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Research Paper

Comparative Study Between Dynamic Hip Screw and Proximal Femoral Nail in the Management of Trochanteric Femoral Fracture

Medical Science

KEYWORDS : Intertrochanteric fractures, Dynamic hip screw, proximal femoral nail

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ABSTRACT

Objectives: To compare functional outcome and complications associated with proximal femoral nailing, an intramedullary device with dynamic hip screw, an extra-medullary device in treatment of intertrochanteric fractures of femur.

Methods: This prospective comparative study included 40 patients of intertrochanteric fractures in which 20 patients were treated by PFN and other by DHS. All patients were operated under image intensifier control. Average follow up of patients was 14months (12 to 20 months). Postoperatively functional and radiological outcome were assessed at regular intervals. Evaluation of the patients was done by using Harris Hip Scoring system.

Results: Compared to DHS, PFN required less operative time, less blood loss, small incision, reduced hospital stay and early mobilization. However Harris Hip Score at the end of one year is same for both the groups. In the long term both the implant had almost similar functional outcomes.

Conclusion: The DHS was tolerated better by young patients with stable fracture while PFN had a better outcome with osteoporotic patients and weak bone mass and reverse oblique fractures.

INTRODUCTION

The incidence of intertrochanteric fracture has been rising steadily due to increasing geriatric population as result of increased life span and better health care facilities [1]. In 1990 26% of all hip fractures occurred in Asia whereas this figure could rise to 37% in 2025 and 45% in 2050[2]. Because of complex stress configuration in this region and its nonhomogeneous osseous structure and geometry, fractures occur along the path of least resistance through the proximal femur[3] . The various treatment options for intertrochanteric fractures are operative and non-operative. Non operative treatment for these types of fractures, with prolonged bed rest and traction has been associated with varus deformity and shortening, along with general complications associated with prolonged immobilization. Operative treatment which allows early rehabilitation and mobilization has become treatment of choice for all trochanteric fractures[4, 5] . Introduction of dynamic hip screw revolutionized the management of intertrochanteric fracture by allowing compression at fracture site with few complications. Development of intramedullary devices for management of intertrochanteric fractures were considered superior to conventional dynamic hip screw[6-8] . We conducted this study to compare outcome of proximal femoral nailing and dynamic hip screw fixation in intertrochanteric fracture.

MATERIALS AND METHODS

This prospective study consisted of total 40 patients which included 20 patients in each PFN group and DHS group admitted in Vivekananda Institute of Medical Sciences, Kolkata, West Bengal between January 2015 to December 2015. We included all intertrochanteric fractures of either sex, between 20 to 80 years of age and less than 3weeks of duration from injury. Patients with compound fractures, inability to walk before injury, neurological disorders and type IV, V fracture pattern were excluded from study. Informed written consent was taken and relevant information collected from all patients including history, general and systemic examination. Surgical fitness was obtained before surgery for all patients. Radiological examination done to confirm the diagnosis. All patients were operated on traction table under image intensifier control. DHS group underwent open or closed reduction and internal fixation with DHS while PFN group underwent open or closed reduction and internal fixation with PFN.

The same postoperative protocols were followed for both the groups. Patients were encouraged to mobilize the knee, ankle and static quadriceps exercises from day one after surgery. Depending on condition of the patient non weight bearing walking started from 2nd post operative day. Suture removal was done on 14th post operative day. Patients were followed up clinically and radiologically at a regular monthly interval for first 3 months then for every 3months.

The modified Harris hip score was used to evaluate the patients, which includes pain relief (47), function (44), range of motion (5) and absence of deformity (4). Maximum point possible is 100. Rating of score is done as below; 90-100=excellent, 80-89=good, 70-79=fair and less than 70 as poor.

RESULTS

Table1: Pre operative comparison between PFN and DHS Group

Pre operative measures	PFN (n= 20)	DHS (n=20)
Average age (years)	56.5	58.5
Sex (M/F)	9/11	10/10
Mode of injury		
1.Domestic Fall	13	12
2.RTA 3.Assault #	6 1	8 0
Type of fractures		
1 Stable	6	10
2 Unstable (Fig1and Fig.7) 3 Subtrochanteric extension	8 6	6 4

Majority of patients were from age group of 5th to 7th decade, with history of domestic fall. We considered intraoperative parameters like duration of surgery, fluoroscopy time, and blood loss.

Table 2: Perioperative comparison between PFN and DHS Group

PARAMETERS	PFN (n=20)	DHS (n=20)
Mean Blood loss (ml)	120	180
Mean Duration of surgery (min)	90	80
Mean Fluoroscopy time (s)	80	60
Union rate (weeks)	11	13.2
Shortening (no. of patients)	1(5%)	3(15%)
Infection	1(5%)	2(10%)

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Table 3: Rotational Malalignment

Malalignment	No. of Patients in PFN	No. of Patients in DHS
External rotation	01 (5%)	0
Internal rotation	0	0
Varus deformity of hip	01 (5%)	2 (10%)
Valgus deformity	0	0
Shortening	01 (5%)	3(15%)

Table 4 : Implant Related Intraoperative Complications
PFN

Intra operative complications	No.of patients	Percentage
Ill fitting jig	4	20%
Impropriate length of proximal screws	00	0
Difficulty in distal locking	00	0
Fracture of greater trochanter	00	0
Fracture below tip of nail	00	0
Revision surgery	00	0

DHS

Intra operative complications	No.of patients	Percentage
Difficulty in Reduction	1	5%
Shattering of Lateral Cortex	1	5%
Fracture below the plate	0	0
Breakage of plate	0	0
Breakage of screw	0	0

Table 5: Radiological Complications Encountered (Post Op)
PFN

Complications	No of patients	Percentage
Cut out of neck screw	00	0
Z effect	00	0
Reverse Z effect	02	10%
Breakage of nail	01	5%
Bolt breakage	00	0

DHS

Complications	No of patients	Percentage
Excessive Lag Screw back out	1	5%
Plate breakage	0	0
Cortical Screw Loosening	0	0
Cortical Screw breakage /bending	0	0

Table 6: Hip range of motion (Calculated by Harris Hip Score)

Range of Motion	PFN				DHS			
	Excellent	Good	Fair	Poor	Excellent	Good	Fair	Poor
Flexion	5(25%)	10(50%)	3(15%)	1(5%)	5(25%)	10(50%)	3(15%) 2(10%)	1(5%)
Abduction	4(20%)	10(50%)	4(20%)	2(10%)	4(20%)	10(50%)	4(20%) 1(5%)	2(10%)
External rotation	4(20%)	10(50%)	4(20%)	2(10%)	4(20%)	10(50%)	4(20%) 2(10%)	2(10%)
Internal rotation	4(20%)	10(50%)	4(20%)	2(10%)	4(20%)	10(50%)	4(20%) 1(5%)	2(10%)

Intraoperatively we encountered difficulty in fracture reduction in case of comminuted fractures and delay in surgery. In DHS group there were two cases of varus angulation encountered in reverse oblique fracture. In DHS group there was one case of screw cut out (Fig.4) All PFN cases were locked distally with atleast one locking bolt (Fig.2,5,6,8). There was one case of varus deformity of hip, four cases of ill-fitting jig, two cases of reverse Z effect and one case of nail breakage.


Figure 1: Intertrochanteric fracture


Figure 2: Post-op IT fracture with PFN


Figure 3: Post-op IT fracture with DHS


Figure 4: Post-op IT fracture with scres


Figure 5: Post-op X-ray with PFN

Figure 6: Post-op X-ray with PFN


Figure 7: Pre-op IT fracture


Figure 8: Post-op IT fracture with PFN

We have used criteria for union as presence of bridging callus at fracture site with absence of pain clinically at fracture site (Fig.3). The mean radiological union time for all 40 patients was 16 weeks(Range: 12 weeks to 20 weeks). One superficial infection noted in PFN group while one superficial and one deep infection noted in DHS group.

Superficial infection controlled with antibiotics while deep infection required wound debridement.

DISCUSSION

Trochanteric fractures more commonly occur in elderly patients, and the outcome may be extremely poor if there is a prolonged bed rest. So treatment of choice will be stable fixation and early mobilization. There are two main types of fixation for trochanteric fractures, which are plate fixation and intramedullary devices[9,10] . The development of DHS in the 1960 saw a revolution in the management of intertrochanteric fractures. This device allowed compression at fracture site without complication of screw cut out and implant breakage associated with nail plate. However extensive surgical dissection, blood loss and surgical time required for this procedure often made it a contraindication in the elderly with comorbidities. The implant also failed to give good results in unstable and osteoporotic bone.In the early 90's intramedullary devices were developed for fixation of intertrochanteric fractures, these devices had numerous biomechanical and biological advantages over the conventional DHS [6-8] . Average age of the patient in PFN group was 56.5 years , with 9 males and 11 females while in DHS group average age was 58.5 years, with 10 males and 10 females. Other study done by T.S.Sethi and Panagopouloas et.al shown similar age group distribution. Gender distribution varied in different study, few studies suggested male are prone to this type of fracture while others suggesting female [9,10] . In our study majority of fractures are due to domestic fall, which is similar to others study done by Hornby et al, Pajarinen et al [11,12] . In our study length of incision used in PFN is smaller than DHS group because PFN is minimally invasive procedure and less number of screws used percutaneously compared to DHS open procedure and more screws used. In our study average blood loss was around 120 in PFN and 180 ml in DHS, so comparatively less in PFN group probably because of smaller incision, minimally invasive procedure, and smaller duration associated with PFN. Mean time taken in PFN surgery was 90 min comparatively DHS lasted around a mean time of 80min, so PFN took less time compared to DHS because it requires smaller incision and less number of screws. Duration of hospital stay for PFN group was less compared to DHS because of its minimally invasive nature. In our study we noticed one superficial and one deep infection in DHS, one superficial infection in PFN because of small incision and less soft tissue dissection. In our series there was one breakage of nail and 2 cases of reverse Z effect in PFN group while 1 case of shattering of lateral cortex and 1 case of excessive lag screw back out was noted in DHS group. In our study limb shortening is more in DHS. In DHS we found successive increase in varus angulation with each follow up because sliding nature of the lag screw of the DHS, which lead to compression at the fracture site and gradual shortening of limb. Harris Hip Score at the end of 1 month was less in DHS group compared to PFN. However this difference disappeared in 1 years of follow up between two groups which were comparable to other studies. A randomized postoperative rehabilitation study in 2005 by Pajarinen et.al. comparing peritrochanteric femoral fractures treated with DHS or PFN was done, they suggested use of PFN may allow faster postoperative restoration of walking ability when compared to DHS[8] .

CONCLUSION

We found that PFN had more advantages than DHS in management of intertrochanteric fractures in many ways such as small incision, less blood loss, reduced operative time, and less amount of shortening, less infection rate and early mobilization. We suggest PFN is implant of choice for management of intertrochanteric fractures, however as DHS is low cost implant and lesser fluoroscopy exposure is required, it still remains to be the gold standard for stable non-osteoporotic intertrochanteric fractures.

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