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Original Article

Outcome of Gamma Nail Fixation in Unstable Trochanteric Fracture of Femur

⁽¹⁾Alaa Ahmed Mostafa El-Negahy, ⁽¹⁾Amr Mohamed Ahmed El-Adawy, ⁽¹⁾Tarek Abdel-Samad El-Hewala, ⁽²⁾Abdulla Milad Ali Hreik

⁽¹⁾Department of Orthopedic Surgery Faculty of Medicine –Zagazig University, Egypt.

⁽²⁾Department of Orthopedic Surgery, Faculty of Medicine, Tripoli University Stated in Libya

Corresponding Author:

Abdulla Milad Ali Hreik

Email:

drabdullah5hreek.4@gmail.com

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ABSTRACT

Background: Pertrochanteric fractures are a common problem with an increasing incidence specially among old age groups.

Objectives: Accurate realignment, rigid fixation, decreasing comorbidities during surgical intervention is the main goal during treatment of these fractures as well as early mobilization Evaluation the results of Gamma nail in treatment unstable trochanteric fracture .

Patients & Methods: This is a prospective study included 18 patients with ages ranged from (53 to 78 years with mean (65.11 years) with closed unstable trochanteric fractures managed between September 2017 and February 2019 at Zigzag university hospital and Zliten teaching hospital fixed with gamma nail.

Results: This study that Gamma nail provides a good choice of treatment of per trochanteric fractures. Younger patients recover better than older patients 72.2% were satisfactory (good & excellent) and 27.8% were unsatisfactory (poor & fair) results according to Harris hip score at last postoperative follow up,

Conclusions: Gamma nail provides a biomechanically stable construct, proved by minimal or negligible incidence of implant-related failures.

Key words: Gamma Nail , Unstable Trochanteric , Fracture of Femur

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INTRODUCTION

Inter-trochanteric femoral fractures occur between the greater and lesser trochanters and are commonly observed in the elderly it is one of the most important causes of mortality and morbidity in the geriatric population^[1]

The incidence of trochanteric fractures has increased significantly during the last few decades becoming important in terms of social and economic issue. Currently, internal fixation devices for treating unstable intertrochanteric femoral fractures are classified into extra-medullary and intramedullary fixation devices, both of which show advantage and disadvantages^[2,3] Extra-medullary fixation, as the dynamic hip screw (DHS) method, has always been universally accepted as the "gold standard" for treating intertrochanteric femoral fractures. However, DHS method has a relatively high failure rate in treating unstable intertrochanteric femoral fracture^[4] The gamma nail is a classic intramedullary fixation device for treatment intertrochanteric fractures that was developed by combining the sliding hip screw

and intramedullary nail system^[5] Primary nail is placed in the intra medullary cavity, creating central fixation^[6] Several advantages of the gamma 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^[7]

In addition, its fixed application through the medullary cavity allows for early functional exercise and full weight-bearing of the affected limb. The standardized surgical technique for implementing gamma nails is accessible for surgeons, and the duration of operation is short, resulting in small operative wounds. However, it is unsuitable for patients with occlusive medullary cavities, very large anterior arches in femur shafts, and those with the risk of fat embolism. The complications of the gamma nail include aggravated intertrochanteric fractures and stress fractures of the distal femoral shaft during the insertion of the main nail^[8]

Aim of The Work: This study is to evaluative outcome of Gamma nail fixation in patients with

unstable trochanteric fractures.

PATIENTS AND METHODS

This study included 18 patients who had been admitted to zigzag University Hospital having traumatic per trochanteric fractures of the femur between September 2017 and February 2019 at Zigzag university hospital fixed with gamma nail.

Written informed consent was obtained from all participants and the study was approved by the research ethical committee of the department and the faculty of medicine, Zagazig University. The work has been carried out in accordance with The Code of Ethics of the World Medical Association (Declaration of Helsinki) for studies involving humans. Patients Selection: Inclusion criteria: Patients above the age of 18, Patients fit for surgery, Unstable intertrochanteric according to Evans classification with lateral cortex comminution, type Ic. with medial cortex comminution, type Id. and Reversed obliquity, type II. Time of trauma: less than 14 days, Isolated fracture. Exclusion criteria: Patients unable to weight bear prior to fracture, Open fractures, Proximal femoral deformities, Pathological fractures other than osteoporosis and active infection. Methods: On admission all patients were subjected to history taking, clinical examination and laboratory investigations. Full counseling of participants in this research and informed consent was obtained with full privacy of participants and confidentiality of the data. History Taking, Personal history: Name, Age, Sex, Residency and occupation. The age of the patients ranged from 53 -78 years with the mean value of 65.11 years and a standard deviation of 72years(Table1) 7 patients in this study were males (38.9%), while 11 were females (61.1%)(Table1). Bilateral cases were not encountered in this study. The right side was affected in 9 patient (50%), while the left was affected in 9 patient (50%). 2 patients (11.1%)

were injured in road traffic accidents (RTAs), 13 patients (72.2%) had a simple fall, 3 patients (16.7%) were injured while climbing stairs, Trochanteric fractures had a medical history of different systemic diseases. In this study 14 patients fractures (77.8%) were Evan’s type I, 4 (22.2%) were Evan’s type II, The time before operation ranged from 2-5 days with mean of 3.11 days (S.D. ± 1.13).

Statistical analysis:

Data collected throughout history, basic clinical examination, laboratory investigations and outcome measures coded, entered and analyzed using Microsoft Excel software. Data were then imported into Statistical Package for the Social Sciences (SPSS version 20.0) (Statistical Package for the Social Sciences) software for analysis. P value was set at <0.05 for significant results & <0.001 for high significant result.

RESULTS:

The 18 patients of the study 7 cases (38.9%) had excellent result, 6 patients (33.3%) had good results, 3 patients (16.7%) had fair results and 2 patient (11.2%) had poor results according to Harris hip score .In this study according to Harris hip scoring system, there were 7 patients with excellent results with average score of 93.4 points, 6 patients with good results with average score of 83.9 points, 3 patients with fair results with average score of 75 points and 2 patients with poor results with average score of 60 points Patients with excellent and good results were considered satisfactory and those with fair and poor results satisfactory (poor& fair) and 72.2% were satisfactory (good & excellent) There were 11.1% ,nonunion and 16.7% had infection , 11.1% had implant failure. (Table 2)

Table1: Age and sex distribution among studied group:

Age / years	Mean± SD	65.11±7.29	
	Range	(53-78)	
Sex	Male	N	%
		7	38.9
	Female	11	61.1
	Total	18	100.0

Table 2: outcome and Complication distribution:

Nonunion		N	%
	No	16	88.9
Yes	2	11.1	
Infection	No	15	83.3

		N	%
Implanted failure	Yes	3	16.7
	No	16	88.9
Harris hip score	Excellent	7	38.9
	Good	6	33.3
	Fair	3	16.7
	Poor	2	11.1
Outcome according to Harris hip score	Satisfactory	13	72.2
	Unsatisfactory	5	27.8
	Total	18	100.0

Relation between outcome and complication

There was significant correlation between nonunion and final clinical results. P.value 0.016 (statistically significant). Where the two non-union were in the unsatisfactory group. There was significant correlation between implanted failure and final clinical results. P. value 0.016 (statistically significant). Where the two implant failure were in the unsatisfactory group. (table 3)

Table 3 : Relation between outcome and complication

			Satisfactory		Total	X ²	P
			Satisfactory (N=13)	Unsatisfactory (N=5)			
Nonunion	No	N	13	3	16	5.85	0.016*
		%	100.0%	60.0%	88.9%		
	Yes	N	0	2	2		
		%	0.0%	40.0%	11.1%		
Infection	No	N	12	3	15	2.71	0.099
		%	92.3%	60.0%	83.3%		
	Yes	N	1	2	3		
		%	7.7%	40.0%	16.7%		
Implanted failure	No	N	13	3	16	5.85	0.016*
		%	100.0%	60.0%	88.9%		
	Yes	N	0	2	2		
		%	0.0%	40.0%	11.1%		
Total		N	13	5	18		
		%	100.0%	100.0%	100.0%		

DISCUSSION

Inter-trochanteric fractures are very frequently faced by orthopedic surgeons worldwide . Increase in the incidence of these fractures are seen in the 5th decade of life onwards, Age of patient, osteoporosis, general health, associated co morbidities are some of the key factors to be considered for the successful treatment of these fractures .Conservative treatment is poorly tolerated by elderly patients and it is also associated with complications like decubitus

ulcers, deep vein thrombosis, and aspiration pneumonitis .Therefor surgical treatment is preferred option of treatment as it facilitates early mobilization and functional recovery. [9]Dynamic hip screw is time tested extramedullary load bearing device used for fixation of trochanteric fractures. It works on the principal of controlled concentric collapse at fracture site. But it also has disadvantages like it requires larger surgical exposure leading to more blood loss, devices causes excessive collapse at fracture site,

possibilities of cut out of lag screw from femoral head if not placed properly In osteoporotic bones and unstable fractures complications like fracture instability, excessive medialization fracture fragment may lead to pain and deformity^[9]

The Cephalomedullary nails with Trochanter tip as entry portal are load sharing implants, as they are placed close to the mechanical axis of femur, they have short lever arm. In unstable trochanteric fractures control of axial load transmission and rotational stability are important factors which are effectively managed by intramedullary devices they are considered biomechanically stronger than extramedullary devices Identification of Tip of trochanter is easy and requires less soft tissue dissection .Gamma nail the original design of cephalomedullary nail has provision of single screw placement in the femoral head, but single screw construct was considered unstable for trochanteric fractures which led to introduction of proximal femoral nail in 1997by AO/ASIF which has provision of two screw placement in the femoral head. This system of Antirotation screw and cervical load bearing screw in this nail makes this construct biomechanically very stable . As compared to Gamma nail there is less incidence of fracture of femoral shaft below the nail tip But Proximal femoral nail may also have complications like Reverse Z effect, Z effect, lateral wall of trochanter fracture in osteoporotic bone ,incidence of fracture of femoral shaft below the nail tip cannot be rolled out^[9]In this study, 18 patients with unstable trochanteric fractures were treated using the gamma nail; 14 were type I and 4 were type II according to Evans classification ^[10]The functional outcome of these cases was assessed by the Harris hip score after a minimum of 6 months post-operative follow up. 13 patients achieving satisfactory results (7 excellent and 6 good) with a percentage of 72.2% and 5 patients achieving non satisfactory results (3 fair and 2 poor). with a percentage of 27.8%. This result was found to be better than Daivesh P Shah et al^[11] with only 70 % of patients with favorable outcome. On the other hand it was inferior to those reported by (JThiyageswaran, et al) ^[12] with 88.75% favorable outcome and A Dhar et al^[13] who reported 73.3% favorable outcome and Ahmad M et al^[14] who reported 79.3% favorable outcome and Faisal Younis et al^[15] who reported 90-100% favorable outcome. The ages of the patients in this study ranged from 53 to 78 with a mean of 65.11 ± 7.29 years, which conforms to the mean age reported by Faisal et al^[16] who reported mean age of 64.8 and Yadkika et al ^[9] who reported mean age of 67 (Table 12). Age was a significant factor in determining the final outcome. Where age in the our study 13 of patients below the age of 62 ± 76

had satisfactory results, while only 5 of patients above the age of 71.8 had unsatisfactory results. And there were significant correlation between age and final outcome. P. value = 0.023. In this study, males were 7 cases, and females were 11 cases, with ratio of (1:1.6), There was a female sex preponderance seen in our study. This as in the **A Dhar et al**^[13] **Lei, Jie Shen, et al** ^[3] Studies while for **Daivesh Pet al**^[11], **Ahmad M et al**^[14] , **Yadkika et al.**, ^[9] There was a male sex preponderance. There was no difference in results in relation to sex.

In this study 13 cases suffered the fracture as a result of simple fall with a percentage of 72.2% while only 3 patients suffered a relatively higher energy trauma presenting in falling down the stairs with a percentage of 16.7%, There was significant correlation between Mode of trauma and final clinical results this conforms to other studies such as **A Dhar et al** ^[13] Where simple fall at home and showing predominance of a domestic fall by 72.2%. (Table 14) P.value 0.006. there was no difference in results in relation to mechanism of trauma. Where It was noticed that the lower the age of the patient the higher the energy required to cause the fracture in this study 18 patients were treated with Gamma nail, 9 patients had right side injury while 9 had left side injury, there was no significant correlation between the side affected and the final functional results. which conforms to the side affected reported by (**Daivesh Pet al**^[11], **Ahmad M et al**^[14], **Yadkika et al**

^[9] the interval from the time of admission to the time of surgery in this study was 2-5 days , and the mean interval was 3.11 days .The short the time from admission to surgery that's better is result. Which conforms **Faisal Younis et al**^[15] **A Dharetal al**^[14], hypertension and diabetes mellitus and ischemic heart diseases were the other common comorbid conditions seen commonly in our patients. diabetes mellitus 44.4% Hypertension 44.4%, And ischemic heart disease 27.8%, there was no significant statistical correlation between clinical results and patients, Comorbidities study of diabetes have no correlation with the final result , In the **Faisal Younis et al**^[15], diabetics this conforms to other studies .The time of union in this study ranged from 2 – 6 months with a mean of 3.5 ± 1.21 months. All patients treated with the Gamma nail achieved union. Except 2 patient 11.1 had nonunion, The 13 patients of the satisfactory results united at mean time of 3.07 ± 1.03 month, While 3 of 5 patients unsatisfactory results patient united at the mean time 4.6 ± 1.5 months. there was significant correlation between union time and final clinical results. **Faisal et al**^[15], **Halder et al** ^[16] (reported one case of non-union out of 76 cases of unstable intertrochanteric fractures. **Leung et al**^[17] reported one non-union out of 93, In

the our study the nonunion cases there is one deep infection and the other was with neck absorption. Union time I n this study was from 3.07 to 4.6 months in the satisfactory and unsatisfactory groups this is related to conservation of fracture haematoma,less invasive surgery with less softtissuedissection,provisionofinternal bone graft via reaming, and the more stable fixation method.in this study we had 3 cases of local complications,one had superficial infection that responded well to antibiotics.Where that other 2 had deep infection, There was no statistical significance percentage of the study.

Cases:

Case 1 with good results: 70 years old male patient sustained simple fall down had lift unstable trochanteric fracture Evan’s type Id, fixation with Gamma 3 nail was done .

In our present study, the 18cases treated with GAMMA NIAL included cases were of type Id, II, according Evan classification &. These mentioned classifications are easy to understand, recollect and apply. We found no cases with screw cut out, fracture below the tip of the nail There was 1 case of backout screw and 1 cases of superficial infection1 case of neck absorption and nonunion.

CONCLUSION:

Gamma nail provides a biomechanically stable construct, proved by minimal or negligible incidence of implant-related failuresand considerable percent satisfactory results.

(A) : Pre-operative X-rays

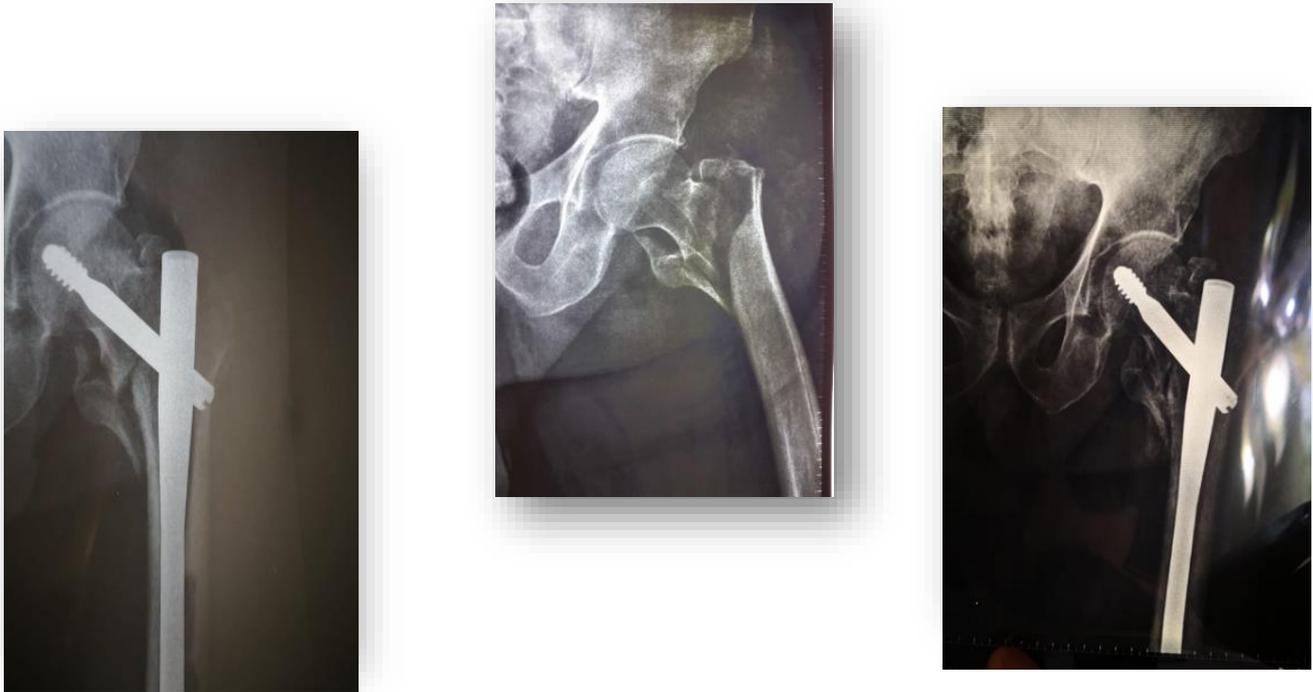


(B): Immediate pos-oprative X-ray

(C) Follow up x-ray After 8 months.

Case 2 with good results: 62 years old male patient sustained simple fall down had left unstable trochanteric fracture Evan's type Id, fixation with Gamma 3 nail was done.

(A): Pre-operative X-rays



(B) : Immediate post-operative X-ray

(C) Follow up x-ray After 8 months.

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