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A study of the functional outcome of intertrochanteric fractures treated with dynamic HIP screw

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Abstract
Background: Fractures of proximal femur are amongst the most often encountered fractures by orthopaedic surgeons. Many treatment techniques are described in literature but internal fixation with Dynamic Hip Screw is the treatment of choice for elderly. This study analyzes the outcome of treatment of intertrochanteric fracture with Dynamic Hip Screw in elderly people.
Materials and Methods: Between October 1st 2015 and July 31st 2017, 32 patients with intertrochanteric fracture who got admitted in Yenepoya Medical College Hospital, Deralakatte, Mangalore, in the department of Orthopaedics were subjected to internal fixation with Dynamic Hip Screw and the results were evaluated.
Results: Average age incidence in the present study was 67.4 years. Male female ratio was almost equal 53:47. The most common mode of injury was after a slip and fall, followed by road traffic accidents. Boyd and Griffins type 2 were more common accounting for 68.8%. The functional outcomes of 32 patients were evaluated using Kyles criteria at their last follow-up: 8 cases (25%) had excellent, 12 cases (37.5%) good, 7 cases (21.9%) fair and 5 cases (15.6%) poor.
Conclusion: Internal fixation with Dynamic Hip Screw is the treatment of choice for treatment of stable intertrochanteric fractures in elderly people.

Keywords: dynamic Hip screw, tip apex distance, intertrochanteric fracture, kyles criteria

Introduction
With the rising life expectancy throughout the globe, the world's older population continues to grow at an unprecedented rate. Today, 8.5 percent of people worldwide (617 million) are aged 65 and over, this percentage is projected to jump to nearly 17 percent of the world's population by 2050 (1.6 billion). The number of elderly individuals is increasing in every geographical region, however the demographics are set to change with more elderly people living in developing countries. The elderly have weaker bone and are more likely to fall due to poorer balance, medication side effects, and difficulty maneuvering around environmental hazards. It is estimated that the incidence of hip fracture will rise from 1.66 million in 1990 to 6.26 million by 2050. The incidence of hip fracture in men is projected to increase by 310% and 240% in women, compared to rates in 1990 [1].
The highest hip fracture rates are seen in North Europe and the US and lowest in Latin America and Africa. Asian countries however show intermediate hip fracture rates. But as three-quarters of the world's population live in Asia, it is projected that Asian countries will contribute more to the pool of hip fractures in coming years. It is estimated that by 2050 more than 50% of all osteoporotic fractures will occur in Asia. The variation in the distribution of hip fracture over different regions of the world demonstrate that genetic and environmental factors play a role in the etiology of hip fracture. The lifetime risk of hip fracture is 17.5 percent for women and 6 percent for men [1].
Proximal femur fractures are divided into three categories: femoral neck and intertrochantric fractures account for 90%, subtrochantric fractures occurring in 5-10%. Intertrochanteric fractures unite readily due to broad fracture surfaces, adequate blood supply and they rarely lead to non-unions. If proper precautions are not taken fractures unite in malposition resulting in shortening, limp and restricted movements. Treatment must involves a combination of surgical fixation, early postoperative physiotherapy and ambulation. The overall goal in the

treatment of hip fractures is to help patient return to his pre-morbid level of function and regain their ability to live independently [2].

Materials and Methods

This study was done in Yenepoya Medical college, Mangalore, India after obtaining the Ethics committee clearance of the institution. Duration of the study was for 20 months from October 1st 2015 to July 31st 2017. The study was a clinical, prospective and observational study.

Inclusion criteria for the study

- Patients above 50 years of age.
- All intertrochanteric fractures treated with DHS.

Exclusion Criteria

- Subtrochanteric fracture patient.
- Patient below 50 years of age

Operative procedure

The patients are taken up for surgery under General, Spinal or Epidural Anaesthesia. The patients are positioned supine on the fracture table with a radiolucent padded counter traction post placed between the patient‘s legs. The uninjured leg is held in wide abduction by a boot attached to one of the leg extensions of the fracture table. The injured leg is held in slight abduction, by a boot attached to other leg extension of the fracture table. The C-arm image intensifier is positioned between the patient‘s legs and the adequacy of both the antero-posterior and true lateral views are verified, before surgical preparation.

Closed reduction of fracture by manipulation is performed. Reduction is checked in the antero-posterior and lateral views in an image intensifier, paying special attention to the posterior and medial cortical contact. If reduction is not achieved by closed manipulation Open anatomical reduction is done. The incision of exposure is the standard lateral approach. The incision begins 5 centimeters, proximal and anterior to the greater trochanter, curving distally and posteriorly over the postero-laterally aspect of the trochanter and then distally along the lateral surface of the thigh, parallel with the femur for about 10 cms. The dissection is deepened in the line of incision down to the fascia lata. The fascia lata is incised with a scalpel in the distal part of the wound and split proximally with scissors. In the proximal part of the wound, the fascia is divided just posterior to the tensor fascia lata muscle. By retraction of the dissected fascia the vastus lateralis muscle and its origin from the inferior border of the greater trochanter is viewed. The muscle fascia is split laterally; the muscle is dissected from its deep surface posteriorly, and divided near the linea aspera. The body of the vastus lateralis is retracted anteriorly, and the perforating arteries are coagulated if they are divided.

The level of insertion of the guide pin is approximately 2 centimeters below the vastus lateralis ridge. The cannulated, power combination reamer is set to the length of the lag screw measured. The reamer is slided over the guide pin, and femur is reamed coaxial to the guide pin, to avoid bending of the guide pin. Tapping is done to avoid excessive torque on the insertion wrench and to minimize risk of inadvertent mal-rotation of the femoral head fragment during final seating of the screw. The appropriate lag screw and plate are assembled onto the insertion wrench. The entire assemble is placed over the guide pin and introduced into the reamed hole. The lag screw is advanced into the femoral head to the predetermined level and its position is verified with image intensification in both planes. When the screw insertion, is complete, the handle of the insertion wrench is perpendicular to the axis of the femoral shaft, which allows proper keying of the lag screw to the plate barrel. Then the side plate is advanced onto the lag screw shaft, lag screw retaining rod is unscrewed and the insertion wrench is removed from the back of the lag screw. Then the guide pin is removed.

Inter-fragmentary compression is obtained using the barrel compression instrument. The 19mm compression screw is threaded into the distal end of the lag screw shaft. The traction of the leg is released and compression screw is tightened to compress the fracture. The position of the lag screw, side plate and fracture compression is confirmed by image intensification in both antero-posterior and lateral views.

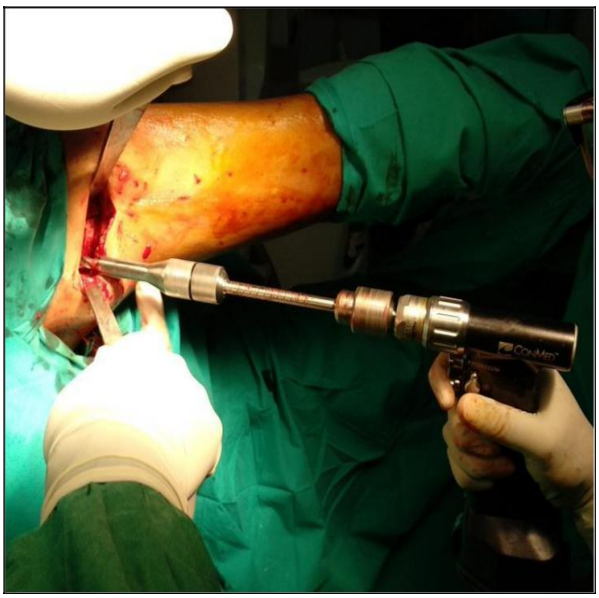
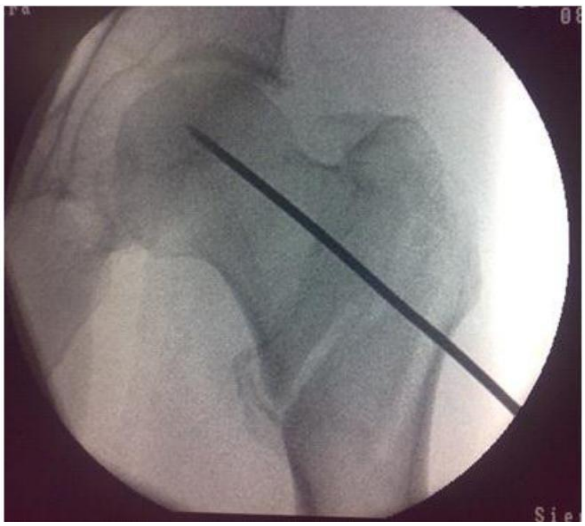


Fig: Incision

Fig: Reaming of head and neck of femur with triple reamer

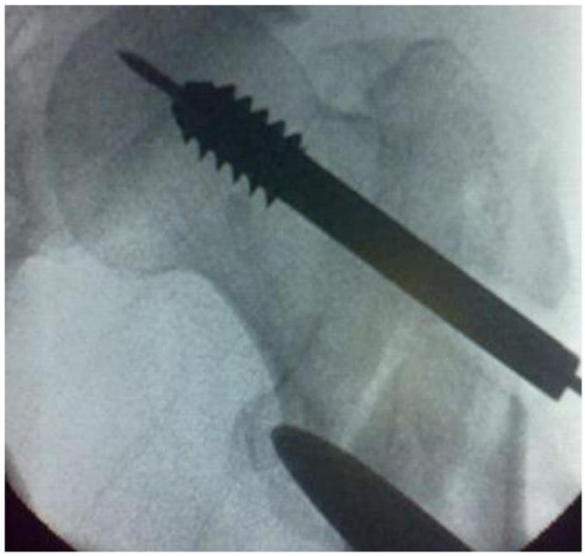
Fig: Screw being inserted with insertion wrench

Fig: Barrel plate inserted into screw

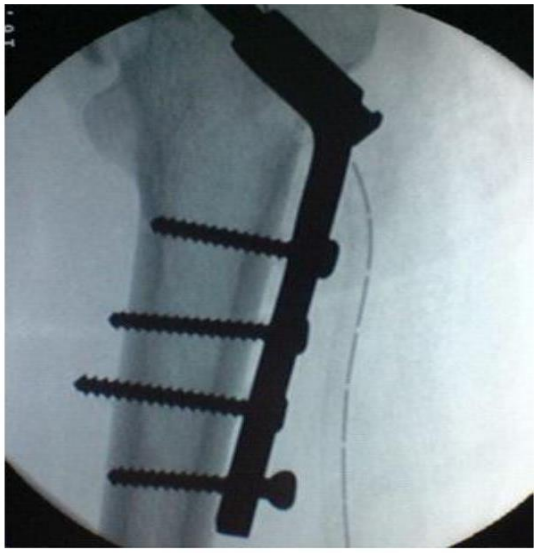


Guide pin inserted

Reaming done with triple reamer



Richard screw insertion over guide pin



Side plate fixed to shaft of femur

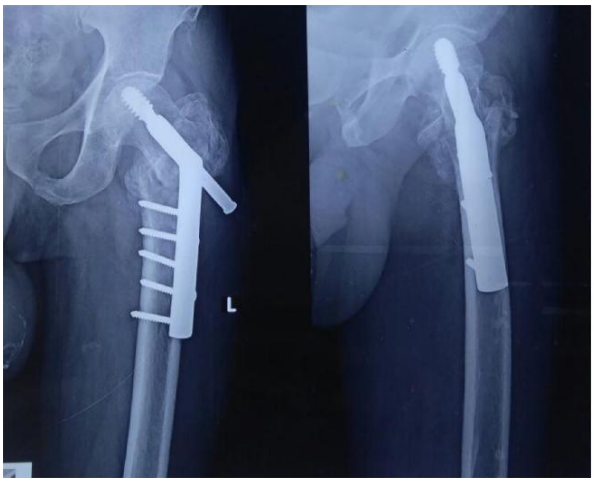
Follow up

The secondary parameters observed was as follows Duration from the day of surgery to mobilization, Infection rates, Duration of stay at hospital.

With each follow up clinical and radiological evaluation was done. The data collected was transferred into a master chart which was subjected to statistical analysis by the Biostatistician of our Institution. Statistical Analysis – Functional outcome of the Patients was evaluated by HIP Assessment Scoring System and results was analyzed by prospective study and percentage.

Pre-operative

Immediate post-op



3 month post-op

6 month operative

Results

In this series 35 patients with trochanteric fracture are admitted in YENEPOYA MEDICAL COLLEGE HOSPITAL, MANGALORE during October 1st 2015 to July 31st 2017 were studied, of these 3 were excluded as they were lost in follow up. Mean age of the study cases was 67.4 years with about a third of them were over 70 years of age. A slight female predominance was observed in present study with 53% females to 47% males. Left sided involvement was seen in 40.6% cases as compared to 59.4% cases with right sided involvement. Most common mode of injury was trivial fall, seen in 81.3% cases.

As per Boyd griffins classification, most of the fractures were of type 2 (68.8%) while 9.4% and 15.6% cases had type 3 and 4 fractures. Percentage of stable fractures was 75% while that of unstable fractures was 25%. In most of the patients level of osteoporosis (Singh Index) was either 3 or 4 confirming that intertrochanteric fractures usually occurs in osteoporotic bone. Most common associated co-morbidity among elderly was Hypertension (46.9%) followed by diabetes (15.6%). In most cases, hospital stay was between 2-4 weeks (78.1%), while in 1 case (3.1%) it was more than 4 weeks. Mean tip Apex distance was 2.12 cm with a min. of 1.7cm and maximum of 2.8 cm. Mean limb length discrepancy was 1.09 cm with a min. of 0.5 cm and maximum of 3.5 cm. Most common screw position was central (53.1%) followed by centro-posterior (18.8%) and centro-inferior (15.6%).

Functional outcome was measured as per Kyles Criteria. At 3 months, good to fair outcome was seen in most cases (81.2%) while poor outcome was observed in 18.8% cases. At 6 months, excellent to good outcome was seen in 62.5% cases while fair and poor outcome was observed in 21.9% and 15.6% cases. No association was observed between age and functional outcome among study cases (p-0.305). No association was observed between Boyd & Griffins classification and functional outcome among study cases (p-0.67). Excellent to good outcome was seen in more cases with Tip to Apex distance of 2 cm or less (10/12 cases) as compared to cases where distance was > 2 cm (10/ 20 cases. The difference was however statistically non-significant (p-0.075). Poor functional outcome was significantly correlated with increasing level of limb length discrepancy. In present study, all the 4 cases with LLD of > 2 cm had poor functional outcome at the end of 6 weeks as compared to only 2 cases out of 13 with LLD < 1 cm ($p<0.01$). No association was observed between hospital stay and functional outcome among study cases (p-0.24).

Discussion

The mean and standard deviation of the age of the patients in this study is 67.4 ± 10.58 years. The average age is higher in western countries compared to our country. The contributing factors for the low average age in Indians will be malnutrition and osteoporosis. The life expectancy of the people from western countries is 10 years more than Indian population. This study has a gender incidence of female to male of 53:47. There is no much gender difference in the present study. The age of the females suggests they are post-menopausal which

causes osteoporosis indicating decreased bone quality and fracture due to trivial trauma. Hypertension is the most common co-morbidity in this study. Diabetes mellitus, Ischaemic heart disease and chronic obstructive pulmonary disease were also associated.

In the present study, type 2 fracture were the most common 68.8%, type 3 was 9.4% and type 4 comprised 15.6% are comparable to the study done by Boyd and Griffins [1,2] but are in contrast to the results reported in the study by Pathak *et al*[10]. Association of Boyd & griffins with functional outcome p value is 0.67 in this study, which is not significant. Percentage of stable fractures was 75% while that of unstable fractures was 25%. This study shows that 12 patients had a Tip Apex distance less than 2 cm and only 20 patients had TAD more than 2 cm. In this study the post-operative screw placement shows that in 17 patients it is centrally placed, postero-inferior in 4 patients, centro-posterior in 6 patients, centro-inferior in 5 patients. Patients with lag screw placed in central and centro-inferior positions had given good functional outcome. According to Vinay Parmar[12] also lag screw placement in central and inferior positions had given good outcomes.

This study shows that the mean duration for hospital stay is 16.44 ± 7.071 days. The minimum stay was 10 days and maximum stay was 34 days due to medical complications. Tage Sahlstrand[11] in his study in 1974 concludes that the average hospital stay for patients operated with dynamic hip screw was 56 days. This shows that because of improved medical facilities and treatment for co-morbidities the average hospital stay is reduced compared to previous studies. This study has given results that patients have given fair results and patients have good results and no excellent result at 6 months out of 32 patients and finally 8 patients have improved to excellent at the end of 1 year. The functional outcome results show that even today intertrochanteric fractures treated with dynamic hip screw give good functional results.

Conclusion

Early surgery on patients with trochanteric fractures improved the ability to return to independent living and complications of prolonged immobilization are prevented. Dynamic hip screw provides satisfactory fixation but success is dependent on many factors like fracture type, fracture reduction, placement of implant, postoperative care and rehabilitation. This study showed Dynamic hip screw to be a versatile, stable, acceptable implant fixation in stable type of intertrochanteric fractures for elderly people.

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