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A Prospective Study on the Functional Outcome of Inter-Trochanteric Fractures Treated With Dynamic Hip Screw

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Abstract: *Fractures of the proximal femur are amongst the most often encountered fractures by an orthopedic surgeon. Many treatment techniques are described in the literature, but the internal fixation with Dynamic Hip Screw is the treatment of choice. This study analyzes the outcome of the treatment of inter-trochanteric fractures with Dynamic Hip Screw. Between December 2017and June 2018, 45 patients with an intertrochanteric fracture who got admitted to Narayana Medical College and Hospital, Nellore, in the department of Orthopaedics were subjected to internal fixation with Dynamic Hip Screw and the results were evaluated. The average age incidence in the present study was 69.91 years. The male-female ratio was almost equal to 51:49. All the fractures occurred after a fall. Evan's stable fractures were more common. Out of the 41 cases, functional outcome evaluated using Harris Hip Sore scoring at their last follow-up:18 cases (44%) had excellent, 11 cases(27%) good, 12 cases (29%) fair. CONCLUSION: Internal fixation with Dynamic Hip Screw is the treatment of choice for the treatment of stable intertrochanteric fractures.*

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I. Introduction

The demographics of world populations are set to change, with more elderly living in developing countries. Asian countries show intermediate hip fracture rates. With rising life expectancy throughout the globe, the number of elderly individuals is increasing in every geographical region, and it is estimated that the incidence of hip fracture will rise from 1.66 million in 1990 to 6.26million by 2050. In the geriatric population, falls are the leading cause of non-fatal injuries and hospital admissions. Proximal femur fractures are divided into three categories: femoral neck and inter-trochanteric fractures account for 90%, sub-trochanteric fractures occurring in 5-10%.[2] 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 also consider effective internal fixation to help early mobilization and to reduce morbidity.[3]A combination of surgical fixation, early postoperative physiotherapy, and ambulation is usually the best approach. The overall goal in the treatment of hip fractures is to return the patient to the pre-morbid level of function. Among the various internal fixation devices used for trochanteric fractures, the dynamic hip screw with a sliding plate is one of the implants which permits the proximal fragments to collapse or settle, seeking its position of stability. In our study period of two years, 45 cases, according to the inclusion criteria, were radiologically classified and treated surgically as early as possible. These fractures were treated with dynamic hip screws and plate system. A study was undertaken to study the effectiveness of the DHS, and Tip Apex distance, stability, reduction and the functional outcome with Harris Hip score.[4]

II. Materials And Methods

Study Design: Prospective study
Study Location: This was a tertiary care teaching hospital-based study done in Department of orthopedics in Narayana Medical College and Hospital, Nellore
Study Duration: between December 2017 and June 2018
Sample size: 45 patients.
Subjects & selection method: By follow up at intervals 1st, 3rd, 6th months, respectively, and 1-year post Operatively. The cases at follow up were analyzed both clinically and radiologically, and
Protocols were filled
Inclusion Criteria
1. Cases of intertrochanteric fractures- Evans classification both stable and unstable fractures.
2. Patients with age 45 years and above and both sexes are included.

Exclusion Criteria

1. Patients with sub-trochanteric fractures, fractures extending into the femoral shaft, intra-capsular fracture neck femur.
2. Patients unfit for anesthesia.

PROCEDURE OF THE STUDY

Pre-operative

Patients admitted with trochanteric fractures were examined, and X-rays of the hip in anterior-posterior and lateral views were obtained. In the pre-operative radiographs, Evan's type of fracture and quality of bone by Singh's index was assessed. Skin traction with the weight of 3-4 kilograms was applied. Oral and parenteral NSAIDswere used to relieve pain. Routine blood investigations, ElectroCardiograph (ECG), chest radiographs were obtained routinely. Physician opinion regarding fitness was obtained, and Echocardiography obtained as per cardiologist opinion if needed.

Fractures were classified according to Evans. The patient was advised to perform chest physiotherapy, static quadriceps exercises preoperatively. The pre-anesthetic evaluation was done for all cases. Parenteral 3rd generation cephalosporin was administered 1 hour before surgery. Part preparation was done on the morning of surgery or before shifting the patient to the operation theatre. Foley's catheterization was done before surgery.

Operative procedure

1.Type of anesthesia: spinal anesthesia

2. Surgery

Position: The patient was positioned in the supine position. The fracture table was used as per the choice of the surgeon. The fracture was reduced with Whitman's technique and reduction checked under C-arm in Antero-posterior and lateral views. This reduction was held by fixing the foot to foot holder.

Exposure: Parts painted and draped. Watson –Jones lateral approach used. The skin incision was made about 5 centimeters proximal and anterior to the greater trochanter and was curved distally and posteriorly over the poster-lateral aspect of the trochanter. The length of incision dependent on the length of the barrel plate to be used. The incision was deepened down to the fascia, exposing vastus laterals muscle which is retracted posteriorly and then perforating branches of profunda femoris identified and ligated. After dividing muscle along the femur for required distance, it is elevated with a periosteal elevator and lateral and anterolateral surfaces of femoral shaft exposed — the capsule of the joint divided to expose fractures. Superior and inferior borders of the femoral neck identified, and two guide pins were passed along their borders.

Guide pin insertion: POINT OF INSERTION: lateral aspect of femoral shaft midway between anterior and posterior cortices approximately 2 centimeters below the flare of the greater trochanter (i.e.vastus lateralis ridge). A fixed or dynamic angle guide measuring 135º is used until the resistance is felt. A stabilizing pin was inserted 1-5 centimeters proximal to the first guide pin. Confirmation was done with an image intensifier in both anterior-posterior and lateral views.

Reaming of femur: A triple reamer with the reamer set 5 mm shorter than the length of the guide pin used in osteoporotic, else reamed to the length of the guide pin.

The tapping of the femoral head: Tapping of the femoral head was done in patients with good bone quality but avoided in osteoporotic patients.

Selection of a lag screw: Measuring scale is used to assess the length of the lag screw.

Insertion of a lag screw: Using a lag screw introducer, screw introduced and checked on image intensifier.

Attachment of plate: A 135º barrel plate was secured to the femoral shaft and fixed with a 4.5-millimeter cortical screw.

Application of compression screw: The compression screw is threaded into the distal end of the lag screw and tightened to compress the fracture after the release of the traction. The final position is conformed, joint movement checked passively (for short movements). Wound washed thoroughly and closed in a layer over a suction drain.

Postoperative

Post-operative radiographs were obtained. Adequate analgesics, I.V antibiotics till 5th post-operative day(POD). Oral antibiotics from POD 6, till suture removal. The drain removal on POD 2. Foley's catheter removal POD 3 and wound inspected on POD 5. By POD 10-12, all sutures were removed. The patient was made to sit upon the bed, chest physiotherapy, and static quadriceps exercises started from POD-2. Patients included in the study were reviewed regularly in the out-patient department at 1st month, 3rd month, 6th month, and one year.

Radiographic assessment was done at each visit as

a. Tip apex distance
b. Migration of screw
c. Cutting out of screw
d. Implant failure,
e. Infection

Clinical evaluation was done by the Harris hip scoring system for six months and 1year.

Statistical methods applied:

Statistical software used: SPSS 16 versions were used for the analysis of the data.

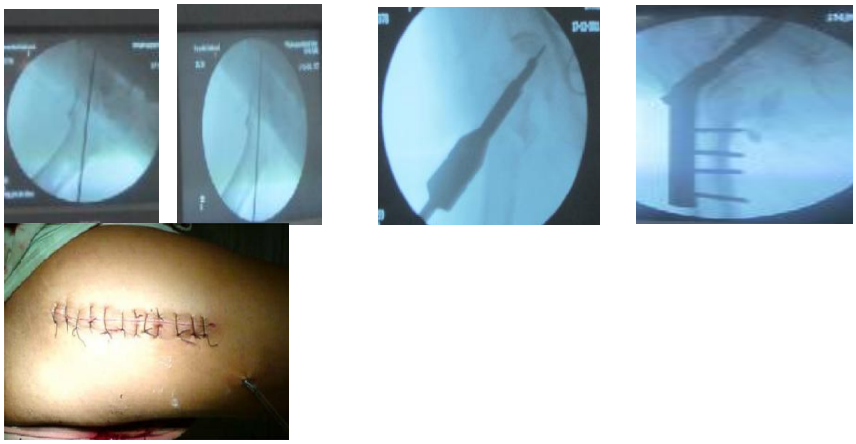
Statistical tests used:

Descriptive statistics like mean, percentage, and standard deviations were used.

Chi-Square test of significance for proportions.

INTRA-OPERATIVE PICTURES

CLOSED REDUCTION UNDER C-ARM DRAPING INCISION SUPERFICIAL and DEEP DISSECTION



GUIDE WIRE in AP & LAT VIEW TRIPLE REAMING SLIDING HIP SCREW APPLIED SUTURING WITH DRAIN

ONE YEAR FOLLOW UP WITH EXCELLENT RESULTS

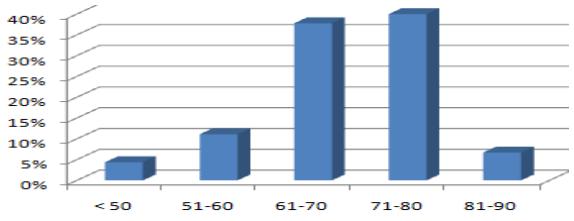
ACTIVE FLEXION ABDUCTION INTERNAL ROTATION EXTERNAL ROTATION ADDUCTION

III. Results

The following observations were made from the data collected during this study:

TABLE 1: DISTRIBUTIONS OF SUBJECTS ACCORDING TO AGE:

Age group in years	Number	Percentage
< 50	2	4.40%
51-60	5	11.10%
61-70	17	37.80%
71-80	18	40.00%
81-90	3	6.70%
Total	45	100%

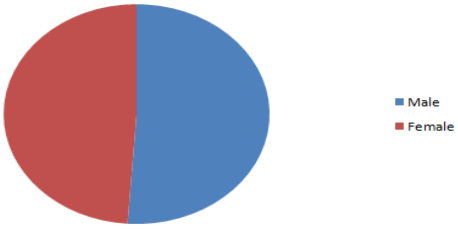


GRAPH 1

The mean and standard deviation of the age of the patients is 69.91 ± 9.07

TABLE 2: STUDY SUBJECTS DISTRIBUTION ACCORDING TO GENDER:

Gender	Number	Percentage
Male	23	51.10%
Female	22	48.90%
Total	45	100%



GRAPH 2

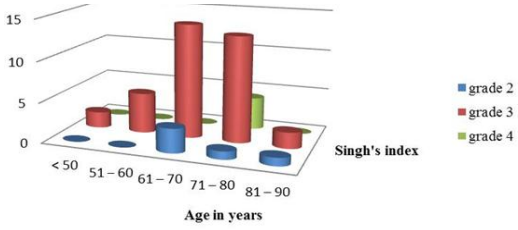
TABLE 3: DISTRIBUTION ACCORDING TO EVANS CLASSIFICATION:

Evans Type	Number	Percentage
Stable	28	62.20%
Unstable	17	37.80%
Total	45	100%

GRAPH 3

TABLE 4: DISTRIBUTION ACCORDING TO AGE AND SINGH'S INDEX:

Age in years	Singh's index grade		
	2	3	4
< 50	0	2 (5.6%)	0
51 – 60	0	5 (13.9%)	0
61 – 70	3 (60%)	14 (38.9%)	0
71 – 80	1 (20%)	13 (36.1%)	4 (100%)
81 – 90	1 (20%)	2 (5.6%)	0

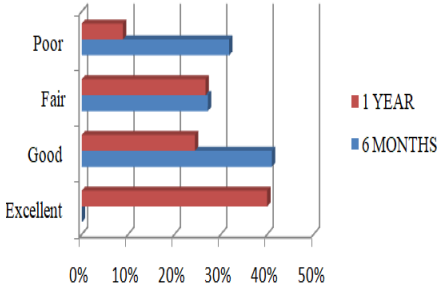


GRAPH 4

X2 = 9.8 df = 8 p = 0.27 it is not significant.

TABLE5: DISTRIBUTION ACCORDING TO HARRIS HIP SCORE AT 6 MONTHS AND 1 YEAR:

HHS	NUMBER (6-MONTH)	PERCENTAE (6 MONTH)	NUMBER (1 YEAR)	PERCENTAGE (1 YEAR)
EXCELLENT [90-99]	0	0	18	40%
GOOD [80-89]	18	41%	11	24.40%
FAIR [70-79]	12	27.20%	12	26.70%
POOR [<70]	14	31.80%	4	8.90%
TOTAL	44	100%	45	100%

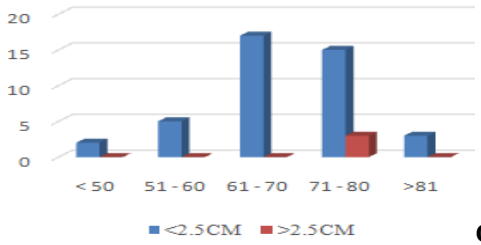


GRAPH 5

TABLE 6: TIP APEX DISTANCE ACCORDING TO AGE:

Age in years	< 2.5 cm	< 2.5 cm
< 50	2	0
51 - 60	5	0
61 - 70	17	0
71 - 80	15	3
>81	3	0

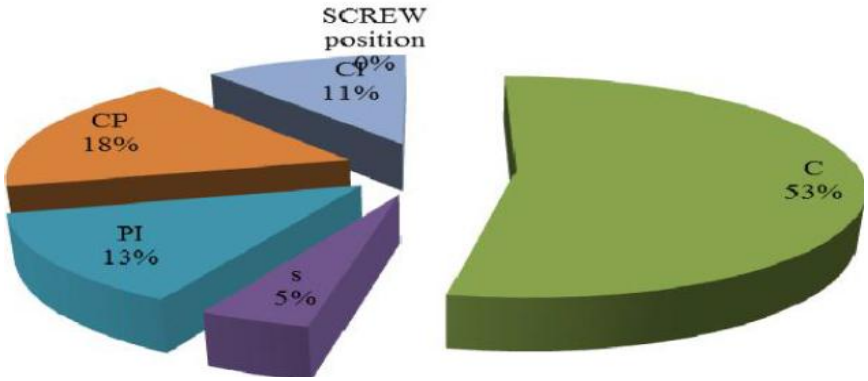
X2 = 4.8 df = 4 p = 0.30 not significant



Series 1 = < 2.5 cm; series 2 = > 2.5 cm

GRAPH 6

GRAPH 7: DISTRIBUTION OF THE PATIENTS ACCORDING TO POSITION OF SCREW



IV. Discussion

The present study was done at the Department Of Orthopaedics, Narayana Medical College, Nellore, during the period from December 2017 to June 2018. In the study, a total of 45 cases of intertrochanteric fracture of femur treated by using dynamic compression screw and plate were evaluated.

Patients admitted here were evaluated pre-operatively; details were collected in a proforma, operated, and followed up regularly on OPD basis. The data collected in this series are analyzed and compared with other studies for age incidence:

Table 7: Age Incidence Compared With Other Studies

Baumgaertner et al	**77 years**
Tage sahlstrand	**75 years**
Ali sedighi	**76.7 years**
R K Kanojia	**56.79 years**
Bolhofner, Brett R	**79 years**
Present study	**69 years**

The mean and standard deviation of the age of the patients in this study is ± 9.07. The average age is higher in western countries compared to our country.

1) The contributing factors for the low average age in Indians will be malnutrition and osteoporosis.
2) The life expectancy of people from western countries is ten years more than the Indian population.

Gender incidence

This study has a gender incidence of male to female of 51:49. There is no such gender difference in the present study.

Table 8: Gender incidence compared with other studies

Baumgaertner et al.	**27: 73**
G.S Kulkarni	**46: 54**
Ian .J Harrington	**13 : 87**
R.K Gupta	**40: 60**
Sanjay Agrawala	**29: 71**
Present study	**51: 49**

The above studies show there is a strong female predominance due to various reasons:

The age of the females suggests they are post-menopausal which causes osteoporosis indicating decreased bone quality and fracture due to trivial trauma

Fracture distribution, according to Evans classification:
This study has 28 stable fractures and 17 unstable fractures. Ali Sedhigi from Iran had had similar results with 72 % stable fractures and 28 % unstable fractures.

Table 9: Fracture distribution according to Evans classification

Study	Stable	Unstable
Ali Sedhigi	**72 %**	**28 %**
Baumgaertner	**45 %**	**55 %**
Present study	**62 %**	**38 %**

Baumgaertner in 1995 had different results with stability. They had 45 % stable fixation and 55 %unstable fixations.

Tip apex distance according to age:
This study shows that 42 patients had a Tip Apex distance of less than 2.5 cm, and only three patients had a TAD more than 2.5 cm.
R K Gupta had similar results in his 64 patients, with ten patients have Tip Apex Distance more than 2.5 cm, and 54 patients have Tip Apex Distance less than cm. The patients with TAD less than 2.5 cm had no complications.
Baumgaertner, S.G gooi, Ali Sedhigi, Ted Tuescu in their studies have concluded that patients with Tip Apex distance less than 2.5 cm had given good results once again, strengthening the fact that Tip Apex distance is a major predictor of good fracture union and cut out failure.

Harris hip score at one year:
This study has given results that 18 patients out of 44 patients have given good results at six months, and 18 patients have improved to excellent at the end of 1 year.

Table 10: Harris Hip Score at one year:

Study	Mean HHS
Yih Shiunn Lee	86.9 ± 5.3
M. Guven and Kjell matre et al.	88.9 ± 6.27
Present study	83.75 ± 15.23

The functional outcome results show that even today, intertrochanteric fractures treated with dynamic hip screw give good functional results.

V. 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, Tip Apex Distance, postoperative care, and rehabilitation. This study showed Dynamic hip screw to be a versatile, stable, acceptable implant fixation in trochanteric fractures.

In the present study, 45 cases of intertrochanteric fractures of the femur were managed by the dynamic hip screw and barrel plate. The data obtained was analyzed**,** and the results evaluated.

The average age incidence in the present study was 69.91 years. The male-female ratio was almost equal to 51:49. Evan's stable fractures were more common.1 patient died on 7th post-operative day due to medical complications. Three patients were lost for one year follow up, however Tip Apex Distance was calculated post-operatively. The position of the implant in the immediate postoperative X-ray and results was evident that results and functional outcomes were good when positioned centrally. Overall, 41 cases were followed up for one year. Out of the 41 cases, evaluated using Harris Hip Sore scoring at their last follow-up:18 cases (44%) had excellent, 11 cases (27%) good, 12 cases (29%) fair with a mean HHS as 83.75 ± 15.23.

Conflict of interest:
The authors declare that there is no conflict of interest.
Funding:
There is no sponsor for this study.
Ethical Approval:
Written informed and signed consent is obtained from the patient for publication of this case report.

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