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COMPARISON OF CONVENTIONAL TWO SCREWS PROXIMAL FEMORAL NAIL VERSUS SINGLE HELICAL BLADE PROXIMAL FEMORAL NAIL A2 IN THE TREATMENT OF INTERTROCHANTERIC FRACTURES

Orthopaedics

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ABSTRACT

Introduction: An intertrochanteric femur fracture is a fracture between greater and lesser trochanters of the femur bone. Unstable IT fractures are those where there is poor contact between fracture fragments, comminution, and weight-bearing forces tend to displace the fracture further.Inter-trochanteric fractures are either seen in young adults due to high-energy trauma like in road traffic accidents or in elder population because of low-energy trauma like fall from height. Proximal Femoral Nail has a two screw system. There is one compression screw in addition to one anti-rotation screw. Proximal Femoral Nail Anti-rotation II (PFN-A2) utilizes a single helical blade. The helical blade is believed to provide stability, compression as well as rotational control of the fracture .In a manner it condenses the cancellous bone during insertion into the neck providing additional anchoring and hence has higher cutout strength compared to other devices.[1] **Aim:** The aim of this study is to do a comparison of the radiological and clinical outcomes between two available implants: PFN and PFN A-II. **Methods:** This was a retrospective study of patients operated between January 2022 to June 2023. 60 patients were selected in the study with unstable Boyd and Griffin's types 2, 3 and 4. The data was collected from in-patient and out-patient records. Following variables were noted: Total duration of operation Amount of Blood loss Time taken for union of fracture Post-operative complications. Follow – up examinations were done after the surgery at intervals of one month, three months, six months, and one year. Harris Hip Score was used for analysis of functional outcome.The student t-test and chi-square test were used with Stata, version 26.0 SPSS INC, Chicago, IL, USA for statistical analysis. **Results:** Out of 60 cases included in the study, 30 were treated with PFN and remaining 30 with PFN A-II. The mean age was 66.1 years. There was significant difference in mean blood loss between two groups: PFN (148.3+-50 ml) and PFNA2(122.7+-50 ml).The average HHS at the one year follow up was 84.9 for PFN and 89.2 for PFN A2. **Conclusion:** Our study saw statistically significant reduction in blood loss during operation and duration of operation. The Harris Hip Score also showed better results in cases operated with PFN AII but the results were not statistically significant. Further research is needed on this topic owing to small sample size of our study.

KEYWORDS

PFN, PFN A2 , Harris Hip Score

INTRODUCTION

Inter-trochanteric femur fractures in young adults are often due to trauma like road traffic accidents[2] . In contrast, in the elder population, they are often due to low-energy trauma, most commonly fall from height[3] . The PFN has been the implant of choice as it has better biomechanical properties and smaller incisions are required for surgery. However, screw cutout, the Z effect, varus collapse and more radiation exposure are major concerns.[4,5]

PFN and the PFNA2 are both intramedullary devices with a 6-degree medial-lateral angle.

PFN has a two screw system. Most common reason for implant failure in cases of PFN is screw pull out most commonly associated with osteoporosis in elderly.

PFNA2 has a single helical screw. It is advantageous as it has superior fixation stability due to increased bone-implant interface. The compaction of cancellous bone makes it more resistant to rotation and varus collapse.

MATERIALS AND METHODS

Ethical clearance for this study has been obtained from the Institute's Ethical Committee.

Inclusion Criteria

The study included:

- individuals who were between 40-80 years old
- individuals who had unstable inter-trochanteric fracture with Boyd Griffin type 2,3,4

Exclusion Criteria

The study excluded:

- individuals who had compound fractures
- stable intertrochanteric fractures Boyd Griffin type 1
- associated injuries hindering post-operative weight-bearing
- severe osteo arthritis of knee.

The following variables were recorded for every case : total duration of operation,amount of blood loss during operation, post operative complications, time taken for fracture union, ambulatory status before and after surgery.

Follow up examinations were done at 3 months, 6 months and 1 year after the operation. Evaluation of functional outcome was done by The Harris Hip Score[6]

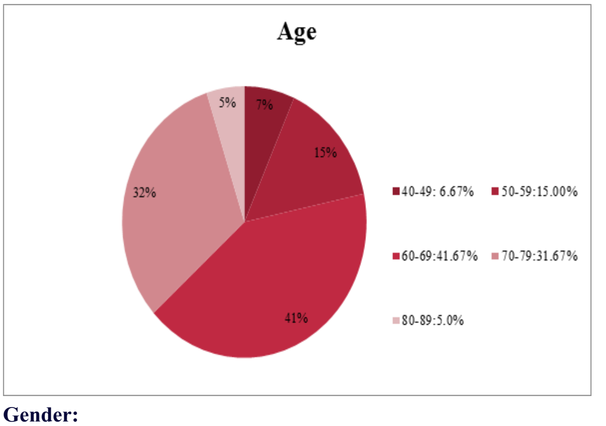
RESULTS

The study included 60 cases of inter-trochanteric fractures.

Age

The mean age of the participants was 66.1±9.61 years. The majority of the patients (41.67%) belonged to 70-79 years age group. The median age was 67.00 years

Age in Years	Frequency	Percent	PFN	PFN A2
40-49	04	6.67%	01	03
50-59	09	15.0%	04	05
60-69	25	41.67%	16	09
70-79	19	31.67%	08	11
80-89	03	5.0%	01	02
Total	60	100%	30	30



Gender:

There were 33 (55.0%) females and 27(45.0%) males in the study.

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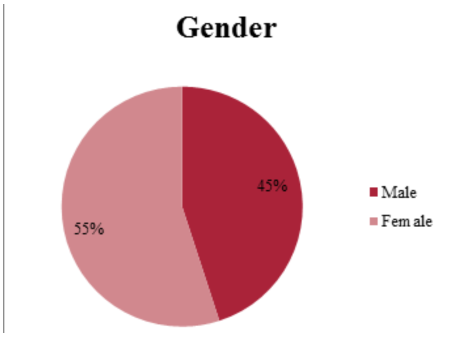
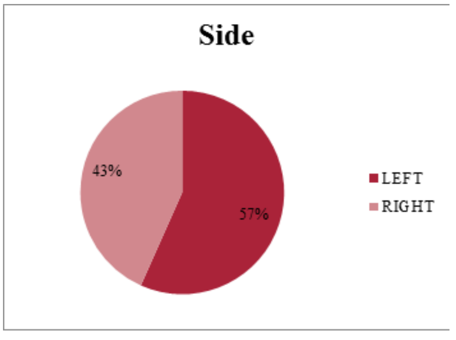


Side And Pattern

There were 34 Left Hip (56.66%) and 26 Right Hip (43.33%) surgeries in the study.



The most common fracture type was Boyd and Griffin Type 2.

Boyd & Griffin Type	Frequency	Percent	PFN	PFNA2
2	43	71.67.0%	23	20
3	05	08.33%	03	02
4	12	20.0%	04	08
Total	60	100%	30	30

Singh's Index

The mean Singh Index was 3.84±1.09.

Singh's Index	Frequency	Percent	PFN	PFNA2
2	05	8.33%	02	03
3	20	33.33%	12	08
4	18	30.0%	07	11
5	14	23.33%	08	06
6	03	5.0%	01	02
Total	60	100%	30	30

Fracture Union

Radiographs of the operated hip were taken at every follow up assessment. The degree to which the fracture had healed was recorded . For radiological purposes, the fracture was determined to have healed if bridging callus were observed on 3 or 4 cortices in two different views.

Fracture union seen at	Frequency	Percent	PFN	PFN A2
3 months	09	15%	03	06
6 months	49	82%	25	24
12 months	02	03%	02	00
Total	60	100%	30	30

Harris Hip Score

The PFN AII group showed improved functional outcome in comparison to the PFN group but the results were not statistically significant.

HHS		Number	Mean	SD	Minimum	Maximum	Median	p-value
1 month	PFN	30	39.6	5.6	23.0	46.0	40.9	0.1450
	PFN A2	30	41.0	4.0	23.0	44.0	42.0	
3 month	PFN	30	58.4	6.7	37.0	66.0	62.0	0.6523
	PFNA2	30	60.5	6.6	47.0	82.0	62.0	
6 month	PFN	30	76.2	12.0	41.0	86.0	80.0	0.0503
	PFNA2	30	81.7	5.8	55.0	86.0	83.9	
1 year	PFN	30	84.9	9.7	58.0	96.0	89.0	0.0617
	PFNA2	30	89.2	7.8	68.0	98.0	91.0	

HHS at one year	PFN	PFN A2
Excellent	07	17
Good	16	08
Fair	03	04
Poor	04	01

Blood Loss

The average blood loss was 150 ml (100-150ml).

Blood Loss	Frequency	Percent	PFN	PFN A2
100	16	26.6%	04	12
150	28	46.7%	12	16
200	15	25.0%	14	01
250	01	01.7%	00	01
Total	60	100%	30	30

	Number	Mean	SD	Minimum	Maximum	Median	p-value
PFN	30	148.3	21.5	100.0	180.0	150.0	0.0008
PFN A2	30	122.7	27.2	90	220	120.0	

PFN had mean blood loss of 148.3 ml. PFN A2 had mean blood loss of 122.7 ml. PFN A2 had statistically significant reduction in blood loss in comparison to PFN.

Duration Of Surgery

The duration of surgery ranged from 60-130 minutes. The mean duration of surgery was 85.17±17.9 minutes.

There was a statistically significant reduction in operative time with PFN A2.

	Number	Mean	SD	Minimum	Maximum	Median	p-value
PFN	30	93.67	16.50	70	130	90.0	0.0443
PFN A2	30	76.67	15.16	60	110	75.0	

Complications

13 complications were seen out of 60 cases.

Complications	Frequency	Percent	PFN	PFN A2
Infection	02	3.33%	02	00
Varus Angulation	03	5.00%	01	02
Screw Backout	03	5.00%	00	03
Z effect	05	8.33%	05	00
Total	13	21.67%	08	05

The PFN group had a greater frequency of complications.

DISCUSSION

Our study did not have any significant difference in the functional outcome between PFN and PFN A2 according to HHS.

However, the PFN A2 group had significantly less duration of surgery and had significant reduction in blood loss. (p-value <0.05). This is in support of findings of Rai B, Singh J, Singh V, et al in which PFN-A2 has the benefit of smaller incision, short operative time, preservation of biology, less soft tissue damage, and early rehab.[7,8]

The helical blade is biomechanically superior and effectively compacts the cancellous bone leading to improved results in osteoporotic fractures. In elder patients with osteoporosis, PFN AII is the preferred implant. It has less operative time, which is required in such patients with medical co morbidities; hence, it has marginal superiority over PFN. Short nail design results in less operative time and less blood loss.[7,9]

We also saw lesser rate of complications with PF2. S, Dakshinamoorthy R also found that PFNA2 is better because it requires less radiation exposure (p<0.05) due to single guidewire use, a short learning curve, less blood loss, shorter surgical time(p<0.05), and fewer complications.[10]

Li J, Cheng L, Jing J showed that the rate of complications using PFNA-II is lower than PFNA for the treatment of unstable intertrochanteric fractures in elderly Chinese patients, and the operation time is shorter.[11]

It is to be stressed that adequate reduction and correct implant placement are of foremost importance while treating inter-trochanteric fractures irrespective of implant choice. Proper operative technique is important for achieving fracture stability and to avoid major complications.[12]

CONCLUSION

Our study saw statistically significant reduction in blood loss during operation and duration of operation. The Harris Hip Score also showed better results in cases operated with PFN AII but the results were not statistically significant. Further research is needed on this topic owing to small sample size of our study.

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Conflict Of Interest

The author(s) declare that there are no conflicts of interest related to this research. There are no financial or personal relationships that could have influenced the results reported in our study.

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