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Research Article

Comparative Study of Pertrochanteric Fractures Treated with Dynamic Hip Screw and Proximal Femoral Nail

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Abstract

Introduction: Intertrochanteric femoral fractures may be managed by, conservative (or) operative methods. Until 1960, before the introduction of new fixation devices, the conservative methods were the treatment of choice.

The choice of implant used for fracture fixation has major influence on complications. Operative management for IT fractures includes extramedullary (sliding hip screw with barrel plate- DHS) and the intramedullary nailing procedures (proximal femoral nail- PFN).

Aim of the Study: The goal of this study is to see the advantages theoretically with PFN over the DHS and also to know whether it may change the outcome functionally in patients with intertrochanteric fractures.

Materials and Methods: 40 consecutive patients with isolated intertrochanteric fracturesmeeting the inclusion and the exclusion criteria during the study period from July -2019 to September-2021, were admitted and treated, and taken up for the study after obtaining the informed consent.

Results: The functional outcome was almost similar in stable intertrochanteric fractures treated with either PFN or DHS. The functional outcomes are significantly better in all patients with unstable IT fractures who are treated with the PFN.

Conclusion: We concluded that both the PFN and DHS has almost same outcomes with no significant difference in patients with the stable intertrochanteric fractures. However, with regarding to unstable intertrochanteric fractures PFN had significantly good outcomes in view of early restoration of walking ability after comparing to DHS.

Keywords: Pertrochanteric Fracture; Proximal Femoral Nail; Dynamic Hip Screw

Introduction

Intertrochanteric femoral fractures may be managed by, conservative (or) operative methods. Until 1960, before the introduction of new fixation devices, the conservative methods were the treatment of choice. The conservative methods of management resulted in higher mortality rates ranging from 15 to 20 percent, and also the complications like, urinary tract infection, pneumonia, decubitus ulcers, thrombo-embolic complications. Hence, these methods are indicated only in the conditions such as age-related chronic medical conditions which are unfit for surgery and for patients who are non-ambulatory before sustaining the fracture.

The choice of implant used for fracture fixation has major influence on complications. Operative management for IT fractures includes extramedullary (sliding hip screw with barrel plate- DHS)

and the intramedullary nailing procedures (proximal femoral nail-PFN).For intertrochanteric fracture fixation the very commonly used device was the DHS with side plate assembly. DHS seeks its own position of stability by permitting the collapse of the proximal fragment or settle on the fixation device. However, the disadvantages of the DHS such as large size skin incision and excessive dissection of soft tissue with excessive blood loss replaced the use of DHS with PFN.

The latest implant for the treatment of Intertrochanteric fractures is Proximal Femoral Nail(PFN).As the implant is cephalomedullary and it has many potential advantages. Because it is intramedullary device, it has more efficient load transfer, the lever arm is shorter which results in less transfer of stress and the chances of implant failure are less, because of intramedullary location the sliding amount is limited, therefore the chances of shortening and the deformity are less. Shorter operative duration, minimal dissection of soft tissue and minimal amount of loss of blood and advantages of controlled impaction can be maintained.

The purpose of present study has been done to compare the management, outcome and related complications associated with management of IT fractures by using PFN and DHS procedures.

Aims of the Study

For comparison of the surgical management of intertrochanteric fractures of the femur with the proximal femoral nail and dynamic hip screw device, with respect to:

- Length of the incision
- Fluoroscopic time
- Duration of time for surgery
- Amount of loss of blood
- Union of the fracture and
- Functional outcome.

Materials and Methods

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Inclusion Criteria

- Unstable pertrochanteric fracture femur that includes
- Posteromedial comminution (31A2.3) and
- Vertic#al split fracture (31A2.2) of greater trochanter in coronal plane
- Lateral wall blow out
- Females with more femoral bow , where long proximal femoral nail is contraindicated.

Exclusion Criteria

- Compound fractures.
- Pathological fractures.
- Reverse oblique fractures
- Fractures with subtrochanteric extension.
- Simple pertrochanteric fractures.
- Patients with cognitive disorders, on steroids or immunosuppressants

Operative procedure

Proximal femoral nail

- The patient placed in supine position over fracture table with adduction of the affected limb by 10 to 15 degree and closed reduction of intertrochanteric fracture was done by traction and gentle rotation.
- In trochanteric fractures we fixed the fracture percutaneously using two “k” wires which pass along the anterior cortex of greater trochanter and neck of femur into the head of femur. Lateral longitudinal incision 5cm long is made from the greater trochanter tip. The tip of GT is exposed.
- Under C-arm guidance in AP view, entry point is made over the tip or just medial to the tip of GT. In lateral view the position of guide is confirmed in the center of medullary cavity. On the guide wire, a rigid cannulated reamer is inserted through the protection sleeve and reaming of femur is done manually.
- After confirming the satisfactory reduction of fracture, a nail of appropriate size was inserted. A guide wire of 2.8mmis inserted through the drill sleeve after making a stab incision with its position in the caudal area of the head of femur for

the neck screw . In AP view the final position of the guide wire should be in lower half of the femoral neck and in lateral view should be in the center of femoral neck.

- Another 2.8 mm guide wire was for inserted for hip screw through drill sleeve above the first one. To prevent the possible rotation of the medial fragment while inserting the neck screw, the hip pin was inserted earlier. Drilling was done on the guide wire with 6.5 mm drill bit to a depth up to length of hip pin which is measured earlier.
- The same length of 6.5mm hip pin was inserted with help of a hexagonal cannulated screw driver. Neck screw is inserted after reaming by 8 mm reamer. Distal locking is performed usually with two locking bolts.

Surgical steps of DHS fixation

- The patient was positioned over the fracture table supine. In unstable IT fractures the varus and rotational deformities are corrected, occasionally leaving the distal fragment medially opposed.
- A lateral approach was used to expose the femur. Vastus lateralis was retracted anteriorly. The use of the angle guide facilitated positioning of guide pin at the desired angle and made later the application of the side plate easier. The entry point is 2cm distal to the trochanteric flare. After placing the pin centrally or slightly inferiorly in both planes which makes the screw less likely to shift.
- The triple reamer was set 10mm shorter than the reading of the direct measuring device. The triple reamer was placed over guide wire and the neck portion was reamed. The richard hip screw was inserted on the guide pin utilizing a T-handled wrench that was marked to indicate the proper depth of insertion and position of slot in the screw.
- Once satisfactory position of the screw was achieved, the guide pin is removed, and by means of the barrel guide the appropriate locking side plate was positioned over the screw. The plate was fixed to femoral shaft with locking screws of appropriate length and the traction was released. Tapping the handle of wrench against the plate and then tightening the compression screw to achieve compression of fracture fragments.

Post op protocol

- Intravenous antibiotics are given for two days.
- From day three oral antibiotics and analgesics given for another one week.
- Dressing changed on post operative second day
- Sutures were removed on post operative day 12
- Assisted partial weight bearing was started with walker after three weeks post operatively depending on the stability of the construct in either group.
- Patients followed up monthly once for three months with serial x-rays and at the end of sixth month.
- Harris hip score, radiological union and neck shaft angle are assessed at the end of sixth month.

Results and Analysis

Type of fracture

Type of fracture	PFN		DHS	
	Count	%	Count	%
I	3	15.0%	7	35.0%
II	12	60.0%	8	40.0%
III	3	15.0%	3	15.0%
IV	2	10.0%	2	10.0%
Total	20	100.0%	20	100.0%
P-value = 0.49				

Table a

Length of incision

Parameters	DHS		PFN		P-value
	Mean	SD	Mean	SD	
Length of incision	15.60	1.23	8.15	0.745	0.000*

Table b

Duration of surgery

Parameters	DHS		PFN		P-value
	Mean	SD	Mean	SD	
Duration of Surgery	88.75	4.25	72.00	5.94	0.000*

Table c

Blood loss (intra operative)

Parameters	DHS		PFN		P-value
	Mean	SD	Mean	SD	
Blood loss (ml)	375.00	41.36	135.00	32.85	0.000*

Table d

POST OPERATIVE MOBILITY SCORE

Post Operative Walking ability	DHS		PFN		Total	
	Count	%	Count	%	Count	%
1	8	40.0%	12	60.0%	20	50.0%
2	6	30.0%	7	35.0%	13	32.5%
3	6	30.0%	1	5.0%	7	17.5%
Total	20	100.0%	20	100.0%	40	100.0%
P-value = 0.108						

Table e

TIME OF FRACTURE UNION

Parameters	DHS		PFN		P-value
	Mean	SD	Mean	SD	
Time of Union (weeks)	12.10	1.52	13.30	1.49	0.016*

Table f

FRACTURE OUTCOME

Final outcome						
	DHS		PFN		Total	
	Count	%	Count	%	Count	%
Excel	3	15.0%	5	25.0%	1	10.0%
Good	7	35.0%	13	65.0%	2	20.0%
Fair	6	30.0%	1	5.0%	4	40.0%
Poor	4	20.0%	1	5.0%	3	30.0%
Total	20	100.0%	20	100.0%	10	100.0%
P-value = 0.05*						

Table g

Discussion

In present study, 40 patient with 40 intertrochanteric femoral fractures are included. Out of 40 patients, 20 patients were treated with DHS and 20 patients treated with PFN.

The patients ranged in age from 40 to 80 years old, with a mean age of 59.9 years for Dynamic hip Screw fixation and 59.9 years for proximal femoral nailing.

In the present study, there is about 23 patients were females and 17 patients were males which shows female preponderance with 57.5%.

The trivial fall is the most prevalence type of injury which is noted in 27 (67.5 percent) patients. The 6 (15%) patients had history of fall from height and in 7(17.5%) patients with RTA.

In our study, all the fractures were classified as per Boyd and Griffin's classification

- Type-I fractures were 10(25%), of which 3 were in PFN group and 7 were in DHS group.
- Type-II fractures were 20(50%), of which 12 were in PFN group and 7 were in DHS group.
- Type-III fractures were 6(15%), of which 3 were in PFN group and 3 were in DHS group.
- Type-IV fractures were 4(10%), of which 2 were in PFN group and 2 were in DHS group.

The stable fractures were 30and unstable fractures were 10.

The stable and unstable fractures are distributed similarly in both DHS and PFN groups. Out of 30 stable IT fractures, 15 are in DHS group and 15 are in PFN group. The unstable fractures were10 of which 5patients were in DHS group and 5 patients in PFN group.

In DHS group the length of incision ranges from14 cm to 18cm with a mean length of 15.60cm when compared to a mean of 8.15cm in PFN group. In PFN group the smaller incision meant for there is less intraoperative blood loss.

In DHS group the duration of surgery between 80 to 100 minutes with a mean duration of 88.75 minutes. In PFN group the duration of surgery ranges between 65 to 80 minutes with a mean duration of 72 minutes. The difference in duration of surgery in both groups is found to be highly significant and concluded that in PFN group the incision is smaller.

There was significantly excessive loss of blood in patients with DHS group with average amount of blood loss of 375ml intra-operatively when compared to PFN group with average amount of blood loss of 135ml.

The complications which we encountered in this study are malunion, backout of the screw and wound infection. No significant difference was found between the two groups with regards to time

for union of fracture as all the fracture are united with a mean of 12.10 weeks in DHS cases and with mean of13.30 weeks in PFN cases. The 3 patients with15 percent of DHS group had malunion whereas in PFN one patient with 5 percent of cases has malunion.. There was statistically significant difference between the two groups regarding malunion.

In the present study one patient of the DHS group has wound infections when compared to PFN group who had no infection. The higher number of wound infections are attributed in patients with DHS group due to the longer skin incisions and the subsequent excessive soft tissue handling in DHS group when compared to the PFN group. Since all are only superficial wound infection and healed without intervention of any further surgical procedure.

In the present study, in patients with DHS group the average limb length shortening is 1.18cm when compared to 0.53cm in patients with PFN group which was significant. This may occur due to sliding of lag screw in patients with DHS group, which allow greater impaction of fracture fragments, when compared to the patients of PFN. Two of the ten patients In patients with DHS group two out of ten patients has fair or poor results with 2cm and three patients had shortening of 1.5cm, while in PFN one patient with fair result has shortening of 1.5cm.

In present study, rergarding the post operative pain we found there is a significant difference between the two groups. In DHS group among 16 patients and in PFN group only 11 patients has post operative pain. Out of 16 patients in DHS group two patients had severe pain in comparing to none in patients with PFN group.

The patients treated with PFN have significantly better overall functional outcome when compared to patients treated with DHS with P value of 0.05. when we separately compared the stable and unstable fractures, but we found that there is no significant difference in between the two groups with regarding to the outcomes in patients with stable fractures. But when comparing the functional outcome in patients with unstable fractures in between the two groups we found that in patients of PFN group have significantly better functional outcome than in patients in the DHS group, with good results of about 60 percent and with fair results of 20 percent in unstable fractures treated with PFN when compared to fair results for about 60 percent and with poor results in about 40 percent of the unstable IT fractures treated with DHS. In the present study only 6 patients out of 20 patients (30 percent) in DHS group regained their pre -injury mobility level when compared to 12 patients out of 20 patients with 60 percent in patients with the PFN group at the third month of follow up.

This states that the use of PFN may be favored in both stable and unstable fracture when compared to the DHS. In DHS group there is some amount of shortening is seen which can be due to significantly greater impaction of fracture fragments.

The smaller incisions, duration of operative time is less, the relatively less amount of blood loss and postoperative pain was less with the PFN indicates that the PFN has signicfiant advantage over the DHS even in treatment of stable intertrochanteric femoral fractures in which the functional outcomes were similar. Also in patients with unstable IT fractures of femur the PFN has significant advantage over the DHS in terms of less shortening limb length, in terms of restoration of pre-injury walking ability earlier and a significant overall functional outcome [1-10].

Conclusion

We concluded that both the PFN and DHS has almost similar outcomes with no significant difference in patients with the stable intertrochanteric fractures. However, with regarding to unstable intertrochanteric fractures PFN had significantly better outcomes in view of earlier restoration of walking ability when compared to DHS. However, as the PFN requires shorter duration of operating time and incision of smaller size, PFN has advantages over the DHS even in the stable IT fractures of femur. Hence in our view, for most of the intertrochanteric femoral fractures, PFN may be the better fixation device.

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