STUDY OF FUNCTIONAL OUTCOME OF PRIMARY HEMIARTHROPLASTY IN THE MANAGEMENT OF COMMINUTED INTERTROCHANTERIC FRACTURES OF FEMUR IN THE ELDERLY PATIENTS.

Dissertation submitted in partial fulfilment of the regulations required for the award of M.S. DEGREE in Orthopaedic Surgery

Branch - II

THE TAMILNADU

DR. M.G.R. MEDICAL UNIVERSITY

CHENNAI-600032

APRIL - 2014

COIMBATORE MEDICAL COLLEGE

COIMBATORE-641014

CERTIFICATE

This is to certify that this dissertation titled **"STUDY OF FUNCTIONAL OUTCOME OF PRIMARY HEMIARTHROPLASTY IN THE MANAGEMENT OF COMMINUTED INTERTROCHANTERIC FRACTURES OF FEMUR IN THE ELDERLY PATIENTS"** submitted to the **Tamil Nadu Dr. M.G.R. Medical University, Chennai** in partial fulfilment of the requirement for the award of M.S Degree Branch - II (Orthopaedic Surgery) is a bonafide work done by ***DR.VIJAYAKUMAR.P***, under my direct guidance and supervision in the **Department of Orthopaedic Surgery, Coimbatore Medical College Hospital, Coimbatore** during his period of study from **May 2011-April 2014**.

Date: **Prof. Dr. S. Dhandapani, M.S. Ortho, M.Ch. Ortho**
Unit Chief

Date: **Prof. Dr. S. Dhandapani, M.S. Ortho, M.Ch. Ortho**
Professor & Head of the Department
Department of Orthopaedics

Date: **Dean**
Coimbatore Medical College
Coimbatore-641014

Coimbatore Medical College

COIMBATORE, TAMILNADU, INDIA - 641 014

(Affiliated to The Tamilnadu Dr. MGR Medical University, Chennai)

ETHICS COMMITTEE

CERTIFICATE

Name of the Candidate : DR. VIJAYAKUMAR . P

Course : M.S. ORTHOPAEDICS

Period of Study : 2011 - 2014

College : COIMBATORE MEDICAL COLLEGE

Dissertation Topic : STUDY OF FUNCTIONAL OUTCOME OF PRIMARY HEMIARTHROPLASTY IN THE MANAGEMENT OF COMMINUTED INTERTROCHANTERIC FRACTURES OF FEMUR IN THE ELDERLY PATIENTS

The Ethics Committee, Coimbatore Medical College has decided to inform that your Dissertation Proposal is accepted / ~~Not accepted~~ and you are permitted / ~~Not permitted~~ to proceed with the above Study.

Coimbatore - 14.

Date : 30.11.12

Secretary
Ethics Committee

turnitin

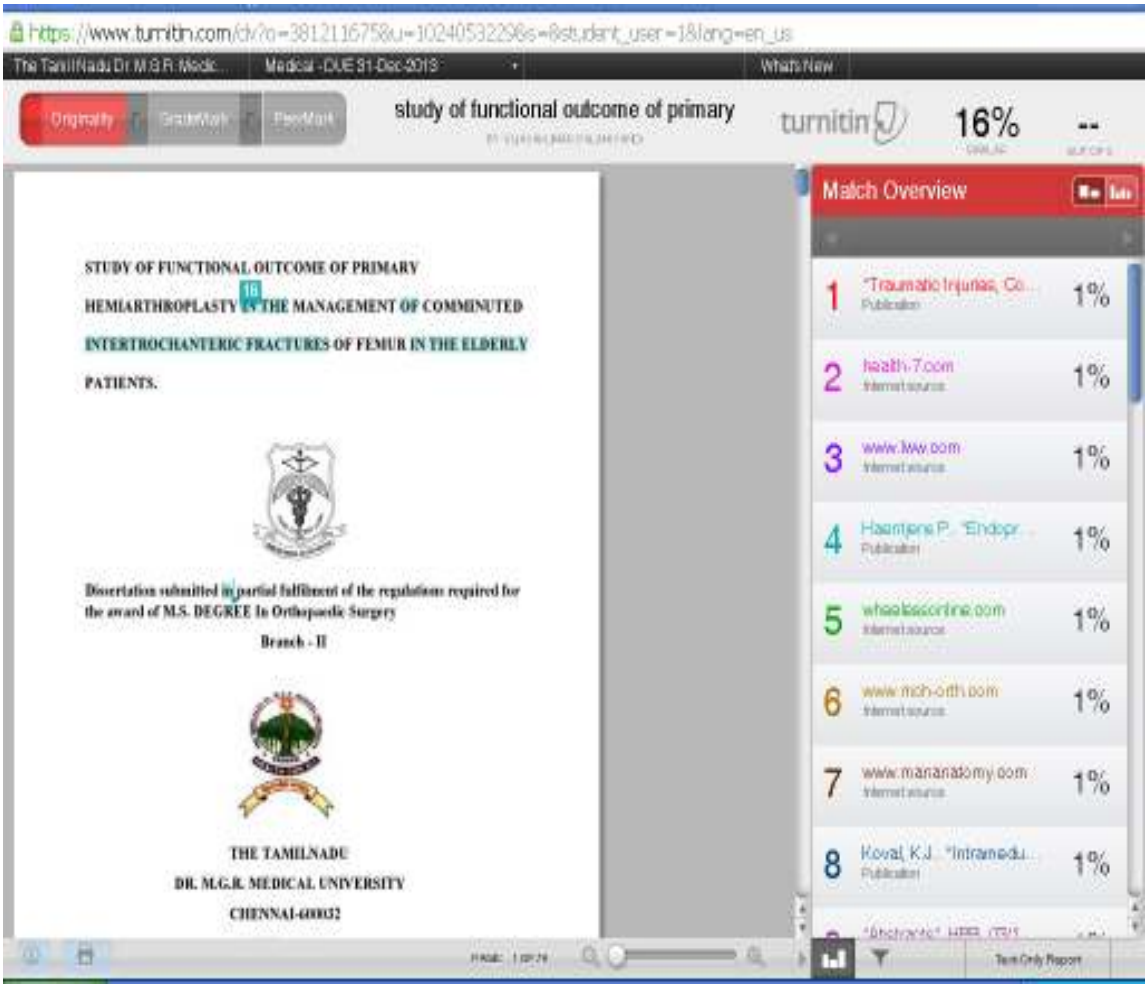
Your digital receipt

This receipt acknowledges that Turnitin received your paper. Below you will find the receipt information regarding your submission.

Paper ID	381211675
Paper title	study of functional outcome of primary hemiarthroplasty in the management of comminuted intertrochanteric fractures in the elderly patients
Assignment title	Medical
Author	Vijayakumar PALANIYANDI
E-mail	dr.vijaykumar87@gmail.com
Submission time	27-Dec-2013 02:19PM
Total words	7415

First 100 words of your submission

STUDY OF FUNCTIONAL OUTCOME OF PRIMARY HEMIARTHROPLASTY IN THE MANAGEMENT OF COMMINUTED INTERTROCHANTERIC FRACTURES OF FEMUR IN THE ELDERLY PATIENTS. Dissertation submitted in partial fulfilment of the regulations required for the award of M.S. DEGREE In Orthopaedic Surgery Branch - II THE TAMILNADU DR. M.G.R. MEDICAL UNIVERSITY CHENNAI-600032 APRIL - 2014 COIMBATORE MEDICAL COLLEGE COIMBATORE-641014 1 INTRODUCTION: There is a worldwide increase in the incidence of intertrochanteric fracture among elderly patients. This is due to the increased life expectancy of people and osteoporosis1-3. Most of the fractures occur from trivial trauma. Intertrochanteric fracture is defined as the fracture...


https://www.turnitin.com/dv?o=3812116758u=1024053229&s=&student_user=1&lang=en_us
The Tamil Nadu Dr M G R Medic...
Medical - DUE 31-Dec-2019
What's New
Originality
GradeMark
PeerMark
study of functional outcome of primary
turnitin
16%
--
STUDY OF FUNCTIONAL OUTCOME OF PRIMARY
HEMIARTHROPLASTY IN THE MANAGEMENT OF COMMINUTED
INTERTROCHANTERIC FRACTURES OF FEMUR IN THE ELDERLY
PATIENTS.
Dissertation submitted in partial fulfilment of the regulations required for the award of M.S. DEGREE In Orthopaedic Surgery
Branch - II
THE TAMILNADU
DR. M.G.R. MEDICAL UNIVERSITY
CHENNAI-600032
Match Overview
1 "Traumatic Injuries, Co... Publication 1%
2 health-7.com Internet source 1%
3 www.law.com Internet source 1%
4 Haentjens P. "Endopr... Publication 1%
5 wheelsscotline.com Internet source 1%
6 www.mch-orth.com Internet source 1%
7 www.mananatomy.com Internet source 1%
8 Koval, K.J. "Intramedu... Publication 1%
Text Only Report

DECLARATION

I declare that this dissertation titled **"STUDY OF FUNCTIONAL OUTCOME OF PRIMARY HEMIARTHROPLASTY IN THE MANAGEMENT OF COMMINUTED INTERTROCHANTERIC FRACTURES OF FEMUR IN THE ELDERLY PATIENTS**" has been prepared by me, at Coimbatore Medical College Hospital under the guidance of **Prof. & HOD. Dr. S. DHANDAPANI,** Coimbatore Medical College Hospital, Coimbatore, in partial fulfilment of **Dr. M.G.R. Tamilnadu Medical University,** regulations for the award of M.S.Degree in Orthopaedics.

I have not submitted this dissertation to any other university for the award of any degree or diploma previously.

Date :

Dr. P. VIJAYAKUMAR,
Post graduate in Orthopaedics,
Coimbatore Medical College Hospital,
Coimbatore.

ACKNOWLEDGEMENT

I am obliged to record my immense gratitude to **Dr. R. Vimala M.D,** the Dean, Coimbatore Medical College Hospital and **Dr. Isaac Christian Moses M.D,** Medical Superintendent, Coimbatore Medical College Hospital for providing all the facilities to conduct the study.

I express my deep sense of gratitude & heartfelt thanks to **Prof. Dr. S. Dhandapani,** HOD of Orthopaedics, Coimbatore Medical College Hospital , Coimbatore for his valuable guidance and constant encouragement in bringing out this dissertation.

I also express my sincere thanks to **Prof. Dr. S. Elangovan** and **Prof. Dr. S. Vetrivel Chezian** for their guidance and suggestions during this dissertation. I sincerely thank all my assistant Professors namely **Dr.Major.K.Kamalanathan, Dr.K.S.Maheswaran, Dr.M.S.Mugundhan, Dr. P.Balamurugan , Dr.R.Prabhakar Singh** for helping me in bringing out this dissertation.

I also thank my colleagues, tutors, staff nurses and other members of the Department of Orthopaedics, Coimbatore Medical college Hospital for their help.

Lastly , my sincere thanks to all my beloved patients and their attenders , who with their excellent co-operation became the backbone of this dissertation.

Dr.P.Vijayakumar

M.S.Ortho Postgraduate.

CONTENTS

STUDY OF FUNCTIONAL OUTCOME OF PRIMARY HEMIARTHROPLASTY IN THE MANAGEMENT OF COMMINUTED INTERTROCHANTERIC FRACTURES OF FEMUR IN ELDERLY PATIENTS.

ABSTRACT

Introduction : Unstable osteoporotic intertrochanteric fractures are common in the elderly population. Failure rate of as high as 56% have been noted with internal fixation of unstable fractures mainly due to inadequate purchase in the osteoporotic bone and early full weight bearing. Hemiarthroplasty is a frequently employed alternative as it gives stability and allows immediate full weight bearing . This study evaluates the role of primary cemented hemiarthroplasty in the treatment of unstable trochanteric fractures in elderly and physiologically elderly patients.

Materials and methods: 20 elderly patients who were above 60 years of age with unstable osteoporotic intertrochanteric fractures, who underwent cemented bipolar hemiarthroplasty were studied prospectively from July 2011- Decemnber 2013. Patients who were less than 60 years of age, non ambulatory before injury and patients with stable intertrochanteric fractures,pathological fractures congnitive impairment were excluded from the study. Fractures were classified based on Boyd and Griffin classification. All the patients were treated with cemented bipolar prosthesis through

posterior (Moore's) approach. Mean follow up period was 12 months. Patients were assessed using modified Harris hip score.

Results : In our study,mean age of the patient was 69.4 yrs,18 cases were of type 2 fractures , 2 cases were type 3 fracture.8 patients had limb shortening of less than 2 cms, whereas1patient had limb shortening of 3 cms.5 patients had abductor weakness. As assessed by modified Harris hip score, excellent to fair results were obtained at 12 months follow up in 15 cases (75 %), 2 cases (10%) had poor results. 3 patients died postoperatively due to unrelated causes. One patient had superficial infection who was treated with i.v. antibiotics. In our series we had no Complications like stem loosening, periprosthetic fractures, prosthetic dislocations.

Conclusion: Primary cemented hemiarthroplasty for unstable osteoporotic elderly trochanteric fractures appears to be a good alternative treatment modality. Early full weight bearing and rehabilitation is a definitive advantage of this method.

Keywords : Intertrochanteric fracture, primary bipolar hemiarthroplasty, elderly patients.

INTRODUCTION

There is a worldwide increase in the incidence of intertrochanteric fracture among elderly patients. This is due to the increased life expectancy of people and osteoporosis[1-3]. Most of the fractures occur from trivial trauma. Intertrochanteric fracture is defined as the fracture extending from the extra-capsular basilar neck region to region along the lesser trochanter before medullary canal development. Unstable fractures are those with comminution in the posteromedial cortex. Stable trochanteric fractures can be treated with internal fixation with predictable results. The management of unstable osteoporotic fracture is still controversial. Initially, in the past, fixation of unstable fractures with fixed blade plate and enders nail had high rate of cut through and fracture displacement[4, 5]. Subsequently sliding hip screw was used with much success and become the predominant method of fixation of these fractures. However, even with this device , early full weight bearing mobilisation of unstable osteoporotic fracture can result in rotational deformity and limb length shortening , due to uncontrolled telescoping, metal fracture, screw cut out through head. Early weight bearing following internal fixation of comminuted trochanteric fractures by various means in physiologically elderly and osteoporotic patients leads

to fixation failure and poor results. Hence period of restricted mobilisation is suggested for this patient[6], which may cause complications like atelectasis, bed sores, pneumonia, deep vein thrombosis[7, 8].

At present intramedullary interlocking devices shows better results in fixing unstable fractures. However long term outcome of these device is yet to be defined. Recently endoprosthetic replacements have shown to achieve early mobilisation of the patient and good long-term results[9-11]. Although further prospective randomized trials are required before reaching to conclusion. Hence an ideal treatment method for unstable intertrochanteric fracture is still controversial. This study evaluates the role of primary hemiarthroplasty in treatment of unstable intertrochanteric fracture in the elderly and physiologically elderly patients.

AIM OF THE STUDY

The aim of study is to analyse the functional outcomes of patients with comminuted intertrochanteric fracture treated by primary hemiarthroplasty.

Objectives of the study:

1. To analyse the clinical and functional outcomes of patients with an unstable intertrochanteric fracture treated by primary hemiarthroplasty.

2. To evaluate the early benefits following surgery and analyse the complications.

REVIEW OF LITERATURE

Laros et al[4] in **1974**, analysed complications of internal fixation in 244 cases of intertrochanteric fractures treated with Jewett nail, Pugh's nail or Smith Peterson nail. In this study, Jewett nail was associated with 31% of fixation failure, whereas Pugh's nail and Smith Peterson nail was associated with 15% & 23% of fixation failure respectively. They found higher rate of fixation failure (25%) in unstable and osteoporotic fracture than the stable fractures (13%).

Jensen et al[5] in **1980,** analysed the results of four methods of internal fixation in the management of unstable trochanteric fractures. They had 53% failure associated with Mc Laughlin nail plate, whereas Jewett nail plate, Ender nail, sliding screw plate was associated with48%, 19%, 6% failure rate respectively. Majority of failure fixation in this study was associated with poor quality of reduction and osteoporosis.

Wolfgang et al[6] **in 1980,** analysed the results of 317 trochanteric fractures treated with sliding screw plate fixation. In this study they found that early ambulation following internal fixation of unstable comminuted,osteoporotic trochanteric fractures resulted in increased rate of complications like metal fracture, disengagement, cutting out of head.

In such cases they have suggested to protect the hip as much as possible throughout the healing period.

Kim[12] and co-workers in **2001**, evaluated 178 cases of intertrochanteric fractures internally fixed with DHS. They found fixation failure in the form of varus collapse, extrusion of lag screw more than 20mm (or) metal failure in 27% of cases. They concluded that internal fixation of unstable osteoporotic intertrochanteric fracture was associated with increased rate of fixation failure (50%). They have suggested bipolar prosthesis should be preferred over internal fixation with DHS in such cases.

The **Bipolar prosthesis** was first introduced by ***James. E. Bateman*** [13] and **Giliberty** in **1974** for the management of hip arthritis. The commonly known versions of Bipolar prosthesis are Monk duo pleet, Monk (1976), Hastings Bipolar prosthesis, Devas et al (1983), Modular Bipolar prosthesis (Biotechnic france) and Talwalkar's bipolar endoprosthesis (Inor, India).

In **1974** ***Tronzo***[9], was the first surgeon to use long- stem Matchett Brown endoprosthesis for the primary treatment of intertrochanteric fractures.

***Stern et al*[14] In 1977** reported 29 cases of trochanteric fractures of the femur that have been treated primarily or secondarily by insertion of a Leinbach prosthesis with use of methyl methacrylate. They concluded that the use of Leinbach bipolar prosthesis in elderly debilitating patients reduces problems associated with prolonged immbolisation by promoting early mobilisation and is an effective way of treating comminuted and unstable intertrochanteric fractures in the elderly.

***Green S, Moore T, Proano* et al [15]** in **1987** performed bipolar prosthetic replacement for 20 elderly patients with intertrochanteric fractures to promote early full weight bearing and rapid rehabilitation. At the hospital discharge, 15 of the patients were ambulatory with full weight bearing on the operated limb (average time was 5.5 days). At the final follow up, 12 patients were ambulatory, four were non-ambulatory. They concluded bipolar prosthesis is a viable alternative to internal fixation in the management of unstable trochanteric fractures in the elderly patients.

***Vahl et al* [16]** in **1994**, in a study of 22 patients with an unstable intertrochanteric or subtrochanteric hip fracture that were treated by hemiarthroplasty, found that , even in patients suffering from several associated diseases or injuries, early ambulation was obtained within a

short period of hospitalisation and an acceptable complication rate. Full weight bearing mobilisation was possible in most patients.

Casey Chan K, Gurudev S.G [17] in **2000**, reviewed the results of fifty four patients treated with standard cemented hemiarthroplasty for the intertrochanteric fractures .In this study, eighty-two percent of patients retained walking ability after surgery.12 patients died within six months of their fractures.They concluded that standard cemented hemiarthroplasty is a viable alternative treatment option.

Rodop O et al [18] **2002 ,** reported a prospective analysis of fifty four elderly patients treated with cemented bipolar prosthesis for unstable intertrochanteric fractures. He achieved good to excellent Harris hip score in eighty percent of the patients. He concluded that hemiarthroplasty gives better results than open reduction and internal fixation in terms of complications and early returning to daily living activities.

Grimsrud et al [19] in **2005** , reported a series of thirty-nine patients with comminuted intertrochanteric fractures treated with a cemented bipolar hip arthroplasty using standard femoral stem and cerclage cabling of trochanter. They achieved early full weight bearing with low complication rate . They have concluded that hemiarthroplasty provides consistently satisfactory results.

Kesmezarcar et al [20] **in 2005,** in a retrospective analysis of eighty-one elderly patients with intertrochanteric fractures treated with internal fixation and endoprosthesis , found increased mortality rate with endoprosthetic group. However in this study endoprosthetic group had an advantage of early full weight bearing over internal fixation.

Kayali et al[21] **in 2006**, In a comparative study of cone hemiarthroplasty versus internal fixation found that, clinical outcomes doesn't differ significantly between the two groups. However, full weight bearing was achieved earlier in the hemiarthroplasty group. They concluded that, cone hemiarthroplasty can be a good alternative treatment option in the management of elderly osteoporotic trochanteric fractures who requires early mobilisation.

Florian Geiger et al [22] **2007**, in a retrospective analysis of 283 patients with pertrochanteric fractures treated with proximal femoral nail , dynamic hip screw and primary hip arthroplasty, compared the mortality risk and complication rates.They found that mortality risk doesn't vary significantly between primary hip arthroplasty and osteosynthesis group and also the complication rate is low in arthroplasty group. They suggested primary hip arhtroplasty is a good treatment option for osteoporotic trochanteric fractures.

Sanchetti et al [23], in **2010** ,in a study of primary hemiarthroplasty performed for osteoporotic unstable intertrochanteric farctures with 37 patients , obtained 71% good to excellent result. They have stated the advantage of minimal operative time & blood loss & early full weight bearing. They concluded that primary hemiarthroplasty for osteoporotic unstable intertrochanteric farctures in the elderly results in early ambulation and good functional results.

Sinno K et al [24],in **2010**, in a comparative study of bipolar arthroplasty and dynamic hip screw for unstable intertrochanteric fractures in the elderly patient, showed that time to full weight bearing ,rate of post op complication and functional outcome was significantly better in cemented arthroplasty group. They concluded that cemented hemiarthroplasty is the treatment of choice in freely mobile elderly patients with intertrochanteric fractures.

Amarjit singh sidhu et al [25] **in 2010,** reviewed the results of fifty three patients of unstable trochanteric fractures treated with total hip replacement . They found that sixty percent of the patients returned early to their normal daily activities. They concluded that total hip arthroplasty offers early recovery with minimal risk of mechanical failure.

Singh walia et al [26] **in 2011** ,in a comparative analysis of primary bipolar arthroplasty and total hip arthroplasty in the management of trochanteric fractures in elderly patients found no significant difference between two groups of arthroplasty in terms of clinical outcomes. They found dislocation rate is higher in the THA group than bipolar prosthetic group. They concluded that bipolar hemiarthroplasty is a better option for unstable intertrochanteric fracture.

Ramachander siwach et al[27] **in 2012** , reported a case series of twenty five patients with intertrochanteric fractures treated by standard cemented hemiarthroplasty, in which eighty percent of cases achieved good to excellent Harris hip score. They suggested that standard cemented arthroplasty is a good alternative to dynamic hip screw in the management of intertrochanteric fracture.

Salunkhe et al [28] **in 2012**, reported a case series of fifty patients with intertrochanteric fractures in which the patients were divided into three groups based on the intactness of calcar and lesser trochanter. AMP type of bipolar , Thompson type of bipolar prosthesis , Modular bipolar prosthesis were used for group 1, group 2, group 3 patients respectively. They concluded that elderly patients with osteoporotic comminuted intertrochanteric fractures are better treated with cemented hemiarthroplasty

***Wei feng et al*[29] in 2013**, evaluated the clinical effects of endoprosthetic replacements for failed treatment of intertrochanteric fractures. They found that failed internal fixations were most commonly associated with osteoporotic elderly patients who were unable to co-operate with partial weight bearing .

***Kiran kumar et al*[30] in 2013** , in a study of twenty cases assessed the efficacy of cemented hemiarthroplasty in management of proximal femur fractures in elderly patients with severe osteoporosis. They found that Cemented hemiarthroplasty provides stable and mobile hips and it has an advantage of early ambulation and less hospital stay.

***Atul patil et al*[31] in 2013**, operated 126 elderly patients with communited osteoporotic intertrochanteric fractures using cemented bipolar hemiarhtroplasty and tension band wiring for greater trochanter. They suggested that cemented bipolar hemiarthroplasty helps in faster rehabilitation and functional recovery in elderly osteoporotic patients. They suggested cemented bipolar hemiarthroplasty is a viable technique for elderly osteoporotic comminuted intertrochanteric fractures.

ANATOMY :

ANATOMY OF THE HIP JOINT :

The hip joint is a multi axial ball and socket joint. The femoral head articulates with the cup shaped acetabulum. The articular surfaces are reciprocally curved and are neither co-existence nor completely congruent. The surfaces are considered spheroid or ovoid rather than spherical.

The femoral head is covered by articular cartilage except for a rough pit for the ligament of the head. In front, the cartilage extends laterally over a small area on the adjoining neck. The cartilage is thickest centrally. Maximum thickness is in the acetabulum's anterosuperior quadrant and the anterolateral part of the femoral head.

The acetabular articular surface is an incomplete ring, broadest above where the pressure of the body weight falls in erect posture. It is deficient below, opposite to the acetabular notch. The acetabular fossa is devoid of cartilage, but contains fibroelastic fat largely covered by synovial membrane.

LIGAMENTS:

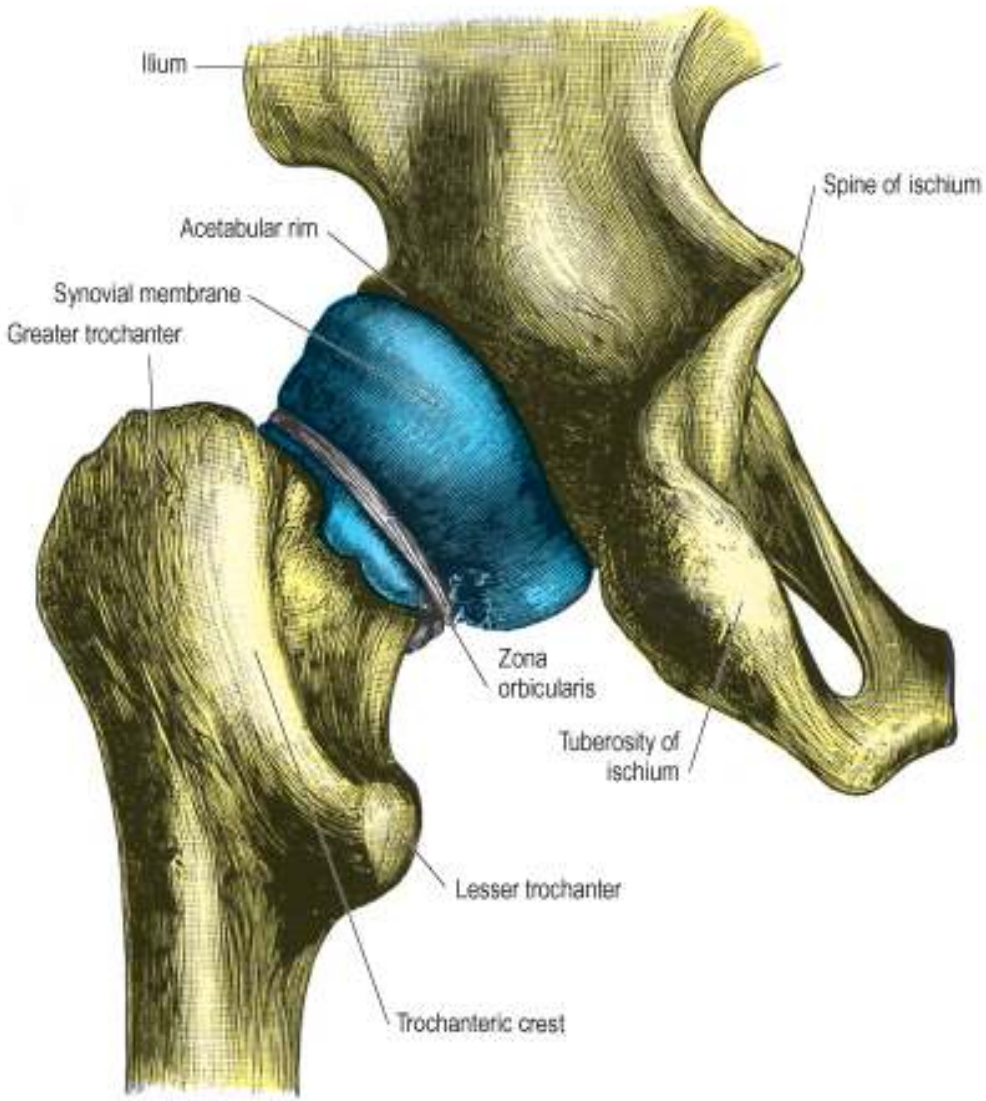
The Acetabular labrum:

It is a fibrocartilagenous rim attached to the acetabular margin, deepening the cup and broadening the acetabular notch as the transverse acetabular ligament, under which vessels and nerves enter the joint. It is triangular in section and its base is attached to the acetabular rim with the apex as the free margin.

The Fibrous capsule:

Strong and dense, it is attached above to the acetabular margin 5-6mm beyond the labrum, in front to the outer lateral aspect and near the acetabular notch to the transverse acetabular ligament and the adjacent rim of the obturator fossa. Distally it surrounds the femoral neck and is attached in front to the intertrochanteric line and above to the base of the femoral neck. Behind, it is attached 1 cm above the inter trochanteric crest. Below it is attached to the femoral neck near the lesser trochanter. Anteriorly, many fibres ascend along the femoral neck as longitudinal retinacula containing blood vessels for the both the femoral head and neck. The capsule is thicker antero-superiorly, where maximal stress occurs, especially on standing. Postero-inferiorly it is thin and loosely attached. The capsule has two layers – inner circular, forming the ‘Zona

Orbicularis' around the femoral neck and blending with the pubofemoral and ischiofemoral ligaments, and an outer longitudinal layer. The circular layer is not directly attached to bone



HIP CAPSULE

The Synovial membrane:

Starting from the femoral articular surface, it covers the intracapsular part of the femoral neck, and then passes to the capsule's inner surface to cover the labrum, ligament of the head and the fat in the acetabular fossa. It is thin on the deep surface of the iliofemoral ligament, where it is compressed against the femoral head. It communicated with the subtendinous iliac (psoas) bursa by a circular aperture between the pubofemoral and the vertical bank of the iliofemoral ligament.

The iliofemoral ligament:

It is also known as "Bigelow's Ligament". Triangular or inverted 'Y' shaped. It is one of the strongest ligaments in the body. Its apex is attached between the anterior inferior iliac spine and the acetabular rim, and its base to the intertrochanteric line anteriorly.

Pubofemoral ligament:

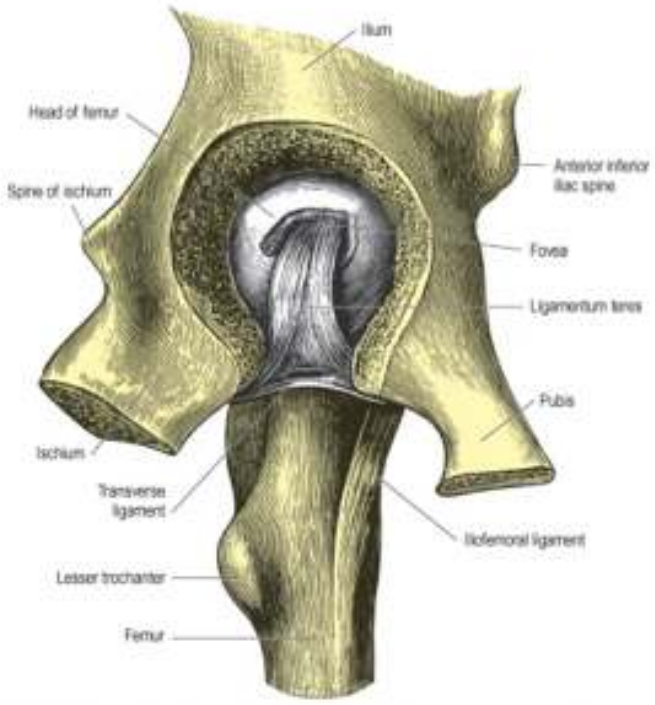
It is triangular with the base attached to the iliopubic eminence, superior pubic ramus, obturator crest and membrane. Distally it blends with the capsule and deep surface of the medial part of iliofemoral ligament.

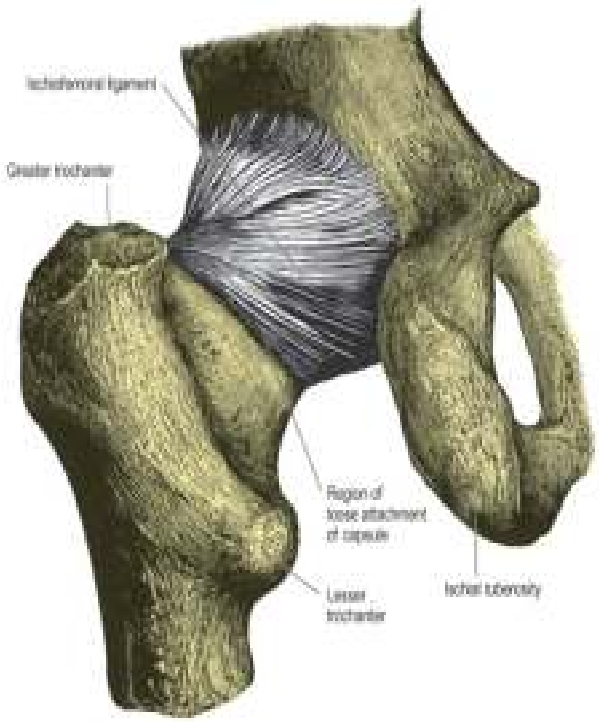
Ischiofemoral ligament:

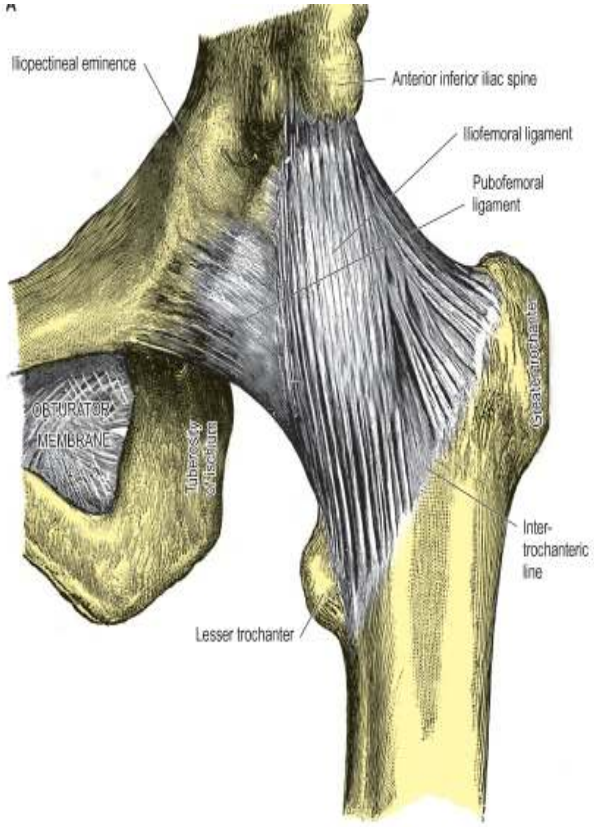
It consists of superior ischiofemoral ligaments, and the lateral and medial inferior ischiofemoral ligaments, extending from the ischium to the base of the femoral neck on the posterior aspect of the joint.

Ligamentum teres:

It is a triangular flat band with apex attached to the pit on the femoral head and base on either side of the acetabular notch. It varies in length sometimes being represented only by a synovial sheath. This ligament is tensed, with the thigh semi flexed and adducted and relaxed in abduction.







LIGAMENTS OF HIP

Anatomy of proximal femur:

The proximal femur comprises of the head, neck, a greater and a lesser trochanter.

The **femoral head** is more than half a sphere directed upwards, medially, and slightly forwards to articulate with the acetabulum.

The **neck** connects the head and the shaft with which it forms an angle of 120 to 130 degrees, roughly pyramidal in shape, flattened anteriorly and at its junction of the shaft is marked by a prominent rough ridge termed the intertrochanteric line. A rounded ridge termed the intertrochanteric crest, which joins the posterior aspect of the greater trochanter to the lesser trochanter, marks the posterior surface at its junction with the shaft. On the upper part of the crest, there is a rounded protuberance called the quadrate tubercle.

The **greater trochanter** is a large quadrangular projection, laterally positioned at junction of the femoral neck with the shaft. Its medial surface presents a roughened depressed area, the trochanteric fossa. Most of the gluteal muscles are inserted on the greater trochanter.

The **gluteus minimus** is inserted in to the rough impression on its anterior surface.

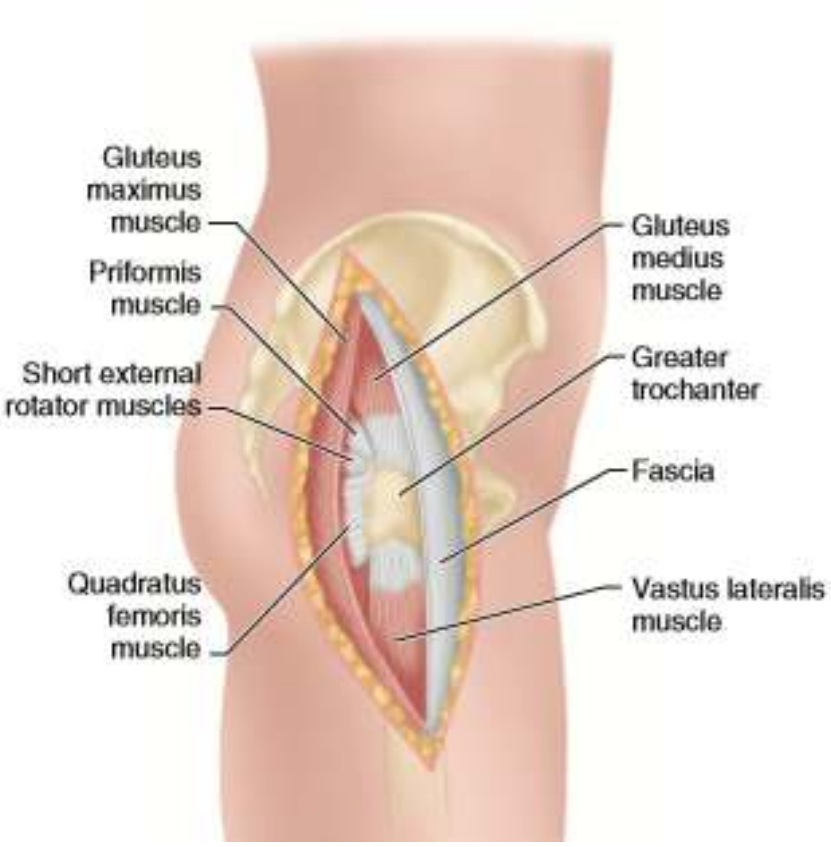
Gluteus medius is inserted into the oblique strip, which runs downwards and forwards across its lateral surface.

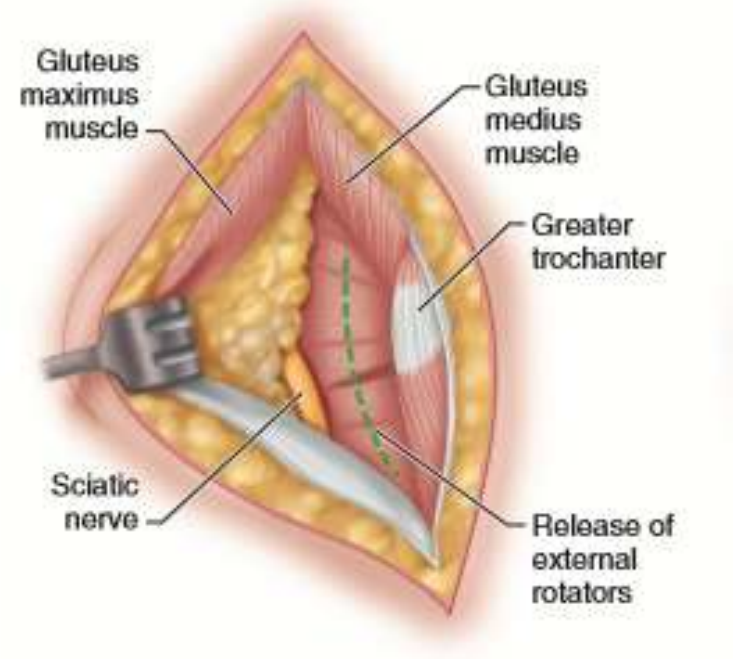
Pyriformis is inserted into the upper border of the trochanter.

Obturator internus, gemelli superior and inferior are inserted by a common tendon into the medial surface of the upper border of the trochanter.

Obturator externus is inserted into the trochanteric fossa.

The **lesser trochanter** is conical shaped, projects medially off the posteromedial surface of the femur and gives attachment to the psoas major at its summit, and iliacus at its base. The upper fibers of adductor magnus insert on its posterior surface.





MUSCLE ATTACHEMENTS IN THE PROXIMAL FEMUR :

TRABECULAR ANATOMY :

If the femur is sectioned in the frontal plane, the orientation of trabeculae can be visualized.

There are 2 principle trabecular systems.

1. Principle compressive trabeculae:

These arise from the medial cortex of femoral shaft and extend into the weight bearing region of the femoral head. These are the most dense and strongest of all the trabecular systems. They form an angle of 160 degrees with the medial cortex of the shaft (trabecular angle).

2. Principle tensile trabeculae:

These extend from the interior region of the foveal area across the head to the lateral femoral cortex. These are produced as a result of shearing forces to which the upper end of femur is subjected. Only a small portion of the body weight is transmitted along these trabeculae .

In addition, there are secondary trabecular systems in the trochanteric region, they are:

3. Secondary compressive group:

These extend from the medial femoral cortex to the greater trochanter.

4. Secondary tensile group:

These extend from the lateral femoral cortex into the middle of the neck.

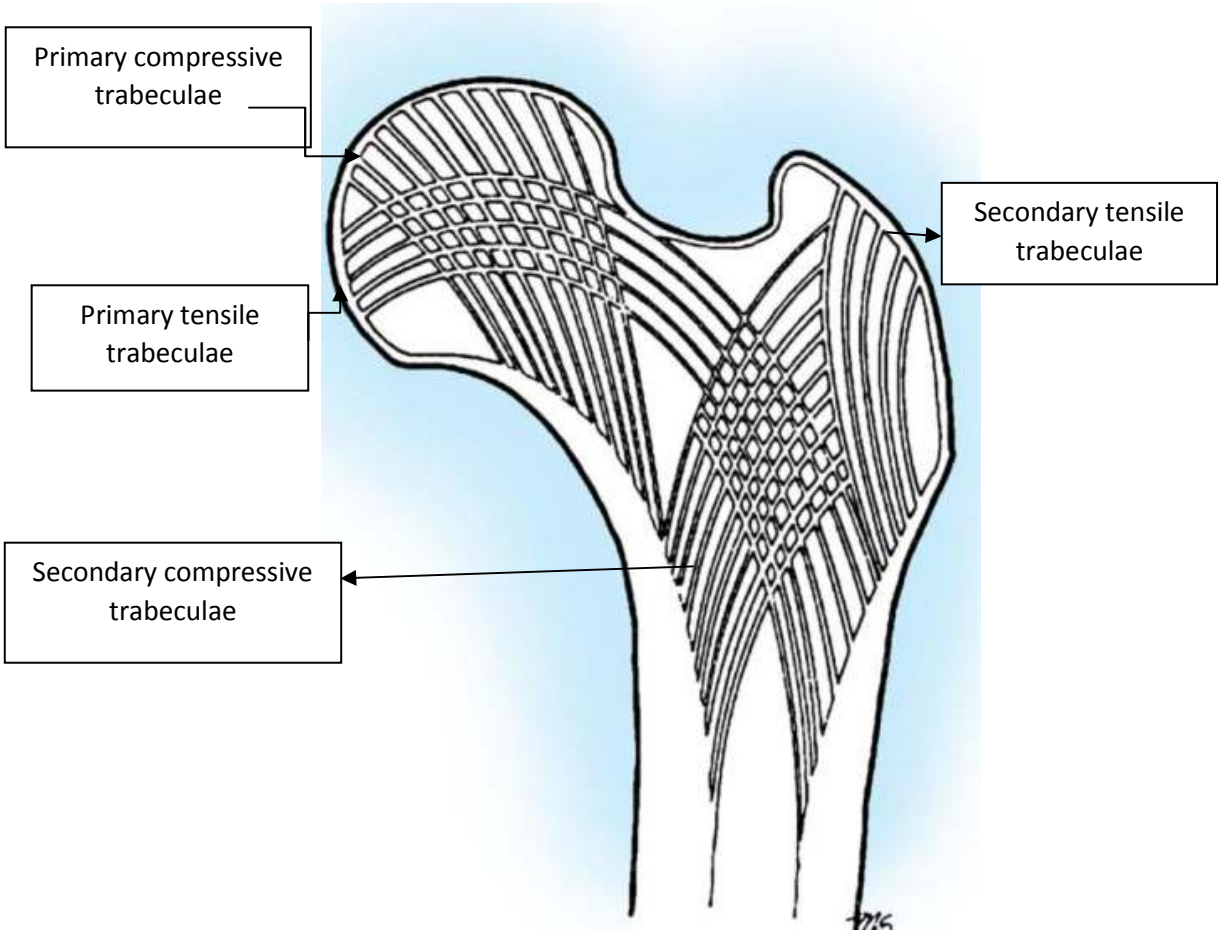
5. Trochanteric group:

These are arranged vertically within the greater trochanter.

These trabeculae are less marked in osteoporotic fracture. Based on the trabecular system, Singh's index have been used to grade the severity of osteoporosis in proximal femur.

CALCAR FEMORALE :

According to Harty and Griffin (1957), the calcar femorale is a dense vertical bone, extending from the posteromedial portion of the upper femoral shaft under the lesser trochanter to reach the posterior aspect of the neck medially and to blend into the spongy bone of the greater trochanter laterally. It represents upward elongation of the diaphyseal cortex into the inferior of the neck through the lesser trochanter. Intactness of calcar is necessary for supporting the prosthesis , absence of which results in sinking of prosthesis.



TRABECULAR SYSTEM OF PROXIMAL FEMUR .

KINESIOLOGY OF THE HIP:

MOVEMENT	**MUSCLES** (Prime Movers and assisted by)
Flexion	Psoas major, Iliacus, pectineus, Rectus femoris, Sartorius, Adductor Longus (in early flexion from full extension)
Extension	Extension Gluteus maximus, Posterior hamstrings
Abduction	Gluteus medius, Gluteus minimus, Tensor fasciae latae.
Adduction	Adductors longus,adductor brevis and adductor magnus, Gracilis, Pectineus
Medial Rotation	Tensor fasciae latae and Anterior fibres of Gluteus medius and minimus
Lateral rotation	Obturator Externus and Internus, superior and inferior Gemelli, Quadratus femorus, Assisted by Piriformis, Gluteus maximus.

RANGE OF MOVEMENTS:

Flexion	120° to 130°
Extension	10° to 20°
Abduction	40° to 50°
Adduction	30° to 40°
Medial rotation	30° to 40°
Lateral rotation	40° to 50°

MOVEMENTS OF HIP :

ABDUCTION

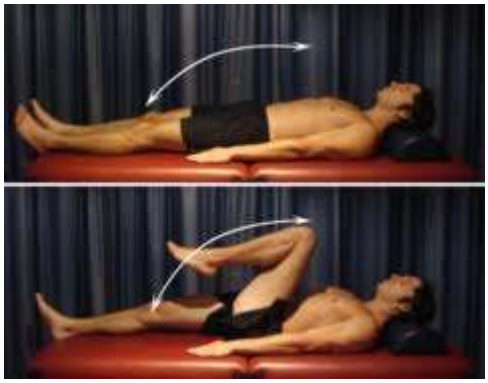
ADDUCTION

INTERNAL ROTATION

EXTERNAL ROTATION

EXTENSION

FLEXION



CLASSIFICATION OF TROCHANTERIC FRACTURES:

Most commonly used classification for trochanteric fractures are as follows:

1. Boyd & Griffin classification
2. Evan's classification.
3. Orthopaedic trauma association (OTA) classification.

BOYD & GRIFFIN (1949) CLASSIFICATION:

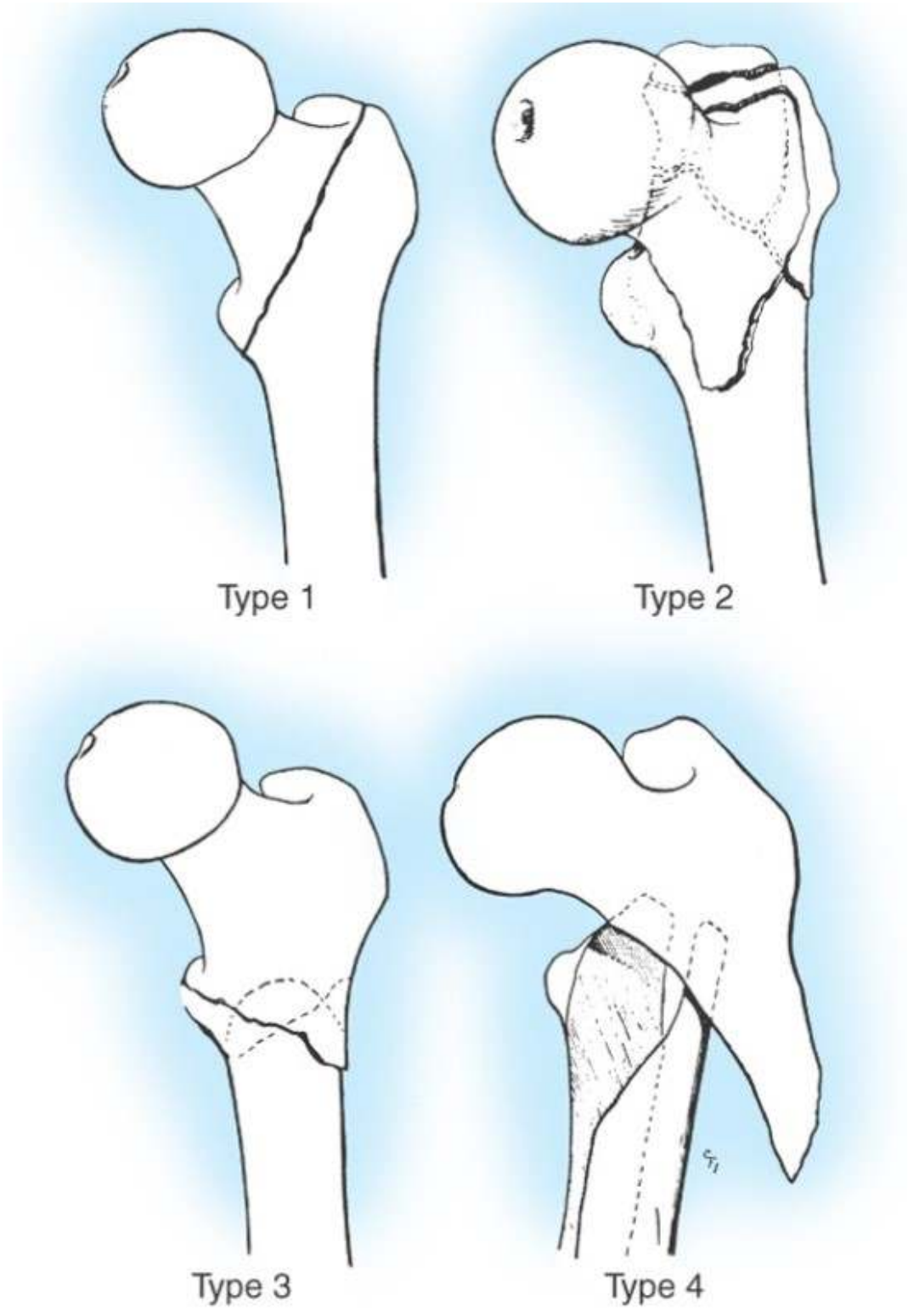
This classification includes all the fractures from extra capsular part of the neck to a point 5cm distal to lesser trochanter.

Type I **:** Fractures that extend along the intertrochanteric line.

Type II : Comminuted fracture, the main fracture being along intertrochanteric line but with multiple fractures in the medial cortex.

Type III **:** Fractures that are basically subtrochanteric with at least one fracture passing the proximal end of the shaft, just distal to or at the lesser trochanter.

Type IV **:** Fractures of the trochanteric region and the proximal shaft, with fracture in atleast two planes, with one fracture along saggital plane.



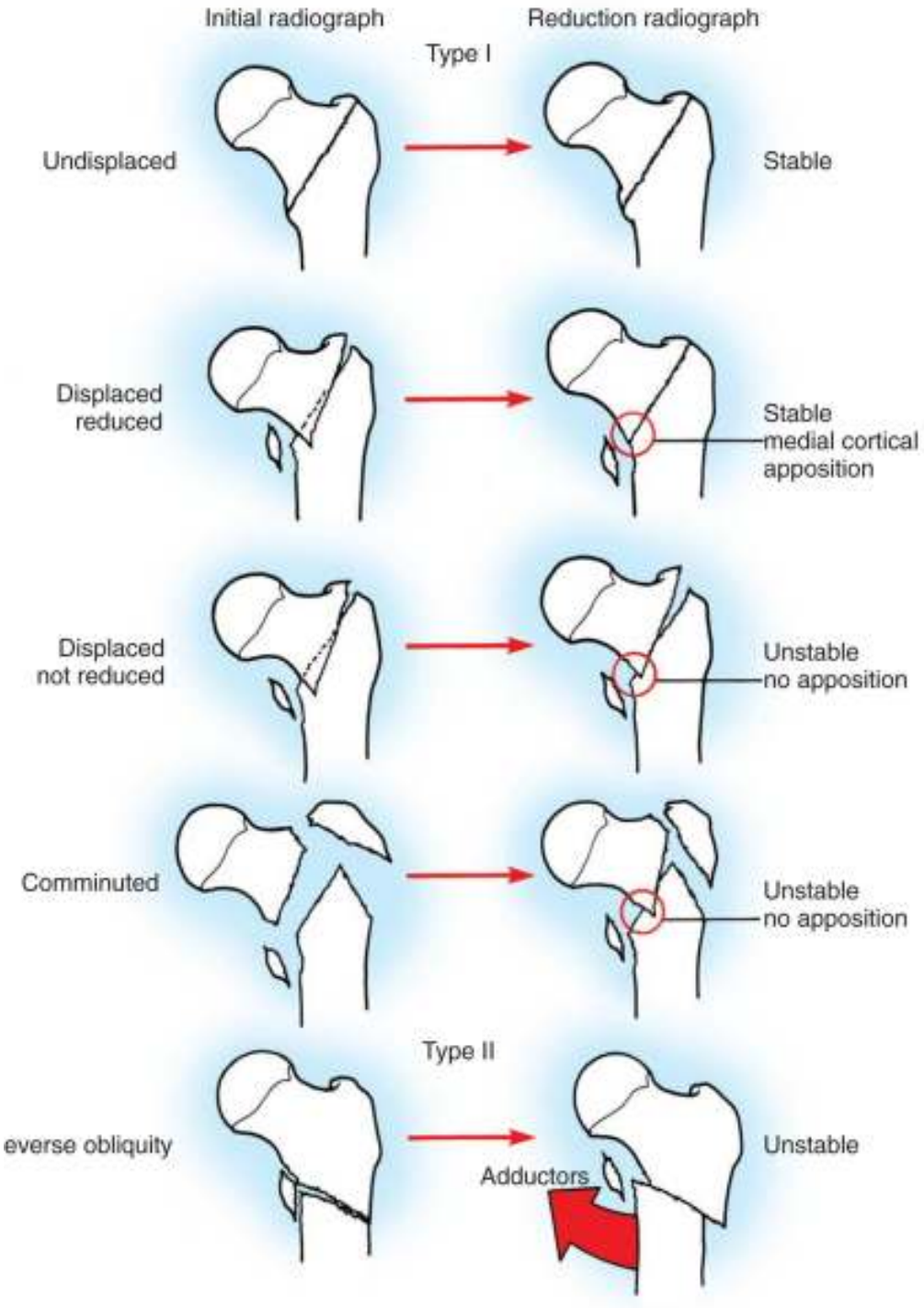
BOYD AND GRIFFIN CLASSIFICATION

EVAN'S CLASSIFICATION:-

This classification system based on stability of fracture pattern. Evan observed that the key to a stable reduction is restoration of posteromedial cortical continuity.

Type I **:** The fracture line extends upwards & outwards from the lesser trochanter.

Type II **:** The fracture line is reversed obliquely. The fracture line extends outward & downward from trochanter and is unstable.



EVAN'S CLASSIFICATION

ORTHOPEDIC TRAUMA ASSOCIATION (OTA)

ALPHANEUMERIC FRACTURE CLASSIFICATION:

31 A:- Proximal femur trochanteric fractures.

A1: Pertrochanteric simple

A1.1: Along intertrochanteric line

A1.2: Through greater trochanter

A1.3: Below lesser trochanter.

A2: Pertrochanteric multifragmentary

A2.1: With one intermediate fragment

A2.2: With several intermediate fragments

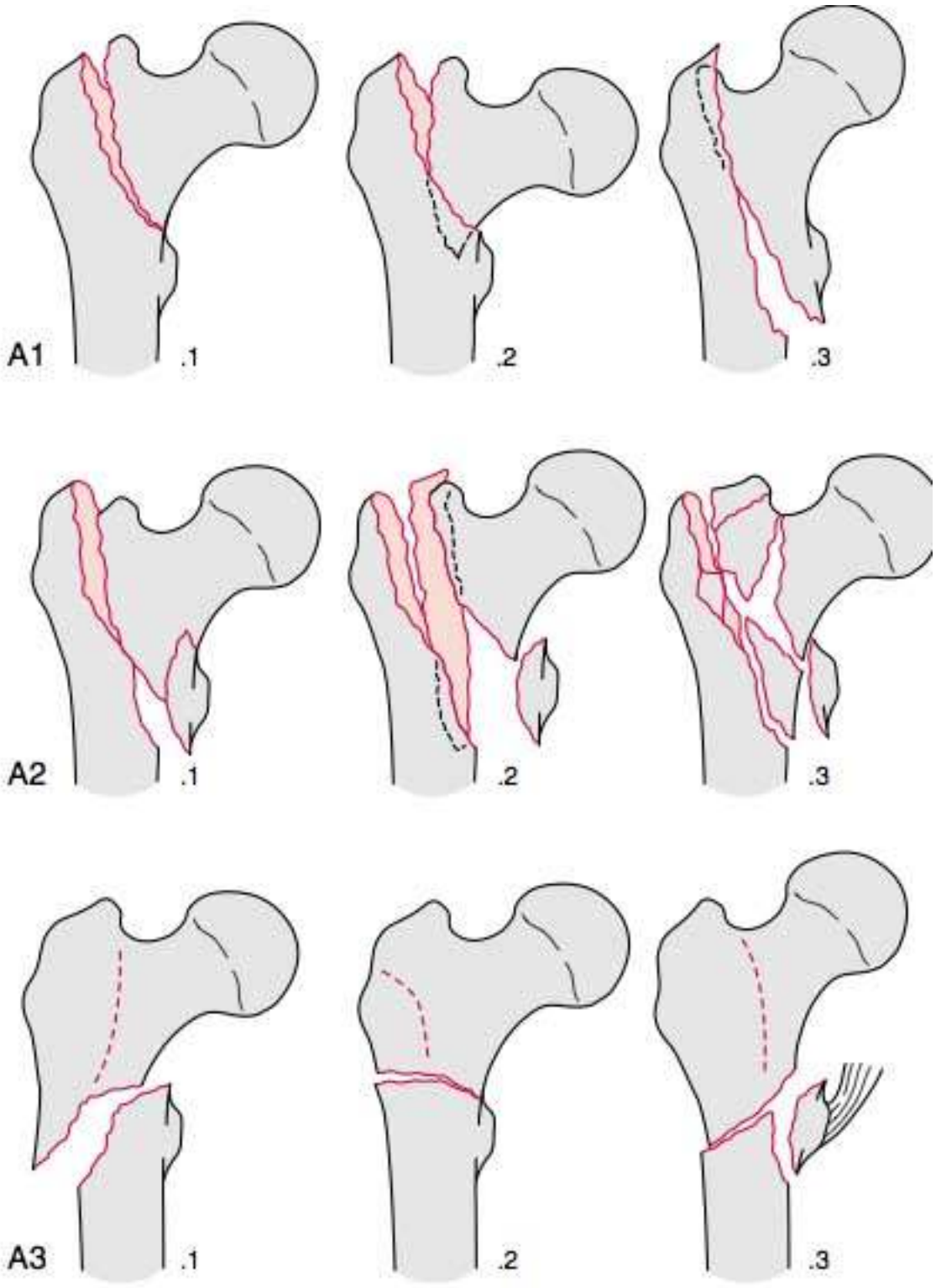
A2.3: Extending more than 1cm below lesser trochanter.

A3: Fracture line extending into lateral cortex (reverse oblique fracture)

A3.1: Simple oblique

A3.2: Simple transverse

A3.3: Multi fragmentary.



OTA FRACTURE CLASSIFICATION

MANAGEMENT OF TROCHANTERIC FRACTURES :

The main aim, more than to achieve union of the fractured bones, (as it usually unites) is, that the union should be solid with almost no residual deformity and functionally patient should be as normal as possible. By 12 weeks, usually trochanteric fractures unite.

Trochanteric fractures can be managed in two ways,

1. Conservative or non operative method.
2. Operative method.

CONSERVATIVE MANAGEMENT:

Conservative treatment of trochanteric femur fractures were associated with high mortality rate. Hence conservative treatment methods were highly abandoned. The indications for non operative treatment of intertrochanteric fractures are:

- An elderly person with high medical risk for anaesthesia and surgery.
- Non ambulatory patient with minimal discomfort following fractures.

SURGICAL MANAGEMENT:

Rigid internal fixation of intertrochanteric fractures with early mobilisation of the patients should be considered standard treatment.

The goals of operative treatment are;

- Rigid and stable fixation of the fracture fragments
- Early mobilization of the patient
- Restoration of the patient to his or her preoperative status at the earliest.

Kaufer Mathew & Sonstegard [32], have listed the variables that determine the strength of fracture fragment-implant assembly .

The variables are:

- Bone quality
- Fracture geometry
- Reduction
- Implant design
- Implant placement.

Bone quality and fracture geometry are beyond the control of the surgeon. Only the quality of reduction, the choice and placement of implant are within the control of surgeons.

Implants used for the management of intertrochanteric fractures can be classified into,

I. Extramedullary devices.

a) Fixed angle nail plate devices.

- JEWETT nail
- HOLT nail
- SMITH PETERSON nail.

b) Sliding devices.

- Dynamic hip screw
- MEDOFF plate
- Percutaneous compression plate .

II. Intramedullary devices.

a) Condylocephalic nails.

- ENDER'S pin.

b) Cephalomedullary nail.

- GAMMA nail
- Intramedullary hip screw
- Proximal hip screw
- Trochanter fixation nail.

III. External fixation

IV. prosthetic replacement

Sliding hip screw:

Internal fixation with dynamic hip screw is the treatment of choice for stable intertrochanteric fracture. However the scenario is different when comes to the management of unstable fracture. Failure rate of as high as 56% have been noted with internal fixation of unstable fractures[33, 34]. This is mainly due to inadequate purchase of screw in osteoporotic bone and inability of the elderly patient to follow partial weight bearing protocol following fixation, who invariably land up in full weight bearing. This leads to excessive collapse at the fracture site with migration of femoral head into varus and retroversion , which results in shortening and decreased abductor lever arm causing limping of the patient [12]. Another complication is screw cut out from femoral head.

FAILED INTERNAL FIXATION IN UNSTABLE TROCHANTERIC FRACTURE

Intramedullary hip screw :

This implant combines the features of a sliding hip screw (SHS) and intramedullary nail . These implants can be inserted in a closed manner with limited fracture exposure, decreased blood loss, and less tissue damage than an SHS. It limits the amount of fracture collapse, compared with an SHS. No clinical advantage of the intramedullary hip screw compared with the SHS in stable fracture patterns.This implant is most effective in intertrochanteric fractures with subtrochanteric extension and in reverse obliquity fractures. It has been associated with an increased risk of femur fracture at the nail tip or distal locking screw insertion point. Use of this implant in unstable trochanteric fractures management has been encouraging , however long-term outcome of these devices are yet to be defined.

PROXIMAL FEMORAL NAIL FOR UNSTABLE TROCHANTERIC FRACTURE:

External Fixation :

This is not commonly employed for the management of intertrochanteric femur fractures. A classical article on, the use of external fixators for intertrochanteric fractures was written by Dr Irwin H Scott[35] in 1957. He summarised 112 cases, demonstrated the pin construction for stable and unstable intertrochanteric fractures. He introduced two pins into to neck at an angle of 130 to 140 degrees, and 2 to 3 pins into the proximal half of the femur. Early experiences with external fixation for intertrochanteric fractures were associated with postoperative complications such as pin loosening, infection, and varus collapse.

EXTERNAL FIXATION FOR UNSTABLE TROCHANTERIC FEMUR FRACTURE.

PRIMARY PROSTHETIC REPLACEMENT :

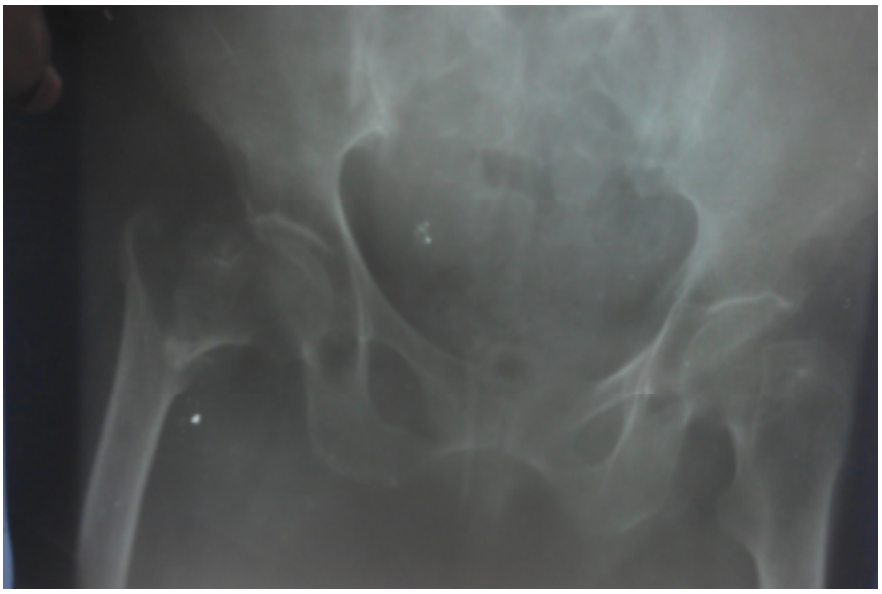
Majority of intertrochanteric and subtrochanteric fractures can be treated with internal fixation. Indications for primary prosthetic replacement for the management of intertrochanteric fractures includes the following:

- Peritrochanteric fractures in the presence of severe arthritis of the hip, especially if the hip is stiff .
- Pathologic fractures in which the bone stock precludes internal fixation
- Unstable, severely comminuted fractures in the very elderly, whose bone is so osteoporotic that internal fixation, even with cement augmentation, is expected to fail . Many clinical studies have shown that early full weight bearing and rehabilitation , which significantly reduces the post-operative morbidity and mortality , was the definitive advantage of prosthetic replacement in the management of unstable intertrochanteric fractures.

PRIMARY HEMIARTHROPLASTY IN UNSTABLE TROCHANTERIC

FRACTURE :

PREOP RADIOGRAPH



POST OP RADIOGRAPH

THE IMPLANT:

The Bipolar prosthesis was first introduced by JAMES. E. BATEMAN[13] and GILIBERTY in 1974 for the management of hip arthritis. The commonly known versions of Bipolar prosthesis are Monkduo pleet, Monk (1976), Hastings Bipolar prosthesis, Devas et al (1983), Modular Bipolar prosthesis (Biotechnic france) and Talwalkar's Bipolar endoprosthesis (Inor, India). Tronzo[9], in 1974 was the first person to use endoprosthesis for the primary treatment of intertrochanteric fracture. Green. S et al was the first person to use bipolar prosthesis for the treatment of unstable intertrochanteric fracture.

Bipolar Hip Prosthesis:

Bipolar hip prosthesis has the great advantage of a second joint below the acetabulum, it has an outer head of metal which articulates with the acetabulum and a second in a metallic head which articulates with the high density polyethylene (HDPE), lining the inner surface of the outer head. This prosthesis proved to be very useful and results were encouraging.

Self-centring action:

The positive eccentricity of the centres of rotation corrects alignment.

Biomechanical fixation:

The biological component is the self-locking action while the mechanical component is represented by 3 point fixation in the femoral shaft.

Preservation of the acetabulum:

It is postulated that distribution of shear forces between the inner and outer bearings will spare acetabular surface from wear and erosion;

- Acetabular wear is reduced through decrease in total amount of motion that occurs between the metallic outer shell and acetabular cartilage.
- by the interposition of a second low-friction interbearing within the implant.

Range of Motion :

Because of dual bearing surface, range of motion is greater in bipolar designs than either unipolar designs or conventional THR. The available range of prosthesis:

- Sizes (dia.37-53mm, in 2 mm increments).
- Outer shell made of stainless steel 3.16L.

- Insert made of UHMWPE.
- To accept metal or ceramic femoral heads.
- Sterilized by Gamma irradiation.

Recent modifications:

Currently the eccentric position of metallic and polyethylene cup axis, allows the metallic cup to rotate laterally than medially on hip loading .This avoids fixation in varus position and prevents impingement of head on edge of cup.

Bipolar prosthesis

Polymethyl Methacrylate (PMMA) -Bone Cement

This is used to fix the implants to bone. It is not an adhesive, but rather a filler and depends on mechanical interlock for stability at the cement bone interface. It is cold curing because the application of heat and pressure to polymerize and harden it is unnecessary. It is self curing, because there is a catalyst in the powder and an accelerator in the liquid.

The cement is supplied in packets of powder containing pre polymerized PMMA, Barium sulfate and a catalyst or initiator. The accompanying vials of liquid contain methylmethacrylate monomer, cross-linking agents and accelerators.

Mixing should be done according to the manufacturer's instructions. Manual mixing produces cement mantles with a high degree of porosity, which encourage crack propagation and hence failure. Vacuum mixing and centrifugation may accomplish porosity reduction.

Heat stable Antibiotics can be added in concentration of 0.5gm to 2 gms of, powdered form to a 40 gm package of cement to decrease infection. This may decrease fatigue strength significantly and therefore is not routinely recommended.

On introducing the PMMA into the femoral canal, there may be transient hypotension as a result of peripheral vasodilatation and direct myocardial depression by the monomer entering the circulation. The lungs quickly clear this. A secure mechanical bond is extremely important because it prevents motion at the bone-cement interface. Motion causes component loosening as a result of bone resorption and fracture of the cement.

Bone cement can withstand considerable compression, but fails under tension or shear force. If the cement is not tightly packed between the bone and the implant component, and if gaps and spaces are left between the surfaces, the cement will break because it is subjected to shear and tension, rather than compression forces.

MATERIALS AND METHODS

MATERIALS:

20 elderly and physiologically elderly patients with comminuted trochanteric fractures who met the inclusion criteria were studied prospectively in the Department of Orthopaedics, Coimbatore medical college hospital, Coimbatore during the period from July 2011 to December 2013.

SELECTION CRITERIA:

Inclusion criteria:

1. Patient above 60 years of age.
2. Independently ambulatory before sustaining the fracture.
3. Communited intertrochanteric femur fracture (type II/III Boyd &Griffin).

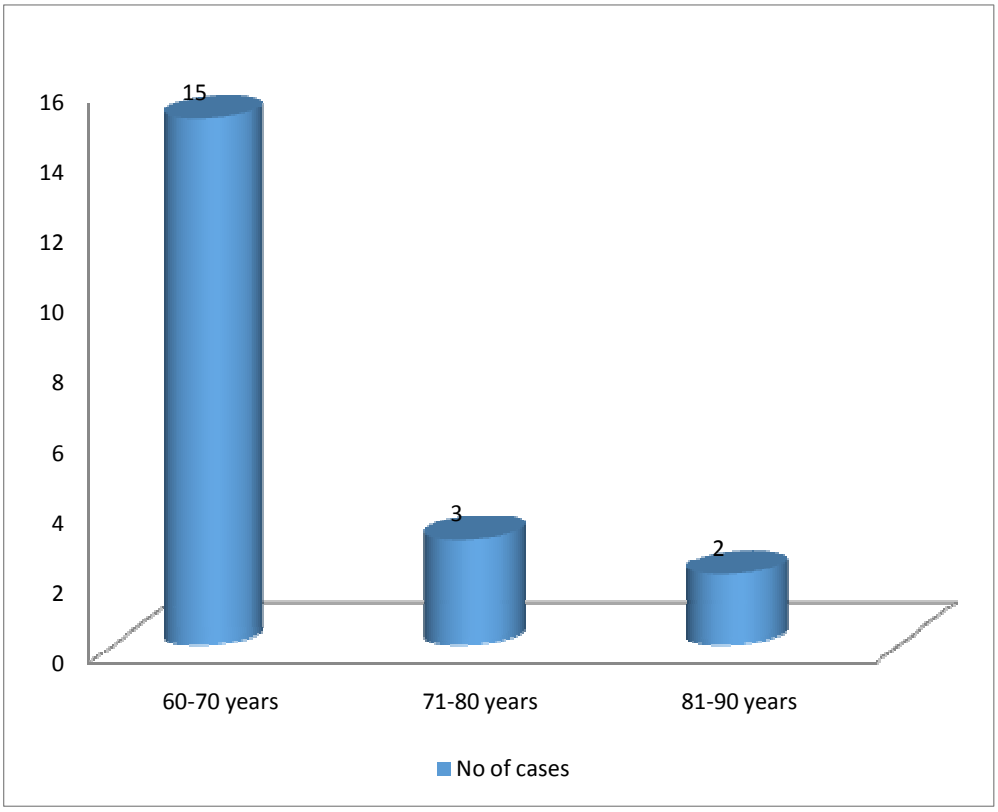
Exclusion criteria:

1. Patient less than 60 years.
2. Non ambulatory patients before the surgery.
3. Patients with pathological fractures.
4. Open / stable fractures were excluded from the study.

Patient‘s average age was 69.4 yrs [60-85 yrs].Both male and female patients were included in the study.8 patients were male, 12 patients were female. Male to female ratio was 2:3.All the patients had sustained fracture following a trivial trauma. 8 patients had left sided fracture .12 patients had right sided fracture.

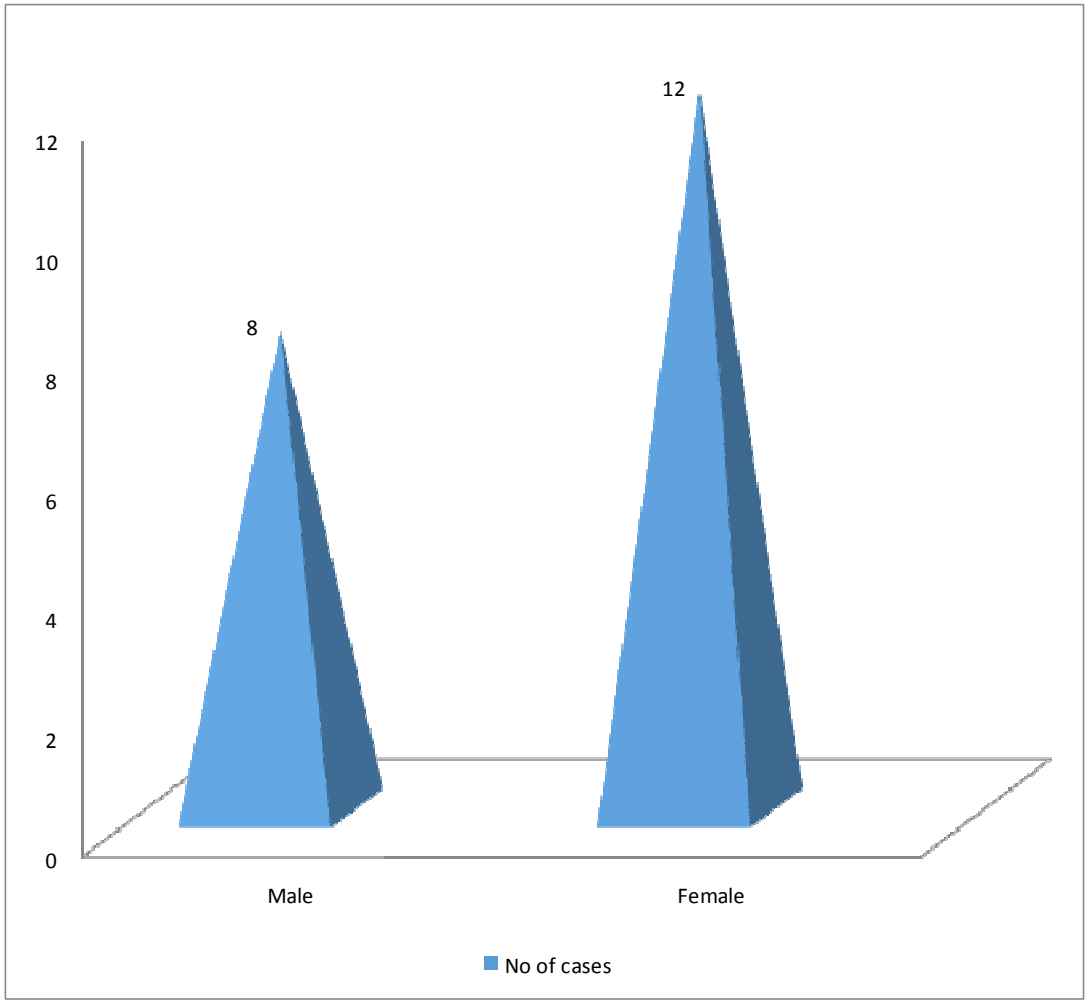
Fractures were classified under Boyd and Griffin classification.18 patients had sustained Boyd & Griffin Type II intertrochanteric fracture, 2 patients had sustained Boyd & Griffin Type III intertrochanteric fracture. The mean number of days from sustaining fracture to surgery was 15 days. All the patients were treated with cemented bipolar prosthesis through posterior (Moore’s) approach.

CHART 1: AGE DISTRIBUTION



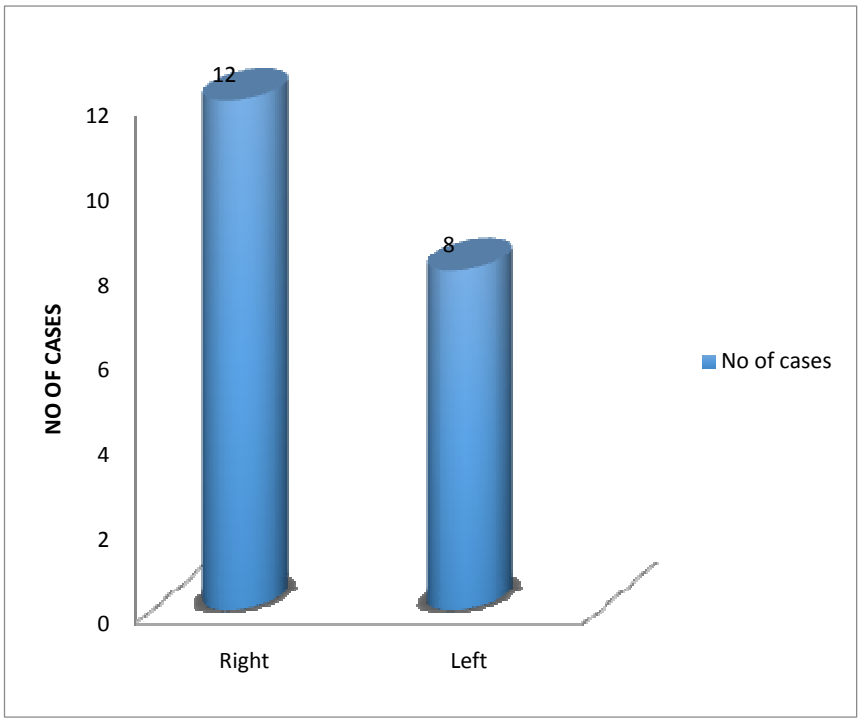
Majority of our patients are between sixty to seventy years of age group.

CHART :2 SEX DISTRIBUTION :



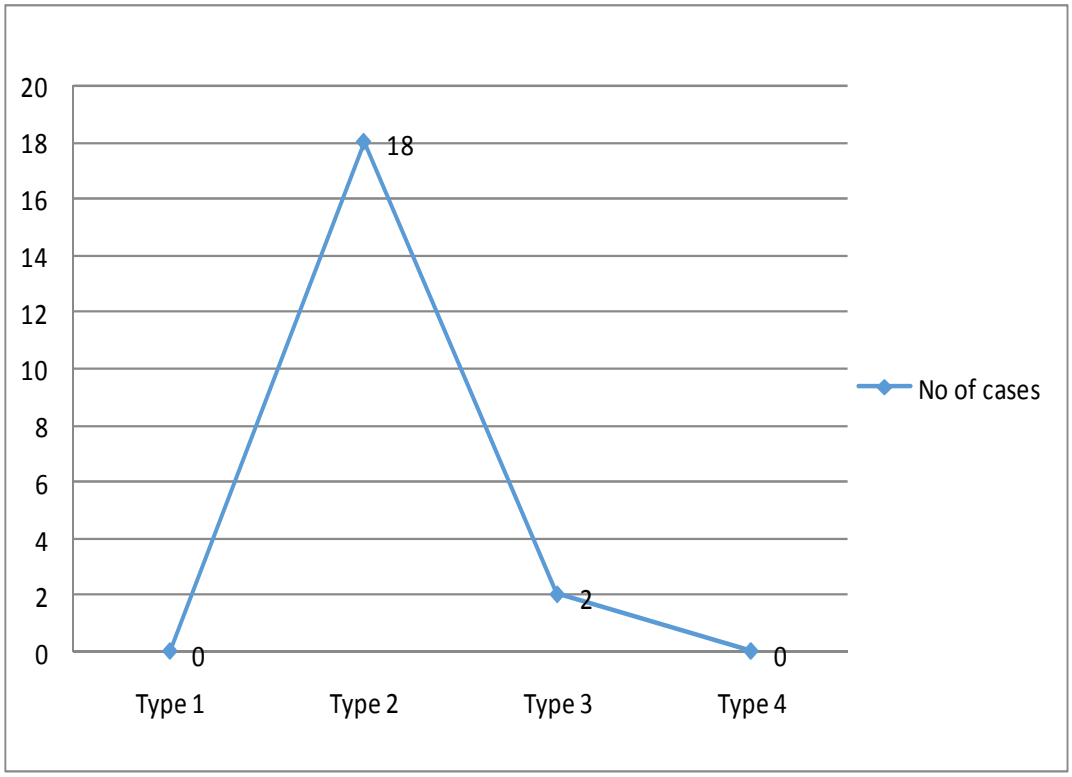
Majority of fractures in our study are associated with elderly female patients.

CHART :3 SIDE DETERMINATION



The above chart shows that right femur is most commonly fractured than the left side.

CHART :4 FRACTURE CLASSIFICATION



BOYD & GRIFFIN CLASSIFICATION

Most of the cases in our study belongs to Boyd & Griffin type 2 fracture.

INSTRUMENTS AND IMPLANTS :

BIPOLAR PROSTHESIS

METHODS:

PREOPERATIVE EVALUATION:

After patient's admission detailed history regarding mode of injury, associated co-morbid condition was taken. Clinical assessment of the patients were done in detail. All patients were treated preoperatively with buck's traction, with the aim of relieving pain preventing shortening and to reduce unnecessary movement of injured limb. Oral or parental NSAIDs were given to relieve the pain.

The following investigations were done routinely on all these patients preoperatively.

Blood investigations includes Haemoglobin %, blood grouping and Cross matching, fasting and Post prandial blood sugar, blood urea and Serum creatinine.

Radiograph :

- Pelvis with both hips – AP
- Injured Hip with femur-AP (Traction and internal rotation view)
- Chest X ray PA view.

Pre-operative templating:

Pre-operative templating of radiographs of the fractured side and contralateral side was performed to determine the approximate size and position of the stem and the approximate femoral neck offset.

The patients were operated on elective basis after overcoming the avoidable anaesthetic risks. Patients as well as the attenders were explained about the surgery and the risk factors; a written consent for the surgery was taken for all patients.

Preoperative preparation:

Injection Xylocaine 0.5cc Intradermally and injection TT 0.5cc Intramuscularly given the day prior to surgery. Intravenous antibiotic were given an hour before the surgery.

The back, lateral aspect of the hip from the iliac crest to the distal thigh, groin was prepared.

Surgical procedure:

Position of the patient: Straight lateral position with the patient lying on the unaffected side .knee of the unaffected side is flexed to 45 degree which is used as intraoperative reference for measuring limb length. The skin over the hip was prepared with a scrub and application of

povidone-iodine and surgical spirit. The operative field was outlined by 4 sterile towels held in place by clips .

Approach: Posterior approach:

Exposure: Incision made from a point 10 cm distal to posterior superior iliac spine and extended distally and laterally to the posterior margin of the greater trochanter and then directed about 10cm parallel to the femoral shaft. Deep fascia was exposed and then gluteus maximus is split in the direction of its fibres using blunt dissection. By retracting the proximal fibres of the muscle proximally, the greater trochanter is exposed. The fractured greater trochanter is reflected anteriorly. The sciatic nerve was usually not exposed, and if it was, it was gently retracted out of the way.

Extraction of Femoral head:

After exposure of posterior part of the capsule, capsulotomy done in a ‘T’ shaped manner. The thigh and knee are flexed to 90° and the thigh is rotated internally to expose the neck of the femur, osteotomy was done at the level of the neck. The head of the femur was levered out of the acetabulum and size measured using template.

Acetabulam preparation:

The acetabulum was prepared, the remnant ligamentum teres was completely excised and the remaining soft tissue from the pulvinar region was curetted.

Femoral canal preparation:

The femoral shaft was rasped using a broach (rasp) and prepared for the insertion of the prosthesis.

Trial reduction: Trial reductions were performed to determine the exact length that would provide the desired tension and tissue balancing of the abductor muscles and an equal leg length.

Cementing technique and reduction of prosthesis:

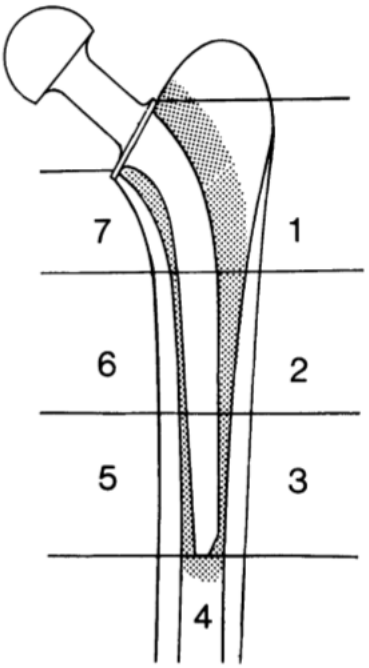
Bone cementing done by standard cementing technique. Then bipolar prosthesis introduced in the proximal femur and then reduced into the hip joint once the bone cement set in. Then the greater trochanter was put back in place. After suturing the capsule the external rotators were sutured, the wound was closed in layers over a suction drain, which is removed at the first change of dressing after 48 hours.

Post operative protocol:

Post operatively Patients were made to sit up on the second day, stand up with support (walker) on the third day and were allowed to full weight bear and walk with the help of a walker on the fourth postoperative day, depending on his/her pain tolerance and were encouraged to walk thereafter. Sitting cross-legged and squatting were not allowed. Suture removal was done on the fifteenth postoperative day. Patients were followed up at an interval of 6 weeks, 3 months, 6 months and 12 months.

Patient was analysed clinically and radiologicaly at each follow up. Radiologically the patient was assessed for position of stem, stem loosening, periprosthetic fracture.

The below figure shows the Seven delineated sections around the, femoral component for zonal evaluation of looseness and progressive loosening[36].



ZONAL EVALUATION OF LOOSENING

Functional outcome was assessed using modified Harris hip score. Harris hip score is a validated 15 item questionnaire in which scores range from0 to 100.

< 70 -Poor

70-79 - Fair

80-89 - Good

90-100 - Excellent.

BOX 3-2 Harris Hip Evaluation (Modified)

Pain
- ☐ None or ignores it (44)
- ☐ Slight, occasional, no compromise in activities (40)
- ☐ Mild pain, no effect on average activities, rarely moderate pain with unusual activity; may take aspirin (30)
- ☐ Moderate pain, tolerable but makes concessions to pain; some limitation of ordinary activity or work; may require occasional pain medicine stronger than aspirin (20)
- ☐ Marked pain, serious limitation of activities (10)
- ☐ Totally disabled, crippled, pain in bed, bedridden (0)

Limp
- ☐ None (11)
- ☐ Slight (8)
- ☐ Moderate (5)
- ☐ Severe (0)

Support
- ☐ None (11)
- ☐ Cane for long walks (7)
- ☐ Cane most of the time (5)
- ☐ One crutch (3)
- ☐ Two canes (2)
- ☐ Two crutches (0)
- ☐ Not able to walk (0)

Distance Walked
- ☐ Unlimited (11)
- ☐ Six blocks (8)
- ☐ Two or three blocks (5)
- ☐ Indoors only (2)
- ☐ Bed and chair (0)

Stairs
- ☐ Normally without using a railing (4)
- ☐ Normally using a railing (2)
- ☐ In any manner (1)
- ☐ Unable to do stairs (0)

Put on Shoes and Socks
- ☐ With ease (4)
- ☐ With difficulty (2)
- ☐ Unable (0)

Sitting
- ☐ Comfortably in ordinary chair 1 hour (5)
- ☐ On a high chair for $^1/_2$ hour (3)
- ☐ Unable to sit comfortably in any chair (0)

Enter public transportation: ☐ Yes (1) ☐ No

Flexion contracture: _____ (degrees)

Leg-length discrepancy: _____ (cm)

Absence of Deformity (all Yes = 4; <4 = 0)
<30 degrees fixed flexion contracture: ☐ Yes ☐ No
<10 degrees fixed adduction: ☐ Yes ☐ No
<10 degrees fixed internal rotation in extension: ☐ Yes ☐ No
Limb-length discrepancy <3.2 cm: ☐ Yes ☐ No

Range of Motion (*Normal)
Total degree measurements, then check range to obtain score

Flexion (*140 degrees): _____
External rotation (*40 degrees): _____
Abduction (*40 degrees): _____
Internal rotation (*40 degrees): _____
Adduction (*40 degrees): _____

Range-of-Motion Scale
- 211-300 degrees (5)
- 161-210 degrees (4)
- 101-160 degrees (3)
- 61-100 degrees (2)
- 31-60 degrees (1)
- 0-30 degrees (0)

Range-of-Motion Score: _____

Total Harris Hip Score: _____

Readmission to Hospital: ☐ Yes ☐ No
Date of Readmission: ___/___/___
Implant Removal Date: ___/___/___

OPERATIVE TECHNIQUE:- RIGHT HIP

Patient Position and draping: Left lateral decubitus position

Skin incision :

Exposure of fracture segment :

Extraction of femoral head :

After extraction of femoral head :

MEASUREMNET OF HEAD SIZE:

Prosthesis cememnted into the femoral canal :

After reduction of prosthesis :

RESULTS

The following observations were made from the data collected during the study of 20 cases of intertrochanteric fractures treated by cemented bipolar hemiarthroplasty in the Department of Orthopaedics, Coimbatore Medical college hospital from July 2011 to December 2013.

Out of 20 patients ,3 patients died within 6 months of surgery . Other 17 patients were followed up at 6 weeks, 3 month, 6 months and 12 months post operatively.

The most common associated comorbid medical problem was hypertension in 9 patients followed by type II diabetes mellitus in 8 patients.

The mean time from injury to surgery was 15 days. All the cases were treated with cemented bipolar prosthesis. Tension band wiring of greater trochanter was done in 2 cases to hold the fragments together. Calcar reconstruction using cement was done in 15 cases.

Intra operatively average volume of blood loss was 354.5 ml, mean operative time was 79mins 48secs.There was no hypotension following application of bone cement into femoral canal.

Pre-operatively 5 patients (25 %) had blood transfusion and post operatively 13 patients (65%) had blood transfusion, which were uneventful.

The mean day of full weight bearing was on the 6th post operative day (chart 5).

Postoperatively, one patient had superficial infection which was treated with I.V. antibiotics (chart 9).

9 patients had shortening of the operated limb, of which 8 had less than 2 cms, so they were given a heel raise. They walked with the help of a cane, 1 patient had shortening more than 2 cm, he had a slight limp (chart 6 & 9).5 patients (25%) had abductor weakness at 12 months of following.

The mean number of days spent by the patient in the hospital in the postoperative period was 12days.

At the end of 12 months 4 patients walked without any support, 11 patients walked with the help of a cane, 4 patients complained of occasional anterior thigh pain on long distance walking, which was relieved on taking rest and analgesics. 2 patients were bedridden (chart 7) , 3 patients died due to unrelated causes.

There was no incidence of deep vein thrombosis, pneumonia, pressure sores or cardiovascular complication in the early post operative period.

Functional outcome analysis:

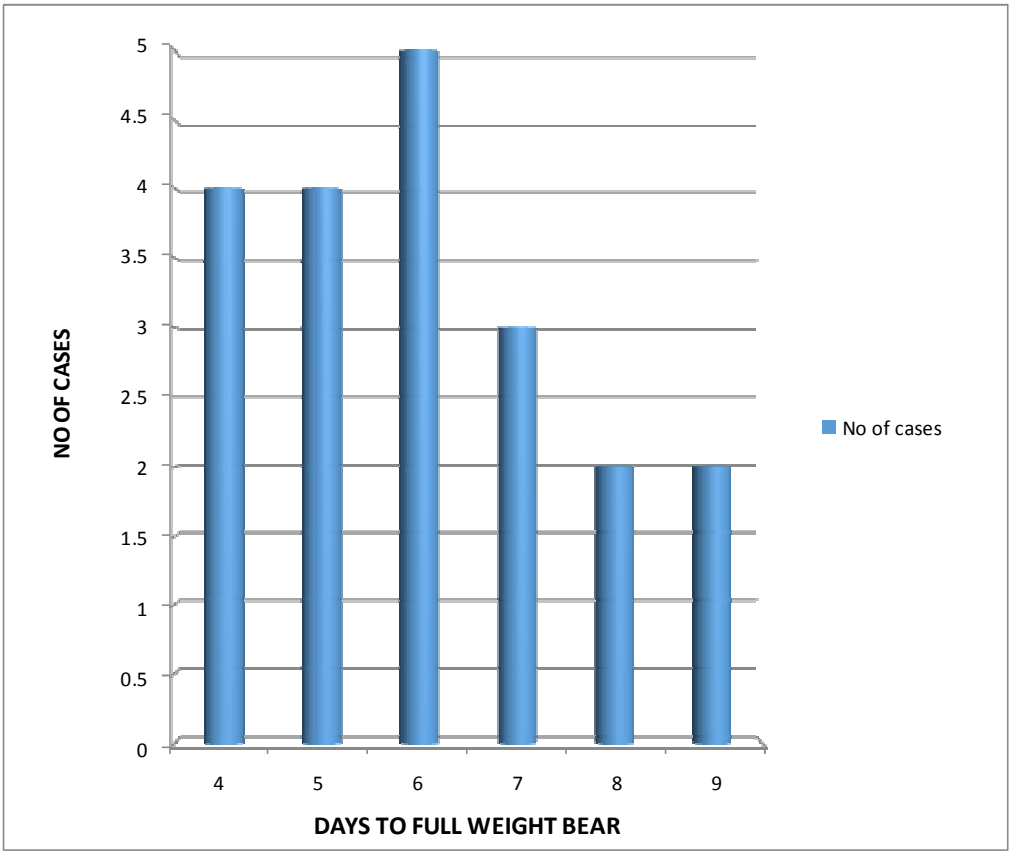
The functional results were graded according to Harris Hip Scoring System. In our study, 4 patients had excellent results, 6 patients had good results, 5 patients had fair results, 2 cases had poor result. In our study ,15 cases (75%) had excellent to fair result as assessed by modified Harris hip score(chart 8).

Radiological analysis:

Bipolar Stem was fitted in valgus position in 2 cases , varus position in 1 patient, whereas the position of the stem was centre (normal) in 17 patients. Cement filling was adequate in 19 cases, whereas it is inadequate in 1 case.

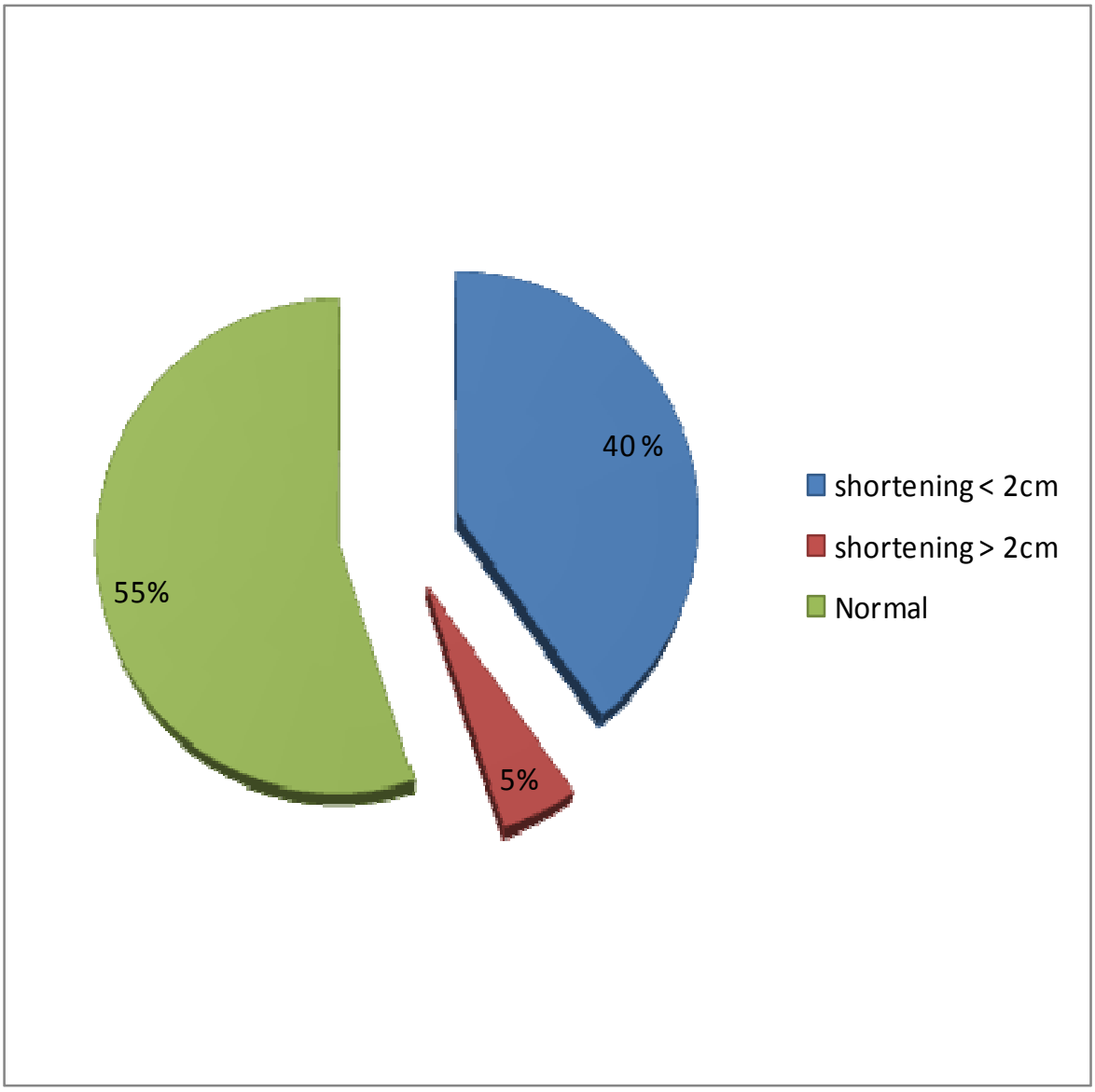
There was no prosthetic dislocation, stem loosening, acetabular erosion or periprosthetic fracture after a period of 12 months follow up in our series.

CHART 5: DAYS TO FULL WEIGHT BEAR



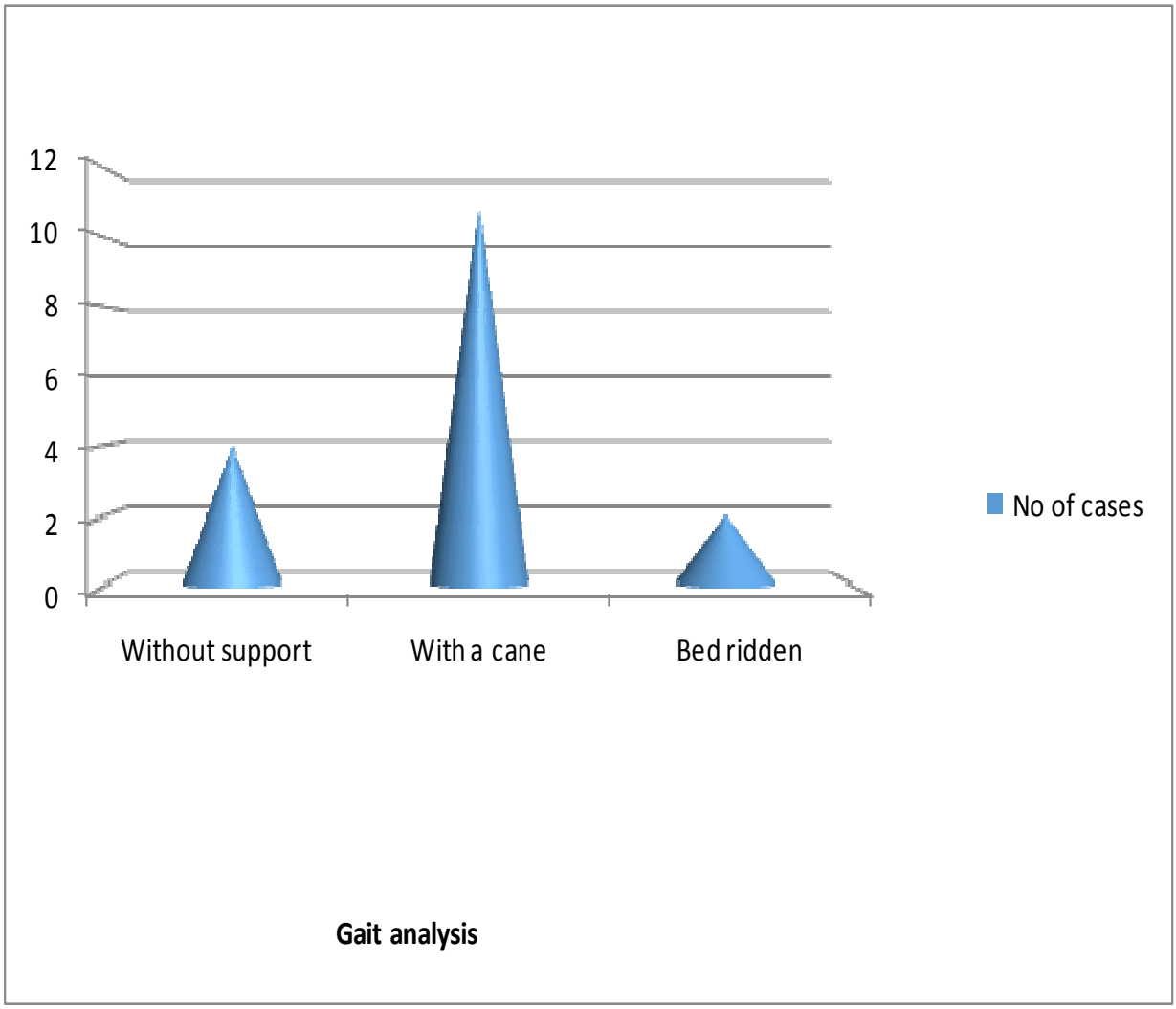
Average day to full weight bear in our study is 6 days.

CHART 6: LIMB LENGTH DISCREPANCY



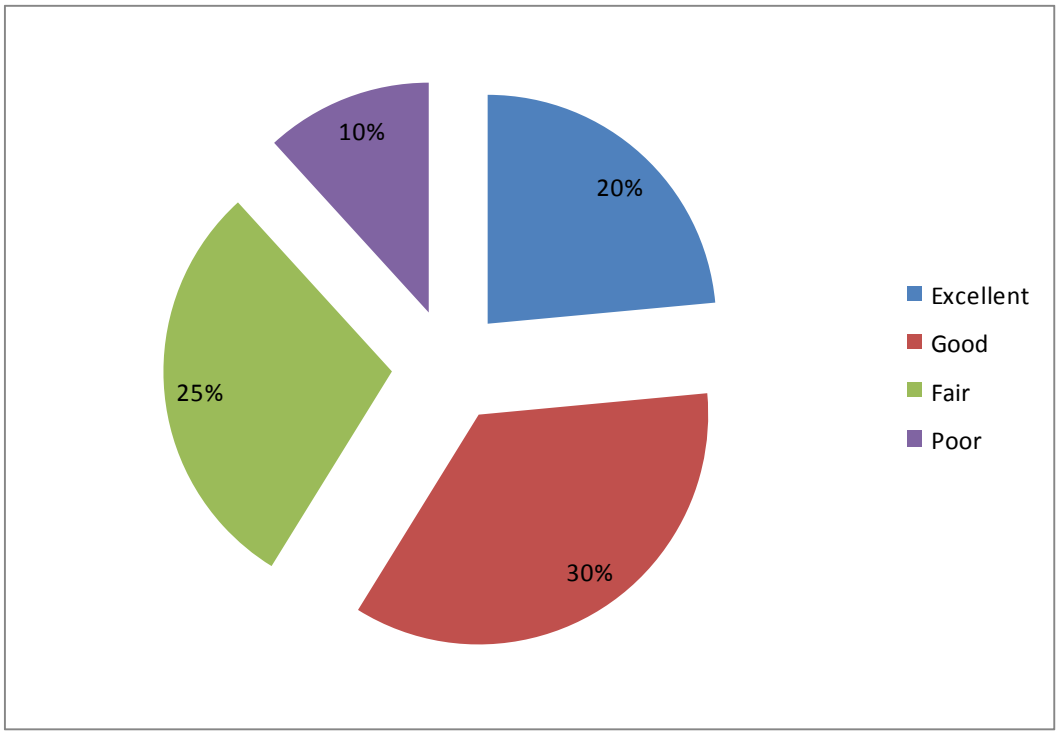
In our study 45% of patients had shortening of limb.

CHART 7: GAIT ANALYSIS



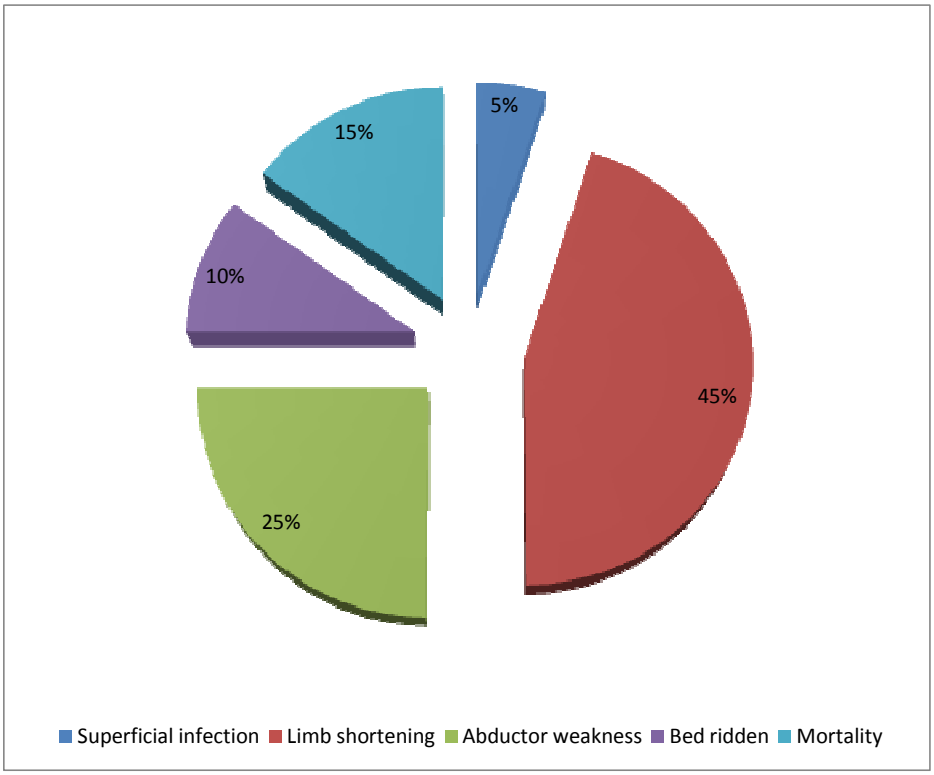
In our study 65% of patients used support (cane) for walking.

CHART 8: FUNCTIONAL RESULTS ACCORDING TO HARRIS HIP SCORE:



In our study 75% of patients achieved excellent to fair result as assessed by modified Harris hip score.

Chart 9 :Complications



The most common complication in our study is post operative shortening of limb.

DISCUSSION

Internal fixation with dynamic hip screw is the treatment of choice for stable intertrochanteric fracture. However the scenario is different when comes to the management of unstable fracture. Failure rate of as high as 56% have been noted with internal fixation of unstable fractures [33,34]. Early weight bearing following internal fixation of communited trochanteric fractures by various means in physiologically elderly and osteoporotic patients leads to fixation failure and poor results[6]. Hemiarthroplasty is a frequently employed alternative as it gives stability and allows early full weight bearing. Most of the complications associated with internal fixation are avoided with the use of prosthetic replacement [37-39]. Initially hemiarthroplasty is used only in the treatment of failed fixation of intertrochanteric fractures.

In 1974 Tronzo[9], was the first surgeon to use long- stem Matchett Brown endoprosthesis for the primary treatment of intertrochanteric fractures.

Following this many other surgeons also reported good results with the use of various prosthesis.

Pho.et al[10], achieved good results with use of Thompson prosthesis.

In 1987, Green et al[15], reported good results with bipolar prosthesis.

In this study we used bipolar prosthesis in all 20 cases.

The average age of patients in our study was 69.4 years. The mean age in studies by Hantjens et al was 80 years, by sanchetti et al[23] was 77 years ,byAtul patil et al[31] was 65.5 years, by Casey C.K et al[17] was 84.2 years, and by Rodop O et al[18] was 75.6 years.

Geiger et al [22], reported a significant increase in blood loss (1050 ml) and operating time (115 min) compared to the internal fixation group .

Stappaerts et al [40], found no significant difference between outcomes of prosthetic group and internal fixation group except for the higher transfusion need in replacement group. Sanchetti et al [23], reported average blood loss of 350 ml and operative time of 71 mins.

In our series average blood loss was 354.5 ml with only 13 patients required blood transfusion and the operative time was 79mins 48 secs. Our results are comparable with other authors.

Stern and Goldstein [14], used Leinbach prosthesis for treatment of 22 intertrochanteric fractures and found early ambulation and early return to preinjury status as a definite advantage. Grimsurd et al [19], in a study of

39 patients of unstable intertrochanteric fractures treated with cemented bipolar hip arthroplasty, reported a relatively low rate of complication.

In this study there was no complications like pressure sores, pneumonia, Deep vein thrombosis , since most of our patients were ambulatory immediately after surgery.

Siwach et al [27], reported shortening of < 5mm in 64% of cases, 28% of cases had limb lengthening between 5mm and 10 mm. He noticed shortening was due to excessive sinking of prosthesis following weight bearing. Kiran kumar et al[30], reported 20% cases had shortening of less than 2cm, 10% of case had shortening of more than 2 cm.

In our series there was 8 cases had shortening less than 2 cm and 1case had shortening > 2 cm.

Sanchetti et al[23], reported 6 patients with abductor weakness, in a study of 37 trochanteric fractures treated with bipolar hemiarthroplasty.In our study 5 patients out of 20 cases had abductor weakness.

Sanchetti et al [23], reported 71 % of good to excellent results according to Harris hip score , in their series of 35 patients treated with hemiarthroplasty.

Rodop et al [18], in a study of 37 intertrochanteric fractures treated with bipolar hemiarthroplasty achieved 82% of good to excellent results as assessed by Harris hip score.

In our study fair to excellent results was achieved in 75% of cases. Thus the results of hemiarthroplasty in the management of intertrochanteric fractures are definitely promising.

Post-operative mortality reports were conflicting as cited in the literature , varying from 5.4 % to 48.8 % . Most of the comparative studies have shown a slight increase in mortality rate in prosthetic group than the internal fixation group.

Kesmezacare et al [20] , reported post-op mortality rate of 48.8 % after a mean of 6 months in patients treated with endoprosthesis. Sanchetti et al [23], reported post op mortality only in 2 patients out of 37 patients (5.4%) within 6 months of surgery . They have predicted delay in treatment is the most common cause for post op mortality and morbidity.

In our series 3 out of 20 patients died within 6 months of surgery due to unrelated causes.

CONCLUSION

In this study primary hemiarthroplasty, was performed for intertrochanteric fractures in 20 elderly patients of more than 6o years,in our Coimbatore medical college Hospital,

This procedure offered excellent pain free mobile hip, with early mobilisation, easy rehabilitation and early return to functional level, when standard techniques were used.

The potential of the bipolar prosthesis in varied indications, shows its versatility. This speaks for the superiority of the procedure.

Bipolar hemiarthroplasty reduced the complications of prolonged immobilisation, prolonged rehabilitation, marked residual deformities and need for revision surgeries. The procedure offered, faster mobilization, rapid return to pre injury level, improved the quality of life and gave a long term solution in elderly patients with intertrochanteric fractures of the femur.

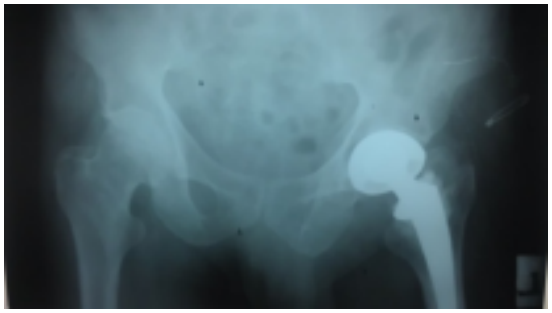
CASE ILLUSTRATION

CASE 1: TYPE II BOYD & GRIFFIN INTERTROCHANTERIC FRACTURE:

PREOPERATIVE RADIOGRAPH:

IMMEDIATE POST OPERATIVE RADIOGRAPH:

AFTER 1 YEAR FOLLOW UP:



CLINICAL PICTURE :

IMMEDIATE FULL WEIGHT BEARING : **AFTER 1 YEAR :**

HIP MOVEMENTS : LEFT HIP

ACTIVE FLEXION

ACTIVE ABDUCTION

CASE 2: BOYD & GRIFFIN TYPE III INTERTROCHANTERIC FRACTURE:

PREOPERATIVE RADIOGRAPH:

IMMEDIATE POST OPERATIVE RADIOGRAPH:

AFTER 1 YEAR FOLLOW UP:

CLINICAL PICTURE :

IMMEDIATE FULL WEIGHT BEARING

AFTER 1 YEAR

ACTIVE FLEXION

ACTIVE ABDUCTION

CASE 3: TYPE II BOYD & GRIFFIN INTERTROCHANTERIC FRACTURE- RIGHT FEMUR

PREOPERATIVE RADIOGRAPH:

POST OPERATIVE RADIOGRAPH:

AFTER 1 YEAR FOLLOW UP:

CLINICAL PICTURE: RIGHT SIDE

IMMEDIATE FULL WEIGHT BEARING

AFTER 1 YEAR

ACTIVE FLEXION

ACTIVE ABDUCTION

CASE:4 TYPE II BOYD & GRIFFIN INTERTROCHANTERIC FRACTURE LEFT FEMUR.

PREOPERATIVE RADIOGRAPH:

IMMEDIATE POST OPERATIVE RADIOGRAPH:

AFTER 1 YEAR FOLLOW UP:

CLINICAL PICTURE:

FULL WEIGHT BEARING

ACTIVE FLEXION : LEFT HIP

ACTIVE ABDUCTION:

ACTIVE ADDUCTION

CASE 5: TYPE II BOYD & GRIFFIN INTERTROCHANTERIC FRACTURE RIGHT FEMUR

PREOP RADIOGRAPH

IMMEDIATE POST OP RADIOGRAPH

AFTER 1 YEAR FOLLOW UP:

CLINICAL PICTURE:

IMMEDIATE FULL WEIGHT BEARING

ACTIVE HIP FLEXION

ACTIVE ABDUCTION:

ACTIVE ADDUCTION

BIBILOGRAPHY

1. Kannus P, Parkkari J, Sievanen H, Heinonen A, Vuori I, Jarvinen M. Epidemology of hip fractures. Bone 1996;18:57S-63S.

2. Koval KJ, Zuckerman JD. Hip fractures are an increasingly public health problem. Clin Orthop RelatRes 1998;348:2.

3. Rockwood PR, Horne JG, Cryer C. Hip fractures: A future epidemic? J Orthop Trauma 1990;4:388-393.

4. Laros, G. S. and Moore, J. F.: Complications of fixation in intertrochanteric fractures, Clin. Orthop. 1994;101:110.

5. Jensen, J. Steen, Tondevold, E. & Sonne-Holm.: Unstable trochanteric fractures. A comparative analysis of four methods of internal fixation. Actaorthop. sand. 1980;51,949-962.

6. Wolfgang GL, Bryant HH, O'Neill JP Treatment of in-tertrochanteric fractures of the femur using sliding screw plate fixation. Clin Orthop 1982;163:148–158.

7. Suriyajakyuthana W. Intertrochanteric fractures of femur: Results of treatment with 95 degrees condylar blade plate. J Med Assoc Thai 2004;87:1431-1438.

8. Kyle RF, Gustilo RB, Premer RF. Analysis of six hundred and twenty two intertrochanteric hip fractures. J Bone Joint Surg Am 1979;61:216-221.

9. Tronzo RG. The use of an endoprosthesis for severely communited intertrochanteric fractures. Orthop Clin North Am 1974;5:679-681.

10. Pho RW, Nather A, Tong GO, Korku CT. Endoprosthetic replacement of unstable, communited intertrochanteric fracture of the femur in the elderly. J Trauma 1981;21:792-797

11. Chan KC, Gill GS. Cemented hemiarthroplasties for eldely patients with intertrochanteric fractures.Clin Orthop Relat Res 2000;371:206-215.

12. Kim WY, Han CH, Kim JY. Failure of intertrochanteric fracture fixation with dynamic hip screw in relation to pre-operative fracture stability and osteoporosis. Int Orthop. 2001;25:360-362.

13. James E Bateman: Single-assembly total hip prosthesis preliminary report. Clin orthop. 1990 Feb; 251 : 3-6.

14. Stern MB, Anger man A: Comminuted Inter trochanteric fractures treated with a Leinbach prosthesis. Clin orthop.1987 May (218): 755-780.

15. Green S, Moore T, Prano F: Bipolar prosthetic replacement for the management of unstable Inter trochanteric hip fractures in the elderly, Clin Orthop 1987, Nov:224:169-177.

16. A C Vahl, P B Dunki Jacobs,P Patka,H J Th M Haarman: Hemiarthroplasty in elderly, debilitated patients with an unstable femoral fracture in the trochanteric region.Acta orthopaedica Belgica 1994;60(3):274-279.

17. Casey Chan K, Gurdev S Gill: Cemented Hemi arthroplasties for Elderly patients with Inter trochanteric hip fractures. Clin Orthop. 2000 Feb; 371:206-215.

18. Rodop O, Kiral, Kaplan H, Akmaz I: Primary bipolar hemiprosthesis for unstable Inter trochanteric fractures. Int Orthop 2002; 26(4): 233-237.

19. Chris Grimsrud,Raul J.Monzon,Jonathan Richman and Michael D.Ries:Cemented Hip Arthroplasty With a Novel Cerclage Cable Technique for Unstable Intertrochanteric Hip Fractures.J Arthroplasty 2005 Apr;337-343.

20. Kesmezarcar H, Ogut T, Bilgili MG, Gokay S, Tenekecioglu Y.: Treatment of intertrochanteric fractures in the elderly patients. Internal fixation (or) hemiarthroplasty. Acta Orthop Traumatol Tur 2005;39:287-294.

21. C Kayali, H Agus, S Ozluk, C Sanli .: Treatment for unstable intertrochanteric fractures in elderly patients. Journal of Orthopaedic Surgery 2006;14(3):240-244.

22. Florian Geiger, Monique Zimmermann-Stenzel Christian Heisel, Burkhard Lehner , Wolfgang Daecke:Trochanteric fractures in the elderly: the influence of primary hip arthroplasty on 1-year mortality.Arch Orthop Trauma Surg. 2007 December; 127(10): 959–966.

23. Sancheti et al.: Primary hemiarthroplasty in elderly unstable osteoporotic intertrochanteric fracture. Indian J orthop 2010;44(4):428-434.

24. Khaldoun Sinno, Mazen Sakr,Julien Girard,Hassan Khatib.The effectiveness of primary bipolar arthroplasty in treatment of unstable intertrochanteric fractures in elderly patients**.** North American Journal of Medical Sciences 2010: 2;561

25. Amarjit Singh Sidhu , Ajay Pal Singh , Arun Pal Singh , Sukhraj Singh.: Total hip replacement as primary treatment of unstable intertrochanteric fractures in elderly patients. International Orthopaedics (SICOT) (2010) 34:789–792.

26. Jaswinder Pal Singh Walia , Dheeraj Sansanwal , Sonam Kaur Walia , Sargun Singh , Avinash Chander Gupta.: Role of primary bipolar arthroplasty or total hip arthroplasty for the treatment of intertrochanteric fracture femur in elderly. Pb Journal of Orthopaedics Vol-XII, No.1, 2011

27. Ramchander Siwach , Hemant Jain , Roop Singh , Kapil Sangwan.: Role of hemiarthroplasty in intertrochanteric fractures in elderly osteoporotic patients: a case series. Eur J Orthop Surg Traumatol (2012) 22:467–472.

28. Salunkhe, et al: Cemented hemiarthroplasty in elderly osteoporotic proximal femoral fracture, Medical Journal of Dr. D.Y. Patil University 2012; 5 (1).

29. Feng W, Hao T, Jia YF , Hao ZT, Bai ZB.: Clinical outcome of endoprosthetic replacement for failed treatment of intertrochanteric fractures: A retrospective case series. Pak J Med sci 2013;29(2): 633-637.

30. Kiran Kumar GN , Sanjay meena, Vijaya Kumar , Manjunath S, Vinaya raj MK.: Bipolar Hemiarthroplasty in Unstable Intertrochanteric Fractures in Elderly: A Prospective Study. Journal of Clinical and Diagnostic Research 2013;7(8): 1669-71.

31. Atul Patil1, Muqtadeer Ansari, Aditya Pathak), Goregaonkar, C J Thakker.: Role of Cemented Bipolar Hemiarthroplasty for Comminuted Inter-trochanteric Femur Fracture in elderly osteoporotic patients through a modified Transtrochanteric approach- "SION Hospital Modification". IOSR Journal of Dental and Medical Sciences (IOSR-JDMS) 2013; 9(4): 40-47.

32. Kaufer H., Matthews L.S. and Sonstegard D. "stable fixation of intertrochanteric fractures" journal of bone and joint surgery" 1974, 56A: 899-907.

33. Kyle RF, Cabanela ME, Russell TA, Swiontkowski MF, Winquist RA, Zuckerman JD, et al. Fractures of the proximal part of the femur. Instr Course Lect. 1995; 44:227-253.

34. Haidukewych GJ, Israel TA, Berry DJ. Reverse obliquity fractures of the intertrochanteric region of the femur. J Bone Joint Surg Am. 2001; 83:643-650.

35. Irwin H Scott et al: Treatment of intertrochanteric fractures by skeletal pinning and external fixattor. Clin orthop 1957;10:326-334.

36. Gruen TA, McNeice GM, Amstutz HC. "Modes of failure" of cemented stem-type femoral components: a radiographic analysis of loosening. Clin Orthop 1979;141:17-27.

37. Dimon JH III, Hughston JC (1967) Major components of unstable trochanteric fractures. J Bone Joint Surg 49A:440–444.

38. Sarmiento A (1975) Valgus osteotomy technique for unstable trochanteric fractures. In: Proceedings of third open scientific meeting of hip society. CV Mosby, St. Louis, 157–169.

39. Ecker MLM, Joyce JJ, Kohe JE (1975) The treatment of trochanteric hip fractures, a compression screw fixxation. J Bone Joint Surg 87A:23–27.

40. Stappaerts KH, Deldycke J, Broos PL, et al. Treatment of unstable peritrochanteric fractures in elderly patients with a compression hip screw or with the Vandeputte (VDP) endoprosthesis: a prospective randomized study. J Orthop Trauma 1995; 9:292-297.

PROFORMA

PATIENT DETAILS :

Patient Name Age: Sex: M / F

Occupation :

Address : contact no :

IP No :

Unit : Head :

DOA : DOS : DOD :

Clinical History :

Presenting complaints :

Mode of injury :

CLINICAL EVALUATION :

Pre injury status

Ambulation : CVS :

Obesity : RS :

Diabetes : CNS :

Hypertension : Psychiatric illness :

Previous hip surgery :

Background Data

Smoker :

Alcohol :

Drug Intake :

Associated injuries

Head injury :

Chest injury :

Other fractures :

if any

Local examination

Hip region :

Open / closed injury

Skin condition

Deformity

RADIOLOGICAL EVALUATION :

x-ray pelvis with both hip – AP view :

x-ray Affected hip with Proximal femur – AP :

(Traction & internal rotation view)

Acetabulum :

OA changes : Dysplasia :

Proximal Femur :

Fracture pattern : Boyd's & Griffin Type I / II / III / IV

Femur Morphology : Dorr's Type A / B / C

Diagnosis :

Plan :

OPERATIVE TECHNIQUE

Approach : Position :

Type of Prosthesis : Cemented/ uncemented :

Duration of surgery : Amount of blood loss :

Tension Band Wiring of Greater trochanter :

Post-operative :

Units of blood transfused :

Duration of I.V.Antibiotics :

Thrombo-prophylaxis :

POST OP EVALUATION :

CLINICAL :

Fever : Pain :

Wound discharge : Swab for C & S in case of infection :

Full weight bearing :

Limb Length discrepancy : Rotational deformity :

RADIOLOGICAL EVALUATION:

At The Time of discharge :

Harris Hip Score

Wound healing

Duration of hospital stay

Complications :

MASTER CHART

S.no	Name	Age/sex	Ip.no	Mode of injury	Side	Fracture type (boyd & griffin)	Comorbid disease	Approach	Prosthesis	Cemented/uncemented	Operative time(mins)	Blood loss(ml)	Blood transfusion (unit)	Complications	Shortening(cm)	Time to full weight bear (in days)	Position of stem	Harris hip score
1	Nanjappan	75/M	469/12	Fall while walking	RIGHT	II	Diabetes mellitus	Posterior	Bipolar	cemented	90	300	1			4	Normal	Died
2	Duraisamy	62/M	1923/12	Fall from bicycle	LEFT	III	Hypertension	Posterior	Bipolar	cemented	85	340	1	Abductor weakness	1	5	Valgus	Fair
3	Petchiyammal	85/F	2399/12	Fall while walking	RIGHT	II		Posterior	Bipolar	cemented	90	380	1			6	Normal	Excellent
4	Parvathi	68/F	8795/12	Fall while walking	RIGHT	II		Posterior	Bipolar	cemented	80	250				8	Normal	Excellent
5	Mayilathal	60/F	17549/12	Fall while walking	RIGHT	II	Diabetes mellitus	Posterior	Bipolar	cemented	70	450	1			7	Normal	Died
6	Parvathi	68/F	20510/12	Fall while walking	LEFT	II		Posterior	Bipolar	cemented	80	300				9	Valgus	Good
7	Paramasiavm	75/M	23499/12	Fall while walking	RIGHT	II	Hypertension	Posterior	bipolar	cemented	75	400	1			4	Normal	Died
8	Valiyammal	70/F	38378/12	Fall while walking	LEFT	II	Diabetes mellitus	Posterior	Bipolar	cemented	75	360			1	7	Normal	Good
9	Veeral	70/F	50747/12	Fall while walking	RIGHT	II	hypertension, diabetes mellitus	Posterior	Bipolar	cemented	68	350			1	7	Normal	Good
10	Ganapathy	84/M	51906/12	Fall while walking	LEFT	II	Hypertension	posterior	bipolar	cemented	85	300	1	superficial infection	1	6	Normal	Good
11	Siromani	70/M	55780/12	Fall from bicycle	RIGHT	II		Posterior	Bipolar	cemented	90	350	1		3	4	Normal	Excellent
12	Arimuthu gounder	70/M	64357/12	Fall while walking	RIGHT	III		Posterior	Bipolar	cemented	90	350	1			6	Normal	Fair
13	Gowri	60/F	68099/12	Fall while walking	RIGHT	II		Posterior	Bipolar	cemented	86	450	1	Abductor weakness	2	6	Normal	Good
14	kuppan	65/M	68439/12	Fall from bicycle	RIGHT	II		Posterior	Bipolar	cemented	68	280				5	Normal	Good
15	Saroja	65/F	77966/13	Fall while walking	LEFT	II	Hypertension,Diabetes mellitus	Posterior	Bipolar	cemented	78	350	1		1	9	Normal	Poor
16	Damodaran	72/M	31434/13	Fall while walking	LEFT	II	Hypertension,Diabetes mellitus	Posterior	Bipolar	cemented	85	400	1	Abductor weakness		4	Normal	Excellent
17	Mayilathal	70/F	33240/13	Fall while walking	LEFT	II	Diabetes mellitus	Posterior	Bipolar	cemented	76	380		Abductor weakness		5	Normal	Good
18	Thirumalai	70/F	37871/13	Fall while walking	RIGHT	II	Hypertension	Posterior	Bipolar	cemented	78	380	1	Abductor weakness		6	Varus	Fair
19	Arockiyammal	65/F	43123/13	Fall from cot	RIGHT	II	Hypertension, diabetes mellitus	Posterior	Bipolar	cemented	68	400	1		0.5	8	Normal	Fair
20	Kaliyammal	65/F	51763/13	Fall from cot	LEFT	II	Hypertension, diabetes mellitus	Posterior	Bipolar	cemented	78	320			1	5	Normal	Poor