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Original Research Article

A Clinical Study to Assess the Outcome of using an Intramedullary Femoral Nailing System to Treat Femoral Fractures

Chandan Kumar Jha

Assistant Professor, Department of Orthopedics, Madhubani Medical College and Hospital, Madhubani, Bihar, India

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Corresponding Author: Dr. Chandan Kumar Jha
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Abstract

Aim: The aim of the present study was to assess the results of using an intramedullary femoral nailing system to treat femoral fractures.

Methods: The present study was conducted in the Department of Orthopedics, Madhubani Medical College and Hospital, Madhubani, Bihar, India. The skilled Orthopaedic surgeons used the intramedullary femoral nailing technique to treat 50 patients. There was a total of 25 patients in group I, with an average age of 32 years, and 25 patients in group II, with an average age of 40.5 years. For this study, there was no control groups created.

Results: There were 29 male and 21 were females. There were 44 fractures brought on by auto-mobile collisions, three by sports-related injuries, and three by falls from great heights. The fracture patterns recorded in the patient data were categorized as per AO classification based on the X-Ray radiographs. Most of the patients had 32 A1-C3 fracture. At the final follow-up, patients evaluated the clinical evaluation for pain, cosmetic appearance and treatment satisfaction using a VAS score (the most extreme score, 10 focuses). The early activation of treated femur fractures was made possible by a variety of painkiller approaches. According to VAS average score decrease as the time elapsed, on average after one month the VAS score was 4.5 which reduced to 2.1 after three months and further decreased to 1.2 after six months later. The recovery of movement was assessed after the physiotherapy session of one month. The patient ROM data of hip motion and knee motion was collected on each postoperative visit. At last visit only two patients were observed with the restricted hip motion and one for knee motion.

Conclusion: Femoral fractures are common fractures that orthopaedic surgeons repair. They happen when an enormous amount of force impinges on the femur. Utilizing intramedullary nails is the most effective approach for treating femoral fractures, and it produces positive clinical results. Most femoral nailing issues are caused by doctors, patients, and equipment, and they may be avoided with appropriate surgery and post-op care. The majority of surgeons favour this minimally intrusive approach since it is effective.

Keywords: Intramedullary femoral nailing system, Femoral fracture, Proper union, VAS score.

Introduction

The femur bone is the longest (48 cm long and 2.34 cm in diameter for average adult male), strongest and heaviest bone amongst all the bones in the human body. The femur's shaft is almost cylindrical and bowed forward. [1] Femur bone can be divided into three parts viz. proximal, diaphyseal and distal. Fractures of the femoral shaft are frequently occurring fracture and one of the most common fractures treated by are being used widely for its treatment that results in large skin incisions, more soft tissue dissection and greater blood loss. Given the above-mentioned problems the ideal implant for the treatment of femoral fractures should be an easy-to-handle intramedullary device. [2] Proximally, the femur is composed of a specialized metaphyseal region consisting of the head, neck, and greater and lesser trochanters. Distally, the femur comprises the metaphyseal flare, which continues into the medial and lateral femoral condyles, separated by the intercondylar notch.

The shaft, or diaphysis, is the segment inferior to the lesser and ending at the metaphyseal flair and condyles. Classically the first 5 cm distal to the lesser trochanter is termed the subtrochanteric region and is considered a separate fracture pattern. These fractures are challenging to manage secondary to the muscular deforming forces. They will not be discussed in this article. [3] According to the Arbeitsgemeinschaft für Osteosynthesefragen (AO) classification of fractures, the femoral shaft begins at the inferior border of the lesser

trochanter. It ends proximal to the condyles at a distance equal to the greatest width of the femoral condyles. [4] The diaphysis is a smooth cylinder with differences in cortical thickness throughout its length, which may help assess intraoperative femoral rotation.

The femur is bowed anteriorly with an average radius of curvature 120 cm (+/- 36 cm); the shorter the radius, the greater the bow. [5] The linea aspera is the major cortical thickening along the posterior aspect of the femur and is an attachment site for muscles and the medial and lateral intermuscular septa and acts as a compressive cortical strut.[4] Worldwide, nearly 5 million people die from traumatic injuries each year. [6] In addition to the mortality attributed to injuries, survivors are subject to profound morbidity. For each mortality related to injury of any kind, an estimated 3 to 8 individuals are left permanently disabled from their injuries [7] The incidence of long bone fractures is relatively high in this population, and these injuries are significant contributors to disability-adjusted life years lost. [8] In resource-limited settings, patients with long bone fractures often experience significant delays in obtaining care following an injury. [9] There are many barriers to securing care, including inability to pay, lack of transportation to regional hospitals, and scarcity of trained personnel. Importantly, the lack of sufficient operating room resources and implants remains a major obstacle to surgical care in these settings. Due to these factors, operative management is often delayed. [10-11] The SIGN intramedullary nailing system was designed to be used in resource-limited settings at low cost and without the need for fluoroscopy, a fracture table, or power reaming. [12] Since its introduction in 1999, the SIGN system has subsequently been adopted by more than 350 hospitals in over 50 countries worldwide. To date, the SIGN nail has been utilized in the treatment of over 250,000 long bone fractures. [13]

The aim of the present study was to assess the results of using an intramedullary femoral nailing system to treat femoral fractures.

Materials and Methods

The present study was conducted in the Department of Orthopedics Madhubani Medical College and Hospital, Madhubani, Bihar, India for One year The skilled orthopaedic surgeons used the intramedullary femoral nailing technique to treat 50 patients. There were a total of 25 patients in group I, with an average age of 32 years, and 25 patients in group II, with an average age of 40.5 years. For this study, there was no control groups created.

Age, gender, height, weight, body mass index (BMI), fracture type and side, American society of anaesthesiologist (ASA) score, and operation date and time were all obtained. According to the AO classification of fractures, as indicated in Table 2, there were 10 patients with a 31 A1-C3 fracture, 18 patients with a 32 A1-C3 type of fracture, and 4 patients with a 31-A3 kind of fracture.

The American society of anaesthesiologist (ASA grade) classified the patient's clinical state into two groups: 6 (4 M and 2 F) were classified under grade 2, which denotes patients with moderate systemic illness, and rest was classified under grade 1, which indicates a normal healthy patient. Patients classified as grade 3 or above by ASA were not included in the research.

The procedure was carried out utilising an intramedullary femoral nailing system made of titanium alloy (Ti- 6Al- 4V) and stainless steel (316LRM). The VAS score was utilised as a standard for measuring pain. The patients with post operative visit in 180 days included in the study. Every patient who received intramedullary nails demonstrated proper union. After six months, an X-ray revealed that fusion had begun. The same surgeon who performed the operation also analysed all of the radiological readings. At last visit, there were no problems with any patient.

Inclusion Criteria

Male or female participants who were at least 18 years old and had recently suffered a femoral fracture with an injury time of between 12 and 72 hours were included in the research.

Exclusion Criteria

Patient age greater than 65, mortality before to surgery, and non-surgical therapy were exclusion criteria. Subjects who had problems with alcohol abuse, those who were detained or were in the process of being detained, those who had an infection at the site of the operation, patients who had any active local infections, those who had an allergy to the metal used in the nailing system, and patients who had problems with neuromuscular diseases were also excluded from this study.

Treatment

When the patients were presented in the emergency closed reduction and splinting were performed. Based on the radiographs, for unstable fractures indications, open surgery and intramedullary nail fixation were planned and operation was performed to stabilize the fracture. Static locking is performed distally and proximal screws used in the proximal section. Dynamic locking is performed in the presence of displacement fracture. A short splint was applied after the surgery to prevent the motion and any load at the surgical site. It was taken off after four weeks and after the confirmation of bone union initiation, the exercises started to increase the wrist ROM and weight bearing.

Statistical Analysis

All statistical analyses will be performed using Minitab. Results are reported as means ± standard deviations for continuous variables and as number (%) for nominal variables. The endpoints are summarized using descriptive statistics (Mean, median standard deviation, minimum, maximum). For a normal distribution, parametric tests will be applied; otherwise equivalent non- parametric tests will be applied for analysis. For normally distributed data, intra group at various follow-up using Paired-t-test using the statistical software. P≤0.05 to be considered as statistically significant.

Results

Table 1: Demographic data

Demographics	Value	
	Group 1	Group 2
Mean age (years)	35	42.8
Male, N	15	14
Female, N (%)	10	11

There were 29 male and 21 were females.

Table 2: Etiology

Fracture cause	Percentage (%)
Motor vehicle accidents	44 (88)
Slip and fall	3 (6)
Other (sports, etc.)	3 (6)

There were 44 fractures brought on by auto-mobile collisions, three by sports-related injuries, and three by falls from great heights.

Table 3: AO fracture classification

AO fracture type	No. of patients
31 A1-C3	18
31 A3	10
32 A1-C3	22

The fracture patterns recorded in the patient data were categorized as per AO classification based on the X-Ray radiographs. Most of the patients had 32 A1-C3 fracture.

Table 4: Result of VAS score

Visit time	Pain scale					
	No pain	Mild pain	Nagging	Distress	Intense	Worst possible
Pre-surgery	-	-	-	-	-	9.8
Post-surgery (After anaesthesia effect wear off)	-	-	-	7.2	-	-
30±15 days	-	-	4.5	-	-	-
90±30 days	-	2.1	-	-	-	-
180±30 days	1.2	-	-	-	-	-

At the final follow-up, patients evaluated the clinical evaluation for pain, cosmetic appearance and treatment satisfaction using a VAS score (the most extreme score, 10 focuses). The early activation of treated femur fractures was made possible by a variety of painkiller approaches. According to VAS average score decrease as the time elapsed, on average after one month the VAS score was 4.5 which reduced to 2.1 after three months and further decreased to 1.2 after six months later.

Table 5: Anatomical result

Anatomical result	N	Percentage (%)
Restriction of hip ROM	3	6
Restriction of knee ROM	1	2

The recovery of movement was assessed after the physiotherapy session of one month. The patient ROM data of hip motion and knee motion was collected on each postoperative visit. At last visit

only two patients were observed with the restricted hip motion and one for knee motion.

Discussion

Internal fixation and open or closed reduction have both been recommended as successful treatments for this injury. Femoral fractures can be treated using a variety of techniques. For its treatment, which leads to significant skin incisions, further soft tissue dissection, and increased blood loss, bone plates are frequently employed. Given the aforementioned issues, an intramedullary device that is simple to handle would be the perfect implant for the treatment of femoral fractures. [14]

There were 29 male and 21 were females. There were 44 fractures brought on by auto-mobile collisions, three by sports-related injuries, and three by falls from great heights. The fracture patterns recorded in the patient data were categorized as per AO classification based on the X-Ray radiographs. Most of the patients had 32 A1-C3 fracture. At the final follow-up, patients evaluated the clinical evaluation for pain, cosmetic appearance and treatment satisfaction using a VAS score (the most extreme score, 10 focuses). The early activation of treated femur fractures was made possible by a variety of painkiller approaches. The VAS scores of the two groups had a little variation. The VAS score has produced positive acceptance results. Therefore, intramedullary nail is the gold standard for treating femoral fractures. It has been indicated that intramedullary nail fixation is the preferred choice for treating femur fractures if complete weight bearing is a consideration. [15-18]

According to VAS average score decrease as the time elapsed, on average after one month the VAS score was 4.5 which reduced to 2.1 after three months and further decreased to 1.2 after six months later. The recovery of movement was assessed after the physiotherapy session of one month. The patient ROM data of hip motion and knee motion was collected on each postoperative visit. At last visit only two patients were observed with the restricted hip motion and one for knee motion. Compared with extramedullary dynamic hip screw (DHS) fixation, intramedullary nail fixation confers a short-term advantage of early weight-bearing [19] especially in unstable per-/intertrochanteric fractures involving the posteromedial wall or lesser trochanter. In patients with such fractures treated with the DHS, weight bearing is delayed until bone union, so as to minimize the collapse of the fixation. [20] A more varus reduction has been associated with a higher cut-out rate after SHS fixation. [21] A more valgus reduction seems to be beneficial for screw positioning resulting in stable fixation of the femoral head and neck. [22] Kashigar could also show a significant association between a more varus reduction and cut-out for cephalomedullary nailing. [23] Additionally, nonunion formation was reduced in patients with a postoperative neck-shaft angle $> 134°$. Regarding nonunion formation, the implant seems to influence bone healing. We found a significantly greater risk for nonunion formation in patients treated with a reconstruction nail compared to those treated with a cephallomedullary device. The incidence of AVFH in a recent review was calculated 0.95% within the first year of follow-up, and with a minimum 2-year follow-up it was 1.37%. [24]

Conclusion

Femoral fractures are common fractures that orthopaedic surgeons repair. They happen when an enormous amount of force impinges on the femur. Utilizing intramedullary nails is the most effective approach for treating femoral fractures, and it produces positive clinical results. Most femoral nailing issues are caused by doctors, patients, and equipment, and they may be avoided with appropriate surgery and post-op care. The majority of surgeons favour this minimally intrusive approach since it is effective.

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