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Comparison Between Cephalomedullary Nailing Procedure and Dynamic Hip Screw For Intertrochanteric Fractures of the Femur

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ABSTRACT

This study is a comparison between two operative modes of management of intertrochanteric fractures. The two procedures used are proximal femoral nail and dynamic hip screw. We selected 40 cases of intertrochanteric fractures. All 4 types of intertrochanteric fractures are included. We had 12 cases of type-1, 16 cases of type-2, 8 cases of type-3 and 4 cases of type-4 fractures. 6 cases of type-1, 8 cases of type-2, 4 cases of type-3 and 2 cases of type-4 fractures. Two groups each were fixed with dynamic hip screw and proximal femoral nailing for each groups consisting of 40 cases. 20 cases were fixed with dynamic hip screw and 20 cases fixed with proximal femoral nail. With a ratio of 1.5:1. All the 20 cases were closed fractures. Most common mode of injury is accidental fall injury. All cases were evaluated with x-ray pelvis with both hips anteroposterior view and the affected hip were both anteroposterior and lateral views.. All fractures are fixed by lateral approach. Operating time is longer for proximal femoral nailing than dynamic hip screw fixation. Fluroscopic exposure is more for the proximal femoral nailing than dynamic hip screw. Time of union for dynamic hip screw fixation at 6 weeks is 28%, 10 weeks is 68% and 14 weeks is 84%. Time of union for proximal femoral nailing at 6 weeks is 36%, 10 weeks 80% and 14 weeks is 92%. Functional outcome is excellent in 12 cases, good in 3 cases, fair in 3 cases and failure in 2 cases. Type-1 and 2 fractures have excellent to fair results. Type-3 and 4 fractures have excellent to failure results. Dynamic hip screw has 60% excellent results, whereas proximal femoral nailing has 70% excellent results. Postoperative complications was infection in 4 cases, malunion in 2 cases, delayed union in 2 cases, bed sores in 1 patient, limb length inequality in 5 patients, none of them had any functional deficit, lag screw pull out in one case. No vascular and neurological complications were noted in these 20 cases.

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Key Words
Proximal femoral nailing, dynamic hip screw, intertrochanteric fractures

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INTRODUCTION

Individual life spans have increased as a result of remarkable advancements in medicine over the decades. Intertrochanteric fractures are most common and most devastating injuries in geriatric age group. These fractures have become more common as people have gotten older[1-3]. These patients are restricted to home ambulation and rely on a family member or a walking aid for their fundamental daily activities, making them a liability. Mortality is very high due to poor ambulation. Early ambulation is achievable as a result of improved therapy and a better functional outcome is achieved with lower morbidity rates. Gender and race play a role in the incidence, which varies by country. In United States, girls have a ratio of 63 per 100,000, while males have a ratio of 34 per 100,000. Because to the longer life expectancy in India, the incidence is on the rise[4,5]. The most significant weight-bearing bone in the lower limb is the femur. The greater trochanter and lesser trochanter are two ridges on the proximal femur. The intertrochanteric fracture is a type of fracture that involves the area between two trochanters[6,7]. Road traffic incidents, as well as low-velocity falls, can produce intertrochanteric fractures, which are more common in elderly people with osteopenic bones. These intertrochanteric fractures can be treated non-operatively as well as surgically. Skeletal traction and a decoration boot are two non-operative options. Dynamic hip screws, intramedullary nailing and prosthetic replacement are some of the surgical options are intramedullary nailing, mostly with a proximal femoral nail and a dynamic hip screw device are the two main techniques of surgical management. Operative treatment improves prognosis and lowers fracture-related mortality. Depending on the type of intertrochanteric fracture, several types of implants are Employed[8-11]. This study is a comparison between two operative modes of management of intertrochanteric fractures. The two procedures used are proximal femoral nail and dynamic hip screw. Comparison is done by analyzing variables such as Functional outcome, Operative time, Blood loss, Fluoro scopic time and Union of the fracture.

MATERIALS AND METHODS

This is prospective study of 40 cases of intertrochanteric fractures treated by early surgical fixation with both dynamic hip screw device fixation and proximal femoral nailing. Time protocol extends from within 1 day of injury to 14 days of injury. The cases were analyzed as per the following criteria. age distribution. sex distribution side of injury. mode of injury. classification of fractures implant used. time interval between injury and surgery associated injuries. duration between injury and hospitalization. Duration of postoperative stay. Duration of union-6 weeks, 10 weeks, 14 weeks range of movements. Postoperative complications rehabilitation.

Dynamic Hip Screw Plate System:

DHS Plates:

- Standard Barrell-38mm.
- Standard plate with barrel angles-135, 10, 145, 150 degrees. Most common-135 degrees.
- 135-degree DHS plates are available in 2, 4, 6, 8, 10, 12, 14, 16 holes. Lengths from 46mm to 206mm.
- Thickness-5.8mm. Width-19mm.
- Hole spacing-16mm.
- Barrell outside diameter-12.6mm.

DHS Plate:

- 135 degrees, 25mm Barrell.
- Short Barrel available with 4, 5, 6 holes. Length 78mm-110mm.

DHS Screws: Smooth shaft and partially threaded and cannulated. Thread tapered at the tip and has reverse cutting flute. Screws available in length from 50mm-145mm in 5mm increments. Thread diameter-12.5mm. Thread length-22mm. Shaft diameter-8mm.

Proximal Femoral Nail: A PFN is a cephalomedullary nail in which the larger diameter lag screw has been replaced with a 6.5mm superior and an 11mm inferior screw.

- Material-steel or titanium Proximal diameter-17mm.
- Distal diameter-10mm, 11mm, 12mm, standard > 11mm <long> Length-170-235mm <standard>, 300 -460mm <long>
- Lag screw insertion angle-125, 130, 135 degrees. MI angle-6degrees.
- Lag screw diameter 11mm neck screw and 6.5mm hip pin. Distal screw diameter
- 4.9mm. Enc cap-yes.

Procedure and Postoperative Protocol:

General Measures: All patients received in the emergency ward were resuscitated for hypovolemia with fluids and blood. Major injuries were treated first. After patient's general condition has improved, x-ray pelvis anteroposterior view and the affected hip anteroposterior and lateral views are taken. Then the fracture was immobilized in bohler brawn splint with upper tibial pin traction. Once the patient is assessed by the anesthetist for surgery, all 4 types of intertrochanteric fractures are fixed with both dynamic compression screw fixation and proximal femoral nailing. Most of the cases are taken up for elective surgery before 5th day. It's taken after 5 days if there is any associated injuries or factors affecting the assessment for surgery.

Fixation with Dynamic Hip Screw: All 4 types of intertrochanteric fractures are fixed with dynamic compression screw fixation. The preoperative lag

screw size and length of plate also was assessed. The fracture table was used. Patient is positioned in supine position with traction was given in affected limb with 15 degrees of internal rotation. Uninjured limb is flexed abducted. Padding the are of peroneal nerve.

Reduction: Reduction of the intertrochanteric fracture is done with the help of fluoroscopy. Fragment position is checked in both anteroposterior and lateral views. Reduction is done with traction, adduction and internally rotate. Thus reduction is done and confirmed by fluoroscopy on both the views.

Draping: Draping is Done Only After Reduction of the Fracture.

Exposure: Proximal femur is approached laterally from the greater trochanter and extend distally. Length of incision depends on length of implant used. Elevate the vastus laterails off the inter muscular septum with coagulating the branches of profound femoris.

Guide Pin Insertion: Entry point is mainly 2cm below the vastus lateralis ridge for the 135 degree angle plate. Guide pin is inserted in the femoral head. Confirm the placement of guide pin in both views.

Reaming of the Head: After confirming the pin position, the triple reamer is adjusted the size after measuring with the direct measuring device. Then slowly reaming of the femoral head is done and stopped in front of sub chondral bone.

Insertion of Lag Screw: After tapping, the lag screw is fixed of proper length without piercing the subchondral bone, short barrel or long barrel is fixed according to the length of the lag screw.

Plate Attachment: Length of the plate depends on the extension of the fracture line. Plate is fixed with cortical screws to the bone. Then traction is released and compression screw on the lag screw is applied. Wound closed in layers. Suction drain attached.

Fixation with Proximal Femoral Nailing: All 4 types of trochanteric fractures are fixed with proximal femoral nailing. Nail size and the size of the lag screws are measured preoperatively.

Patient Position: Patient on fracture table in supine position with traction on injured limb. Other limb is flexed and abducted.

Reduction: Reduction is done with the help of fluoroscopy. Fracture is reduced by adjusting to addiction and also rotation. Reduction is confirmed with fluoroscopy in both the views. Draping done only after reduction of the fracture. Incision made 3-4cm above greater trochanter adequate enough to make entry point. Entry point for this nail is the greater trochanter. Bone awl is used for the entry point. Once confirmed in both views, guide wire is inserted. After checking the position of the guide wire in both the views, the adequate length nail is fixed. Nail has proximally 2 holes for cancellous screws in the head. Incision is made for the fixation of 2 cancellous screws. First the antirotation screw is fixed and then larger lag screw is fixed. Length of both the screws is checked on both views. Proximal screw should be shorter than the distal lag screw. Always distal locking should be done with help of cortical screws. Wound closure is done.

Postoperative Protocol:

Dynamic Hip Screw: Postoperative rehabilitation was decided by the stability of the fracture. In all types of trochanteric fractures with dynamic hip screw fixation, mobilization exercises started in day one. Touch down weight bearing by 10th day. Partial weight bearing allowed after radiological evidence of callus by 4-6 weeks. Full weight bearing is allowed only after radiological evidence of union.

Proximal Femoral Nailing: In type-1 and type-2 fractures, postoperative rehabilitation started by starting mobilization exercises on post operative day one. Touch down weight bearing is started by 6th day. Partial weight bearing is started by 2-3 weeks with crutches. Full weight bearing is allowed only by radiological evidence of union. In type-3 and 4 fractures, partial weight bearing is allowed by 4-5 weeks. Full weight bearing only after full radiological union.

Pitfalls and their Management:

Infection: 5 cases developed wound infection, 3 of them were superficial stitch abscess and one was deep infection. The treatment protocol for superficial infection was continuation of antibiotics and daily dressing. All 3 healed without complications. A case of deep infection was treated with thorough irrigation, excision of slough and debridement of infective material with continuation of antibiotics sensitive to the organism. Once the wound started granulating secondary suture is done.

Malunion: Malunion occurred in 2 cases. Patients were above 60 years and functional disability was minimal with existing malunion, his hip movements are pain-free and good, they are left without any intervention.

Delayed Union: Delayed union occurred in 3 cases. It took 5 months to get complete union in both these cases. Active physiotherapy is given regularly for delayed union.

Bed Sores: It developed in one patient who has 65 years old. It was of grade-1 and it healed with proper dressing and antibiotics.

Limb Length Inequality: Shortening of 1-2cm occurred in 5 patients, none of them had any functional deficit.

Lag Screw Pull Out: It occurred in one patient due to early weight bearing and so implant is removed and active physiotherapy given.

RESULTS AND DISCUSSIONS

Table 1: Distribution According to Mode of Injury

	Type of Injury	No. of Cases	Percentage (%)
1.	Fall Injury	24	60
2.	Road Traffic Accidents	12	30
3.	Fall of Heavy Objects	4	10

Table 2: Boyd and Griffin Classification

Type	No. of Cases	Percentage
Type-1	12	30%
Type-2	16	40%
Type-3	8	20%
Type-4	4	10%

Table 3: Operating Time

Operating Time	Proximal Femoral Nailing Time in HRS	Dynamic Hip Screw Time in HRS
Type-1	1.45	1.30
Type-2	2.10	1.50
Type-3	2.45	2.10
Type-4	2.50	2.20

Table 4: Unit of Blood Transfused

Blood Transfusion	Dynamic Hip Screw	Proximal Femoral Nailing
Type-1	1 Unit	Nil
Type-2	1 Unit	1 Unit
Type-3	2 Units	1 Unit
Type-4	2 Units	1 Unit

Table 5: Time of Union

Time	6 Weeks	10 Weeks	14 Weeks
Dynamic Hip Screw	28%	68%	84%
Proximal Femoral Nailing	36%	80%	92%

Table 6: Statistical Analysis of Functional Outcome

	Material	N	Mean	Std. Deviation	Std. Error Mean
Fluoroscopy	DHS PFN	20	15.30	3.310	.740
time(min)		20	31.50	9.795	2.190
Duration of	DHS PFN	20	1.495 0	.27621	.06176
surgery (hrs)		20	1.885 0	.39805	.08901
Blood loss (ml)	DHS PFN	20	327.0 0	45.665	10.211
Time interval		20	133.5 0	55.372	12.382
for union (days)	DHS PFN	20	86.60	4.893	1.094

Table 7: Postoperative Follow Up Harris Hip Score

Months	Dynamic Hip Screw	Proximal Femoral Nailing
Pain-Max Score-44		
3 months	20	30
6 months	30	40
Distance Walked-Max Score 11		
3 months	2	5
6 months	3	8
Put on Shoes and Chappels-Max Score 4		
3 months	0	2
6 months	2	4
Absence of Deformity-Max Score 4		
3 months	2	3
6 months	3	3
Range of Motion-Max Score 5		
3 months	2	3
6 months	3	4
Total Harris Hip Score		
3 months	29	58
6 months	57	82

The rating system followed was that of Harris Hip Score.

Table 8. Overall Analysis of Functional Outcome

Grading	No. of Cases	Percentage
Excellent	24	60%
Good	6	15%
Fair	6	15%
Failure	4	10%

Table 9: Results According to the Implant Used

Implant	No. of Cases	Grading	Percentage
Dynamic Hip Screw	12	Excellent	60%
	4	Good	20%
	2	Fair	10%
	2	Failure	10%
Proximal Femoral Nail	14	Excellent	70%
	2	Good	10%
	2	Fair	10%
	2	Failure	10%

We selected 40 cases of intertrochanteric fractures. All 4 types of intertrochanteric fractures are included. We had 12 cases of type-1, 16 cases of type-2, 8 cases of type-3 and 4 cases of type-4 fractures. 6 cases of type-1, 8 cases of type-2, 4 cases of type-3 and 2 cases of type-4 fractures. Two groups each were fixed with dynamic hip screw and proximal femoral nailing for each groups consisting of 40 cases. 20 cases were fixed with dynamic hip screw and 20 cases fixed with proximal femoral nail. The youngest patient in our series is 45 years and oldest patient in our series is 80 years. Average age is 60 years. We had 12 male cases and 8 female cases. With a ratio of 1.5:1. All the 20 cases were closed fractures. Most common mode of injury is accidental fall injury. In our study we had 12 cases right sided and 8 cases left sided. Most common associated injuries are 3 public ramus fractures. Others are 1 shaft of femur, 1 both bones leg fractures, 1 pneumothorax and 1 head injury. Duration between injury and hospitalization, 10 cases were between 6-12 hrs and 7 cases were >12 hours, 2 cases were within 3-6 hrs and 1 case within 3 hrs. All cases were evaluated with x-ray pelvis with both hips anteroposterior view and the affected hip were both anteroposterior and lateral views. Routine blood investigations with ECG and x-ray chest also taken for assessment for surgery. Traction and internal rotation special view is also taken for the study of the fracture fragments for fixation plan. All 4 types of fractures are fixed with both types of fixation. All fractures are fixed by lateral approach. Preoperative antibiotics are given. Dynamic hip screw fixation is by lateral approach with fixation of cancellous screw in the femoral head with the side plate to the shaft. Proximal femoral nailing incision is more smaller just for entry point and screw fixation. 2 cancellous screws, one as lag screw and one as hip pin with distal locking in the shaft. Each step of fixation in both these methods is checked with help of fluoroscopy in both anteroposterior and lateral views. Operating time is longer for proximal femoral nailing than dynamic hip screw fixation. Type-3 and 4 fractures have longer operative time. Blood loss is more for type-3 and 4 fractures and also for dynamic hip screw fixation. 2 units of blood transfusion done for type-3

and 4 fractures. Rest are given only 1 unit and mainly 2 units are given for dynamic hip screw fixation. Fluroscopic exposure is more for the proximal femoral nailing than dynamic hip screw. Duration of postoperative stay is 12 days for dynamic hip screw and 6 days proximal femoral nailing. All postoperative cases were started with mobilization on first postoperative day itself. Postoperative x-ray is taken and checked for the fixation. Time of union for dynamic hip screw fixation at 6 weeks is 28%, 10 weeks is 68% and 14 weeks is 84%. Time of union for proximal femoral nailing at 6 weeks is 36%, 10 weeks 80% and 14 weeks is 92%. Full weight bearing allowed only after evidence of full radiological union. Postoperative outcome of both fixation is measured by Harris Hip Score. Pain is mild in proximal femoral nailing compared to dynamic hip screw nailing. Limping is less in proximal femoral nailing. Support distance walked, using public transport, absence of deformity, sitting, using stairs, range of motion are better in proximal femoral nailing in both 3 and 6 months of follow up using harris hip score than dynamic hip screw. Functional out come is excellent in 12 cases, good in 3 cases, fair in 3 cases and failure in 2 cases. Type-1 and 2 fractures have excellent to fair results. Type-3 and 4 fractures have excellent to failure results. Dynamic hip screw has 60% excellent results, whereas proximal femoral nailing has 70% excellent results. Postoperative complications was infection in 4 cases, malunion in 2 cases, delayed union in 2 cases, bed sores in 1 patient, limb length inequality in 5 patients, none of them had any functional deficit, lag screw pull out in one case. No vascular and neurological complications were noted in these 20 cases. In our study, outcome of fixation is studied extensively from operation table till full union function till 6 months of follow up.

CONCLUSION

- Intertrochanteric fractures commonly occur in men around age of 6thdecade due to accidental fall injury.
- Conventional radiographs are not essential to study the fracture pattern, traction and internal rotation view is needed to classify the fractures. 3. Boyd and Griffin classification is essential for classification of intertrochanteric fractures.
- Fracture stabilization by rigid internal fixation by both methods results in early functional recovery and early ambulation. Perfect anatomical reduction gives excellent results.
- Blood loss and unit of blood transfusion is less in case of proximal femoral nailing compared with dynamic hip screw.
- Operative time is longer in proximal femoral nailing than dynamic hip screw.
- Fluroscopic exposure is longer for proximal femoral nailing than dynamic hip screw.
- Duration of postoperative stay is longer in dynamic hip screw than proximal femoral nailing.
- Results of both fixation are better in type-1 and 2 fractures compared with type-3 and 4 fractures.
- Union rates are also better in type-1 and 2 fractures with both fixation than type-3 and 4 fractures.
- Postoperative follow up was measured by Harris Hip Score for a follow up of 3 and 6 months.
- Pain, limp, support, distance walked, sitting, public transport, walking stairs, put chapels, absence of deformity. All these factors are better in proximal femoral nailing for 3 and 6 months follow up than dynamic hip screw.

Advantages of Proximal Femoral Nailing:

- Less blood loss and blood transfusion.
- Early weight bearing.
- Union results better in all 4 types of trochanteric fractures.
- Postoperative complication is less.
- Postoperative functional mobility is better.

Advantages of Dynamic Hip Screw:

- Less operative time.
- Shorter Fluroscopic time.
- Screw pull out is less. <no z-effect>

In our study, proximal femoral nailing has better results than dynamic hip screws. Proximal femoral nailing has better union rates and functional results than dynamic hip screw. It has very good results even in type-1 and 2 stable fractures. Intraoperative and postoperative complications are less in proximal femoral nailing. But disadvantages is screw pull-out<z-effect> is seen and also the operative time and Fluroscopic time is longer which is hazardous to the patient.

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