

EVALUATION THE TREATMENT OF SUBTROCHANTERIC FEMORAL FRACTURES BY GAMMA NAIL

Riad Mansour Megahed⁽¹⁾, Mohamed Abdalla M. Abdelsalam⁽²⁾, Ahmed Mohammed Abdelwahab⁽³⁾ and Yousuf ali ahmed farhat⁽⁴⁾

¹ Professor of orthopedic surgery, Faculty of medicine, Zagazig University¹ Assistant Professor of orthopedic surgery, Faculty of medicine, Zagazig University

³ Lecturer of orthopedic surgery, Faculty of medicine, Zagazig University

⁴ MB.BCH), Faculty of Medicine, Tripoli University, Libya

*Corresponding author: Yousuf ali ahmed farhat

Email: ayousuf91@yahoo.com

ABSTRACT

Background : Fractures of the proximal femur are a big challenge in traumatology. Rapid strides in implant and instrumentations in quest of ideal fixation of subtrochanteric femoral fractures have made various options available. The present study aims to evaluate the treatment of subtrochanteric femoral fractures by Gamma nail. This study was aimed to evaluate the results of treatment of subtrochanteric femoral fractures using proximal femoral nail. Patients and methods: This prospective study conducted at orthopedic department, Zagazig university hospital, from November 2020 to July 2021, includes 24 patients, complaining of closed subtrochanteric fractures treated with proximal femoral nail (Gamma Intramedullary nail) The age was ranged from 23 to 87 years (with mean 54.21 years), 13 of them were males and 11 females. Road traffic accident (RTA) represent the most common mechanism of injury in 10 patients (41.7%) while fall down represent 9 patients (37.5%) and fall from height 5 patients (20.8%).

Results: there was statistically significant difference in HHS among patients with different age groups, mechanism of injury and presence of D.M as associated condition. Statistically there were significant correlation between type of reduction and diabetes mellitus with Harris hip score.

Conclusion: This study concluded that the Gamma nail is a preferred choice in treatment of subtrochanteric fractures as it has many advantages as allows for early functional exercise and full weight-bearing of the affected limb, short the duration of operation, high rotation stability, small wounds and minimize blood loss along with risk of infection

Keywords: Proximal femoral nail, subtrochanteric fractures, trochanteric fractures

INTRODUCTION

The subtrochanteric region is usually exposed to high stresses during routine activities. Axial loading forces through the hip joint create a large moment arm, with significant lateral tensile stresses and medial compressive loads. In addition to the bending forces, muscle forces at the hip also create torsional effects that lead to significant rotational shear forces.⁽¹⁾

High compressive and tensile forces of muscles separate the fracture fragments and cause instability of the fracture. Hence this fracture is difficult to manage and is associated with many complications including mal-union, delayed union, non-union and implant failure.⁽²⁾

Due to these anatomical features conservative treatment is not preferred, and if there are no absolute contra indications and the patient can tolerate surgery, surgery is the treatment of choice. The goal of operative treatment is restoration of normal length, anatomical alignment and angulation to restore adequate tension to the abductors.⁽³⁾

Early mobilization and weight bearing are possible with advances in implants and fixation technology. The two primary options for treatment of subtrochanteric fractures are intramedullary fixation and surface fixation.⁽⁴⁾

Primary nail is placed in the intra medullary cavity, creating central fixation⁽⁷⁾. Several advantages of the proximal femoral nail have been proposed, such as its application to the femoral head and neck and femoral shaft to increase stability at fracture sites and to promote healing.⁽⁵⁾

The aim of the current study was to evaluate the results of treatment of subtrochanteric femoral fractures using proximal femoral nail.

PATIENT AND METHODS

A prospective study conducted at Zagazig university hospital, from November 2020 to August 2021; include 24 patients, complaining of closed subtrochanteric fractures treated with proximal femoral nail (gamma intramedullary nail). The age was ranged from 23 to 87 years (with mean 54.21 years), 13 of them were males and 11 females. Road traffic accident (RTA) represent the most common mechanism of injury in 10 patients (41.7%) while fall down represent 9 patients (37.5%) and fall from height 5 patients (20.8%).

Inclusion criteria: Any patient after skeletal maturity presenting with subtrochanteric femoral fractures included in the study.

Exclusion criteria: Any patient with unstable pelvic fractures and Open fractures, severe medical co- morbidity.

Pre-operative assessment:

History Taking: Name, age, sex, special habits, causes and the time of injury, any previous injuries and previous surgical interventions, any medical comorbidity and medications.

General examination: Blood pressure, Pulse, Temperature, Respiration, Examination of the spine, knee, pelvis and calcaneus is very important for associated injury.

Local examination: Inspection: deformity, skin condition and associated injuries. Palpation: skin temperature, dorsalis pedis and posterior tibial pulse, and popliteal arteries. Neurovascular examination.

Radiological studies: Plain X-ray (Antero-posterior and Lateral views) of the hip joint was done.

Laboratory investigations: Complete blood count. Renal function test. Liver function test. Random blood sugar. Bleeding profile was done in all patients.

Surgical technique:

Systemic broad spectrum interavenous antibiotic was given 30 minute before the operation. Anesthesia was chosen according to the patient's condition by either spinal anesthesia or general anesthesia. After induction of anesthesia, the patient was placed supine on a radiolucent orthopedic traction table. The uninjured limb was flexed and abducted at the hip. To reduce the fracture, traction was applied in the direction of the length of the extremity. The image intensifier was checked and a lateral view showing the head and neck of the femur was insured to be feasible before starting the operation. A qualified x-ray technician is essential in order to produce proper images and to save time and reduce radiation exposure. The patient was then prepared and draped as for the standard hip fracture fixation .Draping is applied up to the pelvic rim.

On the traction table, the fractured leg should be adducted approximately 10–15° to achieve the optimal entry point. The table is then tilted to the opposite direction to eliminate external rotation of the proximal fragment. Rotational alignment of the distal fragment is evaluated with the fluoroscopy and corrected by rotating the foot plate. A mallet or a hammer can be used for indirect reduction in the subtrochanteric fracture; this applies an external force to the fracture fragment into proper reduction. The disadvantage of this technique is that the maneuver used for fracture reduction and guide wire passing must be repeated during reaming to avoid eccentric reaming that may result to improper reduction.

Postoperative care:

Postoperatively, patients pulse, blood pressure, respiration, temperature were monitored. Foot end elevation is given depending on blood pressure. Antibiotics were continued in the post-operative period. Analgesics were given as per patient's compliance. Blood transfusion was given depending on the requirement. Suction drain if used was removed after 48 hours. Sutures were removed between 10th to 15th postoperative days.

Patients were encouraged to sit in the bed after 24 hours after surgery. Patients were taught quadriceps setting exercises and knee mobilization at once the suction drain is removed. Patient was taught gait training before discharge from the hospital. Rest of the patients was encouraged to weight bear partially with axillary crutches or walker depending on the pain tolerability of individual patient.

Follow up:

Clinical and radiological assessments were done for all patients at 2 weeks, 1 month, 3 months and 6 months searching for any complication of the device or technique of fixation.

Assessment of union: The presence of malunion, delayed union, nonunion were assessed after 9 months. Serial x-rays were taken and in every one check to determine 3 parameters, union, implant failure and fixation failure.

Statistical Analysis

Data collected throughout history, coded, entered and analyzed using Statistical Package for the Social Sciences (SPSS version 20.0) (Statistical Package for the Social Sciences) software for analysis. According to the type of data qualitative represent as number and percentage, quantitative continues group represent by mean \pm SD, the following tests were used to test differences for significance; difference and association of qualitative variable by Chi square test (X^2). Differences between quantitative independent multiple by ANOVA, correlation by Pearson's correlation. P value was set at <0.05 for significant results & <0.001 for high significant result.

RESULTS

Table (1): Clinical outcome according to Harris hip score (HHS) among studied group.

Harris hip score	N	%
Excellent	9	37.5%
Good	8	33.3%
Fair	4	16.7%
Poor	3	12.5%

According to Harris hip score (HHS) this study showed 37.5% of patients obtained excellent HHS while 33% obtained good HHS, 12.5% obtained poor HHS As illustrated in **table (1)**.

Table (2): Relation between score and gender:

Gender group	Harris Hip Score				χ^2	p
	Excellent NO. (9)	Good NO. (8)	Fair NO. (4)	Poor NO (3)		
Male	6	5	1	1	2.685	.443
Female	3	3	3	2		

The gender had no statistical effect on final outcome, but the majority of males have satisfactory outcome 11 out of 13 patients, while in females 6 out of 11 patients have satisfactory (excellent + good) outcome according to HHS (table 2).

Table (3): Relation between score and mechanism of injury:

Mechanism of injury	Harris Hip Score				χ^2	p
	Excellent NO. (9)	Good NO. (8)	Fair NO. (4)	Poor NO (3)		
RTA	7	3	0	0	15.12	0.02
FD	0	3	4	2		
FFH	2	2	0	1		

All patients (100%) the fractures caused due to RTA have satisfactory outcome, also the vast majority (80%) of fractures caused by FFH have satisfactory outcome, while most of patients injured due to FD have unsatisfactory outcome (66.67%) according to HHS (table 3).

Table (4):Relation between score and comorbidities:

Comorbidities	Harris Hip Score				χ^2	p
	Excellent NO. (9)	Good NO. (8)	Fair NO. (4)	Poor NO (3)		
No comorbidities	6	1	0	0	10.08	0.02
With comorbidities	3	7	4	3		
Absence of HTN	7	2	2	2	4.931	.169
Presence of HTN	2	6	2	1		
Presence of DM	1	5	4	3	12.86	.0049
Absence of DM	8	3	0	0		

There were statistically significance between presence and absence of comorbidities with HHS (P value 0.02), as 85.7% of them had excellent functional outcome and the rest had good HHS. While only 17.65% of patients associated with comorbidities (either HTN or DM or both) had excellent HHS and 41.18% had either fair or poor functional outcome according to HHS. Presence or absence of HTN had no statistical effect on final outcome as the P value 0.169. While presence of DM had statistically significant effect on the final outcome as no single case in the studied group was fair or poor in non-diabetic patients while 50% of patients with poor and fair outcome had DM. as this table show (**table 4**).

DISCUSSION

Intramedullary nails provide a biomechanical advantage with increased stiffness, rigidity, and a shorter moment arm, which translates to a stronger construct and decreased strain experienced by the implant. Nail entry point and construct design can affect fracture reduction and stability, therefore; the surgeon should understand the modifiable variables that can improve surgical outcomes. (6)

Intramedullary nailing has many advantages, including easy insertion using a closed technique, retaining the fracture hematoma, and a lower infection rate due to less surgical dissection. Closed nailing constitutes a form of biological fixation of the femur, which may be credited for a shorter time to union. (7)

This prospective study conducted at orthopedic department, Zagazig university hospital, from November 2020 to July 2021, includes 24 patients, complaining of closed subtrochanteric fractures treated with proximal femoral nail (gamma intramedullary nail) to study the better management and improving outcome of patient with subtrochanteric fracture.

The current study showed that 37.5% of patients obtained excellent HHS, while 33.3% obtained good HHS, 16.7% had fair HHS and 12.5% obtained poor HHS. Which in agreement with the study of **Abraham et al.**, (8) found that there were 10 patients (38.5%) with an excellent Harris hip score, 9 patients (34.6%) patients with a good score, 4 patients (15.4%) with fair score and 3 patients (11.5%) had poor scores.

Jušković et al., (9) reported that Excellent was reported 41 patients (85.4%), Good was reported in 4 patients (8.3%) and poor was reported in 3 patients (6.3%), this high score in this study maybe due to younger age group included in his study, as the mean age was 42years, in compare with 55.33 years in the current study.

Shah and Shah., (10) reported that Harris hip score showed excellent result in 39 patients, good results in 3 cases and poor results in 5 cases. The poor result in one patient (case 5) was basically because of pathological fracture which leads to delayed union and low Harris Hip score.

The current study showed that there was statistically significant difference in HHS among patients with different age groups. On the other hand all the unsatisfactory outcomes (fair + poor HHS) were above age of 60 years. It had been noted that only one case out of 7 cases aged above 70 years had good outcome while the rest (85.71%) were either fair or poor outcome. Also the mechanism of injury had statistical significant effect on HHS. While no patient injured due to FD was excellent and most of patients (66.67%) were either fair or poor. Also there was statistically significant difference in HHS among patients with and without diabetes mellitus. There were 8 patients obtained excellent HHS in non-diabetic patients while only one patient in diabetic patients obtained excellent HHS, Moreover all the poor HHS score patients were diabetic, while no patient obtain fair nor poor HHS in non-diabetic patients. There were no statistically significant differences in HHS score among different gender, side of fracture, reduction type, Russell Taylor classification and presence of hypertension.

Pisoude et al., (11) found that that sex and age could significantly decrease the HHS. Thus, the HHS was influenced by female sex and age of more than 60 and There was no significant relationship between the HHS and other variables.

The current study showed that regarding complications after proximal femoral nail, there were 4.2% with nonunion, 16.7% with surgical site infection and 8.3% with delay union.

Seenappa et al., (12) found that postoperative complications were noted in 15 (24.2%) patients. Limb length discrepancy in 6 (9.7%) patients and 2 (3.2%) patients had implant loosening. Sub trochanteric nonunion was noted in 3 (4.8%) patients. 4 patients had surgical site infection, which was controlled by adequate antibiotic administration with third generation cephalosporin for two weeks.

Thakur et al., (13) found that the complications studied included wound infection in 2 patients (8.69%), knee stiffness in 2 patients (8.69%), shortening in 2 patients (8.69%) and delayed union in 1 patient (4.47%).

The current study showed that there were a significant correlation between time before surgery and the presence of diabetes mellitus with union time. While no correlation between side of fracture or type of reduction or hypertension with union time. The current study showed that There were a significant relationship between poor HHS score with time before surgery, age, union time, no correlation between poor HHS and DM or hypertension.

Basani et al., (14) reported that Harris hip score was used to assess the functional outcome of patients. The mean HHSs at 6 months and 12 months were 81.57 ± 12.39 and 87.33 ± 8.2 , respectively.

The current study showed that regarding the presence or absence of complications, there were a significant difference in type of reduction and Harris hip score and diabetes. There were no differences between

complicated and non-complicated patients in age or sex or side of fracture or mechanism of injury or the presence of hypertension.

Seenappa et al., (12) found that the factors like age, gender, comorbidities and post-operative complications don't affect functional outcomes..

Conclusion

This study concluded that the Gamma nail is an excellent choice in treatment of subtrochanteric fractures as it has many advantages as allows for early functional exercise and full weight-bearing of the affected limb, short the duration of operation, high rotation stability, small wounds and minimize blood loss along with risk of infection.

Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request

Conflicting Interest (If present, give more details): No Conflict of Interest

No financial disclosure

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Not applicable

Declarations

-Ethics approval and consent to participate

Written informed consent was obtained from all patients and the study was approved by the research ethical committee of Faculty of Medicine, Zagazig University (International review board IRB #:6918-1-12-2020). The study was done according to The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans.

-Consent for publication

Not applicable

Competing interests

The authors declare that they have no competing interests.

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