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Study of Dynamic Hip Screw Fixation for Intertrochanteric Fractures of Femur in Adults

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Introduction

Intertrochanteric fractures account for nearly 50% of fractures around hip. They continue to be a major cause of disability leading to reduced quality of life and also death. 90% Intertrochanteric fractures of femur in elderly occurs commonly through osteoporotic bone due to simple fall[1,2], where as in young individuals it may be a result of high energy injury such as motor vehicle accident or fall from height.[2]

Trochanteric fractures present a huge threat to life. If they are not treated, they may cause a considerable change in quality of life; which results in greater percentage of deaths. Thereby increase mortality or morbidity.

Intertrochanteric fractures represent perhaps the most important public health problem the orthopaedic surgeon facing today. Being common among old age patients, this would need more care and sort out an effective treatment option available today to reduce morbidity and provide mobility.

More than 280,000 hip fractures occur in the United States every year, and this incidence is expected to double by 2050. These fractures are associated with substantial morbidity and mortality; 30% of elderly patients die within 1 year of fracture. After 1 year, patients seem to resume their age-adjusted mortality rate.[3]

In geriatric population, fall is the leading cause of nonfatal injuries and hospital admissions. Proximal femur fractures are divided into three categories:

- femoral neck
- intertrochanteric fractures
- subtrochanteric fractures

Although intertrochanteric fractures unite invariably with conservative treatment, high rate of complications associated with this method makes stable reduction and rigid internal fixation the method of choice. Intrinsic factors such as osteoporosis and communition are beyond the control of surgeon. Extrinsic factors like choice of reduction of the fracture, the type of implant used and technique of its application are within his control.[4]

If proper precautions are not taken fractures unite in coxa vara deformity resulting in shortening, and limits hip movements.

While rehabilitation interventions to decrease the risk of falls and thus prevent hip fractures are of utmost importance, post-fracture rehabilitation care is also crucial. A combination of orthopaedic surgery and early postoperative physiotherapy and ambulation is the best approach. The overall goal in the treatment of hip fractures is to return the patient to pre-morbid level of function.

Rigid fixation with early mobilization of the patient is the goal of treatment in intertrochanteric fracture of femur. Restoration of mobility in patients with intertrochanteric fracture ultimately depends on strength of surgical construct. Although many devices can achieve rigid fixation the Dynamic Hip Screw is the most commonly used device for intertrochanteric fracture of femur[1.] The DHS lag screw easily glides within DHS plate barrel for controlled collapse and impaction of fragments leading to uneventful healing and early mobilization. [5]

In our hospital, the treatment consists of assessment of general health the at the time of admission as per the guidelines. Fractures were radiologically classified and treated surgically with closed reduction. The patients with intertrochanteric fractures were treated with dynamic hip screws and plate system. A study was undertaken to study the effectiveness of the Dynamic Hip Screw and complications associated with the procedure.

Aims & Objectives

1) To study the functional outcome of surgical management of intertrochantric fractures in adults with dynamic hip screw.
2) To study the effectiveness and complications of operative management of intertrochantric fracture of femur using dynamic hip screw.
3) Study etiopathogenesis of trochanter fractures with respect to age, sex, incidence.
4) Analyse advantages and disadvantages of surgical interventions.
5) Study the failure rates of surgical treatment using DHS and associated morbidity with the procedure.
6) To study the associated concomitant condition and their influence on management of intertrochanteric fractures.

Patients & Methods

The cases for the study were collected from patients who were admitted to Prathima Institute of Medical sciences, Nagunoor, Karimnagar, Telengana diagnosed with inter trochanteric fractures. 50 such cases were selected between September 2013 and June 2016 were considered patients and their relatives were explained the condition of the patient. Informed consent obtained and all details of the patients were collected in a preformed proforma.

Patients were admitted to the ward, detailed history taken with particular emphasis on mode of injury and medical illness. Cardiovascular and respiratory system evaluation done prior to surgery.

Following discharge, regular follow up was done on outpatient department for 3 to 6 months in most of the cases. Need for readmission was also considered if required. In case physiotherapy was needed, patients were referred accordingly on OPD basis.

Method of Collection of Data

- By interview
- By follow up at intervals 1,2,3,4 and 6 months post operatively
- The cases at follow up were analysed both clinically and radiologically

Inclusion Criteria

1) All fractures of trochanter as classified by Boyd and Griffin.
2) Fractures of trochanter in patients age above 18yrs, with stable, unstable and comminuted fractures.
3) Patient willing for treatment and given informed written consent.

Exclusion Criteria

1) Patient aged below 18yrs.
2) Not willing for treatment.
3) Medically unfit for surgery.
4) Compound fractures associated with vascular injuries, ipsilateral shaft fractures and pelvic fractures.
5) Old malunited fractures
6) Trochanter fractures associated with neck of femur/head of femur.
7) Trochanter fractures associated with shaft of femur
8) Trochanteric fractures associated with dislocation of hip/knee

Procedure of the Study

Pre operative

Patients admitted with trochanteric fractures were examined and X-rays of hip in antero posterior and possible/need be lateral views obtained. Skin traction with weights up to 2 kgs applied and in old cases and where surgery delayed because of other medical causes skeletal traction with 5-6 kgs applied over Bohler Braun splint.

Oral and parentral NSAIDs available in the hospital used in most cases to relieve pain.

Routine blood investigations like, Complete blood count, urine routine, bleeding and clotting time, blood urea, serum creatinine, random blood sugar, Electro cardiograph (ECG), chest X-rays were obtained routinely, physician opinion regarding fitness was obtained and Echocardiography obtained as per cardiologist opinion if need be.

Patient was advised to perform both static and dynamic quadriceps exercises. Pre anesthetic evaluation was done for all cases and American society of Anesthesiologist (A.S.A) grading system used prior to surgery. Parenteral 2nd generation cephalosporin were administered 1 hour prior to surgery.

Shaving and scrubbing was done morning of surgery else before shifting patient out of waiting room.

Operative Procedure

1. **Type of anesthesia**

i. General anesthesia
ii. Spinal anesthesia
iii. Epidural anesthesia
iv. Combined spinal and epidural

2. **Surgery**

Position: Patient was positioned in supine position on a fracture table and closed reduction was done and reduction checked using C-arm in both AP and Lateral views.

3. **Exposure**

- Draping was done adequately from xiphisternum up to foot. Lateral approach to proximal shaft and trochanteric region used. Incision was made over proximal femur laterally beginning from the middle of the greater trochanter extending distally. The length of incision depends on length of implant used.
- Incision was deepened down to fascia lata, with a scalpel in the distal part of the wound and was split proximally with scissors. In proximal part of the wound fascia lata divided posterior to the tensor fascia latae muscle.
- By retracting, vastus lateralis muscle and its origin from the inferior border of the greater trochanter. Exposed vastus lateralis is then divided near linea aspera.
- The vastus lateralis muscle 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.

Guide pin insertion

- Point of insertion: lateral aspect of femoral shaft midway between anterior and posterior cortices approximately 2 cms

below the flare of grater trochanter (i.e. vastus lateralis ridge).

- An entry point was made using power drill with the help of image intensifier.
- Using fixed/dynamic angle guide measuring $130^0/135^0/140^0$, guide pin mounted on a T handle inserted till the resistance is felt.
- Conformation was done with image intensifier.

Reaming of femur

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

Tapping of femoral head

Tapping of femoral head done in patients with good bone quality but avoided in osteoporotics.

Selection of lag screw

Preoperatively on the X-rays a line is drawn in the centre of head extended along the axis up to femoral cortex. A 10% deduction in length was done to account for magnification and also measured during surgery using a direct measure.

Insertion of lag screw

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

Attachment of plate

A $130^0/135^0/140^0$ barrel plate was secured to femoral shaft and fixed with 4.5 mm cortical screw.

Application of compression screw

Compression screw is then inserted into the distal end of lag screw and tightened to compress the fracture after release of the traction. Final position is confirmed, joint movement checked passively (for short movements). Wound washed thoroughly and closed in layers and sterile dressing applied over a suction drain in required cases.

Postoperative

Patient was initially observed in the recovery room later shifted to ward. Adequate analgesics, I.V antibiotics given up to 48 to 72 hours post operatively. Post OP check X-rays obtained. After Parenteral antibiotics oral antibiotics were administered till sutures removed. Oral antibiotics were continued after discharge if infection was found.

Drain was removed at end of 24 hours, wound inspected at 2^{nd} post op day. Alternate suture removal done and by $8\text{-}10^{th}$ day all sutures were removed. Patient was made to sit up on bed and Static quadriceps exercises started from 2^{nd} day. Patient reviewed regularly after discharge at OPDs for a period of 3 to 6 months. Partial weight bearing allowed from second week and full weight bearing from sixth week with walkers. Cases included in the study were followed up regularly.

Radiographic assessment was done at each visit to see

i. Normal and stable fracture union
ii. Migration of screw
iii. Cutting out of screw
iv. Implant failure

Clinical evaluation was done assessment for pain, swelling, infection and mobility, deformity, wound status, limb length, walking ability determined on follow up.

Salvati and Wilson hip scoring system was used for evaluation.

SALVATI-- WILSON SCORING SYSTEM (Hospital for Special Surgery – hip rating system)

Pain

0 = Constant and unbearable, Frequent strong analgesia

2 = Constant but bearable. Occasional Strong analgesia

4 = Nil or little at rest. With activities

6 = Little pain at rest. Pain on activity

8 = Occasional slight pain

10 = No Pain

Walking

0 = Bedridden

2 = Wheel chair

4 = Walking frame

6 = One stick, limited distances up to 400 yards

8 = One stick, long distances

10 = Unaided and unrestricted

Muscle power and motion

0 = Ankylosis with deformity

2 = Ankylosis with good functional position

4 = Poor muscle power, Flexion < 60^O abduction < 10^O

6 = Fair muscle power. Flexion 60^O -90^O abduction 10^O -20^O

8 = good muscle power. Flexion >90^O abduction > 20^O

10 = Normal Muscle power. Full range of movement

Function

0 = Bedridden

2 = House bound

4 = Limited housework

6 = Most housework, can shop freely

8 = Very little restriction

10 = Normal activities

Grading of results

Score

> 31 = excellent,

24-31 = good.

16-23 = fair,

< 16 poor

Results

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

Table 1: Distribution of sample by age groups and sex

AGE GROUP (YEARS)	Total No of Cases	Male	Female
<20 yrs	1	1	0
21-40 yrs	5	2	3
41-60 yrs	16	11	5
61-80 yrs	27	17	10
>80 yrs	1	1	0
total	50	22	18

Graph 1: Distribution of sample by age groups and sex

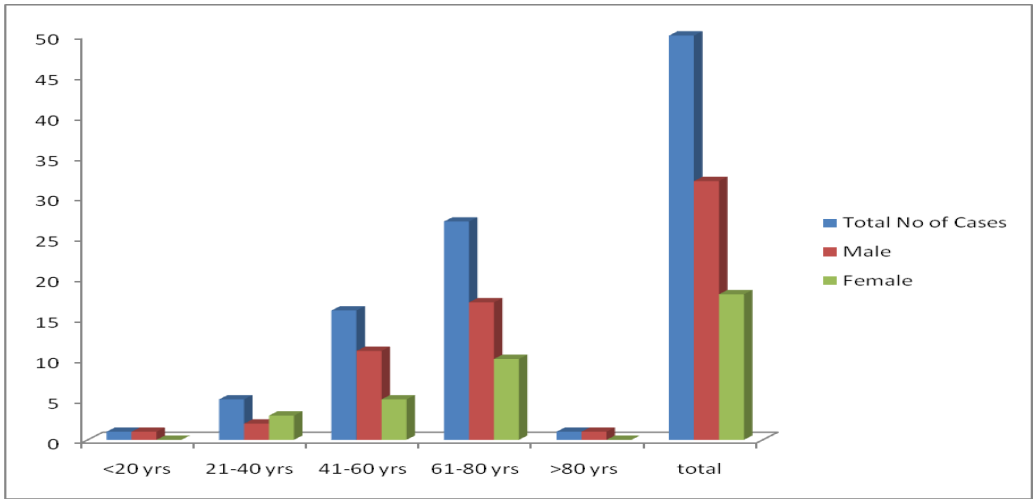


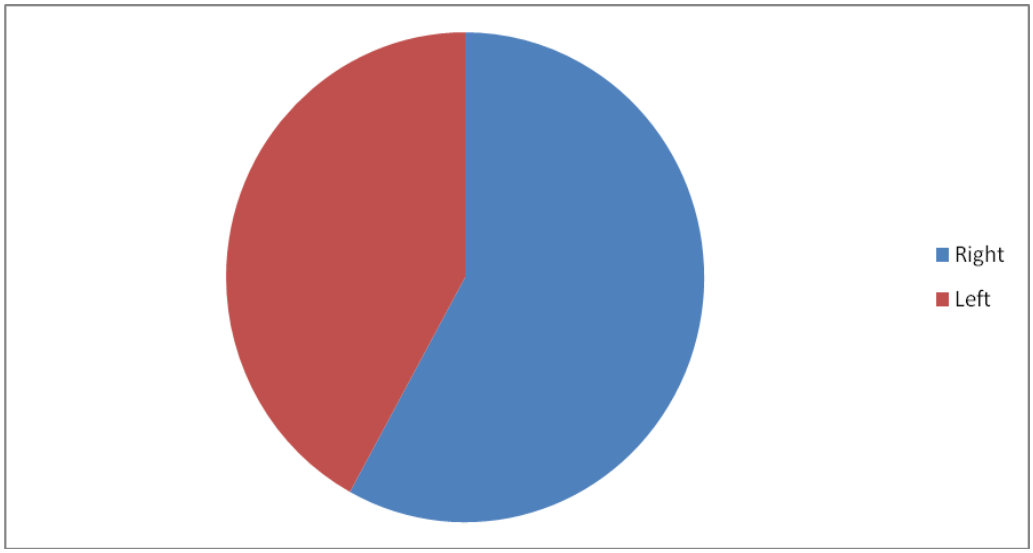
Table 2: Distribution of sample by gender

GENDER	No.of.cases	%
Male	32	64%
Female	18	36%
Total	50	100

Table 3: Distribution of sample by affected side

Side	No. of cases	%
Right	29	58
Left	21	42
Total	50	100

Graph 2 : Distribution of sample by affected side

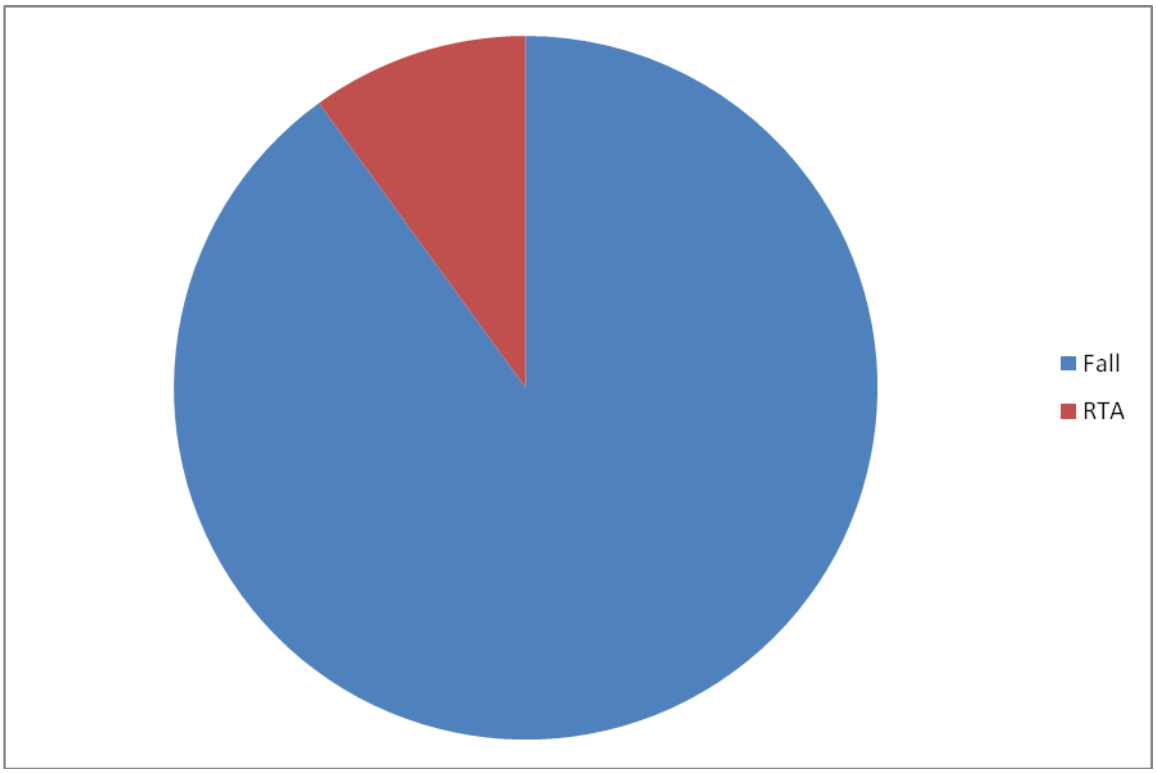


Intertrochanteric fractures of right hip was affected in 29 patients and left hip in 21 cases.

Table 4: Distribution of sample by mode of injury

Mode	No. of cases	%
Fall	45	90
RTA	5	10
Total	50	100

Graph 3 : Distribution of sample by mode of injury



Significantly we find more cases occurring after falls (90%) than RTA (10%).

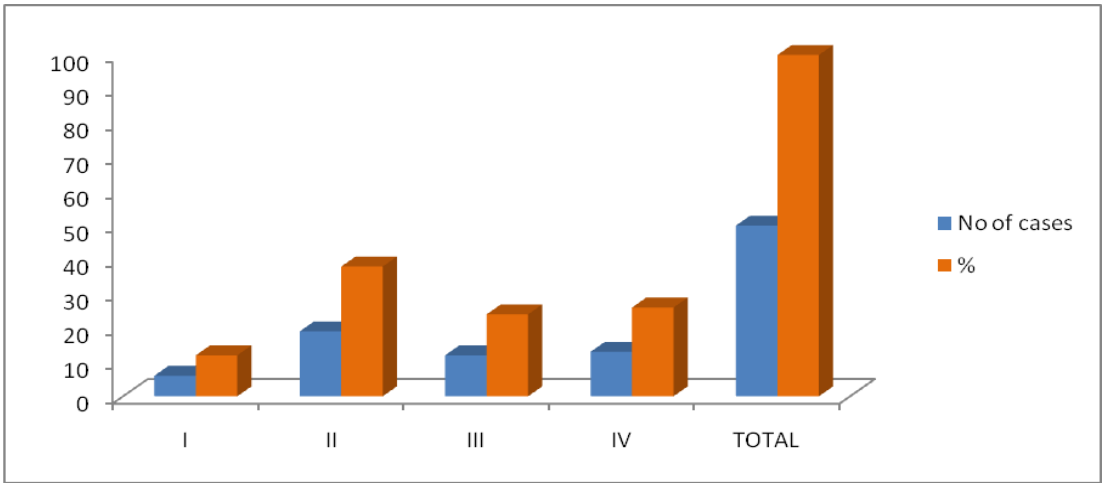
Table 5: Distribution of sample by type of fracture

Boyd and Griffin Type

TYPE	No of cases	%
I	6	12
II	19	38
III	12	24
IV	13	26
TOTAL	50	100

We find more cases were displaced intertrochanteric fractures Type II (38%) common in the present study.

Graph 4 : Distribution of sample by type of fracture

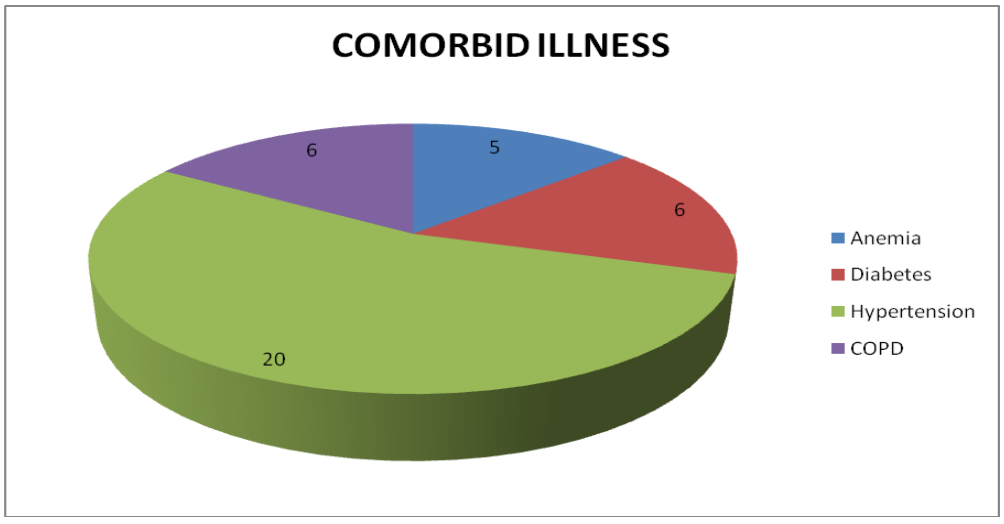


Significantly we find more type II fractures when compared to I/III/IV.

Table 6: Distribution of patients by comorbid status

COMORBIDITIES	NO.OF CASES	%
Anemia	5	10
Diabetes	6	12
Hypertension	20	40
COPD	6	12

Graph 5: Distribution of patients by comorbid status

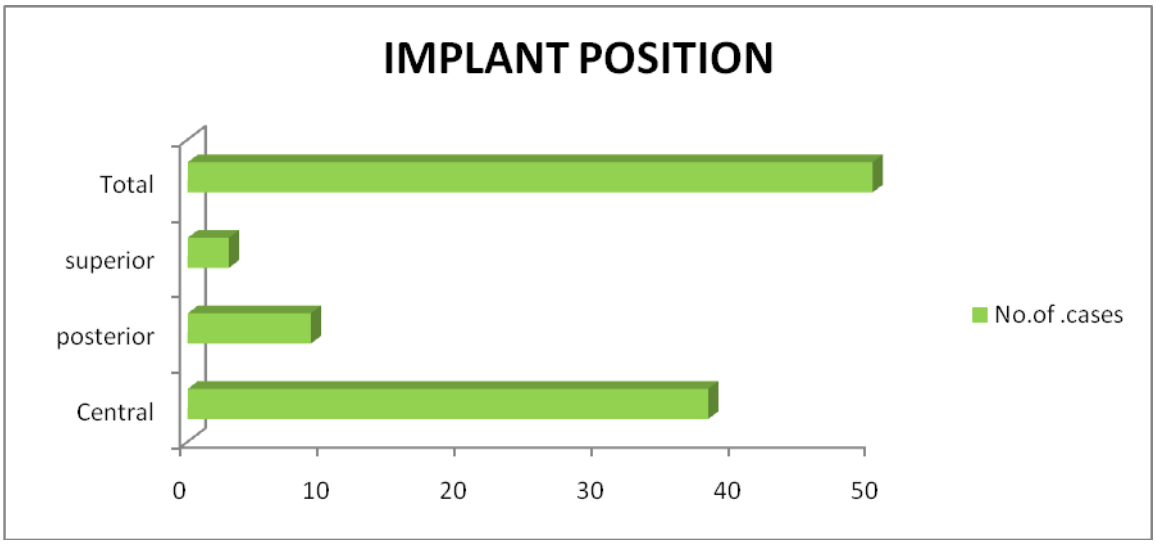


We find that HTN occurring more and DM, COPD, Anemia occurring less frequently occurring in the present study.

Table 7: Distribution of sample by position of implant at immediate postoperative X-ray

POSITION	No.of .cases	%
Central	38	76
posterior	9	18
superior	3	6
Total	50	100

Graph 6 : Distribution of sample by position of implant at immediate postoperative X-ray

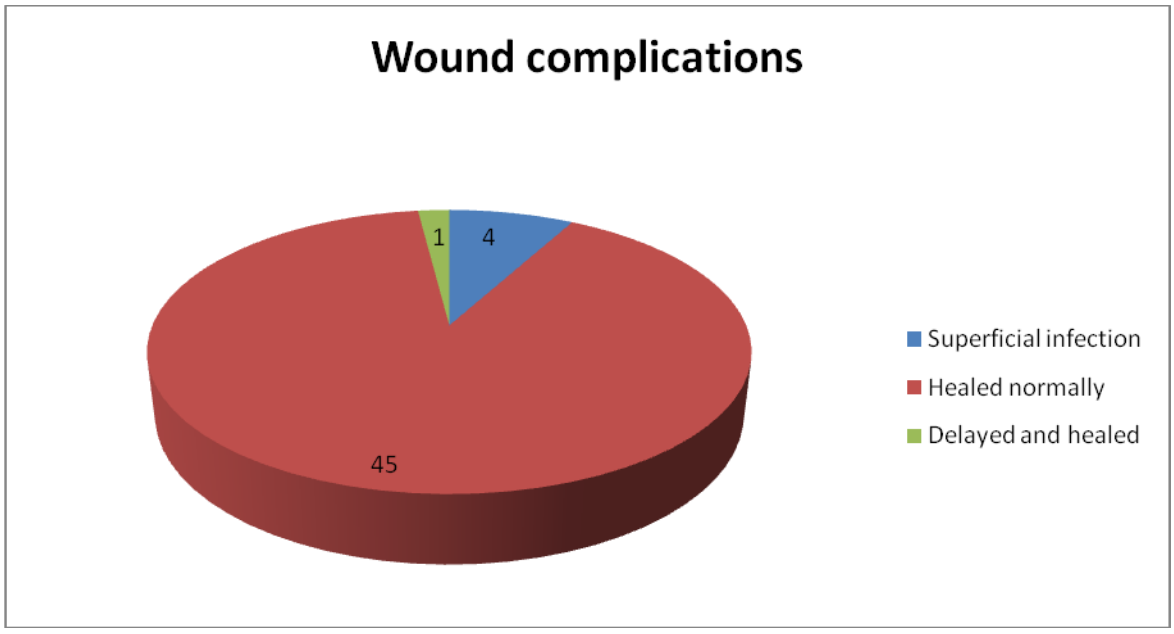


During immediate postoperative X-ray by position of implant though statistically non-significant, majority had central position (76%) then posterior (18%) and least were found in superior (6%)

Table 8: Distribution of sample by postoperative wound complication

Wound	No.of cases	%
Superficial infection	4	8
Healed normally	45	90
Delayed and healed	1	2
Total	50	100

Graph 7 : Distribution of sample by postoperative wound complication



Majority of cases healed normally (90%). 4 case had superficial infection. In 1 case wound healing was delayed because of deep infection but healed well after debridement and iv antibiotics for 3 weeks. This observation is found to be statistically significant.

Table 9: Descriptive statistics for mean duration of hospital stay

MAXIMUM	MINIMUM	MEAN	SD
43	11	18.26	6.11

The mean duration of hospital stay for the entire sample was found to be 18.26 □ 6.11 days.

Table 10: Distribution of sample by pre operative duration of stay

Pre OP Stay

Duration	No.of cases	%
<5 days	23	46
6-10 days	20	40
11-15 days	6	12
16-20 days	0	0
>20 days	1	2

Table 11: Distribution of sample by postoperative stay

Post OP Stay

Duration	No.of cases	%
<5 days	0	0
6-10 days	30	60
11-15 days	12	24
16-20 days	8	12
>20 days	0	0

In the present study, we find majority of cases had postoperative stay for 6-10 days (60%).

Table 12: Distribution of sample by postoperative complications follow up at 3 months – 6 months period evaluation

Complications	No.of cases	%
Limping	6	12
Knee stiffness	2	4
Coxa vara	0	0
Shortening	9	18
Occasional pain	27	54
Mild -moderate pain	21	42
severe pain	2	4

Most patients in the present study had pain, which was relieved by medications (among patients with occasional pain 27 cases, mild to moderate pain 21 cases) limping was observed in 6 cases, shortening in 9 cases and knee stiffness in 2 cases, which improved with physiotherapy.

Graph 8: Distribution of sample by postoperative complications follow up at 3 months – 6 months period evaluation

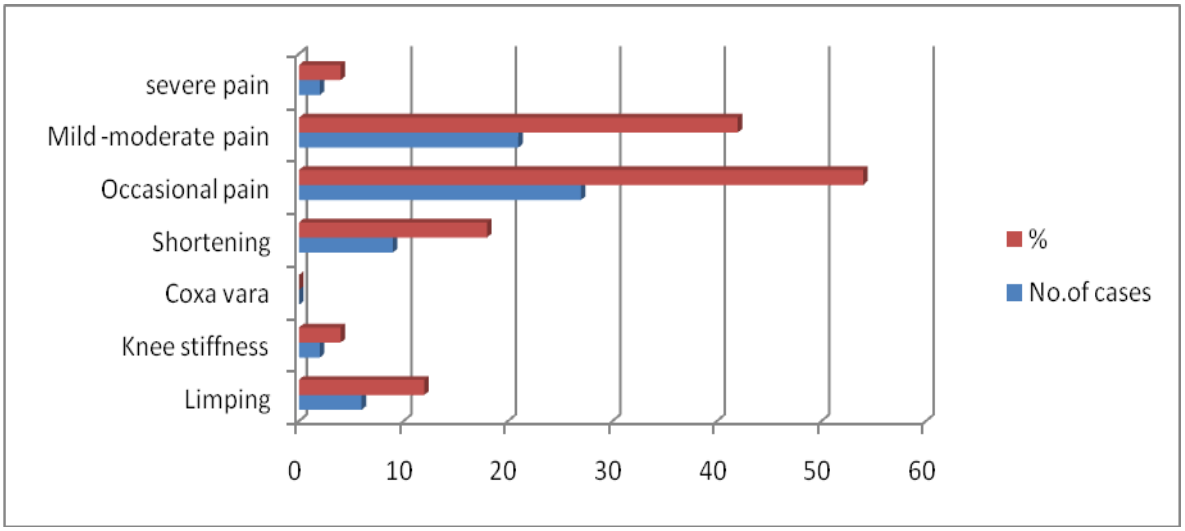


Table 13: Distribution of sample by Salvati-Wilson hip evaluation

SALVATI WILSON GRADE	No. of cases	%
Excellent	13	6
Good	18	6
Fair	15	0
Poor	4	8
Total	50	00

40 cases (80%) had scores above 20 points (20/40). This is comparable with Al-Yassan et al. in which 78% had score above 20 points.

Graph 9: Distribution of sample by Salvati-Wilson hip evaluation

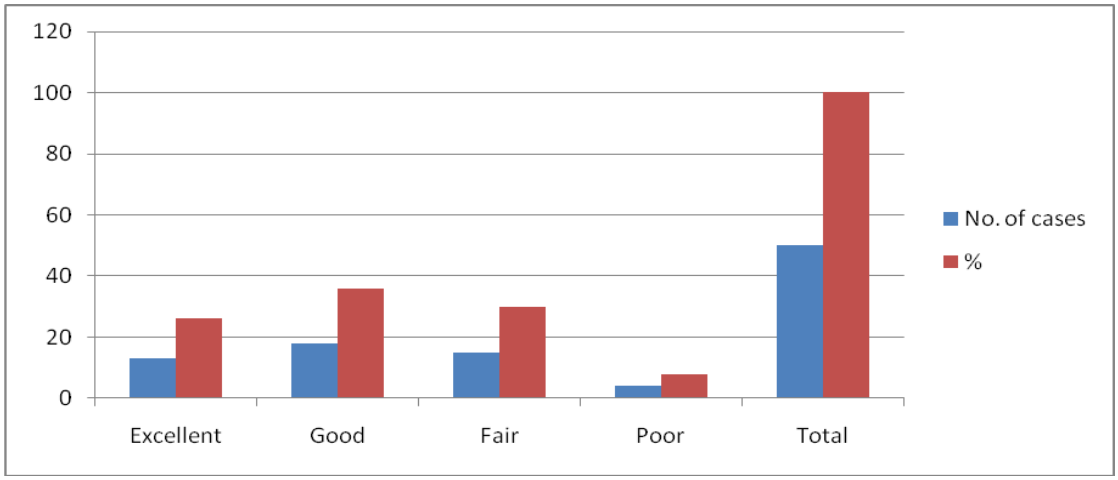


Table 14: Position of implant on follow-up

POSITION OF IMPLANT	No.of cases	%
Remained in same position	47	94
cut out from head	1	2
loosened screw	1	2
coxa vara	1	2
central migration	0	0
total	50	100

We find that majority of cases implant remained in the same position.

Graph 10 : Position of implant on follow-up

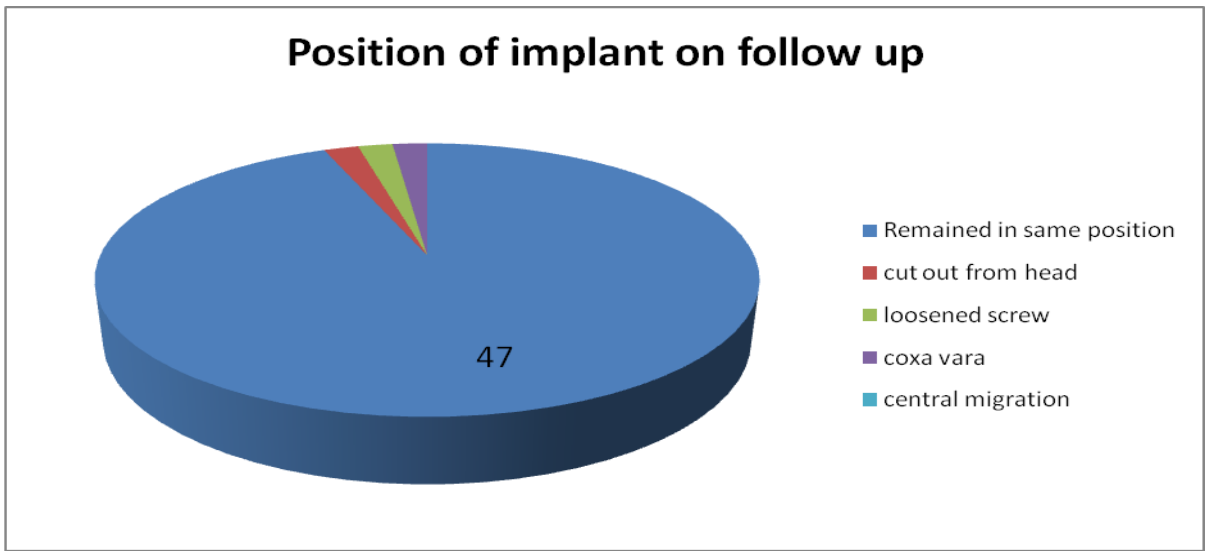


Table 15: Distribution of sample in comparison with fracture type

BOYD & GRIFFIN TYPE	No of cases	%
I	6	12
II	19	38
III	12	24
IV	13	26
TOTAL	50	100

Graph 11 : Distribution of sample in comparison with fracture type

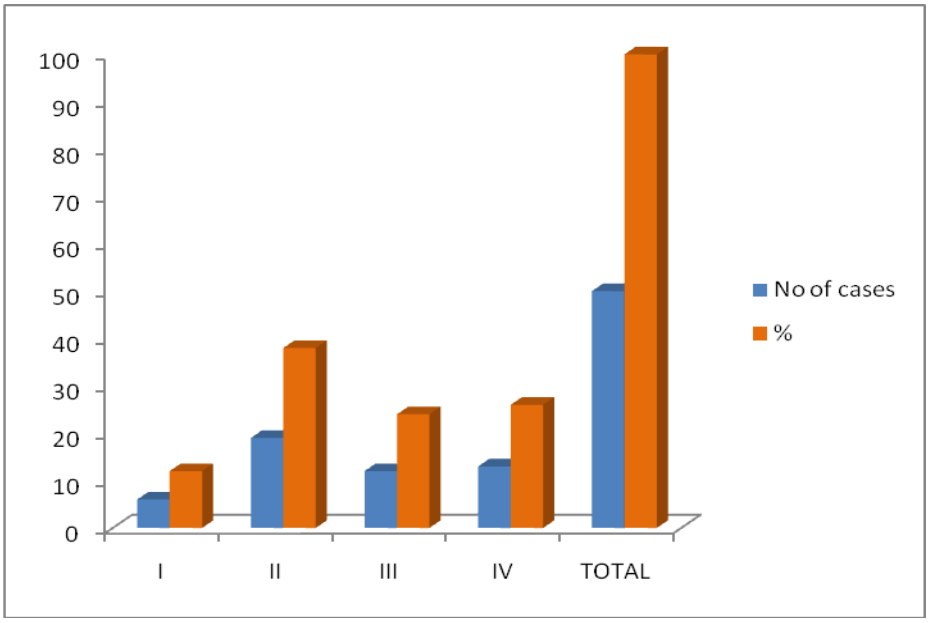
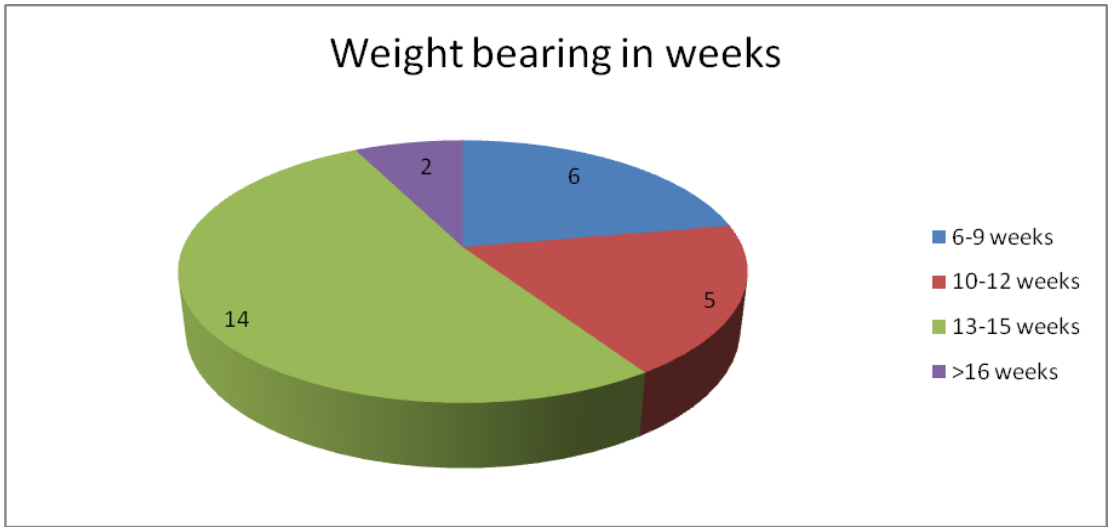


Table 16: Distribution of sample size by time taken for full weight bearing

Duration in weeks	No. of cases	%
6-9 weeks	6	12
10-12 weeks	5	10
13-15 weeks	14	28
>16 weeks	2	4

Graph 12 : Distribution of sample size by time taken for full weight bearing



Discussion

The present study was done at the Prathima Institute of Medical Sciences, Nagunoor, Karimnagar, Telengana during the period from September 2013 to September 2016. In the study a total of 50 cases of intertrochanteric fracture of femur treated by using dynamic compression screw and plate were evaluated.

Patients admitted here were evaluated pre-operatively. Details collected in a preformed proforma, operated and followed up regularly on OPD basis.

The data collected in this series is analyzed and compared with others.

Age of Incidence

Authors	Average age
Karl Lunsp et al.[7]	81.0
Eckriffiner et al.[6]	75.1
Boydd and Griffin[8]	69.7
R C Gupta[9]	51.2
Richard Kyle[10]	72
Mohanty S P[11]	61.7
G S Kulkarni[12]	62
Present study	59.92

The average age incidence in our study was 59.92 years. This is in contrast to higher age group as reported by western literatures.

Our study results are comparable with RC Gupta, Mohanty SP.

Majority of cases occurred in older individuals:

i. The average life expectancy of an Indian is 10 years less than western standards.
ii. Malnutrition and osteoporosis go hand in hand.

Sex incidence

In the present study male: female was 64:36.

There was a male sex preponderance seen in our study. This is in contrast to female preponderance as observed by various other authors.

a) Indian males being more active & mobile than females
b) Indian females are mainly confined to household activities and are less prone to sustain an extracapsular fracture of hip.

Authors	ear	Female	Male
Ecker et al.[13]	975	484 [74%]	171 [26%]
Hunter & Krajbich[14]	978	62 [70.4%]	26 [26.6%]
Wolfgang et al.[15]	982	185 [64.4%]	102 [35.6%]
GS Kulkarni[12]	984	76 55%]	64 [45%]
Tracy Watson[16]	998	17 [606%]	76 [76 [39.6%]
Present study	015	[36%]	32 [64%]

Mode of injury

Trochanteric fracture were more common in persons aged above 60 years, mechanism were resulting from trivial fall in 45 cases.

RTA was the cause in 5 cases.

90% of intertrochanteric fractures in the elderly result from a simple fall. The tendency to fall increases with patient age and is exacerbated by several factors, including poor vision, decreased reflexes, vascular disease, and coexisting musculoskeletal pathology like osteoporosis. Laboratory research indicates that the fall of an elderly individual from an erect position typically generates at least 16 times the energy necessary to fracture the proximal femur. Although these data suggest that such falls should cause fracture almost every time they occur, only 5% to 10% of falls in older white women result in any fracture, and less than 2% in a hip fracture. The fact that overwhelming majority of falls do not result in a

hip fracture implies that the mechanics of the fall are important in determining whether a fracture will occur.

In younger individuals fracture results from high energy trauma such as motor vehical accident or fall from height.

According to Cummings, four factors contribute to determining whether a particular fall results in a fracture of the hip

The fall must be oriented such that person lands on or near the hip

Protective reflexes must be inadequate to reduce the energy of the fall below a certain critical threshold.

Local shock absorbers [e.g. Muscles and fat around the hip] must be inadequate Bone strength at the hip must be insufficient.

Mode of injury

Trivial fall	45	90%
Fall from height	0	-
RTA	5	10%
Total	50	100%

		Fall
Gupta RC[9]	1974	79.4%
Ganz et al.[23]	1979	70%
Hornby et al.[24]	1989	80%

Side involved

In the present study out of 50 cases Right hip fractures were seen in 26 cases and Left side were 24. In studies conducted by Wade P A and R C Gupta79 right sided fractures were more common, whereas in studies made by Kenzor et al. and Cleveland et al. left side fracture were common.

Trochanteric fractures were classified based on BOYD AND GRIFFIN

38% of fractures were Type II being most common

26% of fractures were Type IV

24% of fractures were Type III

12% of fractures were Type I

These results are comparable with Arun Kumar Singh et al. in which Type II were common followed by Type III & Type IV

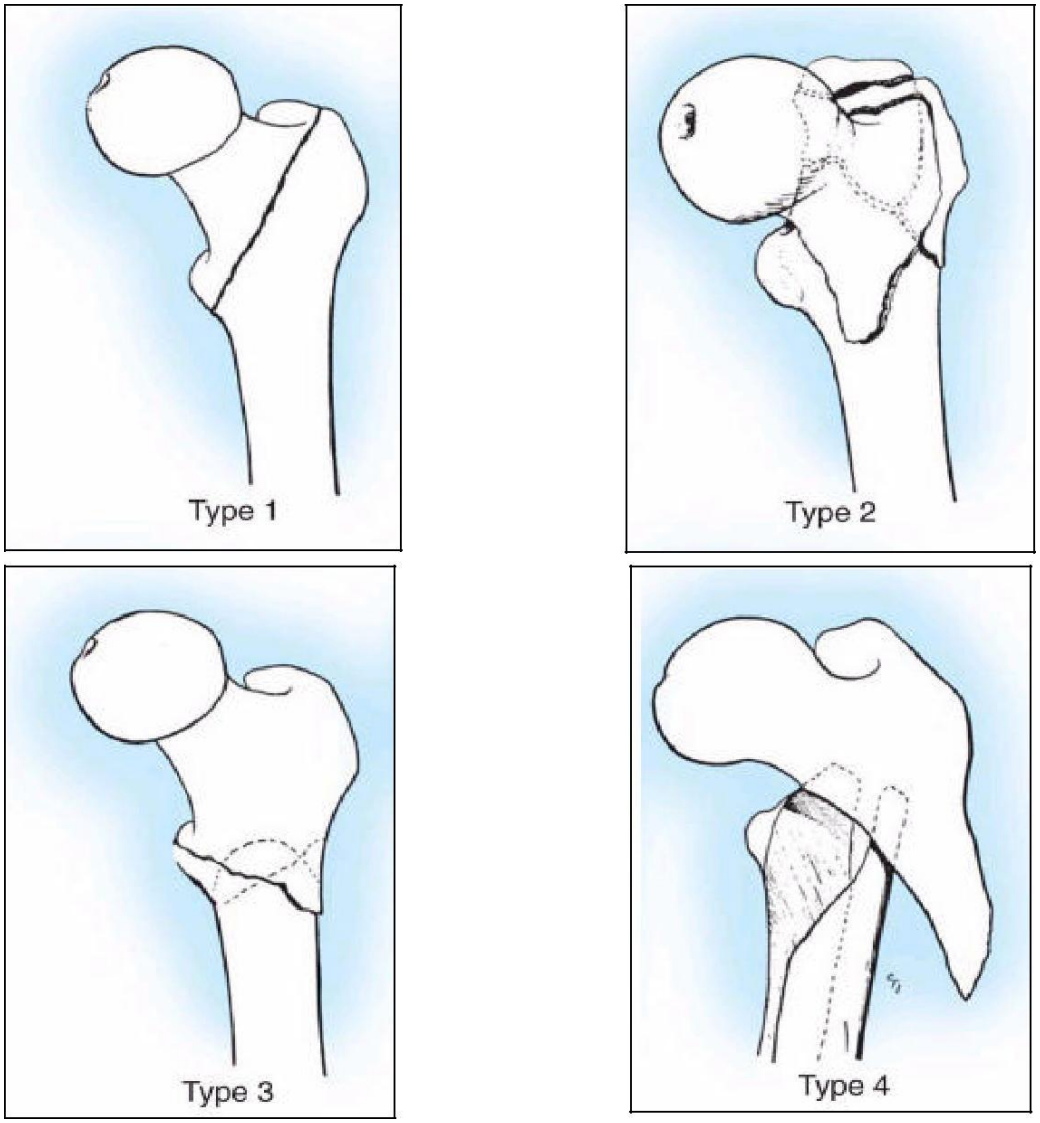
Type 1: Fractures that extend along the intertrochanteric line from the greater to the lesser trochanter.

Type 2: Comminuted fractures, the main fracture being along the intertrochanteric line but with multiple fractures in the cortex. Is a deceptive fracture in which an anteroposterior linear intetrochanteric fracture occurs as in type 1, but with an additional fracture in the coronal plane, which can be seen on the lateral roentgenogram.

Type 3: Fractures that are basically subtrochanteric with atleast one fracture passing across the proximal end of the shaft just distal to or at the lesser trochanter. Varying degrees of comminution are associated.

Type 4: Fracture of the trochanteric region and the proximal shaft, with fracture in at least two planes

Fig.35 BOYD AND GRIFFIN



Distribution according to co morbid status

Anemia was most common co morbid condition. Hypertension, diabetes & obesity were also associated.

Position of implant immediate post operative X-ray

In the immediate post operative X-ray the position of the implants were positioned in central position (76%), followed by posterior (18%) and superior (6%).

Significant association was observed with implant position.

Superior position was associated with implant failure cut out and other complications.

This observation was similar to those made by Mulholland and Gunn (1972) who recommended central placement of screw.

Doherty John H, and Lyden John, in 1979, reported 75 patients treated with hip compression screws. There were 4 cases in which the lag screws were inserted twice into the femoral head. They concluded that central placement of the screw in the femoral head with its tip 10-13 mm. from the subchondral bone is ideal and the design of the compression screw allows increased stability and impaction of the bone fragments in an intertrochanteric fracture .[17]

Baumgaertner Michael R et al. in 1995, studied the value of tip apex index, which is predicting the failure of fixation of peritrochanteric fractures of the hip in a study of 198 fractures in the AP and Lateral Radiographs. They concluded that the average tip apex distance should be 24 mm for successful fixation of pertrochanteric fractures.[18]

Verhofstad MH, Van der Werken C in the year 2004, conducted a retrospective study comparing the use of DHS and a short [two- holed] side plate in stable pertrochanteric femur fracture. They concluded that fixation of stable pertrochanteric femur fractures with a two-hole DHS is safe. The traditional use of a four-hole DHS pla te for this indication is therefore 'over treatment ' since it is more invasive.[19]

Lindskog DM, Baumgaertner MR, in the year 2004 conducted a study on unstable intertrochanteric hip fractures in the elderly and opined that for stable intertrochanteric hip fractures consistently good results have been achie ved with compression hip screw fixation. However, with more unstable fracture patterns, problems with compression hip screw fixation, such as excessive fractur e collapse and implant cutout, increase. For these fractures, adding a trochanteric stabilizing plate or using an axial compression hip screw or intramedullary hip screw is warranted.[20]

Mechanical and Technical Failures: These include –

Varus Displacement

It is associated with failure of nail fixation in the proximal fragment and failure to obtain a stable reduction and internal fixation.

It is accompanied by

a) Implant bending
b) Breaking.
c) Cutting out of the head.
d) Pulling off the femoral shaft.

Taylor et al. found the varus displacement to be symptomatic with pain, weakness of the hip and a short extremity only if the varus was less than 120^0. If varus occurs there are three options –

i. Accept the varus deformity.
ii. Attempt to correct the varus with skeletal traction until bone union.
iii. Resurgery

Nail Penetration

It may account for one third of the treatment failures. Taylor et al. concluded that nail penetration was secondary to too long a nail or to reverse intertrochanteric fracture with medial shaft migration.

They recommended leaving the nail in the penetrated position until union was certain.

Rotational Deformity

It is common in unstable fractures.

Massie stressed avoidance of internal rotation in reducing intertrochanteric fractures to prevent rotational deformity post – operatively.

Dimon, Hughston also stressed the need for correct interpretation of rotational alignment at the time of nailing to prevent post – operative deformity.

Nonunion

Since intertrochanteric fractures occur in cancellous region with good blood supply, nonunion has been uncommon.

The incidence of nonunion has found to be 1% to 2%. The intertrochanteric fractures prone to nonunion include comminuted unstable fractures with loss of medial Calcar continuity, which when stabilized tend to fall into varus.

The treatment options for nonunion include:

i. Repeat attempts at open reduction and internal fixation with bone grafting. The open reduction and internal fixation may be done in a valgus position.
ii. Endoprosthetic replacement.
iii. Total hip replacement.

Aseptic Necrosis

The incidence of aseptic necrosis after an intertrochanteric fracture is low as it is extracapsular. The incidence is about 0.8%.

Rotation of the proximal fragment during screw insertion may be responsible for damaging the blood supply to the femoral head and subsequent aseptic necrosis.

Baixauli et al have reported that osteonecrosis should be included in the differential diagnosis in patients developing hip pain following surgery for intertrochanteric fracture.

Stress Fracture

Tronzo reported that, if an intertrochanteric fracture was internally fixed with a nail that did not enter the head, the nail could cut out of the proximal fragment as the patient flexed the hip and rotated the limb, or the nail could act as a stress riser in the femoral neck and result in a subcapital stress fracture.

According to Mariani, Rand, the predisposing factors include elderly patients with osteoporotic bone, placement of the implant in the anterosuperior aspect of the head of the femur and insertion of the implant not deep enough.

Therefore a sliding compression hip screw should be used, the tip should be within 1 cm of the subchondral bone and the anterosuperior quadrant of the femoral head should be avoided.

Miscellaneous Complications

Evans reported one patient with Peritonitis secondary to a guide pin's violating the pelvis during hip nailing and one patient with Gangrene secondary to a dissecting aneurysm.

Soballe, Christensen reported a case of laceration of the superficial femoral artery by a displaced lesser trochanteric fragment in an elderly patient with an intertrochanteric fracture.

Punn et al. report that in one third of all patients operated on for fracture of the hip an effusion of the ipsilateral knee developed.

Postoperative wound

In the present study we found majority of 45 cases (90%) healed well 2 cases healed by delayed process after debridement of deep infection.

The incidence of post operative wound infection following surgery for an intertrochanteric fracture varies from 1.7% to 16.9%

Barr has listed a few factors significant in the development of postoperative wound infection:

A patient population including patients in the seventh, eighth and ninth decades with decubitus ulcers, bladder infections and cardiovascular disease.

The prolonged operating time that may occur in unstable fractures.

A disoriented patient, who may remove the bandage and contaminate the wound,

Proximity of the wound to the perineum.

Barr has divided post – operative infections into four groups as follows –

Early Superficial Sepsis – with fever, wound swelling, erythema and spontaneous drainage. The recommended treatment is removal of skin sutures, debridement of subcutaneous tissues and administration of parentral antibiotics; allowing the wound to heal secondarily.

Early Deep Sepsis – in this group mortality rate was high. He recommended extensive early debridement and parentral antibiotics.

Late Sepsis without Joint Involvement – treatment included removal of the metallic internal fixation device.

Late Sepsis with Joint Involvement – it is difficult to diagnose and the clues that suggest joint involvement are spiking fever, aching in the hip region post-operatively, muscle spasm and decreased range of motion and an ESR of 30 or above. It often requires extensive reconstructive procedure for pain relief.

The patients with late sepsis included those diagnosed from 6 to 24 months after the fracture.

Duration of hospital stay

In our study the average duration was 18.26 ± 6.11 days. The average duration of hospitalization in our study was comparable with Richard F Kyle.[10]

Authors	Year	Number of days
Malcom L. Ecker[25]	1975	25.9
Richard F Kyle[10]	1979	18.0
G H Yeyse Moore[26]	1983	21.0
Present study	2015	18.26 ± 6.11

Majority of cases were admitted for 10-15 days

Postoperative complications

In the present study pain around the hip joint was the most important complication. 6 cases limping

& 1 case of shortening of affected limb was also observed.

Evaluation of cases with hip scores using Salvati and Wilson scoring system

In the present study 26% excellent 36% good results. 82% (41 cases) had scores above 20 points (out of 40) as comparable with Al- Yassan et al. in which 78% had scores above 20 points. Two cases had implant failure, accounting for 6%. Mullholland and Gunn (1972) reviewed 350 cases. A failure rate in 332 hips was 4.8%. GS Kulkarni (1983) reported a failure rate of 6.3%.

Parker MJ, Maheshwar CB emphasised an article on assessment of hip function rating system after treating 207 proximal femur fractures using Salvati and Wilson's scoring system at the hospital for special surgery.[21]

In November 2008, Gupta RK, Kapil Sahgwan, Pradeep Kamboj, Sarabjeet S Punia, Pankaj Waleeha used Salvati and Wilson scoring system for functional assessment after treating unstable trochanteric fractures with lateral wall reconstruction using Trochanteric Stabilising Plate (TSP) in combination with a dynamic hip screw (DHS).[22]

Evaluation of hip

Pain : Pain is an important criteria for evaluation of hip fractures which could be due to implant failure, joint penetration, infection, due to avascular necrosis etc.

Most of cases had no pain after fracture union. 4% had mild- moderate degree of pain not affecting activities which subsided by medication.

Limping : In study about 6 patients had mild limping. This is due to shortening, etc. Two cases had limping attributed to implant failure which reduced after resurgery and facture united.

Shortening: In the present study significant patients about 41 (82%) had no shortening 9 cases (18%) had 1 cm shortening, No case more than 2 cms.

Up to 1 cm of shortening can be accounted to the collapse at fracture site.

Fixation of Intertrochanteric Fractures with Dynamic Hip Screw – The Do's and Don'ts

- Use image intensification if available. It makes reduction and placement of the hardware faster and more accurate.
- A fracture table is essential.
- Always try to obtain cortical contact along the calcar femorale. If this cannot be achieved in the much comminuted fractures, medial displacement and valgus reduction may be necessary.
- If there is a large posterior fragment that cannot be reduced, do not hesitate to use additional screws in the anteroposterior plane.
- Avoid excessive internal rotation of the femoral shaft at the time of reduction.
- After reduction, manually impact the fracture prior to measuring for screw length to avoid choosing too long a screw.
- Check equipment before starting. Make sure that the cannulated pieces are free of debris to avoid binding on the guide wire, causing it to advance into the pelvis or pull out.
- If the guide wire is pulled out after reaming the channel for the screw, the wire can be placed in the same hole by using a screw inserted backward as a guide.
- Do not ream beyond the point where the tip of the screw should end to reduce any tendency for migration of the screw toward the subchondral bone. The tip of the screw should be about 1.0 cm from the subchondral bone.
- When tapping, the guide wire should be in place to avoid tapping a false channel.
- In osteoporotic patients, always use at least a 4 – hole side plate.
- When using a sliding screw with self tapping cortical screws in the osteoporotic patient, an 8/64 or 7/64 inch drill can be used rather than the recommended 9/64

inch drill to provide better purchase of the screws.

- If the proximal fragment is short, do not use a screw with a longer threaded tip, since the shorter shank may not allow full impaction.
- Do not use too short a screw. This too may not provide a long enough shank on the screw to allow adequate impaction and is less effective in resisting varus angulation.
- Do not use methylmethacrylate to help stabilize routine fractures. It may be used for some pathologic fractures.
- Avoid being casual about treating hip fractures; always anticipate further impaction.

Conclusion

Hip fractures are leading cause of morbidity and mortality in the elderly population. Trochanteric fractures are common injury arising of trivial fall. Hip fractures lead to most severe health problems and reduced quality of life thus causing the greatest number of deaths.

Early operation on patients with trochanteric fractures improved the ability to return to independent living and complications of prolonged immobilization are prevented.

The study showed dynamic hip compression screw a reliable and effective device for the treatment of trochanteric fractures.

Dynamic hip screw provides satisfactory fixation but success is dependent mainly on fracture type, bony architecture, operative technique, position of screw, postoperative care and rehabilitation.

A telescoping screw offers biomechanical advantage. The principle of sliding allows positive compression at fracture site.

Central position of screw had better out come.

The study showed Dynamic hip screw to be a versatile, stable, acceptable implant fixation in trochanteric fractures.

Summary

In the present study, 50 cases of intertrochanteric fracture of femur were managed by dynamic hip screw and barrel plate. The data obtained was analysed and results evaluated.

- Average age incidence in the present study was 59.92 years.
- Predominantly males (64%) were affected.
- Most cases occurred after a fall which was statistically significant.
- Type II fractures were more common.
- Position of implant in the immediate postoperative X-ray and results was evident that results and functional outcome was good when positioned centrally.
- Out of the 50 cases, evaluated using Salvati Wilson scoring at their last follow-up: 13 cases (26%) had excellent, 18 cases (36%) good, 15 cases (30%) fair and
- 4 cases (8%) had poor score.
- 48 patients were able to bear weight within 12-15 weeks in our study.
- DHS and barrel plate are suitable for trochanteric and subtrochanteric fractures.
- DHS allows for fracture collapse, automatic medialisation after collapse and hence stability.

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