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A study of results of fixation of pertrochanteric femur fractures with dynamic hip screw (DHS) & comparison with past studies

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Abstract

Background and Objectives: Trochanteric fracture is a leading cause of hospital admissions in elderly people. The number of such admissions is a rise because of increasing life span & sedentary habits. Conservative methods of treatment result in malunion with shortening and limitation of hip movement as well as complications of prolonged immobilization like bed sores DVT and respiratory infections. This study is done to analyze the surgical management and traumatic fractures using Dynamic Hip screw.

Methods: This is a prospective study of 20 cases of fresh trochanteric fractures admitted to Tertiary care Hospital, Surat, from November 2016 to February 2018. Cases were taken according to inclusion and exclusion criteria i.e., patients with trochanteric fracture above the age of 18yrs. Medically unsuitable and old malunited trochanteric fractures were excluded from the study. Operation was done keeping the Tip Apex Distance (TAD) into consideration.

Results: The study shows sex ratio of 7:3 (M:F) with maximum presentation between 66 to 80yrs with an average of 63 yrs. Mode of injury was more due to fall, 11(55%); followed by RTA, 9(45%). Left side was slightly more than right side. L: R = 11:9. 30% of patients had associated injury. Type II fractures were maximum with 11 cases followed by 9 cases Type I&II. Post-operative results were found to be excellent in 3(15%), Good in 10(50%), Fair in 6(30%) and poor in 1(5%).

Conclusion and Interpretation: This study shows that trochanteric fracture is common in elderly population with male preponderance mainly occurring between 66 to 80yrs. Common mode of injury being trivial fall, Left side being slightly more involved in injury. Early operative intervention with Dynamic hip screw with 135° side plate with barrel gives good results, helps early mobilization of elderly patients decreasing morbidity & mortality and achieves rigid fixation even in osteoporotic bone. From our study we concluded that DHS still is implant of choice by many surgeons and have stood against test of time. Results are similar to past studies.

Keywords: Bone screws; femoral fractures/surgery; fracture fixation; hip fractures/surgery

Introduction

Trochanteric fractures are common in the elderly people. The frequency of these fractures has increased primarily due to the increasing life span and more sedentary lifestyle brought on by urbanization. Trochanteric fractures occur in the younger population due to high velocity trauma, whereas in the elderly population it is most often due to blunt trauma.

The incidence of trochanteric fractures is more in the female population compared to the male due to osteoporosis. In a Swedish study of more than 20,000 patients, the incidence of hip fractures in women doubled every 5.6 years after the age of 30 years.

In spite of the advances in anesthesia, nursing care and the surgical techniques, hip fractures remain a significant cause of morbidity and mortality in the elderly population.

The trochanteric fractures can be managed by conservative methods and there is usually union of the fracture. If suitable precautions are not taken the fracture undergoes malunion, leading to varus and external rotation deformity at the fracture site and shortening and limitation of hip movements. It is also associated with complications of prolonged immobilization like bedsores, deep vein thrombosis and respiratory infections.

Since this fracture is more common in the elderly patients, the aim of treatment should be

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Prevention of malunion, and early mobilization. Taking all the factors into consideration surgery by internal fixation of the fracture is ideal choice.

There are various forms of internal fixation devices used for Trochanteric Fractures; of them the most commonly used device is the Dynamic Hip Screw with Side Plate assemblies. This is a collapsible fixation device, which permits the proximal fragment to collapse or settle on the fixation device, seeking its own position of stability.

In view of these considerations, this study is taken up to analyze the surgical management of Trochanteric Fracture using Dynamic Hip Screw and its outcomes regarding the union of the fracture and early mobilization of the patient.

Objectives

- To analyze the union of the fracture trochanter, internally fixed with Dynamic Hip Screw.
- To study the outcome of the procedure, with respect to early mobilization and return to prefracture ambulatory status.
- Assessment of results based on subjective parameters (like pain, ability to squat or sit cross legged and walking), objective parameters (like deformity, range of movements of the hip and limb length) and radiological findings (like fracture union, consolidation, neck shaft angle and position of the implant), after clinical and radiological union, and comparison with previous studies.

Methodology

The clinical material for the study of surgical management of Trochanteric Fracture of Femur with Dynamic Hip Screws consists of 20 cases of fresh Trochanteric Fracture of traumatic etiology meeting the inclusion and exclusion criteria, admitted to Tertiary care Hospital, Surat.

Inclusion Criteria

1. All patients with fracture of the Trochanter.
2. Age – Patients above the age of 18 years.
3. Sex – Both male and female.

Exclusion Criteria

1. Patients below the age of 18 years.
2. Patients with malunited Trochanteric fractures treated elsewhere.
3. Medically unstable patients who are an extremely poor anesthetic risk.

As soon as the patient was admitted, a detailed history was taken and a meticulous examination of the patient was done. The required information was recorded in the proforma prepared. The patient's radiographs were taken in the Antero-Posterior and Lateral views. The diagnosis was established by clinical and radiological examination.

In the study, Trochanteric fractures were classified according to the Boyd and Griffin classification.

Skin or skeletal traction was applied till the patient was taken up for surgery.

Medical evaluation and stabilization of the patient was begun in consultation with the Physician and, the Cardiologist if necessary.

Hygiene of the skin was maintained with regular betadine scrub wash. The operative site (lateral aspect of the thigh) was shaved, scrubbed with savlon and betadine scrub, and painted with betadine and spirit, and draped in a sterile towel three days prior to the surgery.

The patients were taken up for surgery after obtaining written and informed risk consent of the nature and complications of the surgery. All patients were started on antibiotics prophylactically. Cephalosporins were used. It was administered in the dosage of 1gm IV, prior to induction of anesthesia, and continued at 12 hourly intervals for 3-5 days, and switched over to oral form till the 14th day post-operatively, i.e. until suture removal.

Anaesthesia

The patients were taken up for surgery under General, Spinal or Epidural Anesthesia.

Patient Positioning:

The patients were positioned supine on the fracture table with a radiolucent padded counter traction post placed between the patient's legs.

Post-Operative Management:

Post- Operative radiographs were taken on the following day. Quadriceps exercises was started on the following day.

The patients were encouraged to do active hip and knee movements as soon as the pain and inflammation subsided.

Suture removal was done on the 12th – 14th day. Patient was discharged after suture removal. After suture removal active mobilization of the hip and knee was started with non-weight bearing with crutches or a walker until 6 weeks. Partial weight bearing with walking aids was begun from 6th week onwards. Full weight bearing was started after 16 weeks. Follow up X-Rays were taken at 6th week, 12th week, 16th week, 24th week, after 1 year and 2 years. Follow up was done on OPD basis.

Results

Age

The age of the patients in the study, ranged from twenty-nine years to ninety- five years, average being 63 years.

Table 1: Showing Age Distribution

Age in Years	Number of Patients
29-50	7
51 – 65	5
66 – 80	7
81 – 95	1

Sex

In the study, out of forty patients, 6 were females and 14 were Males.

Mode of Injury

In the study, out of 20 cases, 3 cases were due to forceful trauma due to a fall from a height, the rest 8 cases were due to a trivial trauma as a result of fall and rest 9 were due to RTA.

Side Affected:

In the study, of the 20 patients 9 had an injury of the right femur and the other 11 had an injury to the left femur.

Associated Injuries

In the study 6 patients had an associated injury.

Associated Diseases

In the study of the 20 patients, 6 patients had associated diseases such as Hypertension (HTN) in 4 patients, Diabetes Mellitus (DM) in 2 patients.

Type of Fracture

In the study the trochanteric fractures were classified as per

Boyd and Griffin classification.

Table 2: Showing Type of fracture

Type of fracture	Number of patients
Type I	4
Type II	11
Type III	5

Total Duration of Hospital Stay

In the study, the total duration of hospital stay of the patients ranged from 2 ½ weeks to 4 weeks. 3 patients stayed for 2 ½ weeks, 11 patients stayed for 2 weeks, 5 patients stayed for 3 weeks and 1 patient stayed for 4 weeks.

Functional Evaluation:

Pain

In the present study only three patients had pain in the hip region at the end of six months.

Swelling

Only two patients had swelling in the trochanteric region at the end of six months, due to adduction deformity and prominence of trochanter.

Deformity

Of the 20 patients only one patient had an adduction deformity.

Movements

The ranges of movements were divided into four groups as M I, M II, M III and M IV as mentioned in the key to master chart. Of 20 patients 9 patients had M I range of movements, 7 patients had M II range of movements, 2 patients had M III range of movements and two patients had M IV range of movements at the end of six months.

Table 3: Showing Movements

	M I	M II	M III	M IV
Flexion	More than 100°	80°-100°	60°-80°	Less than 60°
Extension	10°	50	Nil	Nil
Abduction	30°-40°	20°-30°	10°-20°	Less than 10°
Adduction	25°-30°	15°-20°	10°-15°	Less than 10°
External rotation	30°-40°	25°-30°	20°-25°	Less than 20°
Internal rotation	25°-30°	15°-20°	10°-15°	Less than 10°
Present study	9	7	2	2

Shortening

At the end of six months out of the thirty seven patients, 17 patients did not have any shortening, 3 patients had shortening.

Sitting Cross-Legged and Squatting

At the end of six months, 3 patients were not able to sit cross-legged or squat and the remaining 17 patients were able to sit cross-legged and squat.

Walking

At the end of six months, 3 patients were walking with support and the remaining 17 were walking without support.

Limp

At the end of six months, 3 patients had an associated limp while walking and the remaining 17 did not have any associated limp while walking.

Complications

Of the 20 patients in the study, 2 patients had a superficial wound infection post-operatively delaying wound healing, one patient had a cut-out of the Richard's screw from the head and the remaining patients had no complications.

The observations in the present study are as follows

Union

In the present study, in 13 cases the fracture had united by twelve weeks and in the remaining 7 cases the fracture united by the sixteenth week. The average time for radiological union is 13.2 weeks.

Sliding of the Dynamic Hip Screw

In the present study in 16 cases, the Dynamic Hip Screw backed out due to the fracture site collapse resulting in union of the fracture. In the remaining 4 cases there was no backing of the screw.

Neck Shaft Angle

In the study, a 135 angled barrel side plate was used, hence the neck shaft angle was maintained in all the cases except in one case where the screw was placed in the superior part of the head leading onto screw cutout and causing a varus deformity and a decrease in the neck shaft angle.

Mechanical Complication

In the present study of the 20 cases there was only one case of implant failure. There was a cut - out of the screw from the femoral head due to the placement of the screw in the superior part of the head.

Implant Failure

In the present study there was no incidence of implant failure, such as breakage of the plate, breakage of the screw or separation of the screw from the plate etc.

Non-Union/Avascular Necrosis/Secondary Osteoarthritis

In the study none of the cases developed Avascular Necrosis of the femoral head or Secondary Osteoarthritis of the hip joint following surgery during the period of follow-up.

Results

In the present study 20 cases of intertrochanteric fractures managed with dynamic hip screw with barrel side plate assembly, were assessed and evaluated. In the study there were 3 cases with excellent results, 10 cases with good results, 6 cases with fair results and one case with poor results.

Discussion

Intertrochanteric fractures of the femur are relatively common injuries among the elderly individuals.

Sometimes the associated geriatric problems make it a terminal event in the lives of elderly individuals. In order to reduce the morbidity and mortality associated with conservative management of intertrochanteric fractures, surgical management of the intertrochanteric fractures is advocated as the best modality of management of these fractures.

Various fixation devices are available for the fixation of intertrochanteric fractures. Most of the fixed angle nail plates were associated with many complications. Many intramedullary devices have been introduced after the development of the sliding hip screw with side plate

assembly, but have their own restrictions.

The Dynamic Hip Screw with Barrel Side Plate assembly is theoretically, practically and biomechanically more advantageous than other implants. It remains the best implant available for fixation of intertrochanteric fractures of the femur.

In the present study, forty cases of intertrochanteric fractures were surgically managed by dynamic hip screw with a barrel side plate assembly. The purpose of the study is to evaluate the outcome of the management of intertrochanteric fractures with dynamic hip screw with barrel side plate assembly.

The data collected in this study is assessed, analyzed, compared with other series and the results were evaluated.

Age Incidence

In the present study, the average age for intertrochanteric fractures was 63 years ranging from 29 to 95 years. Intertrochanteric fractures are common in the elderly. The average age incidences reported in series by Watson et.al.⁴⁹ was 76. Riska⁶⁵ reported patients with intertrochanteric fracture to be 10 to 12 years older than patients with intracapsular femoral neck fractures.

Sex Incidence

In the present study, 6 patients (30%) were females and 14 patients (70%) were males. Intertrochanteric fractures are more common in females because of metabolic changes. The female preponderance in our study is not similar to the female preponderance observed by various other authors

The sex incidences reported in series by Tracy Watson et.al.⁴⁹ was 60.6% male and 39.4% females.

Mode of Injury: In the present study in the elderly patients, 55% of the cases were due to a trivial trauma, such as fall at home, slipping in the bathroom or missing a step. The higher incidence of intertrochanteric fractures in the elderly due to a trivial trauma is varies from other series.

Side Involved: In the present study 11 of the fractures were on the left side and 9 were on the right side.

In the studies by Wade P.A. et.al.⁸⁰ and R.C. Gupta⁷⁷ right-sided fractures were more common. In the studies made by Kenzor et.al.⁷⁴ and Cleveland et.al.¹² left sided fractures were common. In the present study none of the cases had a bilateral intertrochanteric fractures, whereas in Cleveland's¹² series two patients had sustained bilateral trochanteric fractures and in R.C. Gupta's⁷⁷ series only one patient had bilateral trochanteric fractures.

Type of Fractur

In the study majority were type II fractures, which is the same as that observed by many other authors in the literature. The degree of comminution depends on the quality of bone; in the elderly individuals as the bone is osteoporotic the incidence of comminution is more.

Total Duration of Hospital Stay

The average period of hospitalization was 3.07 weeks. The patients were discharged two weeks after the surgery if there were no complications post-operatively. The total duration of hospital stay in few cases was more than 2 ½ weeks, due to delay in acceptance and consent for surgery, medical evaluation in cases of patients with associated medical diseases. Two patients stayed for four weeks due to pain in the hip as a result of screw cutout in one case and due to

superficial infection in other.

Complications: In the present study, three patients (10%) had a superficial wound infection, one patient (3.3%) had a deep infection and one patient (3.3%) had a mechanical complication of screw cutout.

In the patients who had a superficial wound infection, wound healing was delayed by about a week. The wound healed without any complications with regular dressings.

One of the patient's complained of pain and swelling in the gluteal region at about 24 weeks. On examination an abscess had developed in the gluteal region. The abscess was drained and the implants were removed, as the fracture had united. The infection subsided following implant removal and the patient has no complaints.

Implant Failure: In the present study there were no cases of implant failure, such as breakage of the plate, breakage of the screw or separation of the screw from the plate etc.

Non-Union/Avascular Necrosis/Secondary Osteoarthritis

In the present study none of the cases developed Non-Union or Avascular Necrosis of the femoral head or Secondary Osteoarthritis of the hip joint following the surgery during the period of follow-up. Non-union of an internally fixed intertrochanteric fracture is an uncommon occurrence. Avascular Necrosis of the femoral head following an intertrochanteric fracture of the femur is a rare occurrence. Cleveland et.al.¹² and Kyle et.al.⁸⁴ reported an incidence of 0.8% of avascular necrosis. Only seven cases of avascular necrosis have been reported in the literature.

Results

In 3 patients the results were excellent. The patients did not have pain in the hip joint or swelling in the trochanteric region, or deformity. Two patients had no shortening, but nine patients who had about 0.5 cm of shortening were also graded as excellent due to other criteria. The patients had full range of hip movements by twelve- sixteen weeks. They were able to sit cross-legged and squat without any difficulty by about sixteen weeks. These patients were able to walk without any support or limp by about sixteen weeks. There was radiological evidence of bone union by twelve weeks. There were no complications. The patients were fully satisfied with the treatment.

10 patients had a good result. In this group to the patients did not have pain in the hip or swelling in the trochanteric region or deformity. These patients had a shortening of 0.5 to 1 cm. These patients had full range of hip movements by sixteen to twenty four weeks. These patients were able to sit cross-legged and squat without any difficulty by twenty-four weeks. These patients were able to walk without support by twenty-four weeks. Of the 10 patients 6 did not have limp; only one patient who had a limp was graded good due to other criteria like good range of hip movements and radiological union by sixteen weeks. There was radiological evidence of union by sixteen weeks.

6 of the patients had fair results. They did not have pain in the hip or swelling in the trochanteric region or deformity. They had a shortening of about 1 cm. They had restriction of terminal degrees of hip movements. Three of the patients were not able to sit cross-legged or squat but one of the patients was able to sit cross-legged and squat for a short duration. These patients were walking with support and two patients had an associated limp. Radio logically the fractures

united without any signs of malunion. One of the patients had a superficial wound infection, which delayed the wound healing by a week. The other patients had no complications. One of the patients had poor results. This patients continued to have pain in the hip; in this patient the pain was due to screw cutout from the femoral head. The same patient with a screw cutout had an addiction deformity and prominence of the trochanter. He had gross restriction of hip movements and was not able to sit cross- legged or squat. The radiographs showed fracture union but in the case with screw cutout there was a coxa vara deformity. The results in the present study are similar compared to other series which are as follows:

Table 4: Overall results

Series	Year	Excellent	Good
T. Sahlstrand ¹⁹	1975	72%	18%
Sernbo et. al. ⁸²	1982	82%	18%
Sethi et. al. ⁷⁵	1979	72%	18%

Conclusion

Intertrochanteric fracture of the femur is common in the elderly, due to osteoporosis. The mode of injury for intertrochanteric fracture in the elderly is a trivial trauma, however in the young individuals it occurs following a forceful trauma. As the fracture is more common in the elderly, early reduction and internal fixation increases patient comfort, facilitates nursing care, helps in early mobilization of the patient and decreases the duration of hospitalization. The dynamic hip screw with a barrel side plate has the advantage in that it allows controlled collapse of the fracture site. Central placement of the screw within the femoral head is desirable. A side plate with a barrel at 135 angle is ideal to maintain the neck shaft angle and prevent the screw from cutting out of the femoral head. The fixation with dynamic hip screw is rigid even in osteoporotic bone. Though the dynamic hip screw is technically demanding, the implant design and its biomechanical properties have reduced the incidence of joint penetration and implant failure. From our study we concluded that DHS still is implant of choice by many surgeons and have stood against test of time. Results are similar to past studies.

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