

Original research article

A Comparative Study of Proximal Femoral Nailing Versus Dynamic Condylar Screw Device in Surgical Management of Intertrochanteric Fractures

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Abstract

Background: Intertrochanteric fractures are one of the most prevalent injuries in the elderly, especially in women and those with osteoporosis. About 50% of intertrochanteric fractures are comminuted and unstable. Therefore, treatment is challenging. They were treated at our facility with either Dynamic Condylar Screw (DCS) fixation or Proximal Femoral Nailing (PFN). The investigation was carried out to determine which form of surgical fixing provides the best functional result.

Methods: This cross-sectional interventional study was conducted in the Department of Orthopedics, Kakatiya Medical College, and MGM Hospital, Warangal, Telangana State. Based on the inclusion and exclusion criteria n=40 cases of intertrochanteric fractures were included in the study. They were divided into two groups of n=20 each and all the intertrochanteric fractures were treated by early surgical fixation with dynamic condylar screw fixation and proximal femoral nailing.

Results: The duration of healing was 6 weeks in 36% of cases, 10 weeks in 80% of cases and by 14 weeks 92% of cases were found to be healed. In Dynamic condylar screw placement, 28% of cases showed healing at 6 weeks, 68 % of cases showed healing at the end of 10 weeks and 84% of cases showed healing at the end of 14 weeks. overall results of the study revealed 80% of cases in proximal femoral nails had excellent and good results and 10 % had fair and 10% were with poor results. Whereas in dynamic condylar screw cases excellent results were in 60% of cases and poor results in 10% of cases

Conclusion: Type-1 and type-2 intertrochanteric fractures had better outcomes as compared to type-3 and type-4 intertrochanteric fractures. Pain, limp, support, distance walked, sitting, public transport, walking stairs, putting foot ware, absence of deformity. All these scores were better in proximal femoral nailing at the end of 3 and 6 months follow up than dynamic condylar screw. The mean blood loss during surgery was less in PFN as compared to dynamic condylar screws.

Keywords: Intertrochanteric Fractures of Femur, Proximal Femoral Nailing, Dynamic condylar Screws

Introduction

The incidence of all hip fractures is approximately 80 per 100,000 persons. Intertrochanteric fractures make up 45% of all hip fractures. ^[1] They are 3-4 times more common in osteoporotic women; trivial falls being the most common mechanism of injury. ^[2] The incidence of these fractures has increased with the advancing age. These patients are confined to home ambulation and rely on a family member or walking assistance for fundamental day-to-day tasks, making them a liability. Due to restricted ambulation, mortality rates are quite high. Early ambulation is attainable because of improved therapy, and a better functional outcome is attained with a reduction in morbidity rates. The incidence varies by gender and race and changes by country. Hip fractures are becoming a major problem in Asia, owing to a 2-to-3-fold rise in frequency in practically every nation on the continent. ^[3, 4] Hip fractures are expected to increase from 1.66 million in 1990 to 6.26 million in 2050. ^[5] Aside from increased urbanization throughout Asia, there has also been an increase in the share of the elderly population as the average life span has increased. ^[4, 6] With shifting global population dynamics, it is estimated that more than half of these fractures would be in Asia by 2050, and while the specific explanation for this regional distribution is unknown, potential contributing variables include genetic factors. ^[5] Intertrochanteric fractures are caused by road traffic accidents, even low-velocity fall injuries, especially in elderly patients with osteopenic bone. Treatment of intertrochanteric fracture is by both non-operative and operative methods. The Non-operative method includes skeletal traction and derotation boot. Operative methods are dynamic hip screw, intramedullary nailing, and prosthetic replacement. Stable intertrochanteric fractures are commonly treated with dynamic hip screw fixation with failure rates of less than 2%. The of unstable intertrochanteric fractures are more controversial. Unstable intertrochanteric fractures treated with DCS have a considerably higher rate of failure, ranging from 4% to 15%. ^[7] Two main modes of operative management are dynamic condylar screw and intramedullary nailing mainly proximal femoral nailing. Operative treatment has a better prognosis and reduces mortality due to fracture. Different types of implants are used according to the type of intertrochanteric fracture. This is a study mainly to analyze the functional outcome of the dynamic condylar screw and proximal femoral nailing when used in all types of intertrochanteric fractures.

Material and Methods

This cross-sectional interventional study was conducted from Sept 2020 to Feb 2022 in the Department of Orthopedics, Kakatiya Medical College, and MGM Hospital, Warangal, Telangana State. Institutional Ethical Approval was obtained for the study. Written consent was obtained from all the cases of the study.

Inclusion Criteria

1. Age group between 30 -80 years
2. Male and female patients
3. Clinically and radiologically diagnosed intertrochanteric fracture
4. Consent to participate in the study

Exclusion Criteria

1. Bilateral fractures
2. Pathological fractures
3. Fractures associated with polytrauma
4. Preexisting femoral deformity

Based on the inclusion and exclusion criteria n=40 cases of intertrochanteric fractures were included in the study. They were divided into two groups of n=20 each and all the intertrochanteric fractures were treated by early surgical fixation with dynamic condylar screw fixation and proximal femoral nailing. A pre-structured proforma was used to obtain the details of the patients. All patients received in the emergency ward were resuscitated for hypovolemia with fluids and blood. Major injuries were treated first. After the general condition of the patient is 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 condylar screw fixation and proximal femoral nailing. Most of the cases are taken up for elective surgery before the 5th day. It has taken after 5 days if there are any associated injuries or factors affecting the assessment for surgery.

Fixation with Dynamic Condylar Screw: All 4 types of intertrochanteric fractures are fixed with dynamic compression screw fixation. The preoperative lag screw size and length of the plate also was assessed. The fracture table was used. The patient is positioned in a supine position with traction given in the affected limb with 15 degrees of internal rotation. The uninjured limb is flexed and abducted. Padding the area of the peroneal nerve. Reduction: Reduction is done with traction, adduction, and internally rotating. Thus, the reduction is done and confirmed by fluoroscopy on both views. Draping: Draping is done only after the reduction of the fracture.

Fixation With Proximal Femoral Nailing: The tip of the greater trochanter was located by palpation in thin patients and obese patients, we used an image intensifier. A 5 cms longitudinal incision was taken proximal from the tip of the greater trochanter. A parallel incision was made in fascia lata and gluteus medius was split in line with the fibers. The tip of the greater trochanter is exposed. In the AP view on the c-arm, the entry point is on a tip or slightly lateral to the tip of the greater trochanter. *Reaming:* Using a cannulated conical reamer proximal femur is reamed for about 7 cms. After confirming satisfactory fracture reduction, an appropriate size nail as determined preoperatively is assembled to the insertion handle and inserted manually. The final position of the guidewire should be in the lower half of the neck in AP view and the center of the neck in lateral view. *Closure* After fixation is over, lavage is given using normal saline and the incision is closed in layers. A suction drain is used in case open reduction is performed. Sterile dressing applied overwound and compression bandage given.

Postoperative Management

Dynamic condylar Screw: Postoperative rehabilitation was decided on the stability of the fracture. In all types of trochanteric fractures with dynamic condylar screw fixation, mobilization exercises started on day one. Touch down weight bearing by the 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 postoperative day one. Touch down weight bearing is started on the 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 the full radiological union.

Results

Out of the n=40 cases included in the current study the most common age group involved with intertrochanteric fractures were 60 – 70 years with n=16(40%) of all the cases. Followed by 70 – 80 years with n=12(30%) of cases and n=8(20%) of cases in the age group 50 – 60 years and n=4(10%) in the age group of 40 – 50 years depicted in figure 1. The age range was 42 – 78 years and the mean age of the sample was 64.35 ± 8.5 years.

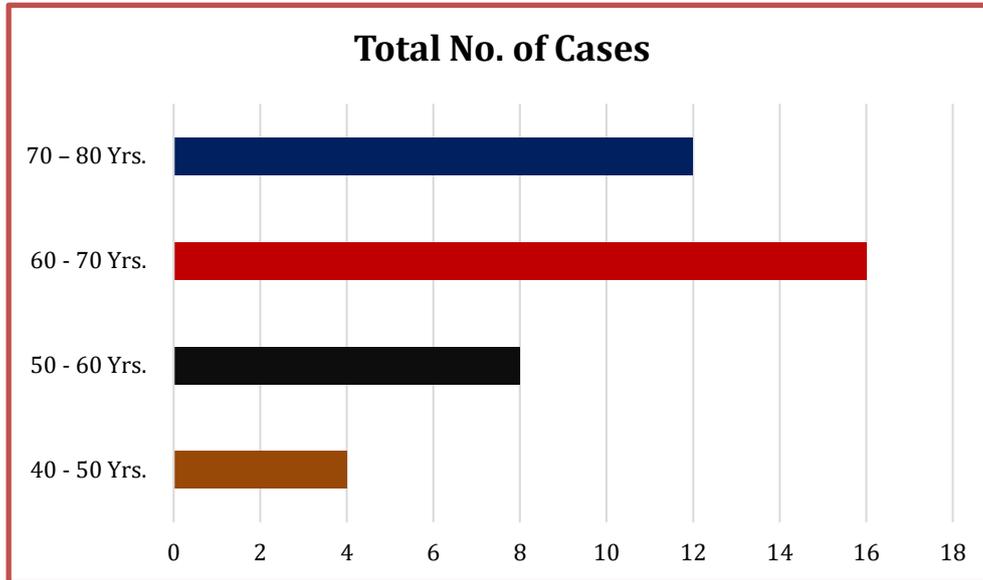


Figure 1: Showing the age-wise distribution of cases in the study

Out of n=40 cases, n=24(60%) cases were males and n=16(40%) cases were females. The male to female ratio was 3:2. The common mode of fractures in the study was fall injuries in n=24 cases and n=12 cases were due to road traffic accidents and n=4 cases were due to falls of heavy objects shown in figure 2. Based on the laterality of involvement we found 60% of cases with left side involvement and 40% of cases involved the right side.

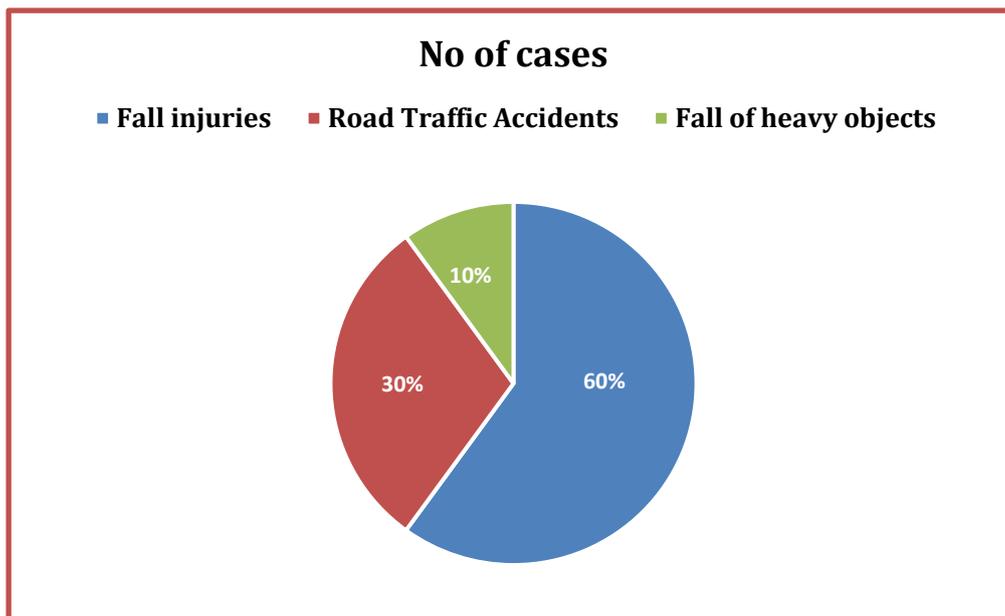


Figure 2: Distribution of cases according to the mode of injury

Based on the Boyd and Griffin classification ^[8] of intertrochanteric fractures type 1 fracture was found in n=12(30%) of cases and type 2 fractures were found in n=16(40%) of cases and type 3 fractures were found in n=8(20%) cases and type 4 fractures in n=4(10%) of cases. The time interval from the injury to surgery was less than 2 days in n=4(10%) of cases and between 2 – 5 days in n=20(50%) of cases and between 5 – 7 days in n=16(40%) of cases. The mean duration of surgery taken in both groups is given in table 1.

Table 1: Showing the mean operating time between two groups of treatment

Type of Fracture	Proximal Femoral Nailing	Dynamic condylar Screw	P values
	Mean operating time in Hours	Mean operating time in Hours	
Type -1	1.45	1.30	0.236
Type -2	2.10	1.50	0.036*
Type -3	2.45	2.10	0.066
Type -4	2.50	2.20	0.062

* Significant

The mean fluoroscopic exposure in the proximal femoral nailing in type-1 fractures the exposure was 20 minutes and type -2 fractures were 25 minutes and type-3 fractures were 30 minutes and type-4 fractures were 28 minutes. Similarly, dynamic condylar screw-in type -1 fractures was 10 minutes and type -2 fracture were 15 minutes and type -3 fractures were 20 minutes and type-4 fractures were 22 minutes. The amount of blood loss and units of blood transfusion done has been given in table 2.

Table 2: Amount of blood and blood transfusion done in the cases of the study

	Proximal Femoral Nailing	Dynamic Condylar Screw
<i>Blood loss</i>		
Type – 1	90	200
Type – 2	180	350
Type – 3	220	400
Type – 4	200	380
<i>Blood transfusion</i>		
Type – 1	Nil	1 unit
Type – 2	1 unit	1 unit
Type – 3	1 unit	2 units
Type – 4	1 unit	2 units

The mean time of union was studied in proximal femoral nailing cases. The duration of healing was 6 weeks in 36% of cases, 10 weeks in 80% of cases and by 14 weeks 92% of cases were found to be healed. In Dynamic condylar screw placement, 28% of cases showed healing at 6 weeks, 68 % of cases showed healing at the end of 10 weeks and 84% of cases showed healing at the end of 14 weeks.

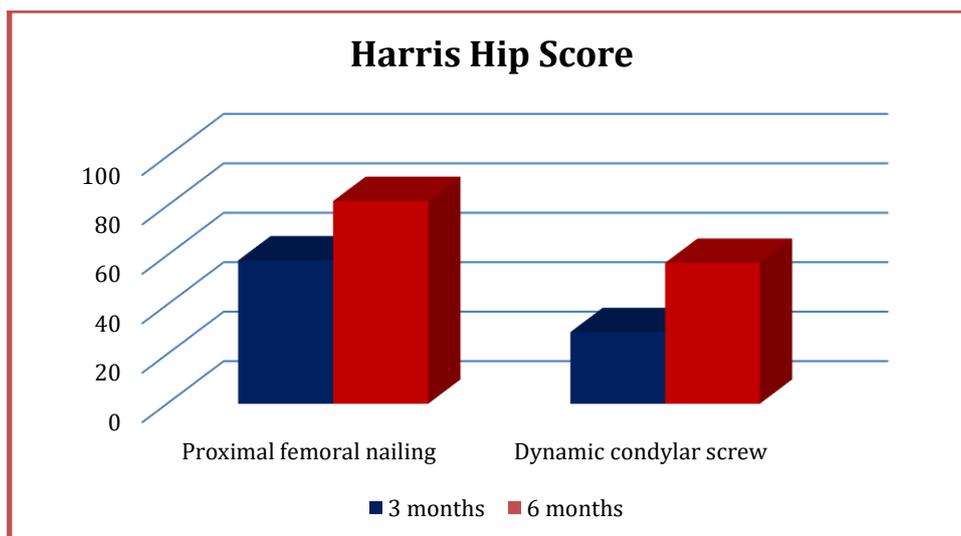


Figure 3: Total Harris Hip Scores at the end of 3 months and 6 months in the cases of study

The rating system followed was that of the Harris Hip Score (figure 3) considered pain, movement, function, shortening, and angulation. This system is easy to analyze other systems are more confusing than multiple factors for analysis. Higher scores indicate better outcomes. The overall results of the study revealed that 80% of cases in proximal femoral nails had excellent and good results and 10% had fair and 10% were with poor results. Whereas in dynamic condylar screw cases excellent results were in 60% of cases and poor results in 10% of cases depicted in table 3.

Table 3: Overall results based on the type of implants used

Implant	No. of Cases	Grading	Percentage
<i>Proximal Femoral Nail (n=20)</i>			
	14	Excellent	70
	2	Good	10
	2	Fair	10
	2	Failure	10
<i>Dynamic condylar Screw (n=20)</i>			
	12	Excellent	60
	4	Good	20
	2	Fair	10
	2	Failure	10

Discussion

Intertrochanteric fractures are more common in persons with low bone quality approximately half of all intertrochanteric fractures are comminuted and unstable. Excessive materialization of the shaft and subsequent loss of contact between the pieces might result in fixation failure in these fractures. Even when the fracture heals, limb shortening and reduced length of the abductor lever arm have a negative impact on hip function. In terms of treatment and prognosis, unstable hip fractures should be distinguished from their stable counterparts.^[9] The current study selected n=40 cases of intertrochanteric fractures. All 4 types of intertrochanteric fractures are included. We had n=12 cases of type-1 fractures, n=16 cases of type-2 fractures, n=8 cases of type-3 fractures, and n=4 cases of type-4 fractures. Two groups each were fixed with a dynamic condylar screw and proximal femoral nailing for each group consisting of n=20 cases each. The locking compression plate was launched as a novel implant that provides

angular stable plating for the treatment of difficult comminuted and osteoporotic fractures. The dynamic compression hole threaded locking hole, or both can be used on the locking compression plate (LCP). This combination allows you the option of the cortical screw or locking screw fixation.^[10-13] Recently, locking plates specifically constructed for the proximal femur, known as PF-LCP, have been available for the treatment of complicated trochanteric fractures.^[14] The therapeutic objective is to establish stability and early mobilization. Early mobilization and successful restoration of stability lower the morbidity and death rates associated with extended immobilization.^[15] The treatment objective is to accomplish anatomic reduction with a stable fracture fixation so that functional rehabilitation may begin as soon as possible. Dynamic hip screws have been used to treat intertrochanteric and subtrochanteric fractures for decades.^[16] After the initial flexible femoral nails and second-generation nails with their disadvantages, the third-generation nails such as the proximal femoral nail, which incorporates multiple screws into the femoral head were introduced. Multiple points of fixation theoretically provide better rotational control of unstable fractures. The smaller-diameter screws will allow a smaller diameter for the proximal section of the nail. The theoretical concern about smaller diameter screws is screw cutout is directly related to their decreased diameter that could be exacerbated by screw bending. Such bending can prevent the sliding of the lag screw. Fracture of the smaller superior screws has seen usually when it is placed near the subchondral bone. In this position, it encounters large varus stresses that are not shared by the larger inferior screw. 20 The mean Operating time is longer for proximal femoral nailing than dynamic condylar screw fixation. Type-3 and 4 fractures have longer operative times. Blood loss is more for type-3 and 4 fractures and also for dynamic condylar screw fixation. 2 units of blood transfusion are done for type-3 and 4 fractures. Rest is given only 1 unit and mainly 2 units are given for dynamic condylar screw fixation. Fluoroscopic exposure is more for the proximal femoral nailing than the dynamic condylar screw. PFN is better than DHS in Type II intertrochanteric fractures of the femur in terms of decreased blood loss, reduced duration of surgery, early weight-bearing and mobilization, reduced hospital stay, and decreased risk of infection and other complications.^[17]

In the current study, the healing was slightly faster in patients with PFN as compared to dynamic condylar screws although the difference was not statistically significant. Chandy G et al.,^[18] wherein there was no significant difference in the time to union among the two groups in which the comparison was between DHS and PFN. The overall results of the study revealed that 80% of cases in proximal femoral nails had excellent and good results and 10 % had fair and 10% were with poor results. Whereas in dynamic condylar screw cases excellent results were in 60% cases and poor results in 10% cases. M Faisal et al.,^[19] in a similar study found an excellent outcome of 66%, a good outcome of 28%, a fair outcome of 6% for PFNA2, an excellent outcome of 36%, a good outcome of 54%, the fair outcome of 8%, poor outcome of 2% for DHS. The type of fracture can have an impact on functional outcomes. Pajarinen et al.,^[20] in their post-op rehabilitation trial comparing peri trochanteric femoral fracture treated with DHS or PFN revealed that PFN may allow for quicker post-operative restoration of walking capacity when compared to DHS.

Conclusion

Within the limitations of the current study, we found that type-1 and type-2 intertrochanteric fractures had better outcomes as compared to type-3 and type-4 intertrochanteric fractures. Pain, limp, support, distance walked, sitting, public transport, walking stairs, putting foot ware, absence of deformity. All these scores were better in proximal femoral nailing at the end of 3 and 6 months follow up than dynamic condylar screw. The mean blood loss during surgery was

less in PFN as compared to dynamic condylar screws. However, the mean fluoroscopic time was higher in the proximal femoral nail as compared to dynamic condylar screws.

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