DISSERTATION ON

"FUNCTIONAL OUTCOME OF PROXIMAL FEMORAL FRACTURES TREATED WITH INTRAMEDULLARY FIXATION USING HELICAL BLADE" IN TERTIARY CARE HOSPITAL - KANCHIPURAM DISTRICT, TAMILNADU.

Dissertation submitted to

THE TAMIL NADU DR.M.G.R. MEDICAL UNIVERSITY

in partial fulfilment of the requirement for the award of

degree of

MS (ORTHOPAEDICS)

BRANCH –II

Reg. No.: 221712551

KARPAGA VINAYAGA INSTITUTE OF MEDICAL SCIENCES AND RESEARCH CENTRE MADHURANTHAGAM, KANCHIPURAM DISTRICT.

THE TAMILNADU DR.M.G.R.MEDICAL UNIVERSITY, CHENNAI, TAMILNADU

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CERTIFICATE

Certified that this dissertation entitled **“FUNCTIONAL OUTCOME OF PROXIMAL FEMORAL FRACTURES TREATED WITH INTRAMEDULLARY FIXATION USING HELICAL BLADE” IN TERTIARY CARE HOSPITAL – KANCHIPURAM DISTRICT TAMILNADU.** is a bonafide work done by **Dr. BALAJI C.**, Post graduate student, Karpaga Vinayaga Institute of Medical Sciences, Madhuranthagam, during the academic year 2017 – 2020.

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DECLARATION BY THE CANDIDATE

I, hereby declare that this dissertation entitled **“FUNCTIONAL OUTCOME OF PROXIMAL FEMORAL FRACTURES TREATED WITH INTRAMEDULLARY FIXATION USING HELICAL BLADE” IN TERTIARY CARE HOSPITAL – KANCHIPURAM DISTRICT, TAMILNADU.** submitted by me for the degree of M.S is the record work carried out by me during the period from January 2018 to June 2019 under the guidance of Professor **Dr. K. NAGAPPAN,** Department of Orthopaedics, Karpaga Vinayaga Institute of Medical Sciences and has not formed the basis of any degree, diploma or fellowship titles in this or any other university or other similar institution of higher learning.

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CERTIFICATE – II

This is to certify that this dissertation work titled **"FUNCTIONAL OUTCOME OF PROXIMAL FEMORAL FRACTURES TREATED WITH INTRAMEDULLARY FIXATION USING HELICAL BLADE" IN TERTIARY CARE HOSPITAL – KANCHIPURAM DISTRICT, TAMILNADU.** of the candidate **DR. BALAJI C** with registration Number 221712551 for the award of M.S. in the branch of ORTHOPAEDICS. I personally verified the **urkund.com** website for plagiarism check. I found that the uploaded thesis file contains from introduction to conclusion pages and result shows 16% percentage of plagiarism in the dissertation.

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INSTITUTIONAL ETHICAL COMMITTEE

KARPAGA VINAYAGA INSTITUTE OF MEDICAL SCIENCES & RESEARCH CENTRE

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CERTIFICATE FOR APPROVAL

The Institutional Ethical Committee of Karpaga Vinayaga Institute of Medical Sciences & Research Centre, Maduranthagam reviewed and discussed the application for approval **"Functional outcome of proximal femoral fractures treated with intra medullary fixation using helical blade in Tertiary care hospital-Kanchipuram district"** by **Dr. Balaji. C**, **I PG**, Guided by **Dr. K. Nagappan**, Professor and Head, Department of Orthopaedics, Karpaga Vinayaga Institute of Medical Sciences & Research Centre, Maduranthagam.

The proposal is **APPROVED**

The Institutional Ethics Committee expects to be informed about the progress of the study and any changes in the protocol / information / informed consent and asks to be provided a copy of the final report.

04/12/17

Chairperson, Ethics Committee

Date: 04 /12/17

CHAIRMAN Member Secretary Institutional Ethical Committee KIMS

CONTENTS

INTRODUCTION

INTRODUCTION

Proximal femoral Fractures account for a large proportion of hospitalization among trauma cases.[1]An overwhelming majority of these patients (>90%) are aged above 50 years. The incidence of these fractures is 2–3 times more in females as compared to male population.[2]They are classified on basis of anatomical location of fracture into: neck of femur fracture, inter trochanteric fracture and subtrochanteric fracture. Each of these fracture types require special methods of treatment and have their own set of complications and controversies regarding the optimal method of management.[3]

Although these fractures are the most difficult to manage in femur, our improved understanding of the complex biology and biomechanics of the trochanteric region as well as the rapid development of orthopaedic principles and implants has led to consensus on the treatment of trochanteric fractures.[4] However, the appropriate implant for the internal fixation of sub trochanteric fractures remains debatable; and a multitude of different intra- and extra medullary devices for their surgical fixation have been advocated.[5-8]

The basic strategy for achieving this goal depends on the biomechanical property of the fixation device and stability achieved by using such devices. Now the proximal femoral fracture is best treated surgically in most cases by the restoration of femoral length, rotation and correction of femoral head and neck angulation . There are two ways to treat intertrochanteric fracture by internal fixation i.e. sliding compression hip screw with side plate assembly and intramedullary fixation devices.[9] Theoretical biomechanical advantages of intramedullary nails over screw and plate fixation are attributed to reduced distance between hip joint and the implant.

Surgical intervention is the definitive treatment for these fractures as it enables patient early mobilization and subsequent return to acceptable levels of function. Implant choice is determined by whether the fracture is ‘‘stable’’ or ‘‘unstable’’ which is predominantly dependant on the status of the posteromedial cortex. According to the Orthopaedic Trauma Association (OTA/AO) fracture classification system, type A1 is universally considered stable and type A3 is generally considered unstable, while the stability of A2 fractures are less clear. For this study we considered OTA/AO fracture classification system A2-1 and above as unstable.[10,11]

The purpose of our study was to evaluate the functional outcome of proximal fractures treated with the intramedullary fixation using helical blade with the following aims and objectives,

AIMS AND OBJECTIVES

AIM AND OBJECTIVES

Objectives:

- To assess the functional outcome of intramedullary fixation using helical blade (PFNA2) in the treatment of proximal femoral fractures.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

History

The first to use metallic implants for fracture neck of femur was **Lange** in 1858 followed by **Konig** in 1875, **Lister** in 1880 and **Simon** in 1913.

Sir Astley Cooper noticed the difference between intra and extra capsular neck of femur fracture in 1852.

In 1870 **Malgaigne**,a French surgeon introduced metal devices embedded in the bone for mechanical stabilisation of fractures. In 1897 **Nicolaysen** described medullary fixation of diaphyseal fractures. In 1931 **Smith Peterson** used the tri flanged nail made of nonelectrolytic material and cannulated by **Johnson** in the next year for insertion of guide wire.

Thorton made a side plate called Thorton plate which allows fixation of Cannulated triflanged nail to the shaft in 1937.

In 1937 **Rush** devised medullary pinning for most difficult fracture problem and published an atlas illustrating relationship between technique and mechanics of flexible pinning.

In 1939 first nailing in humans was done for subtrochanteric fractures.

Kuntscher in 1941 presented at the German surgical society at Hamburg on evidence of intramedullary fixation device. He presented nailing of humerus, femur and tibia. It became more popular after Second World War. **Bohler** performed closed nailing in 58 of 61 closed femoral fractures following intramedullary fixation device by Kuntscher who again introduced the technique of widening the medullary cavity by reaming. At first he used hand reamer and later designed a motor reamer with flexible shaft that enabled reaming over a guide to facilitate insertion of thicker nails. In 1941 **E.L.Jewett** developed the fixed angle nail plate.

In 1947, **Mclaughlin** introduced his angle nail plate such that the angle can be changed due to sliding arrangement. In 1949 **Evans** discussed unstable intertrochanteric fractures. **Boyd and Griffin** called attention to subtrochanteric fractures.

In 1967, Zickel was one of the first to design a double curve customs, intramedullary device for subtrochanteric fracture which obtained one of the highest union and lowest implant failure rates. In

1974 Ender introduced Condylocephalic nailing with help of image intensifier.

In 1986 Reconstruction nails were developed , were commercialised as Russell-Taylor reconstruction nails (Smith and Nephew, United States). They were designed so that ipsilateral femoral neck-shaft fractures could be fixed by one single implant. In 1990 How medica introduced a new device , the gamma nail for reverse oblique fractures and those with subtrochanteric extension.

Background:

Proximal femur fractures are a major cause of morbidity and mortality and occur much more frequently in older people. Most commonly, these fractures occur in the femoral neck or intertrochanteric regions and require surgical repair. Increased risk of fall together with decreased bone strength account for the increased risk of fracture with increasing age. Morbidity and mortality rates associated with hip fractures are substantial. The mortality rate within 1 year of the fracture is between 5% and 20%. They are a major source of disability and loss of independence. For example, it is estimated that of those living independently before a hip fracture, only 50% are able to do so 1 year after the hip fracture.[12]

More than 6,00,000 hip fractures occur in India annually. Most of these fractures occur in the elderly, with associated 1-year mortality rates ranging from 14% to 36%. The treatment of hip fractures often requires a multidisciplinary approach that includes addressing underlying medical conditions and providing appropriate surgical fixation, early mobilization, and rehabilitation to ensure a return to baseline functional mobility and independence. Inappropriate surgical treatment is associated with increased complication and mortality rates .

Suboptimal treatment of hip fractures may result in debilitating complications such as avascular necrosis (AVN), fracture nonunion or malunion, or hardware failure. Therefore, early detection and classification of hip fractures are essential for guiding early appropriate treatment.[13,14]

Though hip fracture incidence has declined in many countries during the last decade, it still represents around 1/4 of the geriatric fractures that require hospital admission, and in spite of the enhancements in both surgical and medical services, its morbidity and mortality remains elevated.[15] Over 90% of hip fracture patients are older than 65 years old and have preexisting medical comorbidities. Both factors have an important influence in its prognosis and treatment.[16]Even with optimal care, elderly trauma patients suffer a higher morbidity and mortality rate when compared with the general population, and often demand for expensive hospital aftercare. Because of that, surgical treatment of hip fracture in these patients has exceptional clinical challenges, and needs strategies to optimize patient care

Anatomy of Proximal femur:

The proximal aspect of the femur articulates with the acetabulum of the pelvis to form the hip joint. It consists of a head and neck, and two bony processes – the greater and lesser trochanters. There are also two bony ridges connecting the two trochanters; the intertrochanteric line anteriorly and the trochanteric crest posteriorly.

Head – articulates with the acetabulum of the pelvis to form the hip joint. It has a smooth surface, covered with articular cartilage (except for a small depression – the fovea – where ligamentum teres attaches).

Neck – connects the head of the femur with the shaft. It is cylindrical, projecting in a superior and medial direction. It is set at an angle of approximately 135 degrees to the shaft. This angle of projection allows for an increased range of movement at the hip joint.

Greater trochanter – the most lateral palpable projection of bone that originates from the anterior aspect, just lateral to the neck. It is the site of attachment for many of the muscles in the gluteal region, such as gluteus medius, gluteus minimus and piriformis. The vastus lateralis originates from this site. An avulsion fracture of the greater trochanter can occur as a result of forceful contraction of the gluteus medius.

Lesser trochanter – smaller than the greater trochanter. It projects from the posteromedial side of the femur, just inferior to the neck-shaft junction. It is the site of attachment for iliopsoas (forceful contraction of which can cause an avulsion fracture of the lesser trochanter).

Intertrochanteric line – a ridge of bone that runs in an inferomedial direction on the anterior surface of the femur, spanning between the two trochanters. After it passes the lesser trochanter on the posterior surface, it is known as the pectineal line. It is the site of attachment for the iliofemoral ligament (the strongest ligament of the hip joint). It also serves as the anterior attachment of the hip joint capsule.

Intertrochanteric crest – like the intertrochanteric line, this is a ridge of bone that connects the two trochanters. It is located on the posterior surface of the femur. There is a rounded tubercle on its superior half called the quadrate tubercle; where quadrates femoris attaches.

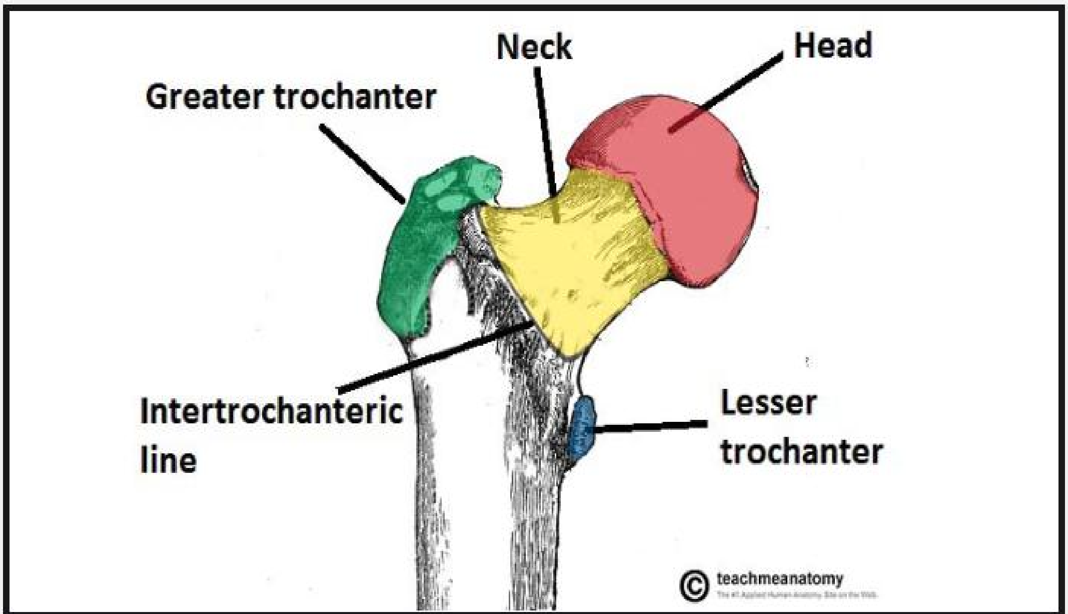


Fig 1 – The anterior surface of the proximal right femur.

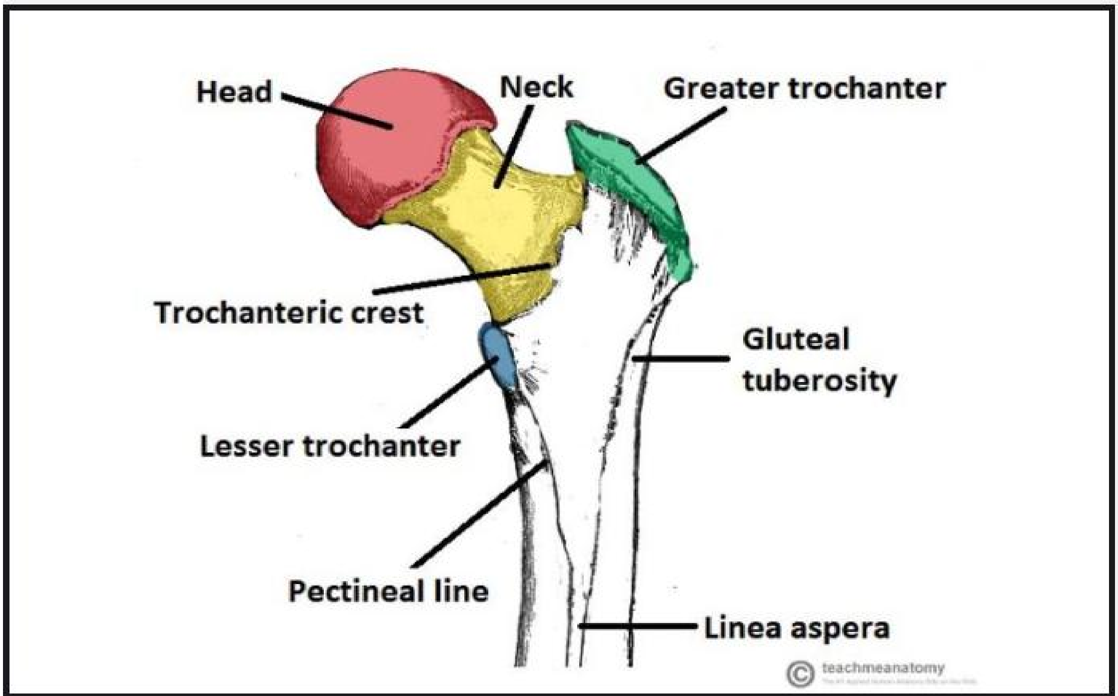


Fig 2 – The posterior surface of the right femur.

The hip joint is one of the most flexible joints in the entire human body. The many muscles of the hip provide movement, strength, and stability to the hip joint and the bones of the hip and thigh. These muscles can be grouped based upon their location and function. The four groups are the anterior, the posterior, adductor and abductor group.

The anterior muscle group features muscles that flex (bend) the thigh at the hip...

These muscles include:

- The iliopsoas group, which consists of the psoas major and iliacus muscles.

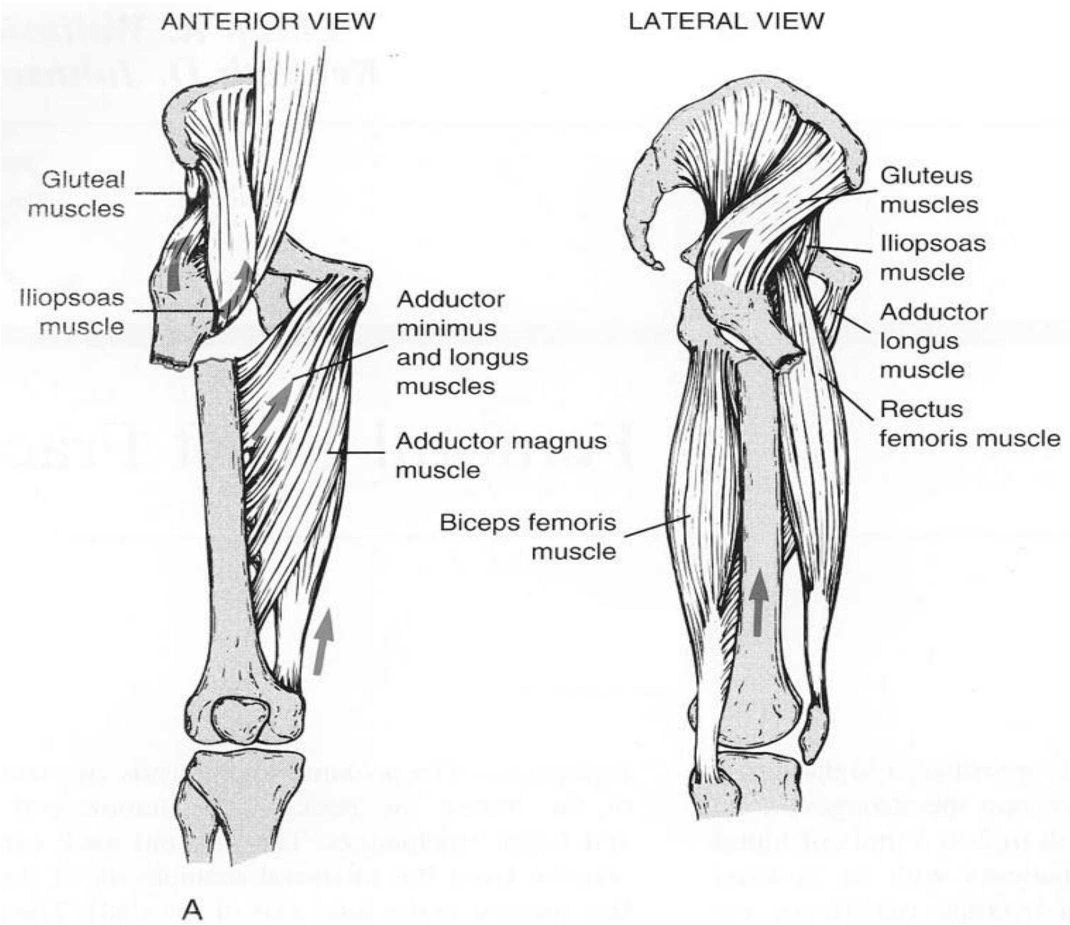
- The quadriceps femoris group, which consists of the rectus femoris, vastus intermedius, vastus lateralis, and vastus medialis,

Sitting up, kicking a ball, and lifting a leg to climb a ladder are all activities that involve contraction of the anterior muscle group.

The posterior muscle group is made up of the muscles that extend (straighten) the thigh at the hip. These muscles include the gluteus maximus muscle (the largest muscle in the body) and the hamstrings group which consists of' the biceps femoris, semimembranosus, and semitendinosus muscles. Climbing stairs, standing, walking and running are all activities that require strong contractions from the posterior muscle group to extend the leg.

The adductor muscle group, also known as the groin muscles, is located on the medial side of the thigh. These muscles move the thigh towards the body's midline. Included in this group are the adductor longus, adductor brevis, adductor magnus, pectineus, and gracilis muscles. Overstretching of these muscles caused by rapid lateral movement the thigh can lead to a groin pull, a common sports injury.

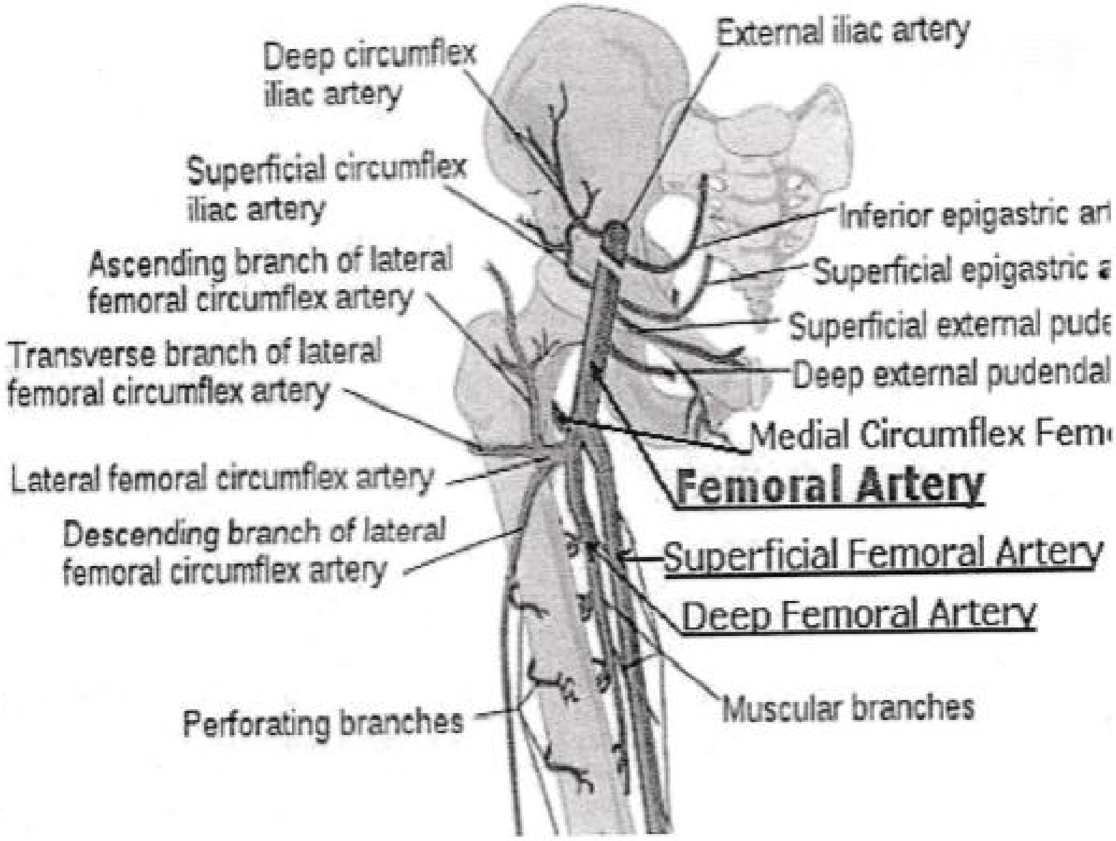
The abductor muscle group is located on the lateral side of the thigh and moves the thigh away from the body's midline. These muscles include the piriformis, superior gamellus, inferior gamellus, tensor fasciae latae, sartorius, gluteus medius and gluteus minimus muscles. Spreading the legs to do split is an example of a movement involving the abductor muscles. The subtrochanteric region is the cortical bone with the lesser trochanter in the posteromedial aspect with the illopsoas inserted on it, this flexes the proximal fracture fragment.The gluteus medius and minimus abduct and externally rotate the proximal fragment. The adductors pull the distal fragment medially and upward. These muscle are highly vascularized and can lead to hemorrhage during the injury or surgical Procedures.


ANTERIOR VIEW
LATERAL VIEW
Gluteal muscles
Iliopsoas muscle
Adductor minimus and longus muscles
Adductor magnus muscle
A
Gluteus muscles
Iliopsoas muscle
Adductor longus muscle
Rectus femoris muscle
Biceps femoris muscle

The blood supply of the femoral head and neck has three distinct components:

- An extracapsular arterial ring that arises from the lateral circumflex femoral artery anteriorly and the medial circumflex femoral artery posteriorly
- Ascending intracapsular cervical branches of the extracapsular ring, known as retinacular arteries; and
- The artery of the ligamentum teres.

The retinacular arteries course superiorly along the surface of the femoral neck and form a subsynovial ring at the articular margin. The medial circumflex femoral artery is generally the largest single contributor of blood supply to the femoral head, particularly its superolateral aspect including the weight-bearing portion, via the lateral epiphyseal artery complex. The lateral circumflex femoral artery supplies the anteroinferior aspect of the femoral head via the inferior metaphyseal artery. The artery of the ligamentum teres contributes a minor but variable amount of femoral head blood flow, variably anastomosing with the lateral epiphyseal and short medial epiphyseal branches, although this supply alone is usually insufficient to adequately perfuse the femoral head. The intracapsular course of the retinacular vessels and the subsynovial ring, and the intraosseous course of the lateral epiphyseal and inferior metaphyseal branches of the subsynovial ring predispose the hip to vascular compromise in the setting of femoral head-neck fracture.[17,18]



Biomechanics:

Early biomechanical studies found that this section of bone can experience upto 1200N of force within the Sub trochanteric area with standing and gait.[19]

These forces are important because while these force can be tolerated in young healthy bone they may overpower weaker osteoporotic bone. In addition to the static forces placed on the proximal femur, this region experiences increased stress secondary to the multiple muscular attachments in the region, which include the lateral hip abductors, medial hip adductors, the iliopsoas, and short external rotators. These muscular attachments have been shown to increase stresses around the hip and proximal femur.[20]In addition to the stresses applied to the Sub trochanteric region, these multiple muscle groups produce predictable deformity patterns that must be understood in order to achieve a proper reduction. The classic deformity that occurs in Sub trochanteric femur fractures is proximal segment abduction, external rotation, and flexion caused by the pull of the gluteus medius, gluteus minimus, the short external rotators and iliopsoas and adduction of the distal fragment by the gracilis and adductor muscle groups.

Displacement of subtrochanteric fractures is largely produced by the action of the muscles attached to the proximal femur: The proximal fragment abducts as a result of gluteus medius and minimis.[21] If the lesser trochanter is still attached to the upper femur, the iliopsoas causes flexion and external rotation. The adductors and hamstrings lead to shortening and adduction distally, with a varus deformity. These muscles produce flexion, adduction and external rotation. The abductor group is functionally weakened. The shortening and varus deformity affect outcome by causing a limp and abductor lurch. Fielding et al. drew attention to the importance of the medial buttress to reduce the load on the implant.[22]The forces on intramedullary devices are less than those on extramedullary ones.[23]

Biomechanically proximal femoral fractures pose a great challenge to the fixation principles because this region has high stress concentration and powerful muscular deforming forces. These deforming forces make the anatomic reduction of fracture difficult.[24]The use of extramedullary fixation devices in these fractures have given mixed results owing to the quality of bone and achieving stable reduction. From a biomechanical point of view the use of an intramedullary nail combined with a sliding neck screw appears to be more appropriative technique. Unfortunately the use of this more popular technique needs a huge learning curve. The technical failures in these fracture fixation construct ranges between 8-l5%. The majority of biomechanical failures however consists of collapse at the fracture site and cutting out of the neck screw.[25]

This serious complication is caused by the rotation potential of the head neck fragment and/or by mal positioning of the neck screw. In order to solve this problem of persistent rotational stability of the head neck fragment and fracture of the femoral shaft at the tip, intramedullary nail incorporating an anti-rotation neck screw and increased length of the nail. Apart from patient dependent factors like osteoporosis, surgeon dependent factors like suboptimal positioning of the device plays major role in fixation failure. Biomechanical studies of Proximal femoral nail-Antirotation, the helical screw placement in the head shows inferior placement in the frontal plane and central portion in the sagittal plane is superior to centre position and provides better biomechanical stability for angular and rotational displacement in unstable proximal femoral fractures.[24]

Proximal femoral neck fractures:

Neck of femur fractures (NOF) are common injuries sustained by older patients who are more likely to have unsteadiness of gait and reduced bone mineral density, predisposing to fracture. Elderly osteoporotic women are at greatest risk.

Classification of fractures:

Femoral neck fractures are a subset of proximal femoral fractures. The femoral neck is the weakest part of the femur. Since disruption of blood supply to the femoral head is dependent on the type of fracture and causes significant morbidity, diagnosis and classification of these fractures is important. There are three types:

1. subcapital: femoral head/neck junction
2. transcervical: midportion of femoral neck
3. basicervical: base of femoral neck

Most significantly, subcapital and transcervical fractures are considered intracapsular(exclusion criteria) while basicervical fractures are considered extracapsular .Extracapsular fractures are present outside the capsule and do not cause the same degree of vascular damage as intracapsular fractures and therefore can be treated differently. The trochanteric fractures are extracapsular injuries. (i) Intertrochanteric fractures and (ii) Subtrochanteric fractures.

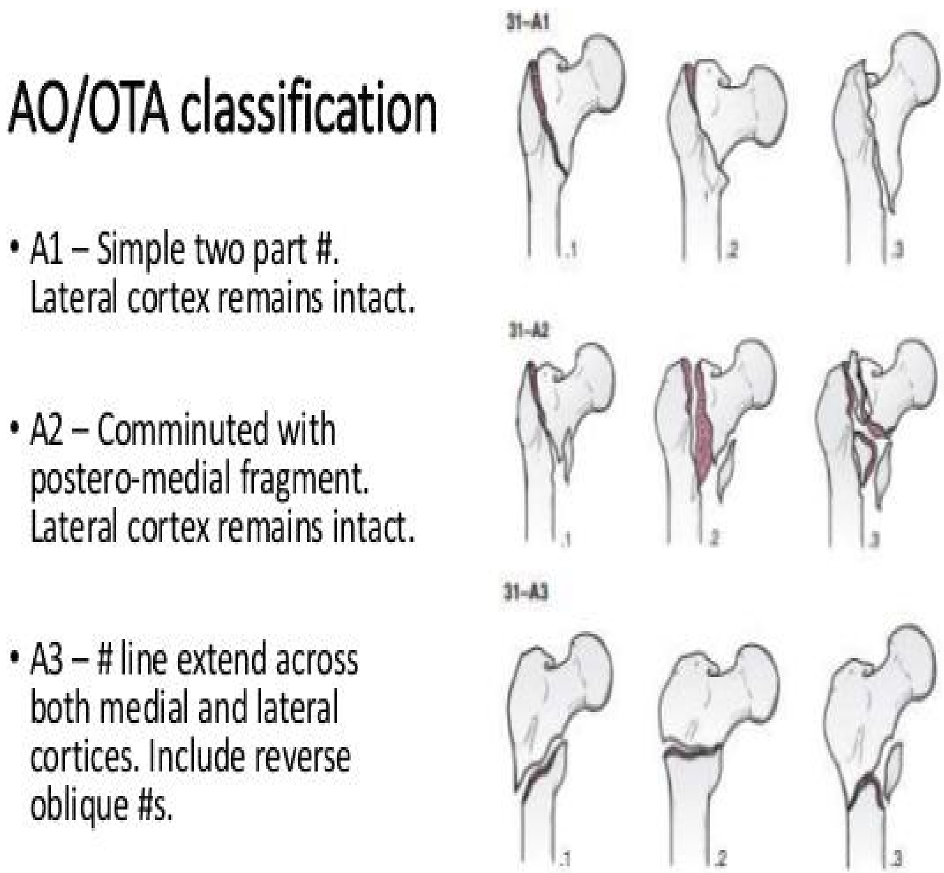
Clinical Presentation of Proximal Femur Fractures:

The clinical presentation of the proximal femur fractures can vary depending on the type, severity, and cause of the fracture.Patients with displaced fractures usually cannot stand or ambulate. However, patients with undisplaced or impacted fractures may be ambulatory and experience minimal pain. Few patients present with thigh or groin pain without any history of trauma. These patients should be suspected to have a stress fracture of the proximal femur. They should be enquired about any recent changes in the type, duration, or frequency of physical activity.

In patients in whom no significant history about activity or trauma is available, pathological fracture must be considered. Most proximal femur fractures in elderly persons are the result of a low – energy fall, whereas in young adults they are more often caused by high energy trauma. In the latter, a search for associated head, neck, chest, and abdominal injuries. Patients with displaced proximal femur fractures exhibit the classic presentation of a shortened and externally rotated extremity. There may be tenderness to palpation in the area of the greater trochanter. Ecchymosis may be present and should be noted. Range-of-motion testing of the hip will be painful and should be avoided. Although the neurovascular injury is rare after hip fracture, careful evaluation is nevertheless mandatory.

Fracture classification:

A number of classification systems are in place to categorize and help in choosing the best possible method of treatment viz. Boyd and Griffin, Evans and AO classification.

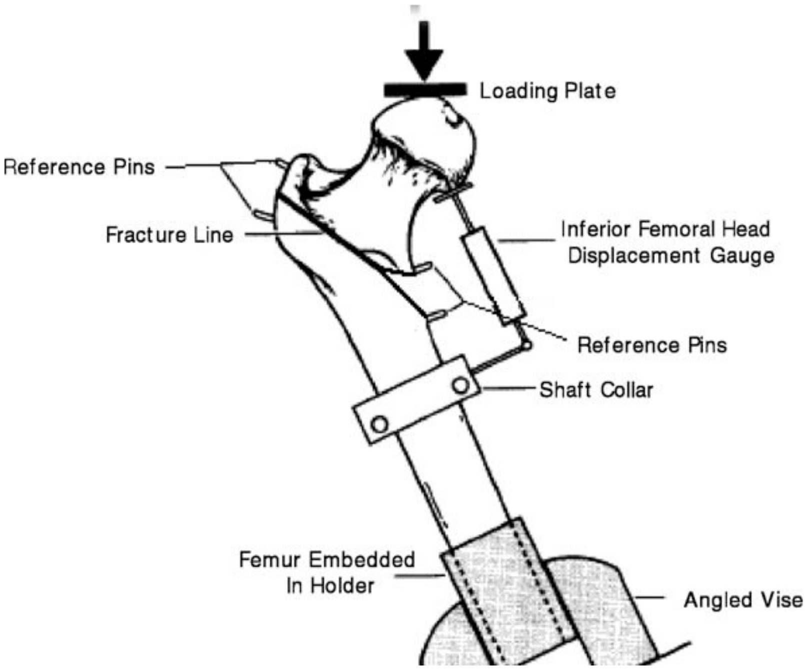


In essence none of the fracture classifications available have an edge over the other in predicting the outcome or the complications with a given fracture type.

Intramedullary fixations:

Strauss, Eric Jason et al, did a study on Helical blade versus sliding hip screw for treatment of unstable intertrochanteric hip fractures: a biomechanical evaluation. They compared the fixation stability in the femoral head with sliding hip screw versus helical blade designs for unstable, intertrochanteric hip fractures. They found that there was significantly more permanent inferior femoral head displacement in the Intertronchanteric Subtrochanteric samples compared to the Trochanteric Femoral Nail samples after each cyclic loading (all p values<0.05). There was significantly more permanent fracture site opening and inferior displacement in the Intertrochanteric Subtrochanteric group compared with the Trochanteric Femoral Nail group at 1000 and 10,000 cycles ($p<0.05$). Final loads to failure were not significantly different ($p=0.51$) between the two treatment groups. Nine specimens demonstrated fracture extension into the anteromedial cortex and subtrochanteric region and three specimens, which had an Inter trochanteric Sub trochanteric implant, demonstrated a splitting fracture of the femoral head. And concludes that fixation of the femoral head with a helical blade was biomechanically superior to fixation with a standard sliding hip screw in a cadaveric, unstable intertrochanteric hip fracture model.[39]

PFN A2



Loading Plate
Reference Pins
Fracture Line
Inferior Femoral Head
Displacement Gauge
Reference Pins
Shaft Collar
Femur Embedded
In Holder
Angled Vise

MATERIALS AND METHODS

MATERIALS AND METHODS

- **Study design** – Retrospective Prospective study
- **Study population** –Patients admitted with proximal femoral fractures treated with helical blade in Karpaga Vinayaga Institute of Medical sciences and Research centre.
- Sample size- 30

Inclusion criteria:

- Patients above 18 years of age.
- All intertrochanteric and sub trochanteric femoral fractures associated with or without ipsilateral shaft of femur fracture treated with helical blade fixation.
- Patients willing to participate after getting the consent.

Exclusion criteria:

- Patients less than 18 years of age
- Isolated intracapsular neck of femur fractures.

- Pathological fractures.
- Patients not willing to participate
- Compound injuries.
- Patients medically unfit for surgery.
- Malunion and non-union of proximal femur.
- Any other long bone fracture other than those in the inclusion criteria.

All patients were classified based on AO system of classification.

Standard preoperative evaluation was followed with complete assessment by physician and anaesthetist. Routine institutional protocol was followed for preoperative preparation and surgery.

All the patients underwent intramedullary nail fixation with helical blade (PFNA2).

All patients were assessed on 12^{th} post operative day, 6 weeks, 3 months and 6 months using the mobility score system devised by Parker and Palmer.

Palmer/Parker score is obtained as follows:

- Three points if the patient was able to ambulate outside and go shopping without any difficult.
- Two points if the patient needed an aid.
- One point if the patient needed the help of another person.
- Zero points if mobility was impossible.

STATISTICAL ANALYSIS

STATISTICAL ANALYSIS

1. Data was collected by using a test preform meeting the objective of the study.

2. Mean SD for descriptive statistics.

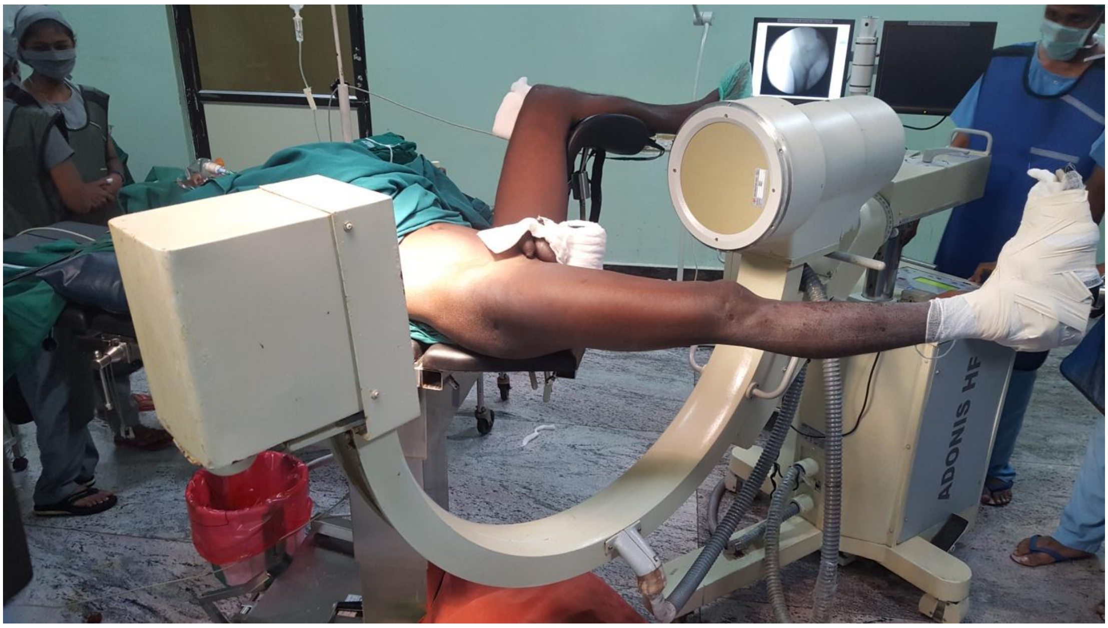
3. Stastistical significance if P>0.05 and value of less 0.05 was considered significant.

4. Student T test was applied and value of less 0.05 was considered significant.

5. Data were analysed using MS Office software and SPSS.

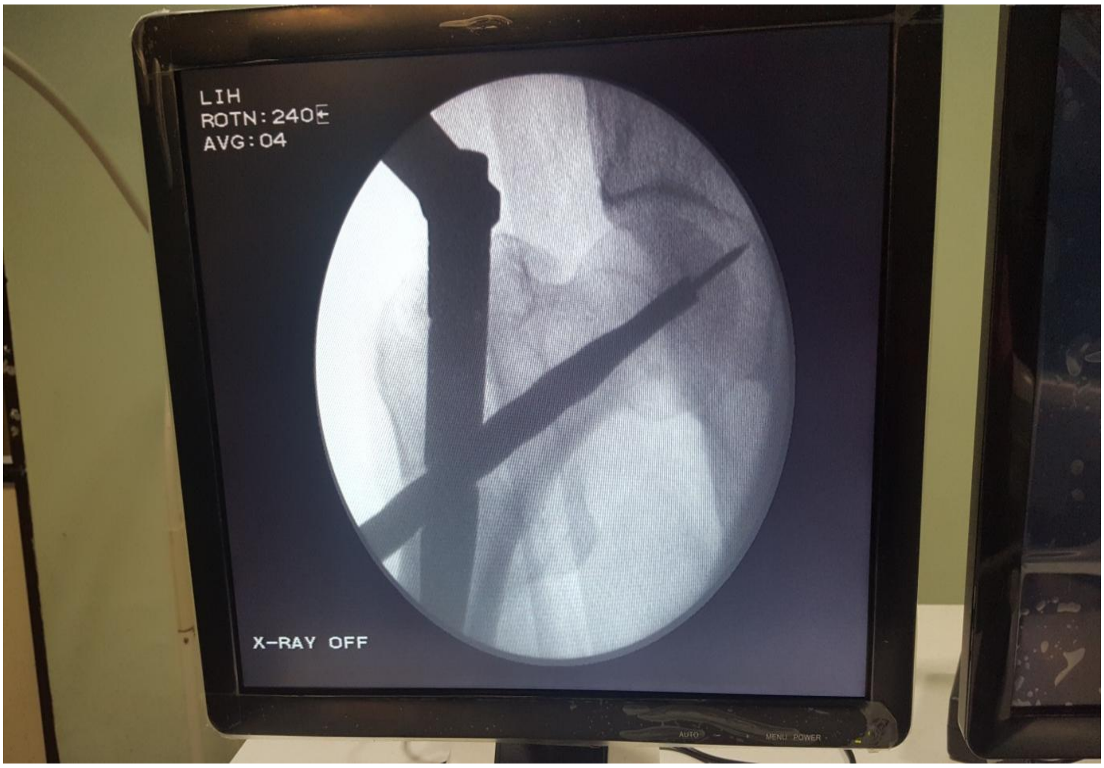
Surgical Technique:

Through lateral skin incision over the trochanter, entry made with bowl awl under imaging guidance. In all patients serial reaming of femur was done starting at 8 mm reamer. The proximal fragment was reamed uptil 13mm to accommodate proximal part of the nail. Fracture was stabilised with proximal femoral nail with helical blade screw (PFNA II) .Distal static locking was done for all patients. Thorough wound irrigation and hemostasis was obtained prior to closure of the wound.



PATIENT POSITIONING IN FRACTURE TABLE

SURGICAL PROCEDURE



C ARM IMAGE

COMPLICATIONS

COMPLICATIONS

- During the study complications were observed in four patients.
- Three patients had superficial infections which were treated with antibiotics for three weeks.
- Only one patient had screw pull out which was managed by implant exit.
- We did not encounter any patient with deep vein thrombosis or pulmonary embolism.

CASE 1

PRE OP XRAY LEFT HIP AP VIEW

IMMEDIATE POST OP XRAY LEFT HIP AP VIEW

POST OP XRAY LEFT HIP AP AND LATERAL VIEW (4 MONTHS FOLLOW OP)

PATIENT STANDING

PATIENT SQUATTING

PATIENT DOING SLR

CASE 2

XRAY RIGHT HIP AP VIEW (PRE OP)

IMMEDIATE POST OP XRAY RIGHT HIP AP VIEW

POST SURGERY XRAY RIGHT HIP AP VIEW

(1 MONTH FOLLOWUP)

POST SURGERY XRAY RIGHT HIP LATERAL VIEW

(1 MONTH FOLLOWUP)

POST SURGERY XRAY RIGHT HIP AP VIEW

(3 MONTHS FOLLOWUP)

POST SURGERY XRAY RIGHT HIP AP VIEW

(6 MONTHS FOLLOWUP)

POST SURGERY XRAY RIGHT HIP AP VIEW

(8 MONTHS FOLLOWUP)

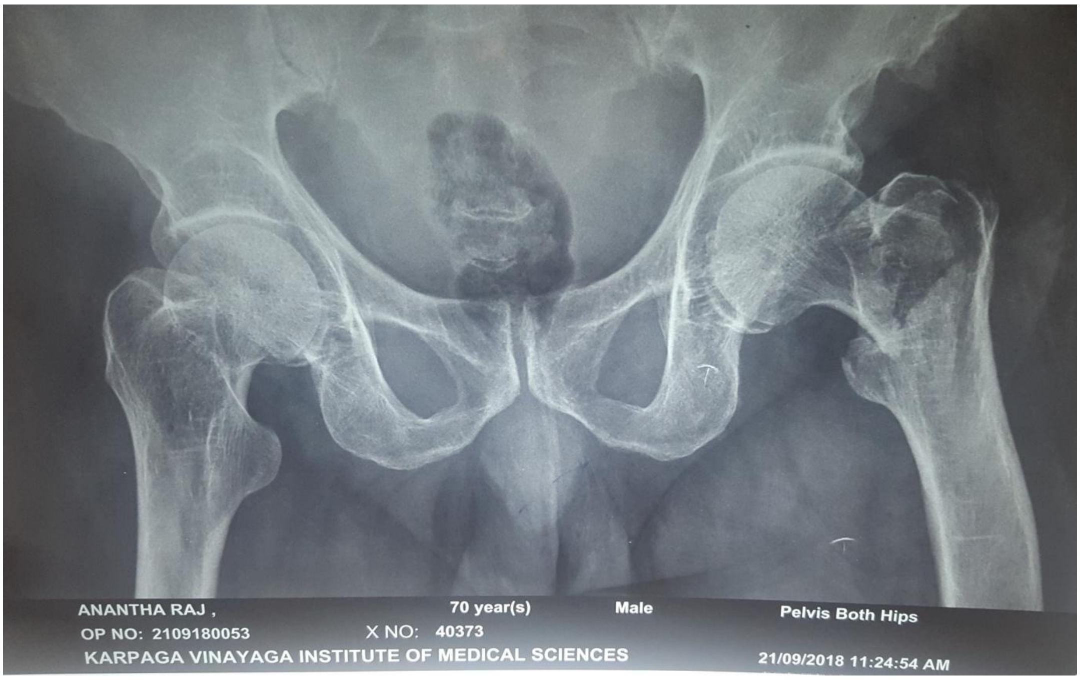
POST SURGERY XRAY RIGHT HIP LATERAL VIEW

(8 MONTHS FOLLOWUP)

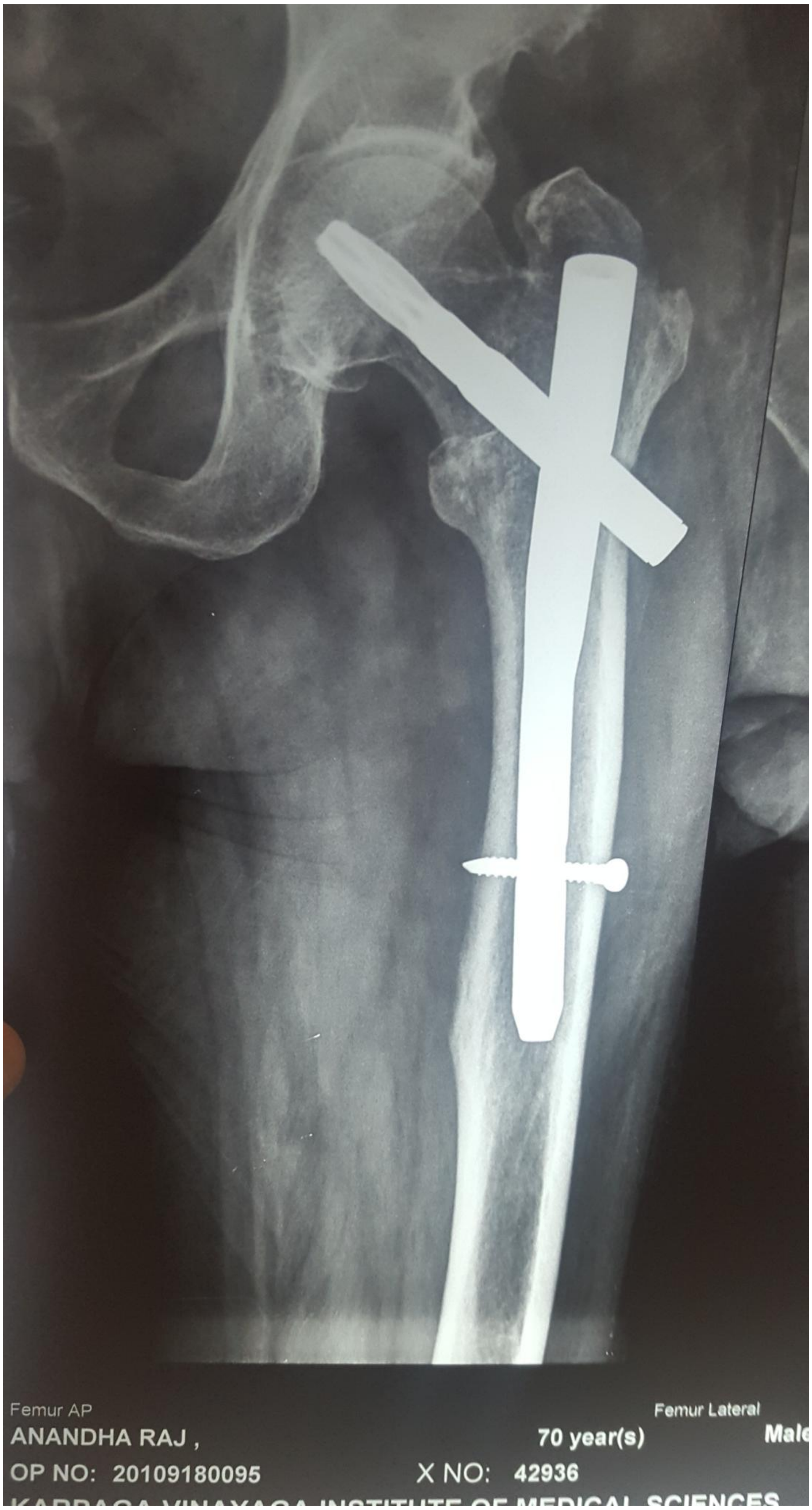
PATIENT STANDING

PATIENT DOING SLR

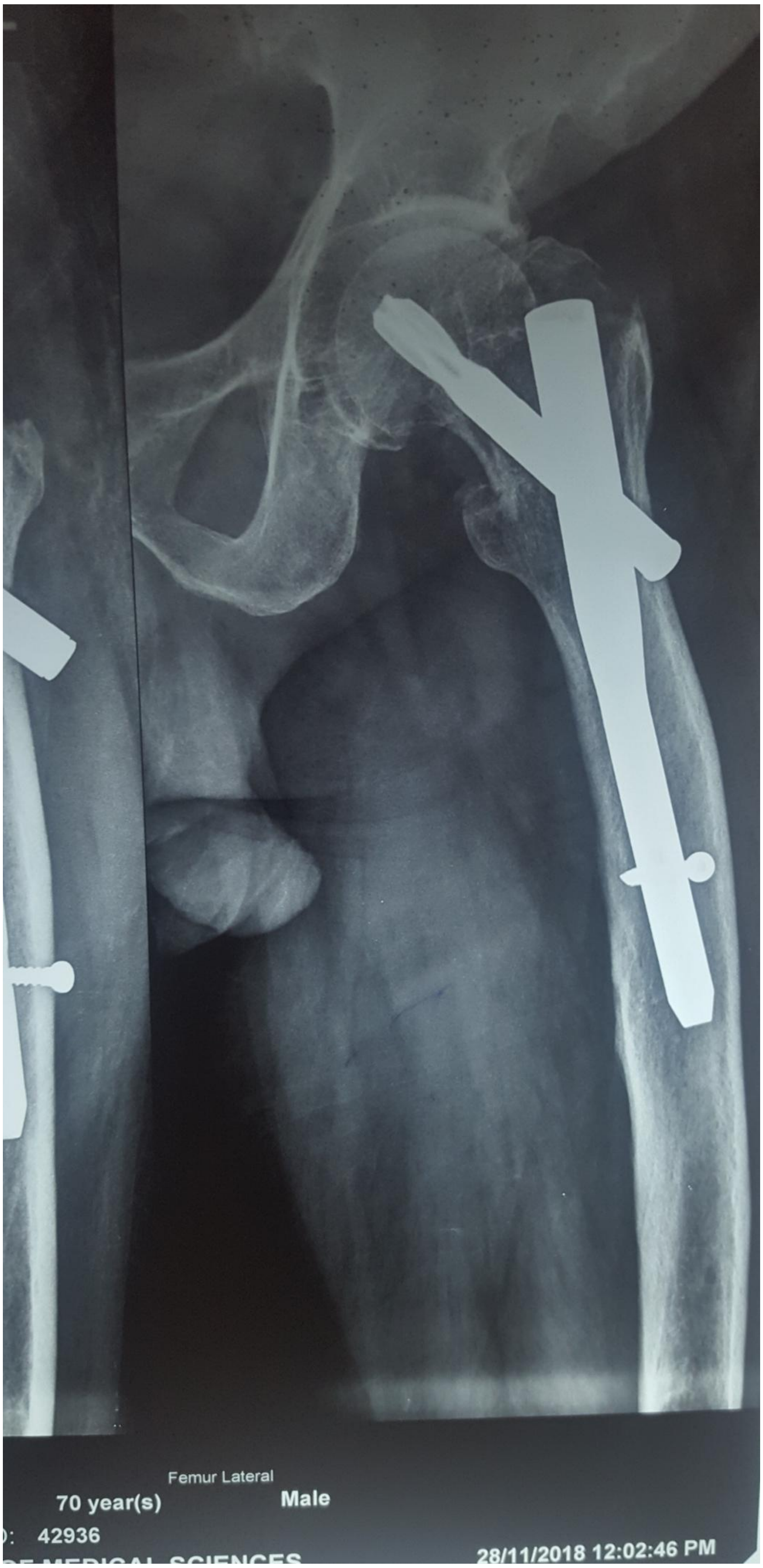
CASE 3



XRAY PELVIS AP VIEW



POST SURGERY- XRAY LEFT HIP AP VIEW



POST SURGERY – XRAY LEFT HIP LATERAL VIEW

PATIENT STANDING

PATIENT DOING SLR

RESULTS AND ANALYSIS

RESULTS AND ANALYSIS

This is a prospective retrospective study from Nov 2017 to Oct 2018 conducted in the Department of Orthopaedics, Karpaga Vinayaga Institute Of Medical Sciences And Research Centre. Approval for the study was obtained from the Institutional Ethics Committee. All skeletally mature patients with intertrochanteric and subtrochanteric fractures presenting to the institution during this period, after applying the exclusion criteria, were included in this study. Those with neck of femur fractures, those immobile or bed-ridden prior to injury and those with previous implants in the fractured hip or femur were excluded. The study included 30 patients with intertrochanteric fractures and sub trochanteric fractures treated with PFNA2, who were followed up for a minimum of nine months

Table :1 GENDER : DISTRIBUTION OF STUDY GROUP

Gender	No of patients	%
Male	13	43.33
Female	17	56.67
Total	30	100.00

Study population had 43.33% males and 56.67 % females. Amongst 13, were males and 17 were females patients were included. A pie chart representation of the data is given in Graph 2.

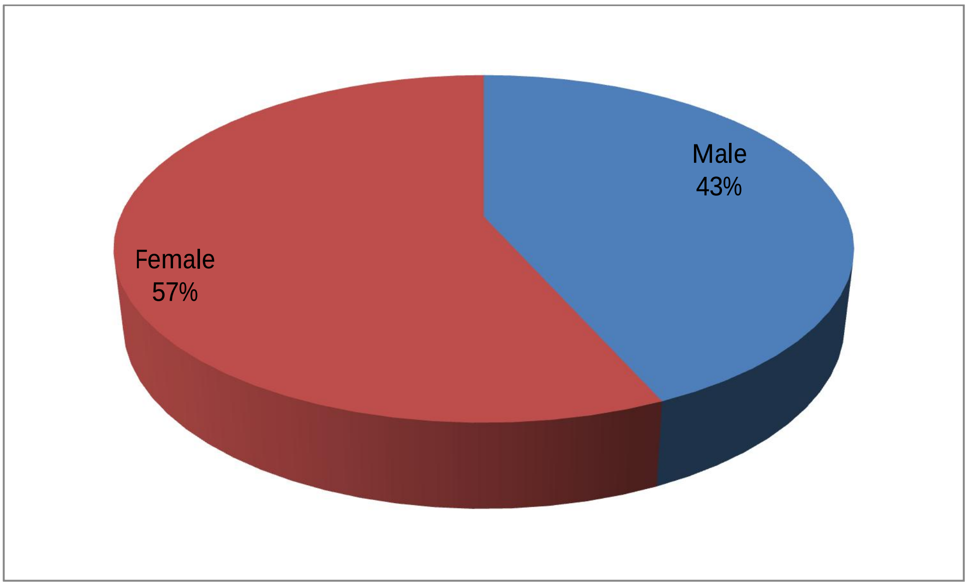


TABLE 2: AGE DISTRIBUTON OF STUDY GROUP

AGE	No of patients	%	Mean ± SD
below 40	4	13.33	60.3±15.05
41-50	7	23.33	
51-60	3	10.00	
61-70	9	30.00	
70 above	7	23.33	
total	30	100.00	

Table 2 provides the distribution of age of patients. Out of 30, maximum i.e. 9 were in the age range of 61 – 70 years, followed by 7 in the range of 70 above years. There were 3 cases in the range 51- 60 years, while 4 were below 40 years. A column chart representation of the data is given in Graph2.

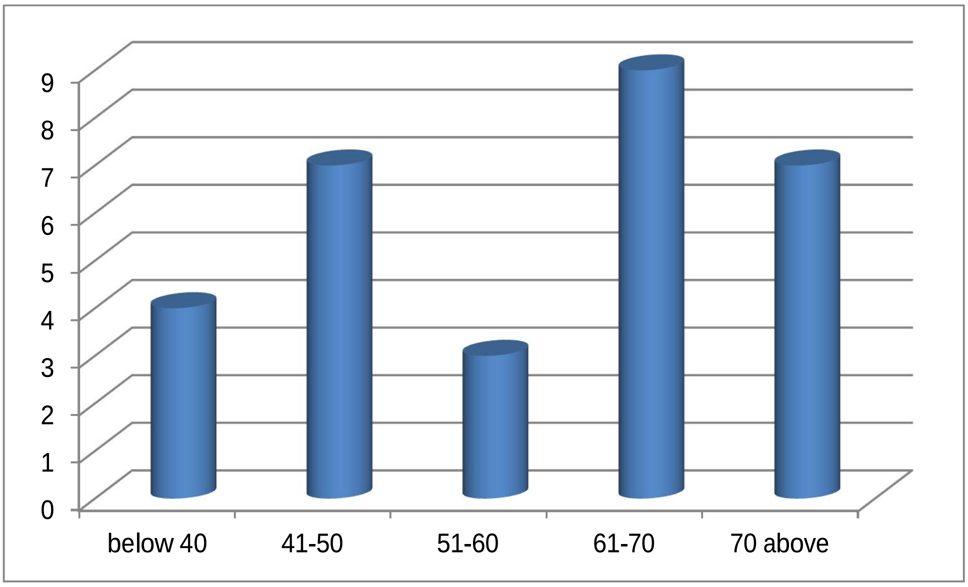

9
8
7
6
5
4
3
2
1
0
below 40
41-50
51-60
61-70
70 above

TABLE:3 DIAGNOSIS OF STUDY GROUP

Diagnosis	No of patients	%	Mean ± SD
Left intertrochanteric Fracture	13	43.33	2.21 ± 1.15
Left Subtrochanteric Fracture	3	10.00	
Right Intertrochanteric Fracture	10	33.33	
Right Subtrochanteric Fracture	4	13.33	
Total	30	100.00	

In this study left intertrochanteric fracture was found in 13 patients (43.33%). right intertrochanteric fracture was found in 10 patients (33.33%). right subtrochanteric fracture was found in 4 patients (13.33%) and left subtrochanteric fracture was found in 3 patients (10.00%).

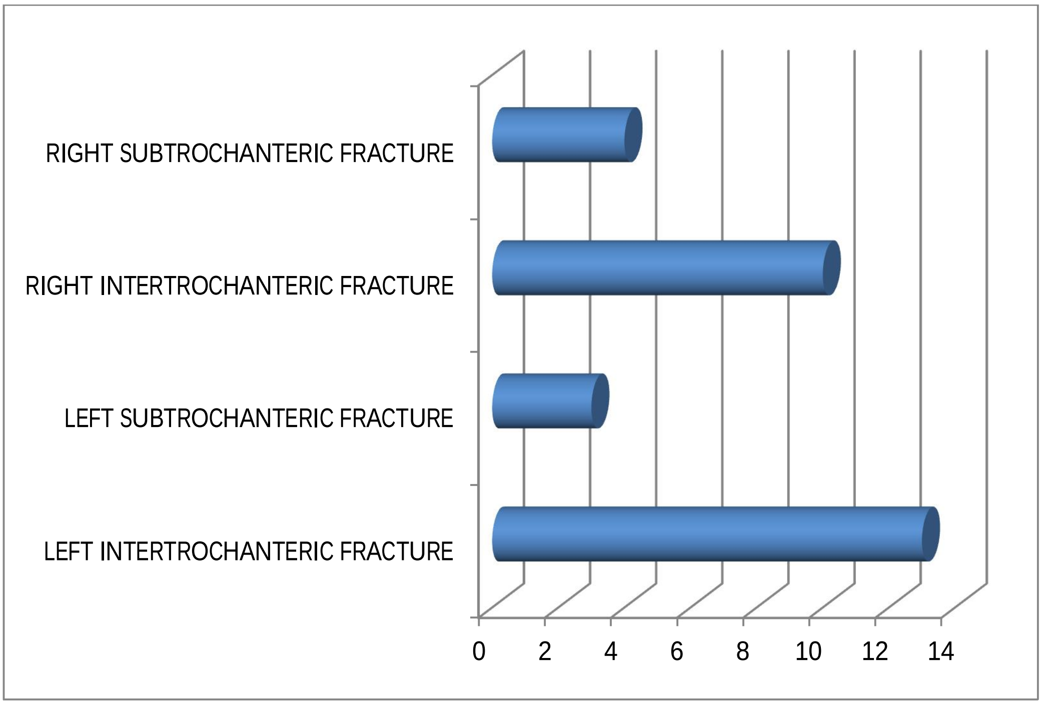
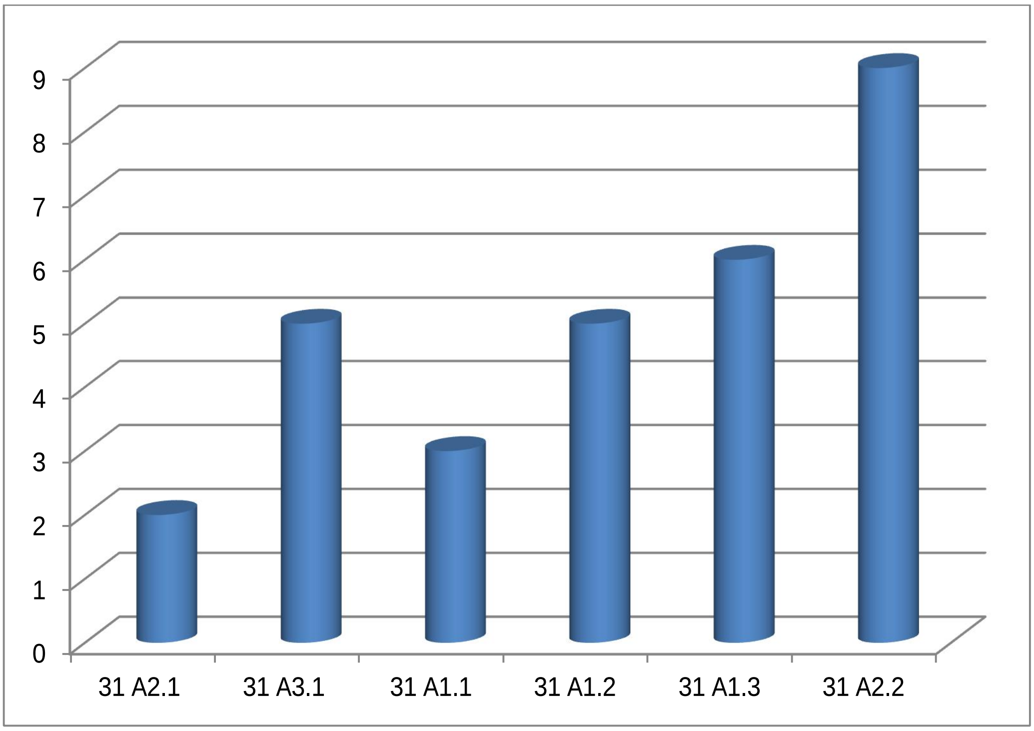
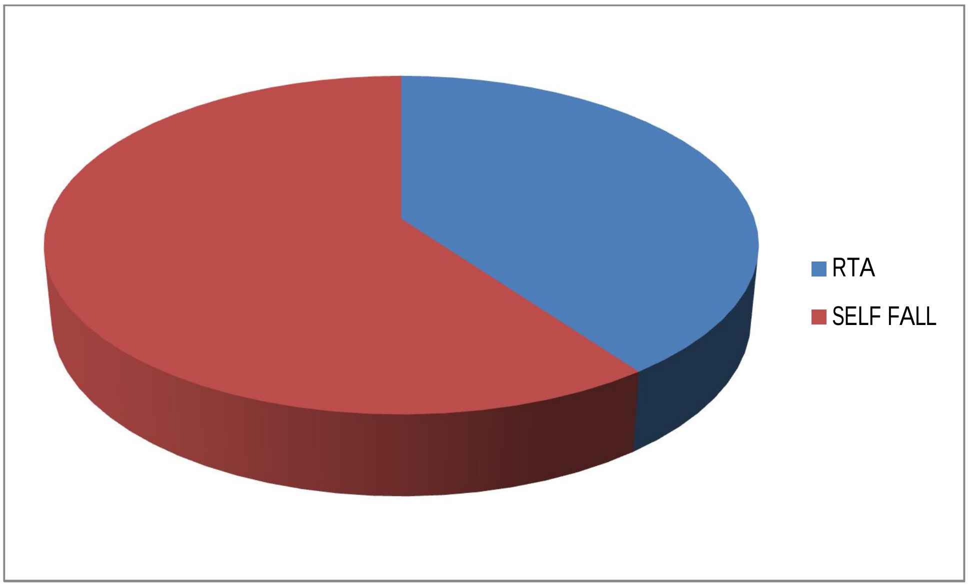

RIGHT SUBTROCHANTERIC FRACTURE
RIGHT INTERTROCHANTERIC FRACTURE
LEFT SUBTROCHANTERIC FRACTURE
LEFT INTERTROCHANTERIC FRACTURE
0
2
4
6
8
10
12
14

TABLE:4 AO CLASSIFICATION OF STUDY GROUP

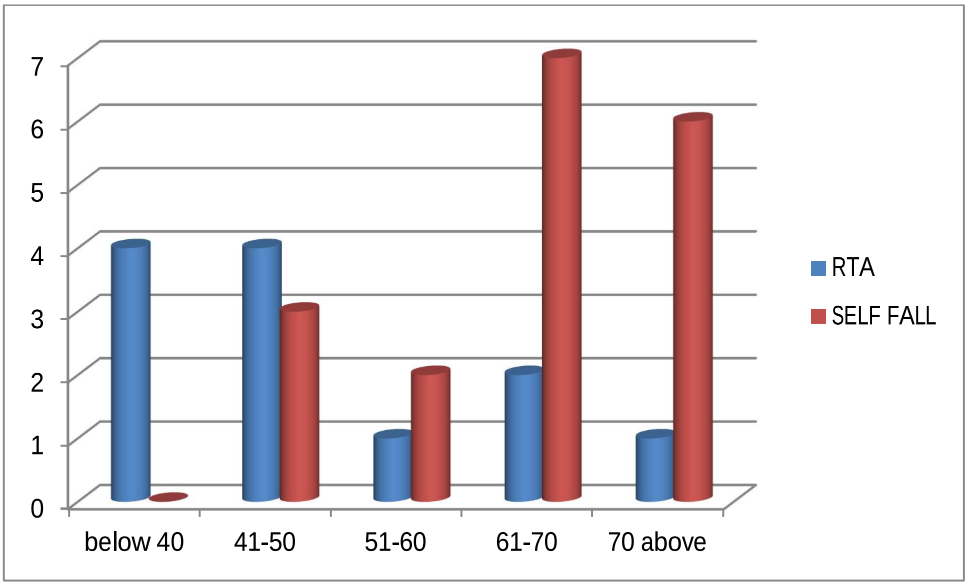
AO Classification	No patients	%	Mean ± SD
31 A2.1	2	6.67	4.62 ± 1.71
31 A3.1	5	16.67	
31 A1.1	3	10.00	
31 A1.2	5	16.67	
31 A1.3	6	20.00	
31 A2.2	9	30.00	
Total	30	100.00	



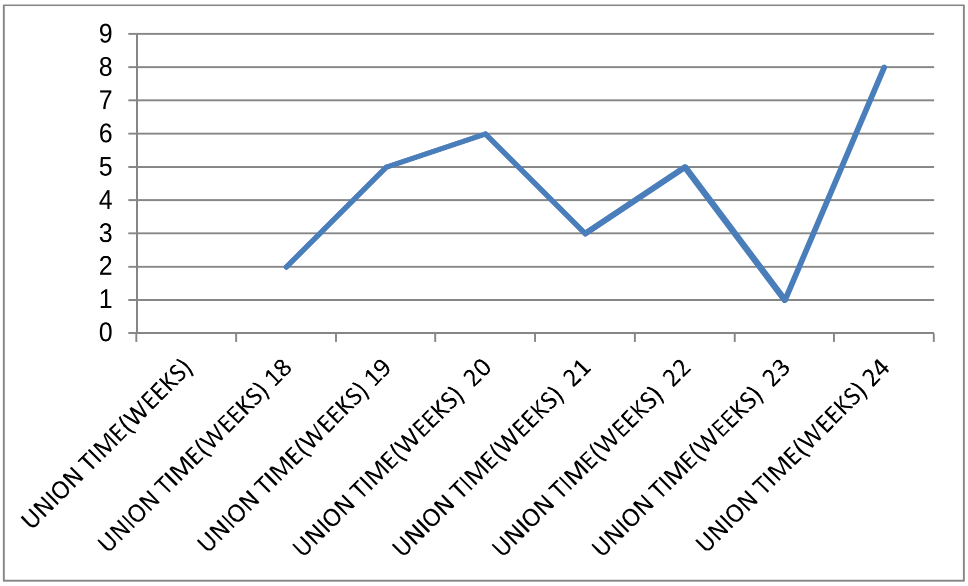
Mode of Injury	**No patients**	**%**
RTA	12	40
SELF FALL	18	60
Total	30	100



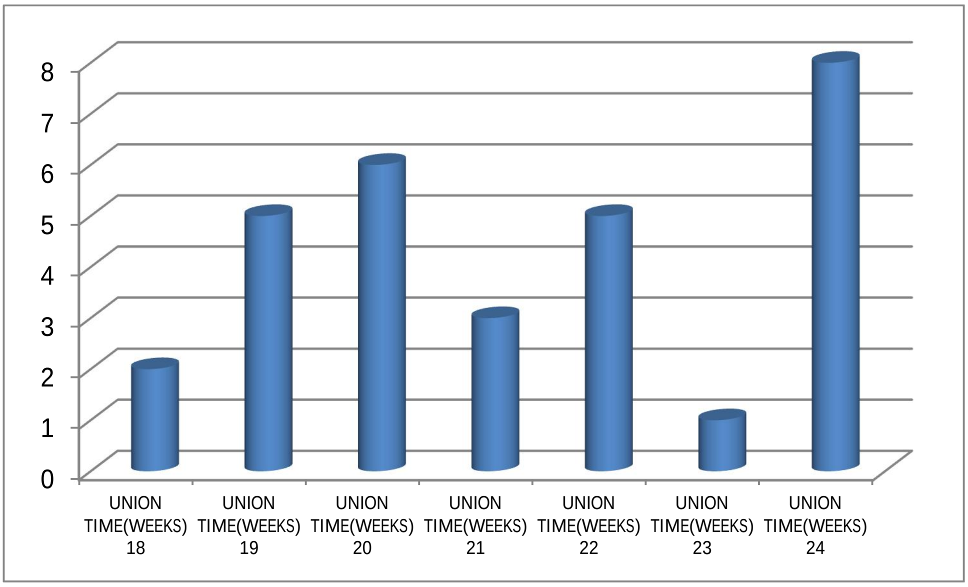
Age	RTA	%	SELF FALL	%
below 40	4	13.33	0	-
41-50	4	13.33	3	10.00
51-60	1	3.33	2	6.67
61-70	2	6.67	7	23.33
70 above	1	3.33	6	20.00
total	12	40	18	60



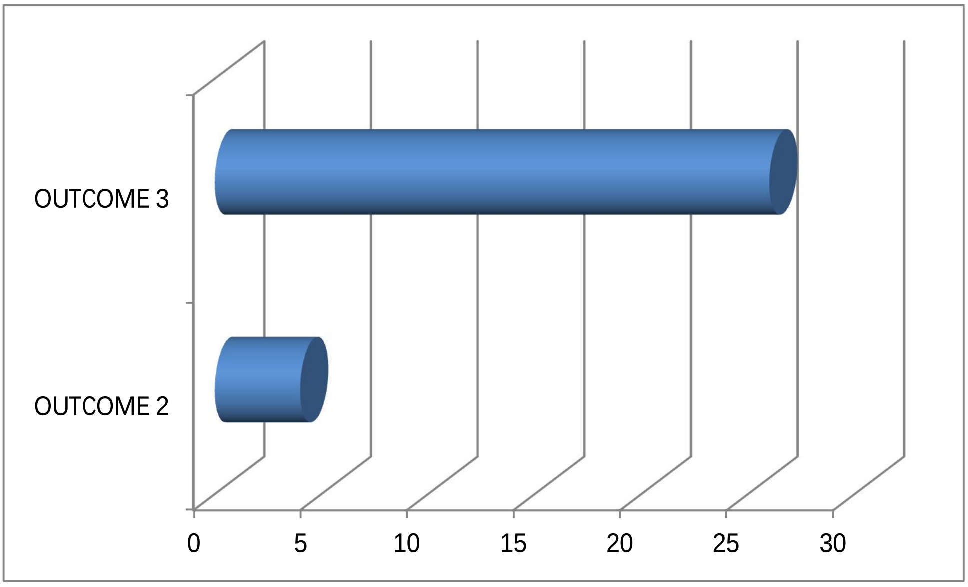
Union Time (WEEKS)	No patients	%	Mean ± SD
Union Time (WEEKS) 18	2	6.67	21.3±2.05
Union Time (WEEKS) 19	5	16.67	
Union Time (WEEKS) 20	6	20.00	
Union Time (WEEKS) 21	3	10.00	
Union Time (WEEKS) 22	5	16.67	
Union Time (WEEKS) 23	1	3.33	
Union Time(WEEKS) 24	8	26.67	
Total	30	100.00	



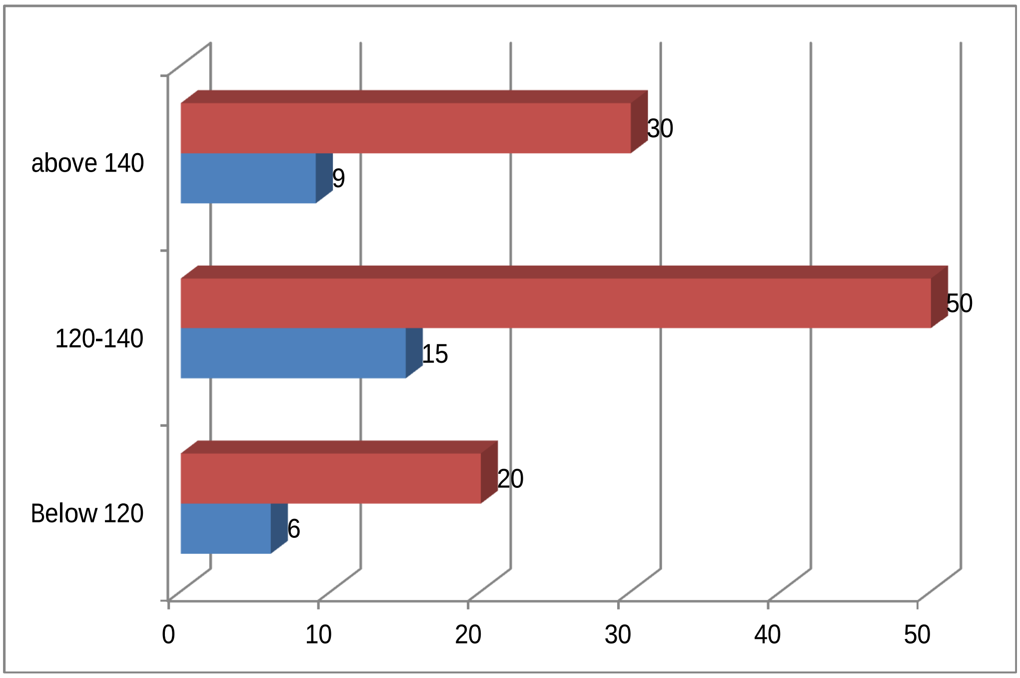
Union Time in Weeks



Outcome (mobility score)	No patients	%	Mean ± SD
2	4	13.33	2.86±0.345
3	26	86.67	
Total	30	100.00	



NECK SHAFT ANGLE	**No patients**	**%**
Below 120	6	20
120-140	15	50
above 140	9	30
	30	100



	T test	**P value**
6^{th}week, VS 3^{rd} month and 6^{th} month	5.68	0.025
3^{rd} month VS 6^{th} month	7.42	0.064

DISCUSSION

DISCUSSION

Over time, there has been no role in conservative management of proximal femoral fractures supported by clanton et al and Delee et al[40]. The treatment of proximal femoral fractures mainly focuses on the type of fracture pattern and the advantages of intramedullary implant over extramedullary devices. Extramedullary devices were associated with the disadvantages of extensive surgical methods, excessive blood loss, increased surgery time, and implant failure. The unusual position of the fixation devices has - a biomechanical drawback of fatigue failure due to mechanical load. Trochanteric stabilizing plates by MIPPO are becoming popular these days ,but is still associated with high technical failure[41]. Intramedullary nails have more biological and mechanical advantages and can be trusted as an effective fixation mode.

In our series, we use PFNA2 (with a helical blade) to fix the head , which provides more swivelling stability than the first model[9]. It is more effective in unstable fracture patterns. 14 patients required long

PFN A2 fixation (length 300-400 mm) because of subtrochanteric extension and the remaining 16 patients (.66%) were treated with the normal length PFN A2(length 180 - 240)

Advantages of intramedullary over extramedullary devices is a less extensive surgical procedure ,with minimal blood loss[42], average surgery time is 77 minutes, reducing the surgical management of soft tissue , reducing direct blood loss in our patients to an average of 190m1 per patient. This reduced the operating time and blood loss, resulting in no blood transfusion after surgery .

In an experimental study by GOTZE et al (1998) comparing the load bearing capacity of fixation devices in unstable fractures, it was found that PFN can handle the maximum device load. In our study, the average duration of starting to weight bear was 3 weeks after surgery and full weight bearing occurred at 8 weeks after surgery. The time to allow weight bearing was decided based on the fracture pattern and the integrity of lateral wall and postero medial cortex . In all our patients, a moderate level of anteromedial continuity is achieved through surgery.

Fracture union was confirmed by calluses sealed on all cortices in accordance with radiological criteria. In a study done by Wang -yue et it was 5 months and in our study the union time is 4 months.

During the hospital stay, 3 patients developed superficial infections recorded by serous discharge at surgical wounds. These patients were managed by increasing the dose of intravenous antibiotics for 3 weeks without any additional interventions. . Fracture of femur at the tip of the implant had not occurred in our study when comparing with the results obtained for Gamma, which is as high as 18% in various studies[43].

This is comparable to Christodolou et al reported good to very good results in 81% of the total 37 patients.

In our study, we had 12 patients (50%) working well. All of these patients had a good radiological union at the end of four months. The majority of complications of internal fixation of proximal femur fractures are due to poor reduction and improper implant selection. Lustenberger in 1995 showed that in an unstable fracture pattern l2% of proximal fragments showed rotation that can be verified by xrays. One patient had screw pull out and non union during the follow-up, that patient was advised for revision surgery but the patient did not follow up for further treatment.

CONCLUSION

CONCLUSION

In our study

- Proximal femoral nail (PFNA2) gives better control of rotation, length and proximal purchase in unstable pertrochanteric fractures.
- Intramedullary nailing in intertrochanteric and subtrochanteric fractures reduces the operating time, blood loss and leads to minimal soft tissue insult.
- Restoration of medial cortical continuity and preservation of lateral wall gives good results in unstable intertrochanteric fractures.
- Our results suggest that proximal femoral nailing (PFNA2) may allow faster postoperative restoration of weight bearing.
- Proximal femoral nail anti rotation is a good option for treatment of osteoporotic pertrochanteric fractures which leads to early post operative rehabilitation and weight bearing.

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BIBLIOGRAPHY

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PROFORMA

ANNEXURES

ANNEXURES

ANNEXURE 1

PROFORMA

QUESTIONNAIRE

NAME:

SEX:

AGE:

IP/OP no:

History of injury:

Date of injury

Mechanism of injury

Any other associated injury

Details of primary treatment received

Past History:

Previous mobility of the patient

Any coexisting systemic illness

Details (if any) of the treatment patient is (was) receiving

General Physical Examination: Local Examination:

Inspection

Palpation

Measurements

Movements

Investigations:

Blood

X-ray Examination

CT (if done)

Type of fracture (class)

Closed/Open (type 1 and 2)

Side

Treatment:

Surgery

Date of surgery

Duration of surgery

Surgical approach

Implant used(with exact dimensions and holes)

Placement of implant

Bone graft used

Number and type of screws used

Post operative management

Days of hospitalization

Days of starting non weight bearing mobilization

Days of starting partial weight bearing mobilization

Days of starting full weight bearing mobilization

Complications:

Infection

Angulation (varus/valgus)

Shortening

Implant loosening

Others

Death with its cause

Follow up:

	At discharge	6 weeks	3 months	6 months
Wound infection				
Shortening				
Varus or rotational deformity				
Implant loosening				
Mobility score system devices by parker and palmer				
Others				
Death and its cause				

PATIENT CONSENT FORM

ANNEXURE 2

PATIENT CONSENT FORM

Study Detail	:	**"FUNCTIONAL OUTCOME OF PROXIMAL FEMORAL FRACTURES TREATED WITH INTRAMEDULLARY FIXATION USING HELICAL BLADE IN TERTIARY CARE HOSPITAL – KANCHIPURAM DISTRICT TAMILNADU"**
Study Centre	:	Karpaga Vinayaga Institute of Medical Sciences, Chinna Kolambakkam
Patient's Name	:	
Patient's Age	:	
Identification Number	:	

Patient may check (√) these boxes

a)	I confirm that I have understood the purpose of procedure for the above study. I have the opportunity to ask question and all my questions and doubts have been answered to my complete satisfaction.	☐
b)	I understand that my participation in the study is voluntary and that I am free to withdraw at any time without giving reason, without my legal rights being affected.	☐
c)	I understand that sponsor of the clinical study, others working on the sponsor's behalf, the ethical committee and the regulatory authorities will not need my permission to look at my health records, both in respect of current study and any further research that may be conducted in relation to it, even if I withdraw from the study I agree to this access. However, I understand that my identity will not be revealed in any information released to third parties or published, unless as required under the law. I agree not to restrict the use of any data or results that arise from this study.	☐
d)	I agree to take part in the above study and to comply with the instructions given during the study and faithfully cooperate with the study team and to immediately inform the study staff if I suffer from any deterioration in my health or well-being or any unexpected or unusual symptoms.	☐
e)	I hereby consent to participate in this study.	☐
f)	I hereby give permission to undergo complete clinical examination and hematological tests.	☐

Signature/ thumb impression

Patient's Name & Address:

Signature of the Investigator

Study Investigator's Name

Dr.BALAJI C.

PATIENT CONSENT FORM
(TAMIL)

ANNEXURE 3

சுய ஒப்புதல் படிவம்

ஆராய்ச்சியின் தலைப்பு: "FUNCTIONAL OUTCOME OF PROXIMAL FEMORAL FRACTURES TREATED WITH INTRAMEDULLARY FIXATION USING HELICAL BLADE IN TERTIARY CARE HOSPITAL – KANCHIPURAM DISTRICT TAMILNADU"

பெயர்: வயது: தேதி: உள்நோயாளி எண்.

இடம்: கற்பக விநாயகா மருத்துவக் கல்லூரி, சின்னக்கோளம்பாக்கம், மதுராந்தகம் தாலுகா, காஞ்சிபுரம் மாவட்டம்.

.... என்பவராகிய நான் இந்த ஆய்வின் விவரங்களும் அதன் நோக்கங்களும் முழுமையாக அறிந்து கொண்டேன். எனது சந்தேகங்கள் அனைத்திற்கும் ஆய்வாளரால் தகுந்த விளக்கம் அளிக்கப்பட்டது. இந்த ஆய்வில் முழு சுதந்திரத்துடன் மற்றும் சுயநினைவுடன் பங்கு கொள்ள சம்மதிக்கிறேன்.

எனக்கு விளக்கப்பட்ட விஷயங்களை நான் புரிந்து கொண்டு நான் எனது சம்மதத்தைத் தெரிவிக்கிறேன். இச்சுய ஒப்புதல் படிவத்தை பற்றி எனக்கு விளக்கப்பட்டது.

இந்த ஆய்வினை பற்றிய அனைத்து தகவல்களும் எனக்கு தெரிவிக்கப்பட்டது. இந்த ஆய்வில் எனது உரிமை மற்றும் பங்கினை பற்றி அறிந்து கொண்டேன்.

இந்த ஆய்வில் பிறரின் நிர்பந்தமின்றி என் சொந்த விருப்பத்தின் பேரில்தான் பங்கு பெறுகிறேன் மற்றும் நான் இந்த ஆராய்ச்சியிலிருந்து எந்நேரமும் பின் வாங்கலாம் என்பதையும் அதனால் எந்த பாதிப்பும் ஏற்படாது என்பதையும் நான் புரிந்து கொண்டேன்.

இந்த ஆய்வில் கலந்து கொள்வதன் மூலம் என்னிடம் பெறப்படும் தகவலை ஆய்வாளர் இன்ஸ்டிட்யூசனல் எத்திக்ஸ் கமிட்டியினரிடமோ, அரசு நிறுவனத்திடமோ தேவைப்பட்டால் பகிர்ந்து கொள்ளலாம் என சம்மதிக்கிறேன்.

இந்த ஆய்வின் முடிவுகளை வெளியிடும்போது எனது பெயரோ, அடையாளமோ வெளியிடப்படாது என அறிந்து கொண்டேன்.

இந்த ஆய்வில் பங்கேற்கும் பொழுது ஏதேனும் சந்தேகம் ஏற்பட்டால், உடனே ஆய்வாளரை தொடர்பு கொள்ள வேண்டும் என அறிந்து கொண்டேன்.

இச்சுய ஒப்புதல் படிவத்தில் கையெழுத்திடுவதன் மூலம் இதிலுள்ள அனைத்து விஷயங்களும் எனக்கு தெளிவாக விளக்கப்பட்டது என்று தெரிவிக்கிறேன் என்று புரிந்து கொண்டேன். இச்சுய ஒப்புதல் படிவத்தில் ஒரு நகல் எனக்கு கொடுக்கப்படும் என்றும் தெரிந்து கொண்டேன்.

பங்கேற்பாளர்/பாதுகாவலர் கையொப்பம் ஆய்வாளர் கையொப்பம்

தேதி: தேதி:

MASTER CHART

MASTER CHART

S,No	AGE	SEX	DIAGNOSIS	CLASSIFI CATION	MODE OF INJURY	ASSOCIATED FRACTURES	NAIL LENGTH	NECK SHAFT ANGLE	OPERATING TIME (MINS)	BLOOD LOSS	COMPLICATIONS	UNION TIME (WEEKS)	OUTCOME (mobility score)
1	36	MALE	RIGHT SUBTROCHANTERIC FRACTURE	31 A3.1	RTA	NIL	380	120-140	65	100		19	3
2	61	FEMALE	LEFT INTERTROCHANTERIC FRACTURE	31 A3.1	SELF FALL	LEFT INFERIOR PUBIC RAMUS FRACTURE	180	<120	78	150	SCREW PULL OUT AND NON UNION	24	2
3	82	MALE	LEFT INTERTROCHANTERIC FRACTURE	31 A2.2	SELF FALL	NIL	180	120-140	68	150		19	2
4	70	FEMALE	RIGHT INTERTROCHANTERIC FRACTURE	31 A1.2	SELF FALL	NIL	240	>140	78	200		21	3
5	45	MALE	RIGHT INTERTROCHANTERIC FRACTURE	31 A2.1	RTA	NIL	180	120-140	89	200		22	3
6	36	MALE	LEFT SUBTROCHANTERIC FRACTURE	31 A 3.1	RTA	NIL	180	>140	50	100		24	3
7	75	FEMALE	LEFT INTERTROCHANTERIC FRACTURE	31 A2.3	SELF FALL	NIL	380	<120	66	150		20	3
8	50	FEMALE	LEFT INTERTROCHANTERIC FRACTURE	31 A2.2	SELF FALL	LEFT COLLES FRACTURE	180	120-140	59	150		24	3
9	50	FEMALE	RIGHT INTERTROCHANTERIC FRACTURE	31 A1.2	SELF FALL	NIL	240	120-140	87	250		22	3
10	70	MALE	LEFT INTERTROCHANTERIC FRACTURE	31 A2.1	SELF FALL	NIL	380	<120	96	150		21	3
11	60	FEMALE	RIGHT INTERTROCHANTERIC FRACTURE	31 A 2.2	SELF FALL	NIL	180	>140	87	350		20	3
12	70	FEMALE	RIGHT SUBTROCHANTERIC FRACTURE	31 A3.1	RTA	NIL	180	120-140	100	300		22	3
13	35	FEMALE	LEFT SUBTROCHANTERIC FRACTURE	31 A3.3	RTA	NIL	380	>140	69	400		23	3
14	38	FEMALE	RIGHT SUBTROCHANTERIC FRACTURE	31 A3.1	RTA	NIL	380	>140	120	300		21	3

15	42	MALE	LEFT INTERTROCHANTERIC FRACTURE	31 A2.2	RTA	NIL	380	120-140	109	100		20	3
16	45	FEMALE	LEFT SUBTROCHANTERIC FRACTURE	31 A3.1	RTA	NIL	380	>140	84	250		18	3
17	48	MALE	RIGHT SUBTROCHANTERIC FRACTURE	31 A3.1	RTA	NIL	180	120-140	73	150	SUPERFICIAL INFECTION	24	2
18	50	FEMALE	LEFT INTERTROCHANTERIC FRACTURE	31 A1.2	SELF FALL	NIL	240	>140	73	200		19	3
19	55	MALE	LEFT INTERTROCHANTERIC FRACTURE	31 A2.2	SELF FALL	NIL	380	120-140	74	150		19	3
20	60	FEMALE	LEFT INTERTROCHANTERIC FRACTURE	31 A2.2	RTA	NIL	180	120-140	66	250		20	3
21	64	FEMALE	RIGHT INTERTROCHANTERIC FRACTURE	31 A1.2	SELF FALL	NIL	180	<120	77	150	SUPERFICIAL INFECTION	22	2
22	66	FEMALE	LEFT INTERTROCHANTERIC FRACTURE	31 A2.2	RTA	NIL	180	120-140	57	100		24	3
23	68	MALE	RIGHT INTERTROCHANTERIC FRACTURE	31 A1.3	SELF FALL	NIL	180	>140	99	100		24	3
24	70	MALE	LEFT INTERTROCHANTERIC FRACTURE	31 A1.2	SELF FALL	NIL	380	120-140	59	150		20	3
25	70	MALE	LEFT INTERTROCHANTERIC FRACTURE	31 A1.1	SELF FALL	NIL	380	<120	60	150	SUPERFICIAL INFECTION	20	3
26	76	FEMALE	RIGHT INTERTROCHANTERIC FRACTURE	31 A 1.3	SELF FALL	NIL	380	120-140	66	100		18	3
27	78	MALE	LEFT INTERTROCHANTERIC FRACTURE	31 A2.2	RTA	NIL	380	>140	76	200		19	3
28	78	MALE	RIGHT INTERTROCHANTERIC FRACTURE	31 A1.1	SELF FALL	NIL	380	120-140	88	150		22	3
29	80	FEMALE	RIGHT INTERTROCHANTERIC FRACTURE	31 A2.2	SELF FALL	NIL	240	<120	75	150		24	3
30	81	FEMALE	RIGHT INTERTROCHANTERIC FRACTURE	31 A1.1	SELF FALL	NIL	380	120-140	98	100		24	3