Original Research Article

FUNCTIONAL OUTCOME OF UNSTABLE INTER TROCHANTERIC FRACTURES WITH OSTEOPOROSIS TREATED WITH TYPE II PROXIMAL FEMORAL NAIL

Abstract :

Introduction: With increasing longevity of the population, the proportion of elderly patients experiencing osteoporosis related complications has significantly increased. The incidence of femoral intertrochanteric fractures has also increased year by year. 45% of all hip fractures are intertrochanteric fractures and 35–40% of these fractures are unstable three or four part fractures and associated with high rates of morbidity and mortality (1)

Materials and Methods: The present studyis a prospective study to show the Functional outcome of unstable inter trochanteric fractures treated with PFNA II in elderly osteoporotic patients, and to note the radiological union in the treated people

Results: In our study, the mean Age most of patients age group is 71-80,6(40%) and 81-90, 6 (40%), followed by 03 (20%) patients were 61-70 years. The means of age is 70.04±12.42. In the present study & observation was done by higher Harris Hip score (HHS). Their intergroup comparison of score showed considerable differences at every single follow-up. Additionally, the negligible blood loss, length of surgery, and a smaller incision, & Average hospital stay revealed no substantial variations.

Conclusion: PFNA2 is a significant advancement in the treatment of unstable trochanteric fractures which has the unique advantages of closed reduction, preservation of fracture hematoma, less tissue damage, early rehabilitation and early return to work. Osteosynthesis using a PFNA2, used in unstable trochanteric fractures, resulted in low rates of clinical complications, excellent stabilization, few mechanical complications and adequate functional results.

Introduction

With increasing longevity of the population, the proportion of elderly patients experiencing osteoporosis related complications has significantly increased. The occurrence of intertrochanteric fractures of femur has grown each year. Among all hip fractures 45% are intertrochanteric fractures among which 35–40% fractures are unstable fractures and combined with elevated rates of morbidity and mortality (1). Cummings et al (2). There are recognized four aspects for establishing whether a fall down in older age group is considerable for fracture,

1. The fall should be in such a way that the direct impact should be over the hip.
2. The shielding reflex action must be lacking to decrease the energy of fall beneath the critical threshold
3. Strength of Muscles and fat act as shock absorbers around the hip must be inadequate.
4. The density of bone at hip must be insufficient to tolerate the fall (2).

Cautionary involvements to reduce the consequence in falls and uncompromising assessment and management in very osteoporotic bone with elevated risk of fracture is very important. Immediate postoperative physiotherapy is more important. The complete purpose in the management of this fracture is to bring in the patient into pre morbid functional status. Before the establishment of appropriate fixation procedures, management of intertrochanteric fracture used to be conservative, associated with extended bed rest with traction in anticipation of fracture union that's for 10 – 12 weeks. Along with wide-ranging plan of training for gait. In older aged people, gait programme was associated with extreme complication rates (3), like urinary tract infection, decubitus ulcers, pneumonia joint contractures, and thromboembolic complications, which lead to an higher mortality rate. Additionally , shortening and varus deformity noted due to lack of ability to maintain traction for neutralizing the distorting muscular forces. Due to which management of intertrochanteric fracture with reduction and internal fixation has become comprehensive method of treatment (4). Acquiring anatomical reduction and dealing unstable intertrochanteric fractures in ageing patients is challenging and controversial. Instability and Osteoporosis are the significant considerations for avoiding premature weight bearing and if not these may lead to inadequate outcomes in such cases. Apart from this, other medical conditions like poor immunity, diabetes, malnutrition and other medical conditions which may influence the results of union of fractures in ageing populace. Henceforth, early surgical management is suggested in fractures osteoporotic bone which frequently happen in ageing individuals. In present times there are several operative techniques accessible of which the dynamic hip screw (DHS) technique, which is a frequently used technique in the previous days, which affects the postoperative early mobilization in patients due to the unacceptable stability of fixation and shear stress alteration, so the management in elderly patients with osteoporosis is restricted. The proximal femoral nail anti-rotation (PFNA) procedure has biomechanical benefits, and is presently is the most frequently used and adequate treatment technique for elderly patients with intertrochanteric fractures associated with osteoporosis. Internal fixation can be completed frequently through a minimally-invasive incision, which reduces intra-operative tissue injury without affecting the blood supply to the fracture site (5). PFNA-II utilizes a helical blade as an alternative of the traditionally used two screws. The helical blade is assumed to deliver stability, compression as well as rotational control at the fracture. In theory it compresses the bone during insertion into the neck and thus has greater cut out strength as compared to another devices. The variations are that mediolateral angle is decreased from 6° to 5°. Hence there is fewer possibility of implant failure particularly in elderly with osteoporotic bones. Therefore, PFN Anti-rotation-II is a variation of the conventional PFN which lowers the minimal complications associated with Traditional PFN, along with additional benefits (6) This study is performed to establish the functional outcome of unstable inter trochanteric fractures with osteoporosis treated with type 2 proximal femoral nail.

Materials and Methods

The current study was performed in a single-centre, Hospital based Prospective observational Study performed on patients admitted in the department of orthopaedics Kamineni Academy of Medical sciences and Research Centre L.B. Nagar, Hyderabad from November 2019 to October 2021. Prior beginning of the study Ethical and Research Committee clearance from Hospital was obtained. Present study a total of 15 patients with unstable intertrochanteric fractures with severe osteoporosis, were enrolled into the study. Patients were selected in the study based on the inclusion and the exclusion criteria as stated below.

Inclusion Criteria

- Age >60 years
- Unstable inter trochanteric fractures
- Generalised osteoporosis graded with Singh's index(grade <4)

Exclusion criteria

- Age < 60 years
- Stable or un displaced intertrochanteric fractures
- Patients with unhealthy skin , frank infection over the hip area , compound injuries

Results

During the study period total 15 patients were enrolled into the study according to inclusion criteria. 15 patients were distributed according to age.

Age Group	Frequency	Percentage
61-70	3	20
71-80	6	40
81-90	6	40

Table 1: Patients were distributed according Age Group

Among 15 patients, most of patients age group is 71-80,6(40%) and 81-90, 6 40%), followed by 03 (20%) patients were 61-70 years. The means of age is 70.04±12.42.

Sex	Frequency	percentage	Ratio (M:F)
Male	9	60	
female	6	40	3:2

Table 2: Patients were distributed according to SEX

Among 15 patients 9 (60%) were male patients and 6 (40%) were female patients. The ratio between the male and female is 3:2.

Mode of injury	frequency	Percentage
Accidental fall	14	93.3
Road traffic accident	1	6.66

Table 3: patient Distrubution according to mode of injury

Among 15 patients, 14 (93.33%) patients were Accidental fall and 1 (6.66%) patient was Road traffic accident.

Side effects	Frequency	percentage	Ratio R:L
Right	4	26.67	1:2.9
left	11	73.3	

Table 4: Patients were distributed according Side affected

Among 15 patients 11 (73.33%) patients have left side injury and 4 (26.67%) patients have right side injury. The ratio between the left and right is 1:2.9.

Time interval in days	Frequency	Percentage
0 – 05	12	80
6 – 10	3	20

Table 5: Patients were distributed according time interval between injury

Among 15 patients, 12 (80 %) patients underwent surgery within 5 days followed by 03 (20 %) patients underwent surgery within 06-10 The Mean of Time interval in days is 16.24 years.

PFN	Frequency	Percentage
Long 135°	4	26.66
Short 135°	11	73.33

Table 6: Patients were distributed according types of proximal femoral

15 patients were distributed according to types of proximal femoral nail used, for 11 (73.33%) patients Short PFNA2 135 degree was used followed by use of Long PFNA2 135 degree for 04 (26.66%) patients

Harris Hip Score	3rd month		6th month		9th month	
	Number of patients	percentage	Number of patients	percentage	Number of patients	percentage
Excellent	1	6.67	8	53.3	9	60
Good	7	46.67	6	40	4	26.67
Fair	4	26.67	1	6.67	1	6.67
Poor	3	20	0	0	1	6.67

Table 7: Patients were distributed according Harris Hip Score.

Among 15patients, 3 patients have post operative complications

complications	frequency	Percentage
Anterolateral thigh pain	3	20
Cut off	0	0
Edge necrosis of wound	0	0

Table 8:Patients were distributed according Post Operative

Ambulatoru status	frequency	Percentage
Independent ambulators	10	66.67
Needs walkers	3	20
Needs tripod / stick	1	6.67
Bed ridden	1	6.67

Table 9: Patients were distributed according Ambulatory status at 1 year

Discussion

The effective management for intertrochanteric fractures relies on many aspects such as : The age, general health and the timing of the surgery, a along with medical treatment and the the fixation stability. The proper procedure and the perfect implant for such fractures are even now questioned with exponents of different methodologies each stating benefits over others. Numerous internal fixation devices were suggested for the management of such fractures, which includes extramedullary and intramedullary systems. The dynamic hip screw used to be the implant of preference for the reason of its beneficial results along with minimal non-union rate and failure of procedure. It delivers controlled compression at the fracture site. The use of DHS had been aided by its biomechanical properties which have been assumed to improve the healing of fractures. DHS needed a comparatively larger exposure, more tissue handling and anatomical reduction, all of which increased the morbidity, the probability of infection and significant blood loss, the likelihood of varus collapse and the failure of the implant to endure until fracture union. The plate and screws diminish the bone strength automatically. The general causes of fixation collapse are unstable trochanteric fractures, osteoporosis, lack of anatomical reduction, failure of the fixation device and incorrect placement of the lag screw in femoral head. Axial telescoping control and rotational solidity are crucial in unstable inter trochanteric fractures. An intramedullary implantation introduced in a marginally small incision is well tolerated in such patients. Cephalo-medullary nail together with a trochanteric entry point have achieved acceptance in current times. They demonstrated a biomechanically firmness than extramedullary implants. The Gamma nail is associated with specific complications, among which is anterior thigh pain and fracture of the femoral shaft are most common (7). The PFNA2 system (8), developed by AO/ASIF, has some major biomechanical innovations to overcome the previously mentioned limitations of the Gamma nail: By addition of the 6.5 mm anti-rotation hip screw to reduce the incidence of implant cut-out and the rotation of the cervico-cephalic fragment. In this respect, it should be conveyed in mind that the lag screw must be adjusted to the calcar, taking into account the need to place the antirotational hip screw. Smaller diameter and fluting of the tip of the nail, specially designed to reduce stress forces below the implant and therefore the incidence of low-energy fracture at the tip. (9)

- Larger implant size, reduced valgus tilt and angle at a better level (11 cm from proximal end).
- Further proximal placement of the distal locking screw helps to prevent unexpected variations in stiffness of the construct which in turn avoids failure at the distal locking site

The PFN nail also demonstrated its strength by preventing the fractures at the femoral shaft level by having a smaller distal shaft diameter which in turn decreases pressure intensity at the tip.

Intramedullary implants designed for fixation in proximal femur endure greater static and greater cyclical payload than DHS type implants. Due to which the fracture unites even devoid of the primary restoration of the medial side. The implant momentarily counteracts for the function of the medial column. Intramedullary nail reduces the bending force on the hip joint by 25 to 30% compare to DHS. This helps elderly people to weight bear as early as possible compared to plates. Entry point of PFNA2 is through the trochanter limits unlike to those nails which require entry through the pyriformis fossa shows less damage to the musculature. Associated to Gamma nail, the additional anti- rotation screw positioned in the femoral neck prevent spin of the cervico-cephalic pieces during weight bearing. The stabilisation and the compression screw of the PFNA2 effectively condense the fracture. (10). During the study period total 15 patients were enrolled into the study according study inclusion . In a study conducted by Dousa P, et al (11) patients were enrolled into the study for the prospective analysis of functional outcome of unstable intertrochanteric fractures managed with proximal femoral nail. In a study by Williams P.C. (12) et al. 25 patients were enrolled in the study for the analysis of functional outcome of intertrochanteric fracture.

Study	Number of patients
Dousa P (8)	30
Williams P.C (10)	25
Current study	15

Table 10: number of patients comparion with other studies

The patients were then distributed according to their age and among 15 patients, majority were in the age group of 71-80 years of age & 81-90 years of age that is 40%. The means of age is 70.04±12.42. In a study by Lewis WH (12) et al majority of patients are in the age group of 41-60 years of age with 50%. The means of ages is 55.75±10.67. in a study by Lavelle DG (13) et al majority of patients are in the age of 40-50 with 42%. The mean of ages is 49.87±12.34.

Study	Age group	Mean
Lewis WH (12)	41 – 60 years	55.75 ± 10.67
Lavelle DG (13)	40 – 50 years	49.87 ± 12.34
Current study	71 – 90 years	70.04 ± 12.42

Table 11: study as per age and compared with other studies

The patients are then distributed according to their sex and among 15 patients 9 (60%) were male patients and 6 (40%) were female patients. The ratio between the male and female is 3:2. In a study by Windoff J et al (12) 50% were males and 50% were females. The ratio between males and females is 1:1. In a study by Frankel VH (13) et al majority of the patients are males with 70% males and 30% females. The ratio between males and females is 2.3:1

Study	Males	Females	Ratio
Windoff J (12)	50%	50%	1:1
Frankel VH (13)	70%	30%	2.3:1
Current study	60%	40%	3:2

Table 12:sex ratio with other studies

The patients were then distributed according to the mode of injury that Among 15 patients, 14(93.33%) patients were Accidental fall and 1 (6.66%) patients were Road traffic accident. In a study by Trueta et al (14) 62.3% patients had accidental fall. In a study by Frankel VH (13) 72.6% patients met with RTA.

Study	Mode of injury	Percentage
Trueta (14)	Accidental fall	62.3%
Frankel VH(13)	Road traffic accident	72.6%
Current study	Accidental fall	93.3%

Table 13: comparison with other studies about mode of injury

The patients are then distributed according to the side affected and 11 (73.33%) patients have left side injury and 4 (26.67%) patients have right side injury. The ratio between the male and female is 1:2.9. In a study by Mussbichler H (15) et al 82.4% patients have left side injury. The ratio between male and female is 1.9:2.4. in a study by Trueta et al (14) 62.3% have right side injury. The ratio of males to females is 3:2.

Study	Side of injury	Ratio
Trueta (14)	Right side (62.3%)	62.3%
Mussbichler H (15)	Left side (82.4%)	72.6%
Current study	Left side (73.33%)	53.3%

Table 14: side comparison with other studies

The patients are then distributed according to time interval between injury and surgery,12 (80%)patients underwent surgery within 0-5 days followed by 03 (20 %) patients underwent surgery

within 06-10 days .The Mean of Time interval in days is 16.24 years. In a study by Wilson C et al (16) 63.45% patients underwent surgery within 30-40 days. In a study by Boyd HB et al (17) 52.4% patients underwent surgery within 20-30 days.

Study	Surgical time interval	Percentage
Wilson C (16)	20 – 30 days	52.4%
Boyd HB (17)	30 – 40 days	63.45 %
Current study	0 – 05 days	80 %

Table 15: **Surgical time interval**

The patients were then distributed according to types of proximal femoral nail used ,for 11 (73.33 %) of the patients , short PFNA2 135 degrees was used , 4 (26.66%) patients, long PFNA2 130 degrees . In a study by Wilson C (16) 45% were using long PFNA2 135 degrees was used . In a study by Evans EM (18) et al 72.3% of patients were using short PFNA2 135 degrees.

Study	PFN	Percentage
Wilson C (16)	Long PFNA2 130 degrees	45 %
Evans EM (18)	Short PFNA2 135 degrees	72.3 %
Current study	Short PFNA2 135 degrees	73.3 %

Table 16 PFN ratio

The patients were then distributed according to the operating time and Most of patients duration of surgery is between 45-75 minutes, Mean duration of surgery = 52 minutes. In a study by Chapman MW (19) et al majority of patients have a duration of surgery between 50-65 minutes. Mean duration of surgery is 47 minutes. In a study by Stewart JDM (20) et al majority of patients have a duration of surgery between 35-55 minutes with a mean duration of 45 minutes

Study	Duration of study	Mean duration
Chapman MW (19)	50-65 minutes	47 minutes
Stewart JDM (20)	35-55 minutes	45 minutes
Current study	45-75 minutes	52 minutes

Table 17: Study duration

The patients were then distributed according to Evans classification and most of 8 (53.33%) patients were Type 3 followed by 04 (26.67 %) patients were Type 4 and 03 (20%) patients were Type 5. In a study by Evans EM (18) majority of patients 79% were type-3. In a study by Mussbichler H (15) majority of patients were type 4 49%.

Study	Evans classification	Percentage
Evans EM (18)	Type – 3	79 %
Mussbichler H (15)	Type – 4	49 %
Current study	Type – 3	53.3 %

Table 18: Evans classification

The patients were then distributed according to the Harris Hip score and majority of patients have excellent prognosis after 6 and 9 months period with 53.33 and 60% respectively. In a study by Stewart JDM (20) majority of patients have a good progress after 6 months with 46% and with 26.67% after 9 months. In a study by Chapman MW (19) most of the patients have an excellent prognosis after 6 and 9 months with 52.8 and 77.6% respectively.

Study	Harris Hip score	
	6 months	9 months
Stewart JDM (20)	46	26.67 %
Chapman MW(19)	52.8 %	77.6 %
Current study	53.3 %	60 %

Table 19: Harris Hip score

The patients are then distributed based on the post operative complications and majority did not report any complications , except for 3 (20%) patients ,who presented with anterolateral thigh pain

because of anterior cortex impingement . In a study by Dousa P (8), et al most of the patients do not report any complications. In a study by Williams P.C (21) 20% patients report anterolateral thigh pain.

study	Post op complications	Percentages
Dousa P (8)	nil	100
Williams P.C (21)	Anterolateral thigh pain	20
Current study	Anterolateral thigh pain	20

Table 20: Post op complications

The patients are then distributed according to the ambulatory status at 1 year follow up and majority of them that is 66.7% are independent ambulators. In a study by Lewis WH (22) majority of patients are 72% independent ambulators. In a study by Dousa P (8) 56% require walkers for 6 months later turned into independent ambulators.

study	Ambualtory status	Percentage
Lewis WH(22)	Independent	72%
Dousa P(8)	Walkers	56%
Current study	Independent	66.67%

Table 21: **Ambualtory status**

Conclusion

The present study was carried out in a population of 15 patients, at a tertiary clinical care setting to study and analyse the functional outcome of unstable intertrochanteric fractures managed with proximal femoral nail. The study applicants were distributed according to their age group, sex and other demographic dimensions. The study participants were also compared for the onset of treatment, surgical time interval and other parameters. Post surgical

complications, ambulatory status were also assessed in the study population. After all the observations and comparison of results with other studies it is concluded that the PFNA2 is a significant advancement in the treatment of unstable trochanteric fractures which has the exceptional benefits of closed reduction, , less tissue damage, conservation of fracture hematoma early mobilization. Osteosynthesis using a PFNA2, used in unstable trochanteric fractures, followed with excellent stabilization, low rates of clinical complications, few mechanical complications and sufficient functional outcome. Thus the treatment of unstable intertrochanteric fracture with PFNA2 had a more favourable outcome and it is the ideal implant of choice for unstable intertrochanteric fractures at present.

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