansen) with functional outcome

			Functional outcome			Total	p-value
			Excellent	Good	Fair		
Winquist and Hansen	Type 1	Count	3	0	0	3	
		% within Winquist_And_Hansen	100.0%	0.0%	0.0%	100.0%	
	Type 2	Count	14	1	1	16	
		% within Winquist_And_Hansen	87.5%	6.3%	6.3%	100.0%	0.694
	Type 3	Count	9	2	0	11	
		% within Winquist_And_Hansen	81.8%	18.2%	0.0%	100.0%	
Total		Count	26	3	1	30	
		% within Winquist_And_Hansen	86.7%	10.0%	3.3%	100.0%	

DISCUSSION

In our study, the mean age was 30.47 years (median age 26.50) & with a standard deviation of 11.132 years which was similar to the study done by Salminen et al. [20], Ricci et al. [21] and Rutter et al. [22]. In our study, out of a total of 30 patients, there were 20 males (66.7%) and 10 females (33.3%). The male to female ratio was 2:1. The result was different from the study done by Chi-Chuan Wu and Wen-Jer Chen [23] and Thoresen et al. [17]. The predominance of male patients over females may be due to Nepalese males being more active outdoors than female counterparts. The major cause of fracture was road traffic accidents (70 %) followed by fall injury (23.30 %) in this study. The higher incidence of road traffic accidents in our study could be explained by higher vehicle accidents and poor road conditions in our country which is alike to a study done by Taitsman et al. [24]. In our study left side was affected in 18 patients (60%) and the right side in 12 patients (40%) which was similar to the study done by Iacobellis et al. [25].This might be due to not following traffic rules. In this study, type A was 25.6%, type B was 74.4 which was a just reverse of the study done by Wu et al. [26] and Burc et al. [27].This might be due to high energy trauma in patients chosen in this study.

In this study of 30 cases, 16 cases (53.3%) were of Winquist and Hansen Type 2 followed by Winquist and Hansen Type 3 in 11 cases (36.7%) and Type 1 in 3cases(10%) which was different from the study done by Sharma et al. [28].This might be due to the difference in the energy level of trauma. In this study, 21 cases (70%) were operated within 7 days of trauma while 8 cases (26.7%) were operated between 7 to 14 days and 1 case (3.3%) were operated in >14 days with a mean of 5.43 days between trauma & surgery, a standard deviation of 4.651 days which is parallel to the study done by Rohilla et al. [29]. This might be because of availability of operating surgeon round the clock and severity of injury. In this study maximum duration of surgery was 110 minutes and the minimum duration was 60 minutes. The majority (86.6%) of surgeries were completed within 60-90 minutes. The mean duration of surgery was 77.27 minutes with a standard deviation of 11.286 minutes which is analogous to the study done by Ostrum et al. [30]. This might be due to an experienced surgical team. In this study, the maximum duration of hospital stay was 39 days & the minimum was 7 days. The mean was 21.07 days and the standard deviation was 9.642 days which was similar to the study done by Zuckerman et al. [31]. This might be due to the degree of comminution, fracture stability and other factors.

In this study, fracture healing was assessed at the end of 6 weeks, 3 months & 6 months on radiographs taken in anteroposterior and lateral views. At the end of 6 months, 27 cases (90%) had obliteration of fracture line, 2 cases (7%) had bridging callus while 1 case (3%) had complete fracture union. The maximum duration of fracture union was 19wks and `the minimum duration was 12wks. The mean duration of fracture union was 15.10 weeks with a standard deviation of 2.171 weeks. Maximum fracture united in 12-14 weeks and all within 19weeks which is comparable to the study done by Thoresen et al. [17]. This might be due to proper care of patient.

In this study, the majority of the cases, 27 cases (90%) had no complication while superficial infection in 2 cases (6.7%) and shortening was seen in 1 case (3.3%). No other major complications were found which is diverse from the study done by Karadimas et al. [32].The complications observed might be attributable to the individuality of the fracture and patient, individual surgeon's capabilities and, many other variables. In our study pain assessment was done using the Visual analogue scale. In the present study of 30 cases, all patients underwent a pain assessment using the VAS at each follow-up visit at 6 weeks, 3 months, and 6 months. The mean difference between the groups when compared between 6 weeks and 3 months was 0.567 and was statistically significant. Similar to the Ricci et al. study [33], there was a substantial decrease in pain for 3 months and a 6-month follow-up. The mean difference between the groups when comparing 3 months to 6 months was 0.267 and was statistically significant.

In this study type of fracture (Winquist and Hansen) was compared with the outcome, the p-value=0.694. This indicates that in this study p-value is not significant so the outcome has no relation with the type of fracture and it might be influenced by many other factors. This was related to the study done by Pal et al. [34]. In this study of 30 cases followed up for 6 months postoperatively, the outcome was evaluated according to the Thoresen scoring system measured at the end of 6 months**.** We found excellent in 86.7% cases, good in 10% cases and fair in 3.3% cases. This is comparable to a study done by Tuzuner et al [35]. The study was performed with small sample size and was single centered study. The duration of follow-up was only 6 months, so the long-term outcome could not be evaluated. The comparison for the union time was different for different studies because of the lack of definitive criteria by which union time of all of the studies could be properly compared. No blinding techniques were used.

CONCLUSION

Femoral shaft fracture occurs mostly in a male in the active part (young adults) of their life with RTA being the most common etiology. The findings with low complications rate, high incidence of union, shorter hospital stay, early mobility, the excellent functional outcome in terms of alignment and range of motion in the majority of patients makes this technique more reliable and method of choice for femoral shaft fracture in adults. Additionally, load sharing property, internal splinting, and rotational stability are the main advantages of IMIL in femoral shaft fracture. Reduced rates of infection, nonunion, and malunion, shorter hospital stay and rehabilitation periods are additional advantages of IMIL. If IMIL done earlier, fracture reduction can be achieved by a closed method with less difficulty and results in early fracture union, excellent functional outcome and prevention of complications. Good outcomes and low complication rates can be expected if the operating surgeon has a good understanding of the anatomy, and surgical technique of treatment of femoral shaft fractures.

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Conflict of interest

None

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Author's Contribution *Design and concept of study, data collection, procedure performing and treatment, statistical analysis, reviewed literatures, writing the first draft of manuscript-**SKS;** Involved during data collection, revision and correction in first draft of manuscript-**MG;** Supervision, critical intellectual content and final revision of manuscript- **PRK.** All authors read the final draft of manuscript and agreed to publish.*

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