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Functional and radiological outcome of intertrochanteric fracture in patients treated with dynamic hip screw and proximal femoral nail

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Abstract
Background: The aim of the study was to assess the functional and radiological outcome of intertrochanteric fracture in elderly patients treated with dynamic hip screw or proximal femoral nail
Materials and Methods: The study was conducted in Government Stanley hospital, from May 2014 to December 2015. A total of 98 cases of intertrochanteric fractures in age group of 55 to 65 years admitted were included in our study. Patients with pathological fracture was excluded. The 98 patients were divided into stable and unstable groups using Evans classification. DHS was done for 56 of them and PFN for another 42 of them and results were evaluated. The mean duration of surgery, mean blood loss and mean length of incision, intraoperative complications, time of weight bearing were evaluated. The Harris hip score was used to evaluate the hip joint function.
Results: Most of the patients in our age group were between 55 to 65 years around 80%. The mean duration of surgery, mean blood loss and mean length of incision was more in DHS group then PFN group. We came across more intraoperative complications in PFN group then DHS group. Time of weight bearing was more in unstable fracture in DHS group. The Harris hip score was in favour of PFN at six weeks after surgery but it became same in both groups after 20 weeks of surgery
Conclusion: PFN has advantage of smaller incision, less blood loss and less morbidity. The short lever arm and lower bending moment in PFN may add mechanical advantage to the construct which makes it the implant of choice in osteoporotic bones. Deformity and complications was less in PFN group in our study. Rate of fracture union was similar in both groups with early mobilization in PFN group, DHS found to be the implant of choice for stable fracture but for unstable fracture PFN is the better choice.

Keywords: Intertrochanteric fracture, DHS, PFN

Introduction
Intertrochantric fractures is one of most common fracture in Orthopedics which is supposed to be the most devastating orthopedic injury in elderly [1, 2, 3]. There is an increase in the incidence of this fracture now due to road traffic accidents, constructions work and rise in elderly population. There exists a bimodal distribution with 10% of cases in young individual with history of fall from height and road traffic accidents [1, 2]. Remaining 90% of cases are elderly people with history of slip and accidental fall in the floor. Fracture of this bone leads the patient to be bed ridden for prolonged period and so increased morbidity and mortality. Appropriate treatment of this fracture is must to prevent these complications [2, 3]. Literature says that about 15 to 20 % of elderly patients with Intertrochantric fractures dies within one year of injury if no appropriate treatment is given [4]. Previously these fractures are treated conservatively with traction and prolonged bed rest for 10 to 12 weeks followed by ambulation training. Prolonged bed rest leads to increase in morbidities like bed sores urinary tract infections, respiratory tract infections, joint stiffness. Avoiding these complications operative treatment of these fractures is tried with the aim of early bed to chair mobilization of these patient [5]. The better understanding of fracture geometry and biomechanics leads to the development a lot of implants for treating these fractures. The first one in the history is Jewett and Holt nail which is a fixed angle nail plate. These nail plate failed because of lack of controlled impaction. The sliding hip screw has been used for fixation of these fractures.

High failures were noted in those fractures with loss of posteromedial congruity [6]. To overcome this, intramedullary devices were developed with theoretical advantage of more load transfer, with short lever arm and decreased implant failure rate. The goal of treatment in fracture is early mobilization of patients to prevent morbidity and mortality and the early mobilization depends on the stability of surgical construct [7]. With these goals of better stable surgical construct of fractures and early mobilization of patients, this study was conducted to compare the functional and radiological outcome of Intertrochanteric fractures in elderly patients treated with dynamic hip screw and proximal femoral nail.

Aim of the study

To assess the functional and radiological outcome of Intertrochanteric fracture in patient treated with dynamic hip screw or proximal femoral nail.

Material and Methods

The present study was carried out in Government Stanley medical college and Hospital, from May 2013 to December 2015. The study consists of total 106 adult patients of Intertrochanteric factures of femur satisfying the inclusion criteria, who are treated with Proximal Femoral nail (42 cases) and Dynamic Hip Screw (64 cases). It was a PROSPECTIVE STUDY. All the cases in the study were having intertrochanteric or sub trochanteric fractures. The fractures were treated with closed method of reduction followed by either operated by Proximal Femoral Nail (PFN) or Dynamic Hip Screw (DHS). In all the patients with personal data, mode of trauma, type of fracture, type of surgery, intra operative &post-operative complications, follow up examination including hip joint examination, duration of full weight bearing was considered.

Inclusion Creteria

1. All patients age over 35 years with Intertrochanteric fractures
2. Both stable and unstable Intertrochanteric fractures as classified by Evan
3. Intertrochanteric fractures and intertrochanteric with sub trochanteric Extension.

Exclusion Criteria

1. Patients with pure sub trochanteric fractures
2. Patients with pathological fracture
3. Patients with multiple injuries

Choice of nail used

Proximal femoral nail of standard length that is 25 mm was used in our study. The nail was made up of AISI 316 L Stainless steel. The proximal diameter of nail is 14 mm which is up to proximal 8 cm of nail, while nail diameter of 9 mm to 12 mm was used in our study. All nails used were of 135 *. There proximal portion of nail has two slots for accompanying the lag screw and the ant rotating screw. The diameter of lag screw was 8 mm with length ranging from 55 to 115 mm was used. Autorotation screw of diameter 6.5mm was used in our study, with length ranging from 55 to 115 mm. The distal portion of nail has two parallel slots for distal interlocking screws.

Richards dynamic compression screw

A cannulated lag screw with threaded distal portion of 12.7 mm diameter and the diameter of proximal unthreaded portion (shaft) is 8.7 mm. It came in various lengths from 50-110 mm. It was cannulated to accept a 3.2 mm guide wire. The lag screw was inserted into the barrel of side plate into which it can slide. The groove in the shank of the lag screw, which corresponds to the key in the barrel, prevents the rotation. The side plate accommodates 4.5 mm cortical bone screws. Mostly 4 or 5 holed plate was used.

Pre-Operative Planning

DETERMINATION OF NAIL DIAMETER: It was measured at the level of Isthmus of femur in lateral X ray.

DETERMINATION OF NECK SHAFT ANGLE: It was measured using goniometer on the normal side. LENGTH OF NAIL: A standard nail length of 25 mm was used in our study.

Operative Technique

Proximal femoral nail – under spinal anesthesia patient in supine position under fracture table control fracture reduction by longitudinal traction followed by abduction and internal rotation. The unaffected leg is placed in flexed and abducted position for accommodating C-arm. The reduced fracture is provisionally fixed by passing k wire in the anterior cortex parallel to neck. This prevent opening out of fracture during adduction of limb.5 cm long incision is made from tip of trochanter distally, guide wire inserted through tip of greater trochanter and passed through fracture site after checking its position in anteroposterior and lateral projection. Successive reaming done over the guide wire and nail inserted. Proximal locking done using jig. The guide wire for the neck screw is to be inserted first which is usually parallel to the inferior border of neck. The guide wire for antirotation screw is inserted and the 6.4 mm antirotating screw inserted after tapping. The neck screw is inserted after tapping which is 10 to 15 mm longer than antirotating screw. Distal locking done using jig and wound closed in layers.

Post-operative protocol

Intravenous antibiotics were given for five days followed by oral antibiotics till suture removal. Suture removed on 12th day. Patient was made to sit in the bed after 24 hours. Quadriceps set of exercises and knee mobilization exercises were immediately, and were asked to weight bear using walker support depending on the pain tolerability of patient. Partial weight bearing allowed from fourth week and full weight bearing after clinical and radiological signs of union were noted.

Follow Up

After discharge patient was asked to come for follow up at 2 weeks, 1month, 2 months, and till fracture union occurs. Modified Harris hip score was used for evaluation.

Operative technique [DHS]

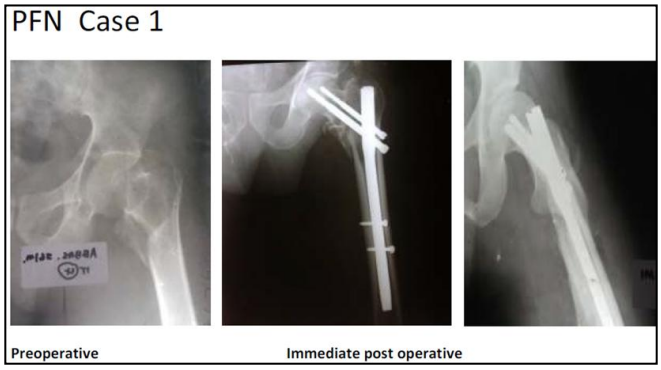
Patient in supine position under fracture table control, unaffected hip Placed in abduction and flexed position. Fracture reduction done by longitudinal traction followed by abduction to correct Varus and external rotation and then internal rotation of distal segment.After draping skin incision is made from distal end greater trochanter up to 8 cm distally and fascia splitting done, splitting of vastus lateralis done which expose the trochanter and proximal part of femur. The 135 * angle guide placed at 2 cm from the vastus ridge, Guide Wire was inserted into the femoral head and its position

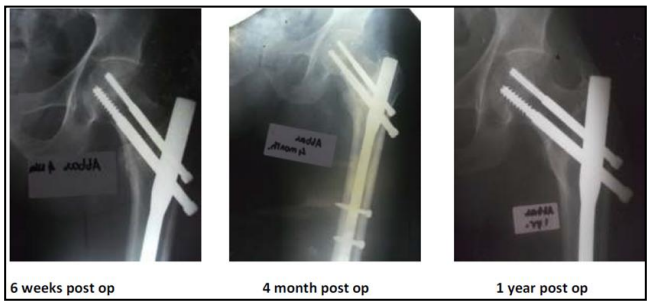
checked in anteroposterior and lateral X ray The wire should be in the center or posterior in both projections. The length of pin inside the femoral head was measured using direct measuring device. Then triple reaming was done 10 mm less than the length measured. Tapping was done until positive stop rest at the lateral cortex. Lag screw was then inserted and the T handle kept perpendicular to the femoral shaft at the end. The DHS plate was inserted and impacted into the lag screw using impactor. The DHS plate is fixed to the bone using 4.5 mm cortical screws. Wound closed in layers.

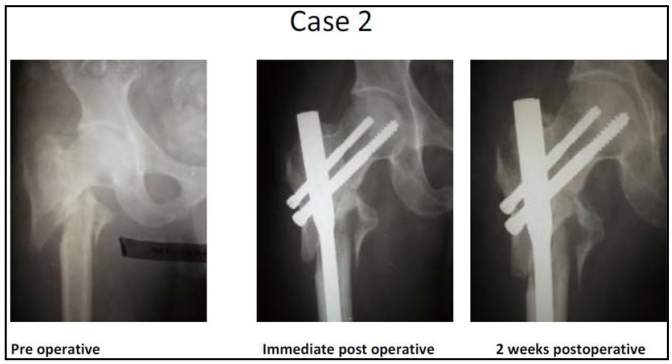
Post - operative care

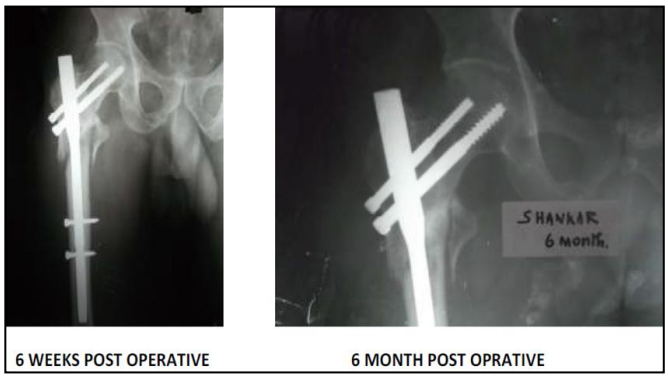
Intravenous broad-spectrum antibiotics were given for 5 days and then shifted to oral antibiotic**.** IV fluids were given till patient started orally. Static quadriceps exercises were begun on 2nd post - operative day. Active quadriceps exercises and hip flexion exercises were then started on 4th or 5th post-operative day**.** Patient was ambulated non-weight bearing with axillary crutches. Partial weight bearing was started after clinically and radiologically evaluated at about 6 weeks post operatively. Full weight bearing allowed only after the confirmation of radiological and clinical union.

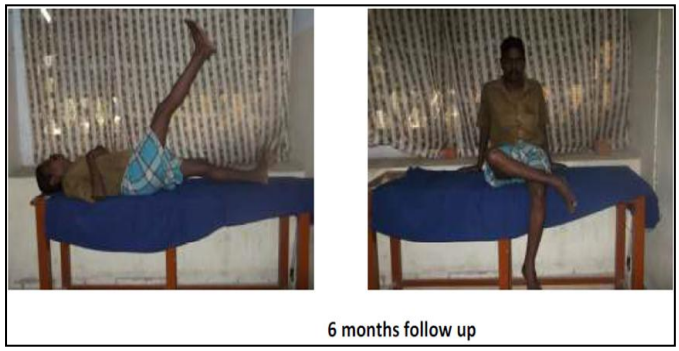
Case illustrations

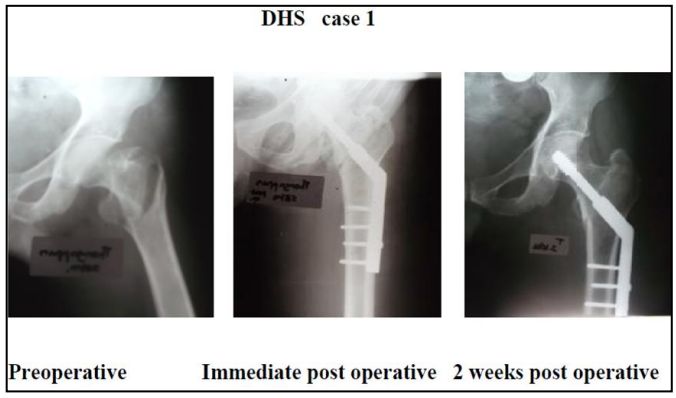


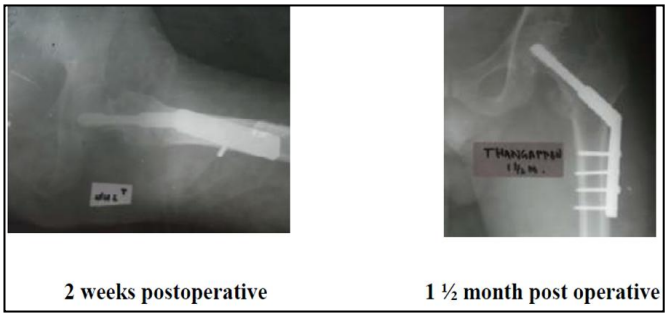


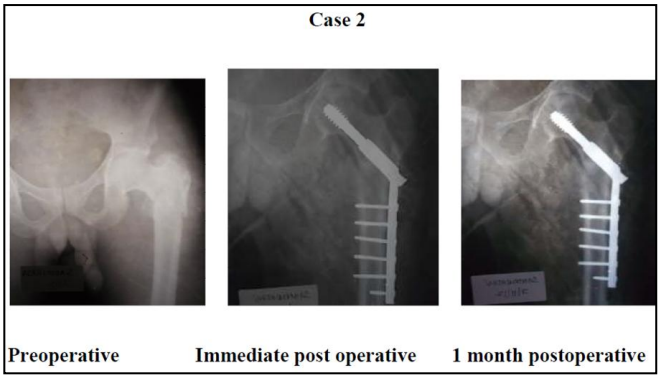


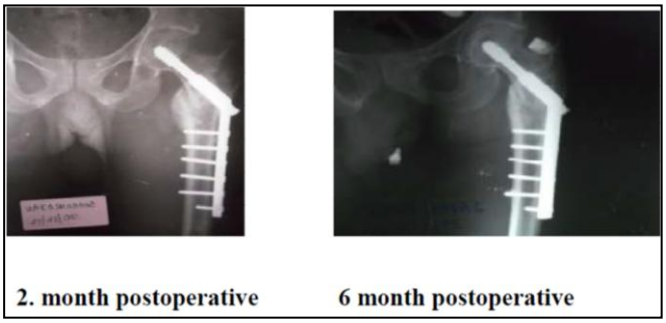












Discussion

Intertrochanteric fracture is a challenge to orthopedic community besides achieving union, the need here is the restoration of optimal Function in shortest period with minimal complications. So, the aim in treating intertrochanteric fracture has drifted to achieve

1. Stable fixation
2. Early mobilization and rehabilitation
3. Making the patient functionally and psychologically independent by returning them to premorbid home and work environment.

Operative treatment Intertrochantric fracture aid in achieving all the above aim and is the treatment of choice now. Our study is an attempt to study, evaluate, document and quantify the management of Intertrochantric fractures by using DHS and PFN. The study was conducted with 98 patients [56 by DHS and 42 by PFN with Intertrochantric fractures attending casualty and OP department of Orthopedics.

1. Age distribution

Most of our patients were in the age group of 5th to 7th decade. The mean age in years of patients in our study was 62.15. Mean age in years for group operated by PFN is 61.1. The mean age in years for group operated by DHS is 63.2. This may be because of decrease in protective reflex in elderly patients, and so frequent fall while walking. Gallaghar *et al* in 1980 reported that the risk of intertrochanteric fracture increases by 8 times in men over 80 years and women over 50 years.

4. Type of fracture

We had 70 cases of Evans stable of which DHS was in 36 cases and PFN in 24 cases .38 cases of Evans unstable fracture of which DHS was done in 20 cases and PFN in18 cases.

6. Time duration between hospital admission and surgery

Most of cases were operated within 10 days of admission. Average time lapse for surgery is 7.25 days.

7. Associated Injures

In present study series, we have found 2 patients with associated injuries amongst 32 patients operated by PFN, out of which 1 patient was having fractures of distal end radius and one patient had ipsilateral fracture calcaneus. One patient with fracture distal end radius on contralateral side were treated in same operative setting by closed manipulation reduction and followed by cast application (As patients were given general anesthesia & to minimize the risk of conservative method was chosen. While one patient with ipsilateral fracture calcaneum was treated conservatively. We have not found patients with head injury, blunt abdominal, blunt chest injury, also there were no patients with ipsilateral fracture shaft femur in the patients treated by PFN.

8. Average length of nail used & Average size of barrel plate

In our present study, we have used of uniform length i.e. 25mm long nail.As in present study we have intertrochanteric fractures of type I, II and III IV of Evans classification. So, need for using long length proximal femoral nail was eliminated. we used 135*, 4 holed barrel plate in the cases treated by DHS.

9. Diameter of the Nail

In present study series nails of diameter 9mm to 12mm were used. In two cases we have used nail of diameter 9mm, In 32 cases nail of 10 mm diameter. No patient was found to have medullary diameter of 12mm so PFN of that diameter was not used. In Indian population average diameter of medullary canal is found to between 9-10 mm. Proximal femoral nail has two segments i.e. proximal and distal. Proximal segment is of 8 cm and is of uniform diameter i.e. 14mm irrespective of diameter of distal fragment.

10. Length of screws

In our study, we used screws of length 75 to 115 mm.in 10 case we used 70 mm screw, 75 mm screw in 15 cases, 85 mm screw in 1 cases, 90 mm screw in two cases and 95 mm screw in one case. Antirotation screw of length 65 to 90 were used.65 mm screw in 6 case 70 mm screw in 8 cases, 75 mm in 12 cases, 80 mm in 6 cases.

11. Complications

Systemic complications: In patients treated with PFN as well as DHS, one patient in each group was found to have chest infection while in other patient we found complication of urinary tract infection. The patients with chest infection were known case of COPD, as they were chronic bidi smoker. Appropriate treatment was given before surgery Prolonged catheterization was noted as cause for urinary traction infection treated with appropriate antibiotics.

12. Wound Complications

Superficial would infection was noted in 8 patients operated by DHS. It was superficial infection and may be attributed to the glycemic status of patient as he was a known diabetic.

There was also more soft tissue exposure in DHS group. In all these patients treated with prolonged intravenous antibiotics.

13. Implant related intraoperative complications
In two cases of PFN operated cases we encountered ill-fitting jig .Due to this the corresponding holes in jig did not match with holes in proximal part of nail and proximal screw nail was a problem. Besides this we had one case of difficulty in fracture reduction and one case of failure in distal locking. In the DHS group, we had difficulty in reduction in one case which is due to delay in surgery as it was a known case of diabetic and operated late.

14. Rotational malalignment
External rotational deformity of 15 * was noted in one case of PFN group.Varus deformity was noted in 9 cases in DHS group which was due toexcessive back out and screw cutout. Shortening of 0 .8 to 1 cm was noted in 4 unstable cases in DHS group but they had no walking abnormality.

15. Radiological complications
In PFN group we encountered one case of 'Z' effect and there was no case of reverse 'Z' effect.

16. Other complications
Radiation exposure was more in PFN group than in DHS group.Blood loss measured by mop count [each fully soaked mop counting 50ml] is more in DHS group which is because of wide exposure.

17. Range of movement
Range of movement using Harris hip score was in favor PFN group after six weeks of operation. But at the end of twenty weeks it became nearly equal.

Conclusion
The advantage of PFN was smaller incision, less blood loss, less morbidity. Shorter lever arm and lower bending moment in PFN may add mechanical advantage to the construct. PFN found to be the implant of choice in osteoporotic bones. Varus collapse and shortening in unstable was more in DHS than PFN but Implant related complications during surgery were less in DHS than PFN. Radiation exposure was less in DHS than PFN 89. Rate of fracture union was similar in both groups with early immobilization in PFN group. DHS found to be the implant of choice as for as stable fracture is concerned. But for unstable fracture the pendulum swings in favor of PFN.

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