



ASSESSMENT OF TREATMENT OUTCOMES OF UNSTABLE INTERTROCHANTERIC FRACTURES WITH PROXIMAL FEMORAL NAIL

Orthopaedics

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ABSTRACT

Background: Intertrochanteric fractures commonly manifest in elderly individuals with diminished bone strength and density. The Proximal Femoral Nail is advantageous due to its positive biomechanical qualities, which provide enhanced mechanical stability and allow for early weight bearing. Present study is aimed to assess treatment outcomes of unstable intertrochanteric fractures with proximal femoral nail. **Methodology:** The present prospective study was conducted on 30 cases of unstable trochanteric fractures admitted under department of orthopaedics, tertiary care hospital, Maharashtra. Patients >18 years of age presenting to our causality with intertrochanteric femoral fractures with all Boyd and Griffin types (1-4) with displaced and un-displaced fractures with less than 1 week duration and without any other associated fractures were included. Functional outcome Intertrochanteric fractures treated by Proximal Femoral Nailing were analysed using Harris Hip Score. Data was analysed using SPSS version 21. Chi-square test was used to compare qualitative variables and quantitative variables were presented as mean and standard deviation. P value <0.05 was considered significant at 95% confidence interval. **Results:** In the present study, out of 35 patients, 60% were males. Mean age was 64.82±7.36 years. Mode of injury was RTA (Road traffic accident) in 37.14%. As per Boyd and griffin fractures classification types, most common was type 2 in 12 (34.29%) patients. Lower age was associated with better outcomes (p value 0.039). Lesser duration between trauma to Surgery was found to be associated with better outcomes (p value 0.001). Majority of the patients had union between 12 to 14 weeks (37%) followed by 34% in < 12 weeks. Lower age was associated with early union time (p value 0.002). Lower types (type 1 and type 2) of Boyd and Griffin classification had lesser duration of union (p value 0.363). The type 1 fractures united in <15 weeks and one patient with type 1 and three patient from type 3 class had union time 15 to 16 weeks but the association was not significant (p value 0.254). Pain at trauma site (hip pain) and Bedsores were most common complications seen in 5 (14.29%) patients each. Surgical Site Infection was observed in 3 (8.57%) patients which were managed with debridement and antibiotics. **Conclusion:** The utilisation of the proximal femoral nail (PFN) in the management of unstable intertrochanteric fractures has demonstrated a more advantageous prognosis, establishing it as the preferred implant for such fractures in current practice.

KEYWORDS

Treatment Outcomes, Unstable Intertrochanteric Fractures, Proximal Femoral Nail, Harris Hip Score

INTRODUCTION:

The incidence and severity of intertrochanteric fractures have been observed to rise in tandem with the growing life expectancy of our society. Intertrochanteric fractures commonly manifest in elderly individuals with diminished bone strength and density. Fractures of this nature are frequently observed in elderly individuals, although they are increasingly prevalent in younger age groups due to high-energy trauma and are frequently accompanied by further fractures. The implementation of preventive measures aimed at reducing the likelihood of falls, as well as the diligent screening and treatment of individuals with osteoporosis who are at a heightened risk of fragility fractures, hold significant importance. The importance of early postoperative rehabilitative treatment cannot be overstated^(1,2).

The primary objective in the care of hip fractures is to restore the patient to their pre-morbid level of functional status. Prior to the implementation of appropriate fixation devices, the management of intertrochanteric fractures involved a non-operative approach, which entailed extended bed rest with the application of traction until fracture union occurred, typically taking 10 to 12 weeks^(3,4). Subsequently, a comprehensive regimen of walking training ensues. High complication rates were observed in older individuals.

The a forementioned problems encompass decubitus ulcers, urinary tract infection, joint contractures, pneumonia, and thromboembolic events, which contribute to a significant mortality rate. Moreover, the process of fracture healing commonly coincided with the occurrence of varus deformity and shortening due to the limited ability of traction to adequately counterbalance the deforming muscle forces. Due to the aforementioned factors, the conventional approach for managing intertrochanteric fractures involves reduction and internal fixation, which has emerged as the prevailing treatment modality.

Two extensively utilised methods of internal fixation in orthopaedic surgery are the dynamic hip screw and the proximal femoral nail. The Proximal Femoral Nail is advantageous due to its positive biomechanical qualities, which provide enhanced mechanical stability and allow for early weight bearing. This makes it particularly ideal for individuals with unstable fractures and osteoporosis, especially in the older population. Present study is aimed to assess treatment outcomes of unstable intertrochanteric fractures with proximal femoral nail.

MATERIALS AND METHODS:

The present prospective study was conducted on 30 cases of unstable trochanteric fractures admitted under department of orthopaedics, tertiary care hospital, Maharashtra. Patients >18 years of age presenting to our causality with intertrochanteric femoral fractures with all Boyd and Griffin types (1-4) with displaced and un-displaced fractures with less than 1 week duration and without any other associated fractures were included. Patients with fractures with non-union changes, old malunited intertrochanteric fracture, patients with arthritic changes in hip joint and patients with pathological fractures were excluded. All patients are followed up for period of at least 6 months.

Collection of data regarding demographic variables, type fracture, initial management, complications and post-op events, clinical and radiological assessment was done as per proforma with consent from patients. All patients were operated on fracture table with the technique described previously. All patients were operated under Spinal anaesthesia. Post-operatively, patients underwent chest physiotherapy, Hip and knee Mobilisation from 1st post-op day, weight-bearing increased gradually, suture removal on 12th post-operative day and regular Follow Up with periodical X rays at 3rd and 6th months.

Functional outcome Intertrochanteric fractures treated by Proximal Femoral Nailing were analysed using Harris Hip Score⁽⁵⁾. Data was analysed using SPSS version 21. Chi-square test was used to compare qualitative variables and quantitative variables were presented as mean and standard deviation. P value <0.05 was considered significant at 95% confidence interval.

RESULTS:

Clinico-demographic Characteristics of the Patients:

In the present study, out of 35 patients of unstable trochanteric fractures, 21 (60%) were males and 14 (40%) females. Majority (13, 37.14%) belong to age group 61 to 70 years followed by 10 (28.57%) from 55 to 65 years. Mean age was 64.82±7.36 years ranging from 43 years to 78 years.

Right side involved in 19 (54.29%) cases Left side involved in 16 (45.71%) patients. Mode of injury was RTA (Road traffic accident) in 13 (37.14%) patients and Self-fall in 22 (62.86%) patients. Duration

between trauma to operative procedure was 72 hours to one week in 28 (80%) patients, < 72 hours in 5 (14.29%) patients and > 1 week in only 2 patients. Mean trauma to surgery time was 3.26 ± 0.72 days, ranging from 12 hours to 10 days post-trauma. As per Boyd and griffin fractures classification types, most common was type 2 in 12 (34.29%) patients, followed by type 3 in 11 (31.43%), type 4 in 8 (22.86%) and type 1 was seen in only 4 patients.

Table 1. Clinico-demographic Characteristics Of The Patients:

Clinico-demographic Characteristics		Frequency	Percentage
Age groups	41 to 50 years	4	11.43
	51 to 60 years	10	28.57
	61 to 70 years	13	37.14
	71 to 80 years	8	22.86
Gender	Male	21	60.00
	Female	14	40.00
Side Involved	Right Side	19	54.29
	Left Side	16	45.71
Mode of injury	Self-Fall	22	62.86
	Road traffic accident	12	34.29
Duration between trauma to operative procedure	< 72 hours	5	14.29
	72 hours to 1 week	28	80.00
	> 1 weeks	2	5.71
Boyd and griffin classification	Type 1	4	11.43
	Type 2	12	34.29
	Type 3	11	31.43
	Type 4	8	22.86

Duration Of Surgery And Blood Loss During Surgery:

Mean duration of surgery was 61.24 ± 11.78 minutes which ranged from 33 mins to 106 mins. Mean blood loss was 114.37 ± 18.72 ml ranging from 41ml to 190ml.

Outcome Of The Patients:

Outcome of the patients was assessed with the help of Harris Hip Score. It was found that out of 35 patients, 9 patients had excellent score, 19 as good, 6 as fair and 1 as poor score (Graph 1).

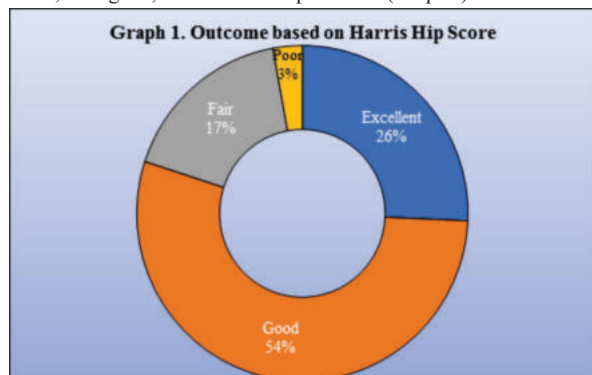


Table 2. Association Between Patient Variables And Harris Hip Score:

Patients' characteristics		Harris Hip Score				Total	P value
		Excellent	Good	Fair	Poor		
Age (Years)	41 to 50	2	2	0	0	4	0.039
	51 to 60	5	5	0	0	10	
	61 to 70	2	9	2	0	13	
	71 to 80	0	3	4	1	8	
Gender	Male	6	11	4	0	21	0.612
	Female	3	8	2	1	14	
Boyd and Griffin classification	Type 1	2	2	0	0	4	0.642
	Type 2	4	6	2	0	12	
	Type 3	2	6	3	0	11	
	Type 4	1	5	1	1	8	
Duration b/w trauma to Surgery	< 72 hours	3	2	0	0	5	0.001
	72 hrs to 1 wk	6	16	6	0	28	
	> 1 weeks	0	1	0	1	2	
Total		9	19	6	1	35	

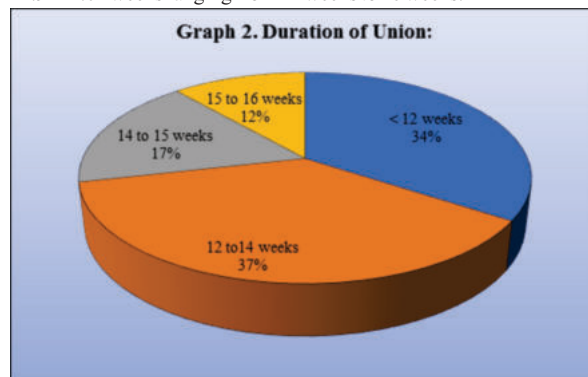
Excellent and Good outcomes were seen in younger age groups, only one patient with poor outcome belong to age group 75 to 85 years. Fair outcome was seen in patients above the age group of 65 only. Lower

age was associated with better outcomes (p value 0.039). Males have better outcomes but difference was not statistically significant (p value 0.612).

Lower types (type 1 and type 2) of Boyd and Griffin classification had better outcomes but difference was not statistically significant (p value 0.642). The type 1 fractures had excellent and good outcome, type 2 and type 3 had excellent, good and fair outcome and 4 had all grades of outcome. Lesser duration between trauma to Surgery was found to be associated with better outcomes (p value 0.001).

Duration Of Union:

Duration of union was assessed after Radiological evaluation. Majority of the patients had union between 12 to 14 weeks (37%) followed by 34% in < 12 weeks. The mean time for union was about 12.91 ± 2.02 weeks ranging from 12 weeks to 16 weeks.



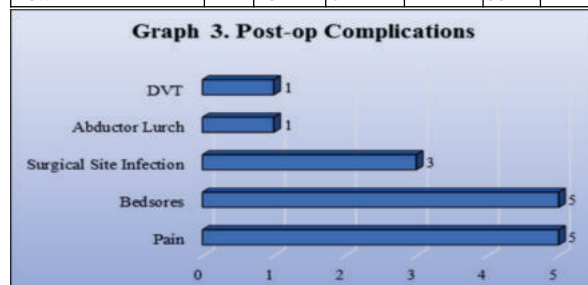
Association Between Patient Variables And Duration Of Union:

Time of bone union was < 14 weeks in younger age groups, 4 patients who had union time 15 to 16 weeks belong to age group 75 to 85 years. Lower age was associated with early union time (p value 0.002). Males have lesser union time but difference was not statistically significant (p value 0.144).

Lower types (type 1 and type 2) of Boyd and Griffin classification had lesser duration of union but difference was not statistically significant (p value 0.363). The type 1 fractures united in < 15 weeks and one patient with type 1 and three patient from type 3 class had union time 15 to 16 weeks but the association was not significant (p value 0.254).

Table 3. Association Between Patient Variables And Duration Of Union:

Patients' characteristics		Duration of Union				Total	P value
		< 12	12 to 14	14 to 15	15 to 16		
Age (Years)	45 to 55	3	1	0	0	4	0.002
	55 to 65	4	6	0	0	10	
	65 to 75	3	5	5	0	13	
	75 to 85	2	1	1	4	8	
Gender	Male	9	9	2	1	21	0.144
	Female	3	4	4	3	14	
Boyd and Griffin classification	Type 1	2	1	1	0	4	0.363
	Type 2	5	5	2	0	12	
	Type 3	4	5	1	1	11	
	Type 4	1	2	2	3	8	
Duration b/w trauma to Surgery	< 72 hours	3	2	0	0	5	0.254
	72 hrs to 1 wk	9	11	5	3	28	
	> 1 weeks	0	0	1	1	2	
Total		12	13	6	4	35	



Post-op Complications Among Patients:

Pain at trauma site (hip pain) and Bedsores were most common complications seen in 5 (14.29%) patients each. Surgical Site Infection was observed in 3 (8.57%) patients which were managed with debridement and antibiotics. Only one patient with abductor Lurch and one patient was found to have DVT which were managed conservatively.

DISCUSSION:

Dynamic hip screw/sliding hip screw with plate is a commonly used implant for fixing inter-trochanteric fractures in elderly. In an in-vitro biomechanical study by **Kuzyk et al.**⁽⁶⁾, compared extra-medullary to intramedullary implants and found intra-medullary devices to be more efficient in achieving a stable fixation in unstable inter-trochanteric fractures. The PFN is an intramedullary load-sharing device that works well. It uses the same ideas and theoretical benefits as the Zicker Nail, Dynamic hip screw locked intramedullary nail, but makes changes to fit the needs of Asian patients.

In PFN, the DHS has a longer moment arm and is more likely to have the lag screw break off or the bone to join in a varus position. PFN benefits include less blood loss, a shorter surgery time, early weight bearing, less chance of implant failure, less time spent on fluoroscopy, less chance of hip pain after surgery, and better performance than any other implant in elderly osteoporotic patients. In this study, everyone was in a union. There were no cases of femur fractures both before and after surgery. There were no cases of malunion in the varus position. Patients who were given the PFN nail lost an average of 130 ml of blood, but some lost as much as 275 ml. The results were the same as in the study by **Levent Karapinar et al.**⁽⁷⁾.

In our study, the average time to run was 62.6 minutes. In the first cases we looked at, the working time was in the higher end of the range (43–82 minutes). With more practise, it took less time to do the job. Boyd and Gryphon types 3 and 4 had longer operating times than the other kinds. Results were similar to what **Yu.W. Zhang et al.**⁽⁸⁾ and **J. Zou et al.**⁽⁹⁾ found in their series. At the end of three months, the average Harris Hip Score⁽⁹⁾ for our patients was 79.8, and at the end of six months, it was 82.3. Most of them got "good" grades on the Harris Hip Score. With older age groups and more Boyd and Gryphon types, people got fair results. **Chiaoling et al.**⁽¹⁰⁾ with good to excellent results in 78.2% patients and by **Ming et. al.**⁽¹¹⁾ who found good to excellent outcome in 81.9% patients.

Bed sores, shallow and deep infections (which got better with intravenous antibiotics and debridement, respectively), abductor lurch, and hip pain after surgery were some of the problems we found. These were also found at the same rates in other tests of PFN. In our study, there were no cases of non-union, just like in **Levent karapinar et al.**⁽⁷⁾ study, where there were no cases of non-union. Studies that looked at non-union showed that higher types (types 3 and 4) were more likely to not join. **I.B. Schipper et al.**⁽¹²⁾ found that femoral shaft fractures are less likely to get worse when screws are used instead of stress risers. Intramedullary implants aren't a good idea for people with a small femoral canal or an abnormally curved proximal femur, according to **Halder et al.**⁽¹³⁾. In our series, we took these suggestions into account. So, in our study, we haven't seen any femoral shaft fractures either before or after surgery.

CONCLUSION:

It is concluded that the PFN represents a notable progression in the management of unstable trochanteric fractures, offering distinct benefits such as closed reduction, preservation of fracture hematoma, less tissue injury, expedited rehabilitation, and prompt resumption of job activities. The utilisation of the proximal femoral nail (PFN) in the management of unstable intertrochanteric fractures has demonstrated a more advantageous prognosis, establishing it as the preferred implant for such fractures in current practice.

Through the implementation of appropriate preoperative planning and utilisation of accurate surgical techniques, such as comprehensive reaming of the femoral canal, precise insertion of the implant, and meticulous positioning of distal locking screws, it becomes feasible to diminish the occurrence of postoperative femoral shaft fractures and non-union rates commonly associated with proximal femoral nail (PFN) procedures.

REFERENCES:

1. Babbhulkar Sudhir S. Management of trochanteric Fractures. Indian J Orthop.

2006;40:210-8.

2. Canale ST, Beaty JH. Campbell's Operative orthopaedics. 12th edition. Elsevier; 2012.
3. Cummings SR, Kelsey JL, Nevitt MC, O'Dowd KJ. Epidemiology of osteoporosis and osteoporotic fractures. Epidemiol Rev. 1985;7:178-208.
4. Cole PA, Bhandari M. What's new in orthopaedic trauma. J Bone Joint Surg. 2005;87:2823-38.
5. Phruethiphat OA, Pinijprapa P, Satravaha Y, Kitcharanan N, Pongchaiyakul C. An innovative scoring system for predicting an excellent Harris hip score after proximal femoral nail anti-rotation in elderly patients with intertrochanteric fracture. Scientific Reports. 2022 Nov 19;12(1):19939.
6. Kuzyk PR, Lobo J, Whelan D, Zdero R, McKee MD, Schemitsch EH: Biomechanical evaluation of extramedullary versus intramedullary fixation for reverse obliquity intertrochanteric fractures. J Orthop Trauma. 2009; 23:31-38.
7. Karapinar L, Kumburaci M, Kaya A, Imerci A, Incesu M. Proximal femoral nail anti-rotation (PFNA) to treat peritrochanteric fractures in elderly patients. European Journal of Orthopaedic Surgery & Traumatology. 2012 Apr;22:237-43.
8. Zhang K, Zhang S, Yang J, Dong W, Wang S, Cheng Y, Al-Qwbani M, Wang Q, Yu B. Proximal femoral nail vs. dynamic hip screw in treatment of intertrochanteric fractures: a meta-analysis. Medical science monitor: international medical journal of experimental and clinical research. 2014;20:1628.
9. Zhou JQ, Chang SM. Failure of PFNA: helical blade perforation and tip-apex distance. Injury. 2012 Jul 1;43(7):1227-8.
10. Lv C, Fang Y, Liu L, Wang G, Yang T, Zhang H, Song Y. The new proximal femoral nail antirotation-Asia: early results. Orthopedics. 2011 May 18;34(5):e18-23.
11. Li M, Wu L, Liu Y, Wang C. Clinical evaluation of the Asian proximal femur intramedullary nail antirotation system (PFNA-II) for treatment of intertrochanteric fractures. J Orthop Surg Res. 2014; 9:112.
12. Schipper IB, Steyerberg EW, Castelein RM, Van der Heijden FH, Den Hoed PT, Kerver AJ, Van Vugt AB. Treatment of unstable trochanteric fractures: randomised comparison of the gamma nail and the proximal femoral nail. The Journal of Bone & Joint Surgery British Volume. 2004 Jan 1;86(1):86-94.
13. Halder SC. The Gamma nail for peritrochanteric fractures. The Journal of Bone & Joint Surgery British Volume. 1992 May 1;74(3):340-4.