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Original Research Article

Comparative study of PFN and DHS in the management of intertrochanteric fractures

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Abstract

Trochanteric fractures are common in the elderly people. The frequency of these fractures has been increasing primarily due to the increasing life span and sedentary life style. The incidence of trochanteric fractures is more in the female population compared to the male due to increased severity of osteoporosis. The present study consists of 60 adult patients with intertrochanteric fractures of femur who were treated with either DHS and PFN. Cases were selected by simple random sampling, each individual is chosen randomly and entirely by chance. This study was carried out to compare the results of intertrochanteric fractures treated with DHS and PFN. All the 60 patients were asked to follow up at regular intervals. Average hospital stay for PFN patients were 10.5 days and for 14.5 days for DHS patients. Two patients who underwent PFN and two patients who underwent DHS expired within one week after surgery due to systemic complications. Average days were calculated excluding these cases. Delayed complications were accessed after excluding 4 expired cases and 5 case which we lost in follow up.

Keywords: PFN, DHS, intertrochanteric fractures

Introduction

Intertrochanteric fractures account for nearly 50% of all fractures of the proximal femur. These injuries commonly affect the elderly and they have a tremendous impact on the health care system. Intertrochanteric fractures comprise of fractures occurring in the region between greater and lesser trochanters. Despite marked improvements in implant design, surgical technique and patient care, Intertrochanteric fractures, still remains to be a challenge [1].
Trochanteric fractures are common in the elderly people. The frequency of these fractures has been increasing primarily due to the increasing life span and sedentary life style. The incidence of trochanteric fractures is more in the female population compared to the male due to increased severity of osteoporosis [2].
Mortality is usually more because these fractures are associated with other co-morbid conditions like anemia, diabetes, hypertension, renal failure. Increased dependency in

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activities of daily living, and a history of other osteoporosis related ("fragility") fractures are also found to be associated with intertrochanteric fractures. Hip fracture occurs in approximately 341,000 persons in the United States each year. The rate of hip fracture increases with age, doubling every 5-6 years after age 60 year. In a Swedish study of more than 20,000 patients, the incidence of hip fractures in women doubled every 5.6 years after the age of 30 years. According to Kannus P, Parkkari J, There were an estimated 1.66 million hip fractures world-wide in 1990, this worldwide annual number will rise to 6.26 million by the year 2050. The growth of the elderly population will be more marked in Asia, Latin America, the Middle East, and Africa than in Europe and North America, and it is in the former regions that the greatest increments in hip fracture are projected so that these regions will account for over 70% of the 6.26 million hip fractures in the year 2050 [3, 4].

IT fractures can be managed by conservative or operative methods. Conservative methods were the treatment of choice until 1960 before the introduction of new fixation devices. If suitable precautions are not taken the fracture undergoes malunion, leading to varus and external rotation deformity leading to shortening and limitation of hip movements. It is also associated with complications of prolonged immobilization like bedsores, deep vein thrombosis and respiratory infections. According to Evans 30% mortality rate occurs in conservative line of treatment using long term immobilization. Active surgical approach decrease the mortality to less than 15%.

Since this fracture is more common in the elderly patients, the aim of treatment should be prevention of malunion, and early mobilization. Taking all the factors into consideration surgery by internal fixation of the fracture is ideal choice [5, 6].

Methodology

The present study consists of 60 adult patients with intertrochanteric fractures of femur who were treated with either DHS and PFN.

Cases were selected by simple random sampling, each individual is chosen randomly and entirely by chance.

This study was carried out to compare the results of intertrochanteric fractures treated with DHS and PFN. All the 60 patients were asked to follow up at regular intervals.

Data collection

After the patient with intertrochanteric fracture was admitted to hospital all the necessary clinical details were recorded in proforma prepared for this study. After the completion of the hospital treatment, patients were discharged and called for follow up at out patient level, at regular intervals for serial clinical and radiological evaluation.

Inclusion criteria

- Type I, II, III (Boyd and Griffin's classification).
- Age >18 years.
- Both sexes.
- Fresh IT fractures in adults.

Exclusion criteria

- Patients with Type IV, Boyd and Griffin's classification.
- Patients who are medically unfit for surgery.
- Polytrauma patients.

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- Patients with other associated fractures (multiple fractures).
- Pathological fractures.
- Old neglected fractures.
- Age less than 18 years.

Results

All the cases included in our study group were fresh fractures who underwent surgery at the earliest possible in our set up. The delay was due medical co morbidities of the patient. All the patients were operated at an average interval of 3 days from the day of trauma.
There were no associated injuries, since patients with polytrauma were excluded from the study.

Table 1: Intra-operative complications

Intra-operative complications	Surgery		Total
	PFN	DHS	
Drill bit breakage	3	2	5
Failure to attain closed reduction	5	4	9
Failure to lock distally	1	0	1
Failure to put derotation screw	3	0	3
Fracture displacement by nail insertion	4	0	4
Fracture of lateral cortex	5	0	5
Guidewire breakage	1	0	1
Improper postioning of hip screw	0	5	5
Varus angulation	0	6	6

In our study, we considered various intraoperative parameters such as duration of radiographic screening-more exposure in case of comminuted fractures with difficult reduction. We took less exposure time in cases of intertrochanteric fracture where reduction was not a problem. We took more exposure time for the initial few cases but as we got experience the radiation exposure was less.

Table 2: C-ARM Shots

C-ARM Shots	Surgery		Total
	PFN	DHS	
30	0	4	4
35	0	3	3
40	0	17	17
45	0	1	1
50	0	5	5
65	5	0	5
68	5	0	5
70	10	0	10
72	5	0	5
75	5	0	5
Total	30	30	60

Duration of surgery was more for the initially operated cases. More in cases of subtrochanteric fractures when compared to trochanteric fractures and in fractures where we had to do open reduction.

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Table 3: Duration of surgery in minutes

Duration in Min	Surgery		Total
	PFN	DHS	
60.0	3	0	3
70.0	2	0	2
80.0	20	3	23
90.0	2	4	6
100.0	3	16	19
110.0	0	4	4
120.0	0	3	3
Total	30	30	60

Blood loss-measured by mop count (each fully soaked mop containing 50ml blood). Blood loss was measured by mop count and collection in suction. Blood loss was more for DHS compared to PFN. DHS cases, surgical wounds were closed in layers over a drain while in PFN, drain was not required.

Table 4: Blood loss

Blood loss in ml	Surgery		Total cases
	PFN	DHS	
180.0	3	0	3
190.0	4	0	4
200.0	13	0	13
210.0	2	0	2
220.0	3	0	3
300.0	1	5	6
320.0	0	8	8
340.0	0	4	4
350.0	3	3	6
400.0	1	4	5
450.0	0	2	2
500.0	0	2	2
550.0	0	1	1
700.0	0	1	1
Total	30	30	60

Table 5: Type of Reduction

Type of reduction	Surgery		Total
	PFN	DHS	
Closed	25	25	50
Open	5	5	10
Total	30	30	60

Table 6: Post-Operative Complications During Hospital Stay

Post-operative complications	Surgery		Total
	PFN	DHS	
Chest infection	2	2	3
No complications	28	26	54
superficial wound infection	0	2	2
	30	30	60

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Table 7: Post-operative complications

Post-operative complications	Surgery		Total
	PFN	DHS	
Chest Infection	2	2	4
NO	28	26	54
superficial wound infection	0	2	2
Total	30	30	60

Table 8: Hospital stay

hospital stay in days	Surgery		Total
	PFN	DHS	
8	4	0	4
9	7	0	7
10	6	0	6
11	7	3	10
12	3	2	5
13	1	1	2
14	0	4	4
15	0	2	2
17	0	4	4
18	0	7	7
19	0	1	1
20	0	4	4
Total	28	28	60

Table 9: Mobility After 6 Weeks

Mobility (6weeks)	Surgery		Total
	PFN	DHS	
Aided	14	16	30
Independent	12	8	20
Cases expired	2	2	4
Non-ambulatory	2	4	6
Total	30	30	60

There is no stastical significance since p value is more than .05.

Table 10: Range of Movements of Hip Joint after 6 Weeks

ROM Hip joint (flexion in degrees)	Surgery		Total
	PFN	DHS	
70	1	4	5
75	2	2	4
80	1	0	1
90	2	2	4
100	9	2	11
110	13	12	25
120	0	6	6
Total	28	28	56

There is no stastical significance since p value is more than .05.

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Table 11: Range of Movements of Knee Joint after 6 Weeks

ROM Knee joint (6 weeks) (flexion in degrees)	Surgery		Total
	PFN	DHS	
70.0	0	1	1
80.0	0	1	1
90.0	1	0	1
100.0	3	7	10
110.0	4	4	8
120.0	20	15	35
Total	28	28	56

Table 12: Full Weight Bearing in Weeks

Full weight bearing (in weeks)	Surgery		Total
	PFN	DHS	
6	12	8	20
8	2	0	2
9	5	0	5
10	2	0	2
11	0	3	3
12	2	4	6
13	1	3	4
14	0	5	5
16	2	1	3
20	0	2	2
24	0	1	1
Total	26	27	53

We excluded expired cases and 2 cases of PFN and one case of DHS which were not mobilized till 6week, when we lost them in further follow up.

Average hospital stay for PFN patients were 10.5 days and for 14.5 days for DHS patients. Two patients who underwent PFN and two patients who underwent DHS expired with in one week after surgery due to systemic complications. Average days were calculated excluding these cases.

Table 13: Complications

Delayed anatomical complications	Surgery		Total
	PFN	DHS	
External rotation	1	0	1
Shortening more than 1cm	4	10	14
Varus deformity	5	4	9
NO complications	15	12	29
Total	25	26	51

Delayed complications were accessed after excluding 4 expired cases and 5 case which we lost in follow up.

Table 14: Delayed Radiological Complications

Delayed radiological complications	Surgery		Total
	PFN	DHS	
Cortical screw loosening	0	3	3
Implant failure	0	1	1

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Cases with out complications	12	13	25
Reverse z effect	3	0	3
Screw backout	0	2	2
Screw breakage	3	0	3
Screw cutout	0	3	3
Varus malunion	5	4	9
Z effect	2	0	2

Table 15: Functional Results

Functional results	**PFN**	**DHS**	**Total**
Excellent	8	10	18
Expired	2	2	4
Fair	1	3	4
Good	11	7	18
Lost in Follow UP	3	2	5
Poor	5	6	11
Total	30	30	60
Follow up	Good/ Excellent (%)		
PFN	63.33		
DHS	56.67		

All patients were followed up at an interval of 6 weeks till the fracture union is noted and then after once in 3 months till 1year after surgery.
At every visit patient was assessed clinically regarding hip and knee function, walking ability, fracture union, deformity and shortening. Modified Harris Hip scoring system was used for evaluation. X-ray of the involved hip with femur was done to assess fracture union and other implant related complications.

Discussion

In our study we encountered certain complications intraoperatively. Most of these occurred in the first few cases. There was difficulty in achieving closed reduction (5 cases) particularly in case of comminuted displaced and reverse oblique fractures, where the surgery was delayed. There were iatrogenic fractures of the lateral cortex of proximal fragment in 5 of 30case of PFN. This occured in initial cases probably due to wrong entry point and osteoporotic bone. 3 of 30 cases, we failed to put anti-rotation screw, it could not be accommodated in the neck after putting neck screw. 2 of the cases anti-rotation screw had to be removed after inserting as it was penetrating superior cortex of the neck. In 4 of the cases anatomic reduction could not be achieved as fracture extended to the entry point of the nail, nail opened up fracture and prevented anatomic reduction. We had difficulties in distal locking in one case. There were 3 instances of drill bit breakage.
There were comparatively minimal intraopertive complications encountered during DHS fixation. Reduction was comparatively easier, However difficulties in reduction were encountered in 4 cases were we had to do an open reduction.
In 5 of 30 cases there was improper placement of screw. The screw was placed superiorly. Drill bit breakage was encountered in 2 cases as the entry point was made posteriorly and there was difficulty in drilling through posteriorly placed plate. Difficulties were encountered in reverse oblique fractures (type 111) as the fracture site extended to entry point. Screw had to be inserted more proximally which resulted in varus angulation. Comparatively DHS fixation was technically easier and had lesser intraoperative complications.
Altner PC (1982) studied Implant failure in the form of cut out in the Richard screw from the femoral head was observed in one case. This was associated with varus collapse of the neck

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shaft angle and nonunion at the fracture site. Baumgaertner M.R Chvostoski (1995) reported the incidence of fixation failure to be as high as 20% in unstable fracture patterns. Osteoporosis was found to be the most important predisposing factor for this complication [7].
External rotation of 15° was noticed in one case (3%) operated by Proximal femoral Nail (PFN). Osteosynthesis with the PFN offers the advantages of high rotational stability of the head-neck fragment.
Post operatively the angle was measured and compared to the normal side to assess the correction achieved. Again the neck shaft angle was determined at follow up to assess any variation from immediate postoperative. Varus deformitity was noted in 5 case (17%) of PFN group. It might be seen due to early backing out of screws.
In 4 case (13%) we noted shortening of one centimeter which was not significant functionally for patient. Shortening might have resulted due to comminution of variable degree at fracture site & concentric collapse at fracture site [7].
In 4 cases (13%) of Varus deformity was seen in the cases operated by DHS. Due to the pull of the muscle the distal shaft fragment has the tendency to migrate upwards thus resulting in varus deformity. The other reason that patients had coxa vara deformity was due to inadequate reduction and failure to maintain neck shaft angle preoperatively. There were 10 cases (33%) of shortening seen in the cases operated by DHS. This shortening ranged from 1-1.5 cms. Patients were given shoe raise which compensated for the necessary shortening. Patients did not have any difficulty later while walking.
The deformities usually which is encountered is limb shortening and coxa vara. In the series by K.D Harrington [8], out of 72 cases there were 4 cases of coxa vara and 56 cases of limb shortening at an average of 1.5 cms. In his series, shortening was noted in unstable fractures in which Dimon Hughston procedure was done. In the series by Juluru P. Rao[177] of the 124 cases of intertrochanteric fractures, 5 cases of unstable fracture had limb shortening
We found the mobilization of patients operated by both PFN and DHS was almost same but the weight bearing of patients from the PFN group was earlier in the series of B. Mall [9] (30 patients) average time of ambulation was 14 days. In the series of Dr. G.S Kulkarni [10] ambulation was usually started after 11-12 days after the stitch removal.
In present study, the cases that we operated by Proximal Femoral Nail (PFN) we have encountered ‘Z’ effect in two cases (6.7%.) we have found reverse ‘Z’ effect in 3 cases (10%)
In 3 cases (10%) neck screwwas broken. This complication was noticed when patient came for second follow up. On taking detailed history it was found that patient started unpermitted early full weight bearing i.e. immediately after discharge from hospital. But despite of this patient was able to walk with help of support. A careful surgical approach and technique with a stable osteosynthesis have markedly contributed to a more rapid mobilization of patients and thus decreases of post-op operative complications.
PFN nail has been shown to prevent the fractures of the femoral shaft by having a smaller distal shaft diameter which reduces stress concentration at the tip[178] in patients with unstable intertrochanteric fractures treated with proximal femoral nailing, technical or mechanical complications seem to be related to the fracture type, operating technique, and time to weight bearing rather than the implant itself Low rates of femoral shaft fractures and fixation failure suggest that the PFN is useful for treating stable and unstable trochanteric fractures.
In two case (6.7%) which was operated by DHS, it was seen that there was excessive back out of the Richard’s screw (lag screw).

Conclusion

Average hospital stay for PFN patients were 10.5 days and for 14.5 days for DHS patients. Two patients who underwent PFN and two patients who underwent DHS expired with in one week after surgery due to systemic complications. Average days were calculated excluding

these cases.

References

1. AngSen JO. Intertrochanteric osteotomy for failed internal fixation of femoral neck fracture. Clin Orthop. 1997;341:175-182.
2. Ansari Moein CM, Verhofstad MHJ, Bleys RLAW, Werken C Van Der. Soft tissue injury related to the choice of entry point in ante grade femoral nailing; pyriform fossa or greater trochanter tip. Injury. 2005;36:1337-1342.
3. Albareda J, Laderiga A, Palanca D, *et al*., Complications and technical problems with the gamma nail. Int Orthop. 1996;20:47-50.
4. Al-Yassari G, Langstaff RJ, Jones JW, Al-Lami M. The AO/ASIF. proximal femoral nail (PFN) for the treatment of unstable trochanteric femoral fracture. Injury. 2002;33:395-399.
5. Anne AK, Ekeland A, Odegaard B, *et al*., Gamma nail versus compression screw for trochanteric femoral fracture. Acta Orthop Scand. 1994;65:127-130.
6. A comparative study of unstable per-and intertrochanteric femoral fractures treated with dynamic hip screw (DHS) and trochanteric butt-press plate vs. proximal femoral nail (PFN) Zentral bl Chir-Aug-IC linger HM, Baums HM, Eckert M, 2005.
7. Haidukewych GJ, Berry DJ. Hip Arthroplasty for salvage of failed treatment of intertrochanteric hip fractures. J Bone Joint Surg (Am). 2003;85:899-904.
8. Kevin D Harington, San Francisco, James O Jhoston. The management of comminuted unstable intertrochanteric fractures. JBJS. 1973 Oct;55A(7):1367-76.
9. Mall B, Susheel Kumar Pathak, Vineet Malhotra. Role of dynamic compression hips screw in trochanteric fracture of femour. Indian Journal of Orthopaedics. 1999 July;33(3):226-228.
10. Kulkarni GS. Treatment of trochanteric fractures of hip by modified Richard's compression and collapsing screw, Indian Journal of Orthopedics. 1984;18(1):30.