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A comparative study of intertrochanteric fractures of hip treated with PFN & PFNA 2

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Abstract

Background: Management of intertrochanteric fractures have been evolved from extra medullary implants to intramedullary implants. Intramedullary implants have proven advantage over their counterpart in terms of stable anatomical fixation and better functional outcome. Among the intramedullary implants, Proximal Femur Nail (PFN) & Proximal Femur Nail Anti Rotation for Asia (PFNA2) have been traditionally used. This study is based on the comparison between these two intramedullary implants in terms of clinical and functional outcome.

Materials and Methods: A total of 40 patients fulfilling inclusion and exclusion criteria were randomized into two groups PFN (n= 20), PFNA2 (n=20) between August 2018 to July 2019. They were compared in terms of demography, per operative variables, postoperative functional outcome and were followed up for a period of 6 months postoperatively.

Results: Average age of PFN group was 61.35 years & PFNA2 was 66.90 years. In PFN group 9 patients (45%) had grade 2 of Singh's osteoporosis index and in PFNA2 12 patients (60%) had grade 2. Mean Harris hip score at 6 months in PFN was 83.15 and in PFNA2 it was 86.80. Complications like infection were seen in 2 patients (10%) in PFN and 1 patient (5%) in PFNA2. Valgus deformity was seen in 1 patient (5%) in PFNA2. Z effect was seen in 4 (20%) in PFN

Conclusion: There was no significant difference between the two groups in terms of clinical and functional outcome. However implant related complication's like screw back out, Z effect were not present in PFNA2 and the duration of surgery was less in PFNA2. We conclude that PFNA2 is a better option for treatment of intertrochanteric fractures of hip especially in osteoporotic patients.

Keywords: PFNA 2, PFN, AO, intertrochanteric fractures

Introduction

Aging is a natural process which no one can defy. As the population continues to age, the number of hip fractures will be expected to increase exponentially. Trochanteric femoral fractures are common in elderly patients^[1]. These fractures are one of the most common fractures in older population due to low energy trauma such as simple fall due to osteoporosis and in younger patients with high energy trauma such as motor vehicle accident or fall from height^[2]. These fractures typically occur in frail patients with multiple medical comorbidities and often result in the end of the patient's functional independence^[3].

Intertrochanteric fractures are defined as 'fractures involving upper end of femur through and in between both trochanters with or without extension into upper femoral shaft'^[4]

It is universally agreed that the treatment of intertrochanteric fractures is stable internal fixation as early as possible. Stable fixation is the keystone of successful union of trochanteric fractures. Early surgical intervention is advocated in the majority of these patients to reduce the complications associated with long-term immobilization^[5].

Stable trochanteric femur fracture can be treated successfully with conventional implants, such as sliding hip screw, cephalomedullary nail, and angular blade plates, and rarely by a primary hip arthroplasty^[6]. However, comminuted and unstable inter or subtrochanteric fractures, fractures with extension into the piriformis fossa, and combined intracapsular and extracapsular fractures are challenging injuries that are prone to complications. The PFNA was introduced by the Arbeitsgemeinschaft für Osteosynthesefragen /Association for the Study of

Internal Fixation (AO/ASIF) in 2003, and uses helical neck blade fixation to obtain high stability to prevent rotation and collapse [7, 8]. The PFNA is one of the most effective methods in the treatment of intertrochanteric femur fractures [9, 10]. However, PFNA was designed in accordance with the anatomical data of Westerners. The anatomy of Asians are different from Westerners resulting in some complications due to mismatch [11].

Methods

A total of 40 patients were included in the study conducted from August 2018 to July 2019, after patients with closed trochanteric femur fractures were admitted to hospital, thorough history and clinico-radiological workup was done for each patient according to the working proforma. General condition of the patient was assessed with regards to hypovolaemia, associated orthopaedic or other systemic injuries and resuscitative measures taken accordingly. All patients were given preliminary management by temporary below knee skin traction and necessary medical management. The patients were taken for definitive fixation after a variable period of time depending upon medical condition. Definitive fixation was done in the form of closed reduction and internal fixation with proximal femoral nail (PFN) and proximal femoral nail anti-rotation-asia (PFNA-II). After the completion of the hospital treatment, patients were discharged and called for follow up at outpatient level, at regular intervals at 3 weeks, 3 and 6 months. In each determined follow up, Clinical, Functional & Radiological evaluation as by parameters (i.e.) implant position, tip apex distance, and progression of healing (union; determined by visibility of fracture lines) was documented. Complications like surgical site infection, deep infection, thigh pain, limb length discrepancy, varus, valgus deformity, haematoma were documented. The Functional evaluation was done based on Harris hip score.

All patients were administered either spinal or epidural anaesthesia. After taking written consent patients were positioned supine on a fracture table prior to closed reduction of fracture. Surgical approach and reduction was same in both the groups except for techniques and instrumentation. Three doses of antibiotics were given, first dose at 30 minutes before the procedure. Immediate post-operative radiographs were taken to determine the bone alignment and maintenance of reduction. All patients were allowed toe touch weight bearing with walker immediately on first post-operative day following which weight bearing was planned based on the status of fracture union. All patients were followed up in OPD at 3 weeks, 3 months, 6 months and evaluated based on radiological and functional outcome using harris hip score.



Fig 1: Preop



Fig 2: Immediate post op



Fig 3: Six months post op

Results

Mean age of subjects in PFN group was 61.35 ± 10.07 years and in PFNA 2 was 66.90 ± 4.70 years. There was no significant difference in mean age between two groups ($p=0.062$). In PFN group, 45% had simple fall, 20% had fall at work place and 35% had RTA. In PFN 2, 55% had simple fall, 45% had RTA. In both groups majority of the cases had Singh's index of grade 2 45% and 60% in PFN and PFNA2 respectively. There was no significant difference in Singh's Index between two groups ($p=0.546$). In PFN, 70% had A2 fracture and 30% had A3 fracture. In PFNA 2, 65% had A2 fracture and 35% had A3 fracture. There was no significant difference in fracture pattern between two groups ($p=0.736$). Mean duration of surgery was high in PFN group compare to PFNA 2 however there was no significant difference in duration of surgery between two group ($p=0.117$). In PFN group, 10% had infection, 20% had Z effect as complications and in PFNA 2 group, 10% had infection and 5% had valgus deformity. There was no significant difference in complications between two groups ($p=0.152$). In PFN, 50% had excellent, 20% had Very good, 10% had good and 20% had poor outcome, in PFNA 2, 60% had had excellent, 20% had Very good, 5% had good and 15% had poor outcome. There was no significant difference in functional outcome between two groups ($p=0.883$).

Table 1: Harris hip score comparison

Harris hip score	PFN		PFNA 2		Total		P value
	Mean	SD	Mean	SD	Mean	SD	
3 weeks	53.70	10.17	55.45	2.91	54.58	7.44	0.464
3 months	72.55	11.63	72.70	8.18	72.62	9.92	0.963
6 months	83.15	14.00	86.80	11.05	84.98	12.59	0.366

Table 2: Functional outcome comparison

		PFN		PFNA 2		Total	
		Count	%	Count	%	Count	%
Functional outcome	Excellent	10	50.00%	12	60.00%	22	55.00%
	Very Good	4	20.00%	4	20.00%	8	20.00%
	Good	2	10.00%	1	5.00%	3	7.50%
	Poor	4	20.00%	3	15.00%	7	17.50%

Table 3: Complications comparison

		PFN		PFNA 2		Total	
		Count	%	Count	%	Count	%
Complications	Nil	14	70.00%	17	85.00%	31	77.50%
	Infection	2	10.00%	2	10.00%	4	10.00%
	Valgus	0	0.00%	1	5.00%	1	2.50%
	Z-Effect	4	20.00%	0	0.00%	4	10.00%



Fig 4: Preop



Fig 5: Immediate postop



Fig 6: 6 months postop

Discussion

At present it is generally believed that all Intertrochanteric fractures should be internally fixed to reduce the morbidity and the mortality of the patient. But the appropriate method and the ideal implant of choice to fix the Intertrochanteric fracture is still a debate, as each method has its own pros & cons.

Proximal femoral nail was noted to be more useful in unstable and reverse oblique patterns due to the fact that it has better axial telescoping and rotational stability as it is a load sharing device^[12, 13]. It has shown to be more biomechanically stronger because they can withstand higher static and several fold higher cyclical loading than dynamic hip screw. So the fracture heals without the primary restoration of the medial support. Proximal femoral nail also acts as a buttress in preventing the medialization of the shaft.

The AO/ASIF group further modified PFN to the PFNA to ameliorate the angular and rotational stability with one single element. It is an intramedullary device with a helical blade rather than a screw for better purchase in the femoral head and was tested in a clinical study^[14].

The Asia proximal femoral nail anti-rotation (PFNA-II) was specifically designed for Asian patients to avoid these problems, which was designed to have a mediolateral angle of 5° and a proximal diameter of 16.5 mm. The modified nail has a considerably better anatomic fit. This effectively decreases the hoop stress inside the femoral shaft and may have led to a significant decrease in intraoperative and postoperative diaphyseal fractures^[15].

In our study Mean age of subjects in PFN was 61.35 ± 10.07 years and in PFNA 2 was 66.90 ± 4.70 years. Kunderna *et al.*^[14] in their study had 72% of the patients over 60 years of age with average age of 68 years ranging from 21 years to 94 years. This is comparable to my study.

In our study PFN group 70% had A2 fracture and 30% had A3 fracture. In PFNA 2, 65% had A2 fracture and 35% had A3 fracture. Ming hui Li *et al.*^[15] in their study of 163 patients with intertrochanteric fractures, according to AO, 53 (32.52%) fractures were classified as 31A1, 83 (50.92%) as 31A2, and 27 (16.56%) as 31A3. Mean duration of surgery in PFN was 53.25 ± 14.07 and in PFNA 2 was 48.10 ± 2.83 min Mohan N.S *et al.*^[16] had similar finding in their study with 50 minutes the average duration of surgery for PFNA and 80 min for PFN

In PFN 10% had infection, 20% had Z effect as complications and in PFNA 2, 10% had infection and 5% had valgus. This is comparable to study done by Kashid MR *et al.*^[17].

In PFN 50% had excellent, 20% had Very good, 10% had good and 20% had poor outcome, in PFNA 2, 60% had had excellent, 20% had Very good, 5% had good and 15% had poor outcome GN Kiran Kumar *et al.*^[18]. In their study, Harris hip score was excellent in 15(35.7%), good in 18(42.8%), fair in 6(14.2%), poor in 3(7.1%). This is comparable to my study.

Conclusion

Our study suggests that both PFN & PFNA 2 are preferred modalities of treatment of intertrochanteric fractures. Both implants have similar functional outcome and in terms of complications there is no significant difference between the two. However in PFNA 2 implant related complication's like screw back out, Z effect were not present and has lesser operating time and better functional outcome, especially in osteoporotic patients with hip fractures.

References

1. Al-yassari G, Langstaff RJ, Jones JWM, Al-Lami M. The AO/ASIF proximal femoral nail (PFN) for the treatment of unstable trochanteric femoral fracture. *Injury*. 2002; 33(5):395-9.
2. Chalise PK, Mishra AK, Shah SB, Adhikari V, Singh RP. Outcome of pertrochantric fracture of the femur treated with proximal femoral locking compression plate. *Nepal Med Coll J*. 2012; 14(4):324-7.
3. Haidukewych GJ. Intertrochanteric fractures: ten tips to improve results. *J Bone Joint Surg Am*. 2009; 91(3):712-9.
4. Kumar R, Singh RN, Singh BN. Comparative prospective study of proximal femoral nail and dynamic hip screw in treatment of intertrochanteric fracture femur. *J Clin Orthop Trauma*. 2012; 3(1):28-36.
5. Kregor PJ, Obremskey WT, Kreder HJ, Swionkowski MF. Unstable pertrochanteric femoral fractures. *J Orthop Trauma*. 2005; 19(1):63-6
6. Pu J-S, Liu L, Wang G-L, Fang Y, Yang T-F. Results of the proximal femoral nail anti-rotation (PFNA) in elderly Chinese patients. *Int Orthop*. 2009; 33(5):1441-4.
7. Mereddy P, Kamath S, Ramakrishnan M, Malik H, Donnachie N. The AO/ASIF proximal femoral nail anti-rotation (PFNA): A new design for the treatment of unstable proximal femoral fractures. *Injury*. 2009; 40(4):428-32.
8. Gardenbroek TJ, Segers MJM, Simmermacher RKJ, Hammacher ER. The proximal femur nail antirotation: an identifiable improvement in the treatment of unstable pertrochanteric fractures? *J Trauma*. 2011; 71(1):169-74.
9. Kristek D, Lovrić I, Kristek J, Biljan M, Kristek G, Sakić K *et al.* The proximal femoral nail antirotation (PFNA) in the treatment of proximal femoral fractures. *Coll Antropol*. 2010; 34(3):937-40.
10. Boyd HB, Griffin LL. Classification and treatment of trochanteric fractures. *Arch Surg (Chicago, Ill 1920)*. 1949; 58(6):853-66.
11. Kyle RF, Wright TM, Burstein AH. Biomechanical analysis of the sliding characteristics of compression hip screws. *J Bone Joint Surg Am*. 1980; 62(8):1308-14.

12. Simmermacher RKJ, Ljungqvist J, Bail H, Hockertz T, Vochteloo AJH, Ochs U *et al.* The new proximal femoral nail anti-rotation (PFNA) in daily practice: results of a multicentre clinical study. *Injury*. 2008; 39(8):932-9.
13. Williams WW, Parker BC. Complications associated with the use of the gamma nail. *Injury*. 1992; 23(5):291-2.
14. Kuderna H, Böhler N, Collon DJ. Treatment of intertrochanteric and subtrochanteric fractures of the hip by the Ender method. *J Bone Joint Surg Am* [Internet]. 1976; 58(5):604-611. Available from: <http://europepmc.org/abstract/MED/932059>
15. Li M, Wu L, Liu Y, Wang C. Clinical evaluation of the Asian proximal femur intramedullary nail anti-rotation system (PFNA-II) for treatment of intertrochanteric fractures. *Journal of Orthopaedic Surgery and Research*. London; 2014, 9.
16. Mohan NS, Shivaprakash S. US. PFNA v/s PFN in the Management of Unstable Intertrochanteric Fractures. *J Evol Med Dent Sci*. 2015; 4(24):4086-91.
17. Kashid MR, Gogia T, Prabhakara A, Jafri MA, Shaktawat DS, Shinde G *et al.* Comparative study between proximal femoral nail and proximal femoral nail anti-rotation in management of unstable trochanteric fractures. *Int J Res Orthop*. 2016; 2:354-8.
18. Kumar GNK, Sharma G, Khatri K, Farooque K, Lakhota D, Sharma V *et al.* Treatment of Unstable Intertrochanteric Fractures with Proximal Femoral Nail Anti-rotation II: Our Experience in Indian Patients. *The Open Orthopaedics Journal*. 2015; 9:456-9.