A COMPARATIVE STUDY OF FUNCTIONAL OUTCOME FOLLOWING DYNAMIC HIP SCREW AND PROXIMAL FEMORAL NAILING FOR INTERTROCHANTERIC FRACTURES OF THE FEMUR

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MASTER OF SURGERY

IN

ORTHOPAEDICS

Under the Guidance of

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PRIOR PERMISSION TO START OF STUDY

The Institutional Ethics Committee of Sri Devaraj Urs Medical College, Tamaka, Kolar has examined and unanimously approved the Synopsis entitled **"A Comparative Study of Functional Outcome Following Dynamic Hip Screw or Proximal Femoral Nailing for Intertrochanteric Fractures of Femur"** being investigated by Dr.ANIL KUMAR P & Dr. Nagakumar J S in the Departments of Orthopaedics at Sri Devaraj Urs Medical College, Tamaka, Kolar. **Permission is granted by the Ethics Committee to start the study.**

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ABSTRACT

Introduction: Inter-trochanteric fractures are common in the old age group. The goal/aim for the treatment for inter-trochanteric fractures will be to nearly restore pre-injury condition as early as it is possible. Dynamic hip-screw and proximal femoral-nailing has been the 2 standard treatment methods used for treating these kinds of fractures. The main goal of this proposed study was to compare functional outcomes of two available fixation devices for inter-trochanteric fracture using Harris Hip scoring. The to compare the functional outcome of the dynamic hip screw and proximal femoral nailing for the treatment of Intertrochanteric hip fractures achieved by the patient based on Harris hip score.

Methods and materials:

The clinical methodology for the study consists of 46 cases of Inter-trochanteric fractures of femur that meet the inclusion criteria of patients aged above 45years diagnosed with closed intertrochanteric fracture that are less than 3 weeks duration who were able to walk prior to fracture and exclusion criteria, admitted to R L Jalappa Hospital, Tamaka, Kolar between November 2019 and November 2021. The patients were divided into 2 groups, group A treated with DHS and group B treated with PFN and followed up at 6 weeks, 12 weeks and 24weeks based on the functional outcome on 24^{th} week using Harris-hip score.

Results: A total 46 patients were included in the study. Mean Age in Group DHS was 61.09 ± 11.69 and in Group PFN was 65 ± 14.98. In Group of DHS, 9 out of 23patients were male and 14 out of 23patients were female patients. In Group of PFN, 12 out of 23patients were male and 11 out of 23patients were female. Mean 6 weeks score in Group DHS was 34.43 ± 3.23 out of 100 and in Group PFN was 34.35 ± 2.5 out of 100. Mean Harris Hip Score in

Group DHS was 84.3 ± 7.68 out of 100. Mean Harris Hip Score in Group PFN was 89.26 ± 6.53 out of 100. In Group DHS, 52.17% had Injury on Left Side and 47.83% had on Right Side. In Group PFN, 39.13% had Injury on Left Side and 60.87% had on Right Side.In Group DHS, Results were Excellent in 34.78%, (8 patients) Good in 43.48% (10 patients) Fair in 17.39% (4 patients out of 23 patients),Poor in 4.35% (1 patient). In Group PFN, Results were Excellent in 56.52% (13 patients) Good in 34.78%(8 patients) Fair in 8.70% and (2 patients).

Conclusion: From the study it can be concluded that Proximal Femoral Nailing had better Outcome in Intertrochanteric fractures compared to DHS. Highest percentage of subjects in PFN group had Excellent to Good Outcome and none of them had poor outcome when compared to DHS group. PFN group had higher scores of Harris Hip score at 12 weeks, 24 weeks and at the end of follow-up.

Key Words – Intertrochanteric fractures, Dynamic Hip Screw, Proximal Femoral Nailing, Harris Hip Score, Functional Outcome.

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LIST OF ABBREVIATIONS

GLOSSARY	ABBREVIATIONS
ANT	ANTERIOR
AO	THE ARBEITSGEMEINSCHAFT
AP	ANTERO-POSTERIOR
CRIF	CLOSED REDUCTION INTERNAL FIXATION
DHS	DYNAMIC HIP SCREW
DM	DIABETES MELLITUS
DM	DIABETES MELLITUS
GA	GUSTILO ANDERSON
HHS	HARRIS HIP SCORE
HTN	HYPERTENSION
LAT	LATERAL
LFCA	LATERAL FEMORAL CIRCUMFLEX ARTERY
ORIF	OPEN REDUCTION INTERNAL FIXATION
PA	POSTERO-ANTERIOR
PFN	PROXIMAL FEMUR NAIL
POST	POSTERIOR
ROM	RANGE OF MOTION
RTA	ROAD TRAFFIC ACCIDENT
SD	STANDARD DEVIATION
WKS	WEEKS
YRS	YEARS

INTRODUCTION

INTRODUCTION

Inter-trochanteric fractures are very common in the old age group, but infrequent in the younger age group. These fractures easily treated with many conservative treatments that healed with vicious callus. In intertrochanteric fractures treated conservatively with that healed with vicious callus, coxa-vara deformity is frequently observed, resulting in lower limb shortening and limb flaccidity.[1] Multiple surgical procedures with multiple different implants have been described in literature and used for the treatment in inter-trochanteric fractures.

Little possible attention that has been paid to these kinds of fractures in the past because they arise from porous bone with an excellent and rich blood-supply and can heal without active intervention. Conservative treatment, however, resulted in vicious callus with varus, external rotation with shortening resulting in short limp gait of walking and an high mortality rate due to the complications when lying down and prolonged immobilization.

The goal/aim for the treatment for inter-trochanteric fractures will be to nearly restore pre-injury condition as early as it is possible. This has led to internal fixation to increase the patient comfort by facilitating the nursing care, reducing hospitalization, early mobilization and reducing complications [2].

Problems in treating this fracture are the instability and fixation complications that will result from the treatment of the inter-trochanteric fractures. Stability is the ability of internally attached fracture to withstand gravity and muscle forces acting around it and cause the fracture to undergo varus displacement. Other contributing factors that might contribute mostly to fixation failure are some intrinsic factors such as the fracture reduction of the fractures and osteoporosis and some extrinsic contributing factors such as implant of choice and insertion technique.

The implant type used will affect the final-outcome and the complication of that fixation that might accompany the fracture and its fixation. Dynamic hip screw, and sliding plate device, is already widely used for fixation. However, if weight bearing is started early, especially in the compound and comminuted fractures, the device may have a tendency to penetrate or retract through the head.

The proximal femoral nail(PFN) is the intra-medullary device that has commonly been reported to have beneficial in such fractures because its placement is close to its mechanical-axis of the body and thus it reduces lever arm aspect on the implant. In addition, they also take very less time to insert with little blood loss, allow early weight-bearing movement post-surgery and result in less shorter long-term follow-up.

The main aim/goal of this proposed study was to compare functional outcomes of two available fixation devices for inter-trochanteric fracture and if any one device can have an advantage over the other in-terms of the patient's ultimate functional outcome using Harris Hip scoring.

AIMS &

OBJECTIVES

AIMS OF THE STUDY

"To compare the functional outcome of the dynamic hip screw and proximal femoral nailing for the treatment of Intertrochanteric hip fractures achieved by the patient based on Harris hip score"

OBJECTIVES OF THE STUDY

A. Assessment of the functional outcome of the dynamic hip screw(DHS) for the treatment in Intertrochanteric hip fractures based on Harris hip score.

B. Assessment of the functional outcome of proximal femoral nailing(PFN) in the treatment of Intertrochanteric hip fractures based on Harris hip score.

C. To compare the functional outcome of the dynamic hip screw(DHS) and proximal femoral nailing(PFN) in the treatment of Inter-trochanteric hip fractures achieved by the patient based on Harris hip score

REVIEW OF LITERATURE

REVIEW OF LITERATURE

HISTORICAL REVIEW

In the past, conservative treatment was widely accepted as the only the rational treatment for trochanteric fractures. It might be due to the high incidence of these type of fractures in the elderly, where mortality rates of almost one in five were considered almost inevitable[1].

In 1916 Heygroves introduced the Quadrangular nail implant, which was designed to provide better fixation of head of femur and the neck which might prevent implant cutouts.[4]

In the year 1931, Smith-Peterson et al reported their series of open nailing surgery with an triangular nail. They advocated open reduction, impaction and internal fracture fixation.[4]

Johansson in 1932 and Westcott in 1934 introduced the cannulated hip device for a more precise placement of implant on the femoral head. This technique was a forerunner of current techniques that use guide pins for the precise placement of fixation devices in the stabilization of hip fractures.[4]

In the 1940's, Jewett [5] introduced the tri-flange nail, which then allowed the operating surgeon to obtain immediate stability of a fracture and very early mobilization of patient. However, the very use of a Jewett nail for fixation of the unstable inter-trochanteric fractures has been a problem, as loss of fracture fixation is frequently observed. An rigid implant might not allow for the impaction of crushed fracture site fragments. As a result of this, stress exerted to the implant increases and ultimately leads to fatigue and implant failure or penetration and cutting out of femoral head 6,7.

In 1942, Brittain[8] introduced the Low-Nail to remove/eliminate the varus deformity and rotational deformation forces.

In the year 1944, Capener Neufeld simplified the existing Jewett nail implant and introduced an one-piece stainless steel-angle plate called a V - plate. In the year 1944 only, Moore AT designed an sheet plate.[4]

In 1947, Mc Laughlin introduced the combination of adjustable nail plates. He used a triangular nail whose side end had a slot into which a plate is secured with the washer and screw.[8]

In 1949, Murray found that although fractures of the inter-trochanteric region heal with good conservative treatment, there were verystrong arguments were made for early mobilization of the patients with an adequate trochanteric fracture stabilization/fixation with internal fixation.[9]

In the year 1949, Merwyn Evans[10] developed a classification that divides trochanteric fractures into unstable and stable types classified on stability. He has presented 101 cases that were well treated conservatively with derotational boot and 22 cases fixed with the internal-fixation with the Capener Neufeld nail-plates and had suggested that the internal fracture-fixation of the inter-trochanteric fractures had the good advantages of early patient mobility and lower mortality.[10]

In the year 1950, Earnest Roll, Germany, was the first one to use the sliding device in the internal fracture fixation of inter-trochanteric fractures.[11]

The Zickel Nail that was introduced in the 1950s by Dr. Robert Zickel and was a descendant of Kuntscher's Double-Nail.[4]

In the year 1955, Dr. Pugh and Badgley[12] introduced a new sliding drill system(sliding device fitted with trephine tip) in the United States. In the same year of 1955, Schumpelick et al.[13] described a use of the sliding nail.

In the year 1957, Clawson [14] studied unstable and stable fractures fixed internally with a nail-plate implant and found that 41percentage of the treated fractures evolve to angle-varus and it concluded that, in unstable fractures, traction might be better than internal fracture fixation with a nail-plate.

In the year 1958, Massie[15] first introduced an sliding nail plate fastener, which can cause an impaction.

In 1959, Cleveland [16] reported an overall failure average rate of almost 20percentage after the fixation in 229 cases with “Jewett nail plate” implant.

In the year 1962, Massie[17] modify that sliding nail-plate implant/device to allow the fragments to collapse and impact, might improve the final results of the treatment of inter-trochanteric fractures.

In the year1964, Clawson[18] reported that in the treatment in inter-trochanteric fractures with the sliding-compression screw and a Jewett nail. “The Richards Manufacturing Company” and Mr. Ian McKenzie of the “Royal National Orthopedic Hospital” had developed the very first sliding compression screw and where they were used. Clawson then made several changes/modifications and, in its current form, the device is now known currently as the “Richards Compression Screw”.

In the year 1966, Kuntscher G [19] and Enders introduced condyle-cephalic intramedullary nails in 1970. Cephalo-medullary fixation was attempted with a Kuntschner-en-Y nail, and it was extremely difficult to insert and, in many cases resulted in an communited displaced fracture of the greater trochanter.

Fixed nail-plate device defects have been recognized and those very techniques have been later developed to restore medial femoral cortical stability in the patients with unstable inter-trochanteric fractures. These techniques that combined the use of hard-rigid devices with different types of osteotomies around femoral neck and the trochanteric region. Dimon and

Hughston [20] advised for a osteotomy procedure in which the greater-trochanter that was osteotomized/ separated and then the shaft of femur was displaced medially so as to force the head of femur and the neck of femur into the shaft of femur.

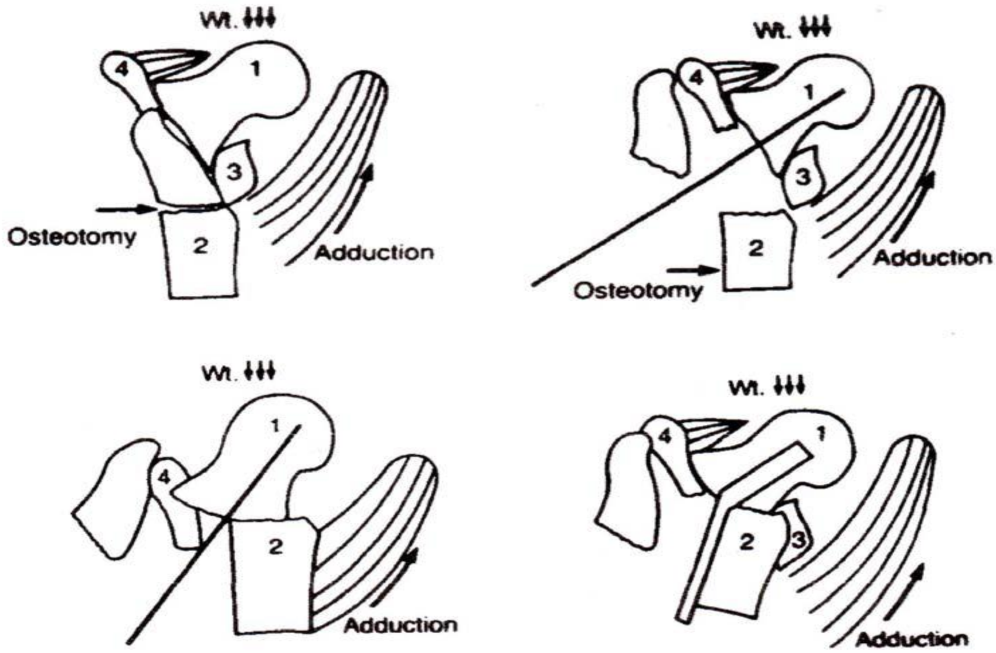


Figure 1: Dimon-Hughston Procedure[20]

Sarmiento [21] and Williams [22] recommended that an valgus osteotomy procedure in which a basal lateral wedge was resected at the very proximal end of the diaphyseal fracture fragment and then the femoral neck fragment was placed in a valgus position over the medial cortex to create a stable fixation.

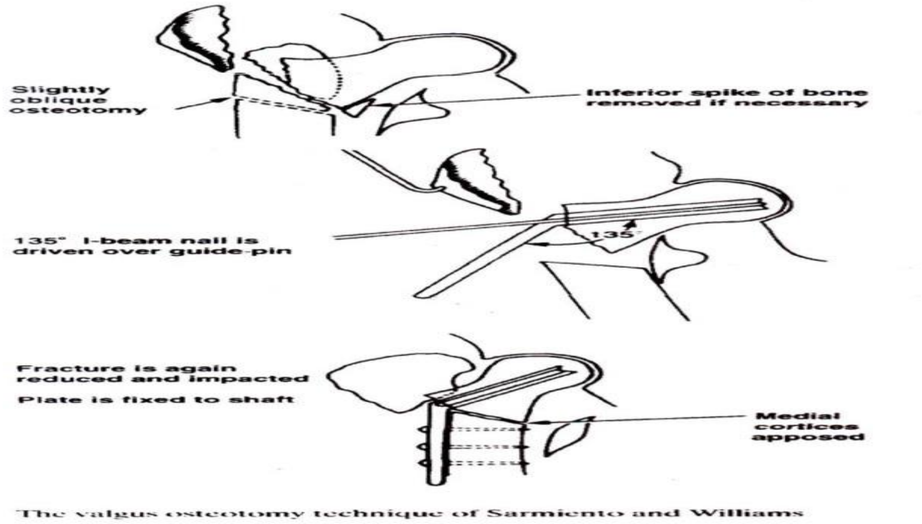


Figure 2: Sarmiento And Williams Valgus Osteotomy Technique[21]

Sliding Nail-Plate devices gave rise to Sliding Hip Screw Devices (SHS). Von Pohl[23] invented the sliding hip screw. An blunt end screw with a very large male thread diameter that replaced the nail portion. These changes improved the fracture fixation of proximal fracture fragments and reduced the screw cut-out. The sliding hip-screw is very commonly used for stable and the unstable inter-trochanteric fractures in the femoral head. Hip screw side plate slide angles are available from 130 to 150 degrees in 5 degree increments in barrel with the side plate. The 135-degree plate is the most commonly used as it aligns with the normal angulation. This technique gave equal or better results than osteotomies[23] and is still the mainstay of current treatment today.

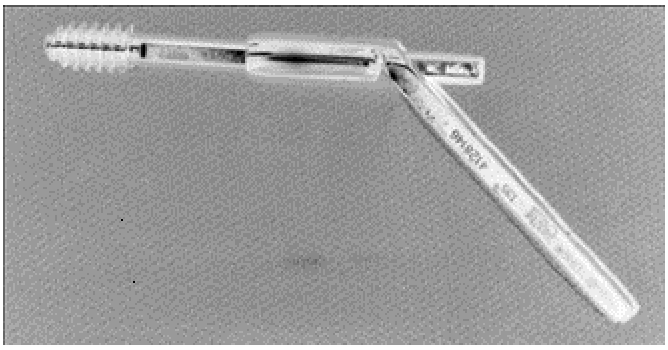


Figure 3: Sliding Hip Screw Device[23]

Between the mid-1970s, flexible intra-medullary devices such as an Ender-nail and the condyle-cephalic nail were introduced for the internal fixation of inter-trochanteric fractures. The mechanical advantage of these such devices were due to their intra-medullary position, which reduced the total bending moment of that device. In addon, the use of distal insertion sites has also been reported that will reduce operational time and blood loss, compared to the use of proximal sites.[24,25] This surgical technique was enabled by the usage of image enhancement and was much promoted as a closed system method for fracture fixation of intertrochanteric fractures. However, a very high prevalence of an varus deformity, as well as pain in the knee caused by an distal thread migration, that had been reported in association with this procedure.[26,27] These problems lead to a very high incidence of reoperations for thread extraction and correcting the distortion.

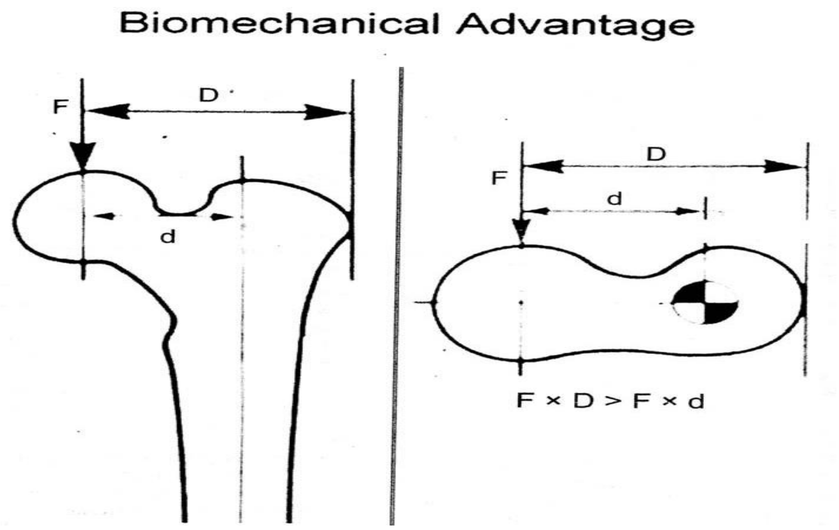


Figure 4: Biomechanical Advantage of Intramedullary Device[25]

First-generation intra-medullary nails had a short lever arm, which reduces the pull on the very implant itself, the lack of an intactness lateral femoral cortex, improves load transfer (due to medial nail placement), the potential of closed reduction of fracture, percutaneous nail insertion, shorter operative time, and less/little blood loss. These are few theoretical advantages of intra-medullary devices over screw type hip compression screw devices.[28]The gamma nail is a versatile implant for the fracture fixation of inter-trochanteric fractures. The development of this nail went through different designs. The original project was called the Mark I. The later projects that followed were called the Mark II and Mark III. Initially it was called Halifax Nail, after the region where it was developed by Dr. Subhash Haldar. A group of Strasbourg surgeons changed the name of this very nail into a universal one, namely Gamma Nail, due to its shape that resembled the Greek letter.

The gamma-nail was the first-generation nail for the treatment in the inter-trochanteric fractures associated with the very relatively high incidence of peri-implant fractures ranging from 2.2% to 17%, approximately around 4times higher than that for dynamic hip compression screws.[29,30] Geometry and size of the nails were the most contributing factors. A large 10° valgus curvature, a long 200 mm length with no anterior arch, and the relative stiffness caused by a large proximal diameter of 17 mm and a distal diameter ranging from 12 to 16 mm all contributed to increased stress concentration of the nail.[28]

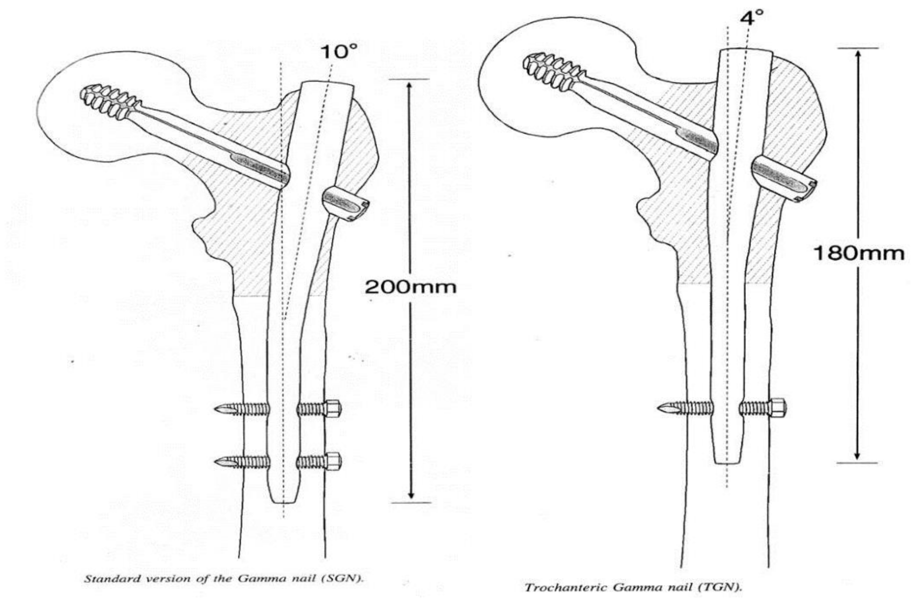


Figure 5 and 6 : Standard Gamma Nail and Trochanteric Gamma Nail[30]

The cutout rate speed of these first-generation nails was 2percentage to 4.3 percentage [31], was not better than that one’s observed with hip compression screws that is 2.5 percentage [32].

Changes in the implant geometry lead to reduction in curvature in valgus to 4°, reduced distal most diameter to 11 mm and shortening the nail length upto 180 mm reduced stress concentrated at the very tip of the nails so called Second generation Gamma nails. [28]

The incidental percentage of the peri-implant fractures of second-generation devices was reduced to 0% to 4.5%[29]. Recently, third-generation nails have been introduced, such as an proximal femoral nail(PFN), in which contains multiple screws that go into the head of femur and femoral neck. Theoretically, multiple fixation points provide better control of the rotation of unstable fractures compared to a single fixation screw. The smaller diameter screws of these multi-screw devices that allow the very proximal portion of nail have a smaller diameter.

The smaller diameter of that nail is beneficial in reducing the amount of injury to the gluteus-medius tendon at the tip/point of insertion. The theoretical problem that occurred with screws of smaller diameter is that the clipping of screw directly related as its reduced diameter, which can be exacerbated by the bending of screw. The sliding of that guide lag screw can be prevented/avoided by this bending in this manner. Fracture of the superior/upper minor derotational screw has been seen when placed very near to the that subchondral bone in the femoral head. It's this position, it encounters significant varus stress which are not completely shared by the larger lower screw.[28]

In 1980, Jensen et al[33] showed that telescoping a 135 ° hip sliding screw at 10mm and 20mm improved the strength of the implant by 28percent and 80percent respectively, due to that shortening of the lever mechanism arm. Jacobs et al. [34] demonstrated that as sliding hip-screw acts as “lateral tension band” in stable inter-trochanteric fracture patterns, while transmitting the forces through medial cortex.

Dr.Simpson and colleagues[35] have demonstrated that the due to loss of this sliding ability leads to a functionally rigid construction and higher failure rates.

In 1993, Rha[36] discovered that excessive screw slippage was an very major contributing factor causing fixation failure. A credible association made between fracture resolution and pain when Baixauli and their associates[37] foundout that a slip> 15mm was to be associated most commonly with postoperative pain.Müller-Farber et al[38] found an increase in hip screw slippage was associated with an decrease in postoperative mobility.

To overcome or to resolve the above-mentioned complications, a trochanteric support plate that is attached to a traditional hip glide screw was developed to increases the internal stability of an inter-trochanteric fracture fixation after the initial failure by cutting out of the superior lag screw.[31] This lateral plate provided a reinforcing effect to a large crushed trochanter during compression plating of hip with associated inter-trochanteric fractures and very was useful in reducing displacement of medial shaft during fracture site impaction.

In the condition such as osteoporosis, tightening the large main lag screw has lead to its removal and loss of the fixation in the head of femur. Therefore increase in the buying force of guide screws used - with adequate sliding-screw of the hip was easily achieved through an use of reversible folding claws also called as deployable talons - which amplified the buying force of the lag guide screw inside the femoral head, resisting the torque forces between the head and an guide lag screw, and the amount of bone that was engaged/held by the lag screw increased, but the ease of removal of the very implant itself in clinical practice has remained a concern.[28]

REVIEW OF COMPARATIVE STUDIES

1. A prospective comparative study in treatment of stable interochanteric fractures of femur with PFN versus DHS in India in 2017 done on 40 patients using Harris hip score showed the result as DHS is better compared to PFN because technical errors were significantly higher in PFN when its compared with DHS but the incision time, faster recovery was comparably better in PFN and have similar outcome in a 6 month follow up.[39]
2. A prospective comparative study on treatment of type 2 inter-trochanteric fracture with the PFN versus DHS done in 2015 with 60 patients for the study assessed resulted that the PFN treated group had good outcome in terms such as decreased blood loss(73ml), limb shortening (4,8mm), reduced duration of surgery(92min), early weight bearing and mobilization, decreased risk of infection by organisms and decreased complications compared to DHS group and in the end of 1year similar outcome was seen in both.[40]
3. A prospective comparative study in inter-trochanteric fractures that were well-treated with DHS versus PFN done in 2014 in India assessed with Harris hip score resulted that the PFN (66.2%) may be better fixation implant for the most unstable inter-trochanteric fractures with less reduction loss compared to the DHS group (37.5%) whereas early complications like deep vein thrombosis, blood clot, surgical site region infection was seen more in DHS group.[41]
4. A meta-analysis of study of PFN versus DHS in treatment of inter-trochanteric fracture done in the year 2014 in China showed that PFN group had a less operative period, intra op blood loss, and incision hence decided that PFN is a better fixation in the terms of above reason.[78]

5. A comparative study of Unstable pertrochanteric and subtrochanteric femoral comminuted fractures that were well-treated with DHS and trochanteric buttress plate(TBPP) versus PFN done in 2007 Russia compared on 173 patients showed that the fixation with DHS/TBPP osteosynthesis in unstable inter-trochanteric fractures was associated with an higher incidence in complications, full-weight-bearing immediately after the fixation was possible for 98% of the PFN patients and 81% of the DHS patients.[79]
6. A study on stabilization of unstable inter-trochanteric fractures using DHS with trochanteric stabilization plate (TSP) versus PFN done on 129 patients showed that Unstable peri-trochanteric femoral comminuted fractures can be well treated just as well with PFN as with DHS and TSP as the full-weight bearing immediately after the surgical-procedure was possible for 97% of PFN operated patients and 88% of the DHS patients. [80]
7. A prospective randomized study of 100 patients treated for intertrochanteric fractures conducted by Hardy et al.[43] showed that the average mobility score was significantly higher at 1 month and 3 month duration for patients with an intra-medullary nail and who had significantly less bone slip. Head screw and subsequent limb shortening compared to that treated with the dynamic hip-screw device.
8. Kim and colleagues[44] in their study stated that the main observed reason of dynamic-hip screw(DHS) failure was fracture instability compared to the PFN group.
9. Kukla et al.[45] recommended that we use of an intra-medullary device only for the unstable peri trochanteric fractures after studying nearly 1000 consecutive patients who were well-treated with this device between 1992 and 1998.
10. No major difference was found in the results comparing the stable fracture patterns and the unstable fracture patterns in the series by Adams et al.[46] and they then

reported that only 21percentage of their 197 patients regained their mobility before the fracture. Therefore, they argued that those theoretical benefits of intramedullary devices did not become into the better treatment of inter-trochanteric fractures.

11. Saudan et al.[47] showed that there were nothing significant statistically different in the intraoperatively, radiologically and clinical outcome inbetween patients who were treated with a dynamic or intra-medullary hip-screw in their study of 206 patients.
12. According to Ahrengart et associés[48], the intramedullary device most often maintained the position of that fracture pattern obtained preoperatively.
13. A study by Bellabarba et al.[49] examining the percutaneous fracture fixation treatment of peri trochanteric fractures using intramedullary inter-trochanteric fractures that were treated with one large diameter traction screw or two small diameter traction screws with the intra-medullary hip screw device concluded that there was nothing significant statistical difference between the two in static or cyclic loading related to screw slip or lower and lateral head displacements.
14. Kubiah et al.[50] compared the results of patients with inter-trochanteric fractures that were well treated with one large diameter traction screw or two small diameter traction screws with the intra-medullary hip-screw device and concluded that there was nothing statistically-significant difference between these two in terms of static load or cyclic with regard to lag-screw slippage or lower and the lateral displacement of the head.
15. By comparing the sliding properties and stability of the lag-screw in unstable intertrochanteric quadrilateral fractures of the femur, Bong et al.[51] found that the sliding hip screw secured with a additional lateral support plate provided stability and the ability to withhold displacement medially.

16. A comparative study in India in 2019 on 40 patients showed PFN group had a better outcome interms of union (95%), infection (5%), blood loss(127ml), operation duration(68min), range of movement hip joint (99.25degree), at 6 months of follow-up compared to DHS group.[78]
17. A randomized controlled single blind study was conducted by Adeel k et al in Pakistan, from September 2015 to September 2017, and comprised 68 were treated by closed reduction and fracture internal fixation with dynamic hip-screw and proximal femoral nail. The mean Harris-Hip score after 12 months in Groups A and B were 81.83±23.01 and 87.62±17.28 respectively. Concluded that Proximal femoral nail provided equivalent functional-outcome when compared with the dynamic hip-screw with lesser bloodless and surgical time.[80]
18. A multicentre, pragmatic, single-blinded randomized controlled trial (RCT) was conducted by shivakumar et al on Nine-hundred patients with inter-trochanteric fractures (A1 and A2 AO/OTA) treatment using a PFN and DHS. The outcome consists of radiological evidence of construct failure within 6months following surgery, with failure being defined as breakage of the femoral nail or distal locking screw, a change in tip-apex distance of more than 10mm in length or lag screw cut-out through the head of femur. Considered that Proximal femoral nailing provided equivalent functional outcome when compared to dynamic hip-screw with little blood loss and surgical time and less implant breakage. [81]
19. A cadeveric cohort study conducted in 2020 by Ceynowa M et al, on 50 femurs based on fixation types 4 – hole Dynamic Hip-Screw with a, a standard proximal femur nail. The specimens were then tested with cyclic axial loading, from 500 N increasing of 50 N increments in each cycle. And founded that the short proximal femur nails dislocated into varus under preload because the nail migrated laterally whereas the

Dynamic Hip-Screw was initially stable, but some specimens rotated around the lag screw. The proximal femur nail was rotationally stable. Concluded that the study shows PFN (proximal femur nail) is unstable in a large medullary canal but offers better rotational stability of the proximal fragment. [82]

20. A retrospective case analysis method done by Gao H et al was used for data examine of all patients with proximal metastatic cancer of femur who then were then treated with internal fixation in Beijing Friendship Hospital, from January 2007 to December 2018 on 33 patients. Twenty-three patients had undergone IMN and 10 DHS, according to bone defects and the patient’s overall condition. The average survival time was 10 months in the IMN group and 11 months in the DHS part of group. The authors later concluded there was no statistical significant difference between DHS and IMN in terms of surgical efficacy. IMN and DHS were different in terms of surgical time and hospital stay. [83]

21. Vamsi K et al, in India did a comparative prospective study in inter-trochanteric fractures that were treated with DHS versus PFN. Their study shows similar outcome for PFN and DHS group in stable inter-trochanteric fractures. PFN group had a better outcome interms of union (95%) ,infection (5%) , range of movement(ROM) at hip joint (99.25degree) at 6 months of follow-up compared to DHS group[84]

22. Sharma A et al did a comparative prospective study in treatment of stable interochanteric fractures of proximal aspect of femur with PFN versus DHS and their study concluded that DHS is better compared to PFN because of technical errors were significantly higher in PFN when compared with DHS .The results shows PFN is more a technically high demanding surgery that might leads to more implant

failures and the consequent re-operations compared to DHS but similar outcome on 6monthly follow up [85]

23. Jonnes C et al, conducted an comparative prospective study in India did a study on treatment of type-2 intertrochanteric fractures with the PFN versus DHS and they concluded that PFN is better than DHS in type II intertrochanteric fractures. The results show PFN group had good outcome in terms of decreased blood loss, reduced duration of surgery, early weight bearing and mobilization, reduced risk of infection and decreased complications compared to DHS group.[86]

24. Venkatesh S K et al, conducted an retrospective cohort study in India did an comparative study in inter-trochanteric fractures that were well-treated with the DHS versus PFN .They came to a conclusion that PFN may be better fixation implant for most unstable type of inter-trochanteric fractures with reduction loss is less compared to DHS group .The functional results were assessed with the Harris-Hip Score and observed 37.5% excellent results in DHS group and 66.2% excellent results in the PFN group. [87]

25. Kairui Z et al, china did a meta-analysis of study of PFN versus DHS in treatment of intertrochanteric fracture. They concluded that PFN fixation had a significantly less operative time, intra-op blood loss, postoperative infection rate compared to DHS group. [88]

26. Klinger M et L from Russia did a comparative study of Unstable pertrochanteric and subtrochanteric femoral communited fractures treated with DHS and trochanteric buttress plate(TBPP) versus PFN .They conclude that treatment with DHS/TBPP osteosynthesis in unstable inter-trochanteric fractures that were associated with a higher incidence of the complications hence recommended to treat unstable inter-

trochanteric with the PFN . Their study results recommend treatment with PFN as full-weight-bearing immediately post the fracture fixation was possible for 98% of the patients that were treated with PFN and 81% of the DHS patients. [89]

27. Nuberat S et al, from Russia did a study on stabilization of unstable inter-trochanteric fractures using DHS with trochanteric stabilization plate (TSP) versus PFN. Their study concluded that Unstable pertrochanteric femoral communited fractures can be well treated just as well with PFN as with DHS and TSP. Their study results recommend treatment with PFN as the application of full-weight bearing immediately post-surgery/operation was possible for 97% of PFN operated patients and 88% of the DHS patients. [90]

28. V Dubey et al conducted an prospective, randomized study which includes sixty patients operated with DHS and PFN respectively. Blood loss, duration of the surgery, time to union and leg length shortening was significantly less in the patients who were then treated with PFN ($p < 0.05$}. The mean Harris-hip score for patients that were managed with PFN was significantly more than in DHS group, 12 months after surgery. Concluded that PFN requires a smaller incision, lesser operative time, reduced blood loss and has improved functional results. In the authors opinion PFN may be an better fracture fixation device for most of the unstable intertrochanteric femur fractures.[91]

29. A retrospective case analysis method was used to examine data of 33 patients with proximal metastatic cancer of the femur which were then treated with intramedullary internal fixation. The authors later concluded there was nothing significant difference between DHS and IMN in terms of surgical efficiency and efficacy. IMN and DHS were different in terms of surgical duration and hospital stay. However, because due

to the limited number of cases in this study, multi-factor analysis has not been performed and needs to be further verified in future analysis.[91]

SURGICAL ANATOMY

PROXIMAL FEMUR

The femur is the longest and largest bone in the human body. The proximal aspect of the femur consists of a head, neck, greater trochanter and the lesser trochanter.

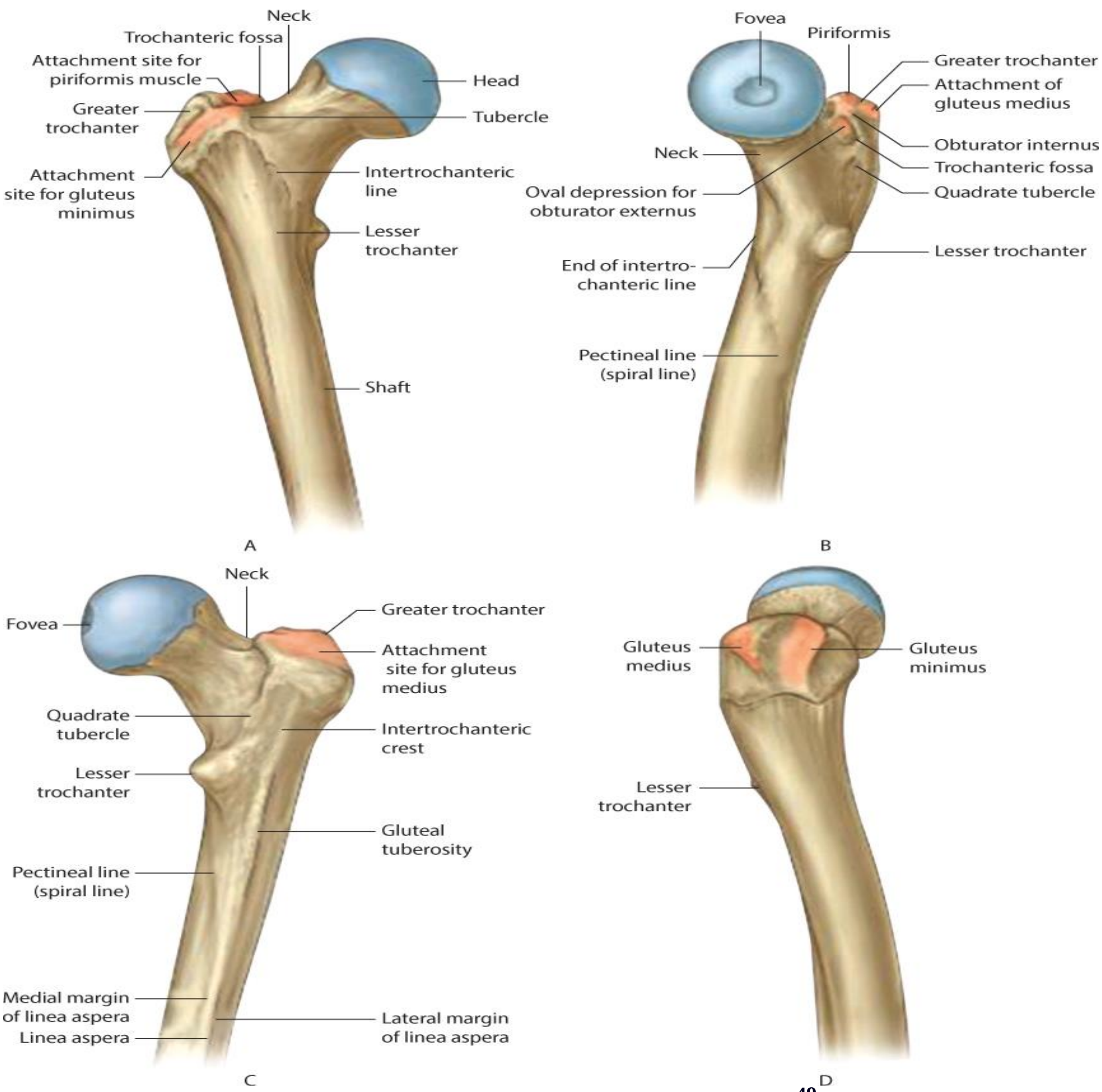


Figure-7: Anatomy of Proximal Femur[49]

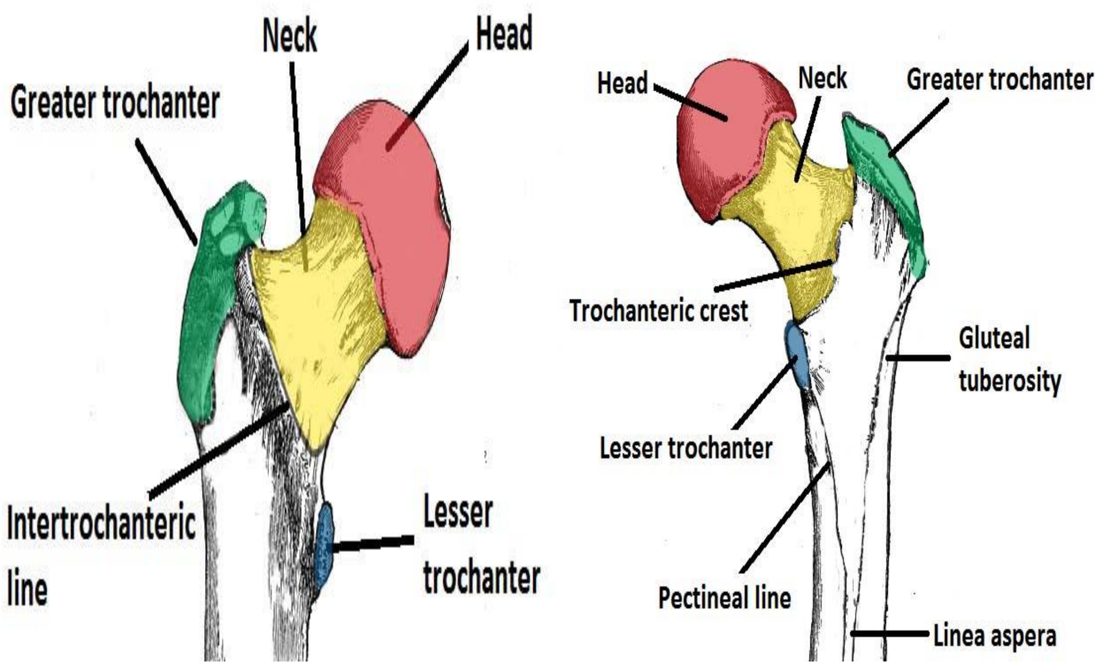


Figure-8: Anatomy of Trochanteric region anteriorly and posteriorly [49]

THE FEMORAL HEAD: The head is little more than a hemisphere. It is directed medially, slightly superiorly and slightly anteriorly. It articulates with the acetabulum of the pelvis to form hip joint. The medial convexity of the femoral head has a cavity, the fovea, which is located just below and slightly behind its center, and provides fixation/insertion to the ligament of the femoral head {ligamentum teres / ligamentum teres}. The femoral head is entirely intracapsular and is surrounded laterally at its largest diameter by the acetabular bead known as labrum acetabulare. The head circumference is well defined except in front where the place cartilage covered surface extends to the anterior aspect of the femoral neck.

THE FEMORAL NECK: The femoral neck connects the head of the femur and with the shaft of the femur. It is approximately about 3.8-4 centimeters long. As the neck bends upward and medially, it forms an angle with the shaft of femur known as the, neck-shaft angle, which is about 125degrees normally in adults. This facilitates movement of the hip joint, allowing the normal limb to move away from the pelvis. The neck is also tilted forward as it rises upward and medial to the axis of the shaft of femur. As a result, that transverse axis in the neck and of the head forms an angle with an transverse axis with the lower aspect of the femur, called the anteversion angle, which corresponds approximately 15degrees in the normal person.

The femoral neck usually has two edges and two surfaces. The upper edge is concave and horizontal; it attaches to the axis of shaft of femur the greater trochanter aspect of proximal femur. The lower edge is straight and oblique; we can find the axis of shaft of femur near to the lesser trochanter. The anterior surface is flat, completely intracapsular; attach to the axis of shaft of femur on the inter-trochanteric line. The posterior surface is convex from top to bottom and concave from side to side, hardly more than the medial half is intracapsular; finds the axis at the level of rounded intertrochanteric ridge.

The femoral neck is grooved primarily on the anterior aspect/surface, indicating attachment of the retinacular fibers of the hip-joint capsule, which reflect proximally which from the distal attachment of the hip-joint capsule. Numerous vascular foramina, centered on the head, pierce the anterior and posterior sides of the neck of femur. The neck is reinforced along the cavity by a thickened dense bone called calcar femorale**.**

THE GREATER TROCHANTER: The greater trochanter is the large quadrangular projection that projects upwards and backwards from the convexity of junction of the femoral neck and shaft. The upper edge of greater trochanter is a single hand's width compared to below the tubercle of iliac crest and is level with that of the femoral head centre.

The greater-trochanter has an upper edge, an apex, and 3 surfaces i.e anterior, medial, and lateral surfaces. The top edge projects to an inward facing the vertex. Posteriorly, the apex continues downward as an intertrochanteric ridge to the lesser trochanter of femur. The medial surface of superior edge of greater trochanter has the insertion on piriformis and is also known as piriform fossa. Anterior surface shows a J-shaped crest for future fixation of the gluteus minimus tendon. The medial surface provides anterior fixation for common tendon of the obturator internus and gamelli and anteriorly is the rough trochanteric fossa for fixation of the obturator externalis. The lateral surface of greater trochanter has an oblique band that slopes down and faces forward and holds the gluteus medius in place. There is a trochanteric pocket/ bursa in the gluteus medius in front of the crest and gluteus maximus behind the crest or ridge.

THE LESSER TROCHANTER: The lesser trochanter is an conical eminence. It is directed medially and behind the shaft at lowest part of the neck. The rounded surface provides a medial attachment to psoas major muscle tendon. Iliacus is inserted in front of the tendon and into the bone under lesser trochanter. The posterior smooth surface is covered with a bursa deeply embedded in the superior horizontal fibres of the adductor magnus.

THE INTER-TROCHANTERIC LINE: This line marks the intersection of anterior surface of the neck with the shaft of femur. It is a prominent rough ridge, starting proximally to the anterosuperior angle of greater trochanter as a nodule or tubercle, and descending and continuing medially downward with the spiral line till the lesser trochanter. The spiral line curls under the lesser trochanter till it meets posterior surface of the shaft of femur.

The intertrochanteric line of the proximal aspect of femur you can confirm the attachments to it such as:

- The surrounding capsular ligament of hip joint.
- The superior band of iliofemoral ligament on the upper extremity.
- The inferior band of iliofemoral ligament on the lower extremity.
- Superior fibers of the upper extremity of Vastus lateralis.

- Superior fibers of vastus medialis muscle from the lower extremity.

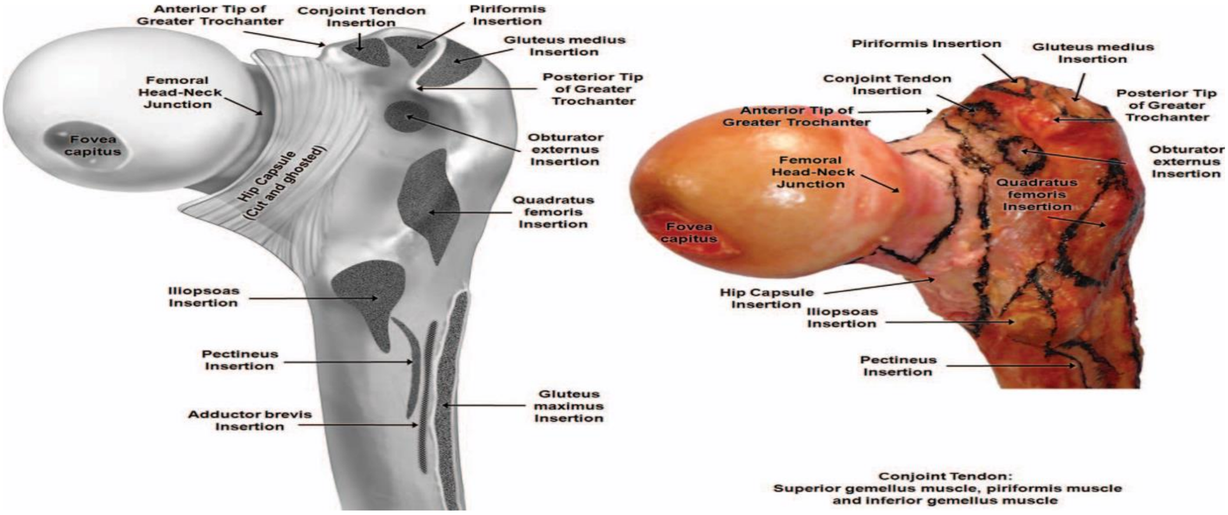


Figure 9: Attachments of The Proximal Femur[49]

THE INTER-TROCHANTERIC CREST: This crest marks an junction of posterior aspect of neck of femur with the femoral diaphysis. It will be a smooth, rounded ridge that begins at the posterosuperior corner of the greater-trochanter and extends downward and medially finally to terminate at lesser trochanter. Almost halfway of the apex is the oval eminence, the qudrate tubercle, which fixes the quadratus femoris muscle. Above the tubercle, the apex/crest that is covered by muscle of gluteus maximus, and then, below that tubercle, it is separated from gluteus maximus muscle by the quadratus femoris tendon and the superior border of belly adductor magnum.

THE DETAILED SKELETAL ANATOMY

The Proximal aspect of femur that consists of porous bone with a thin outer compact bone layer. The inter-trochanteric area is more porous bone.

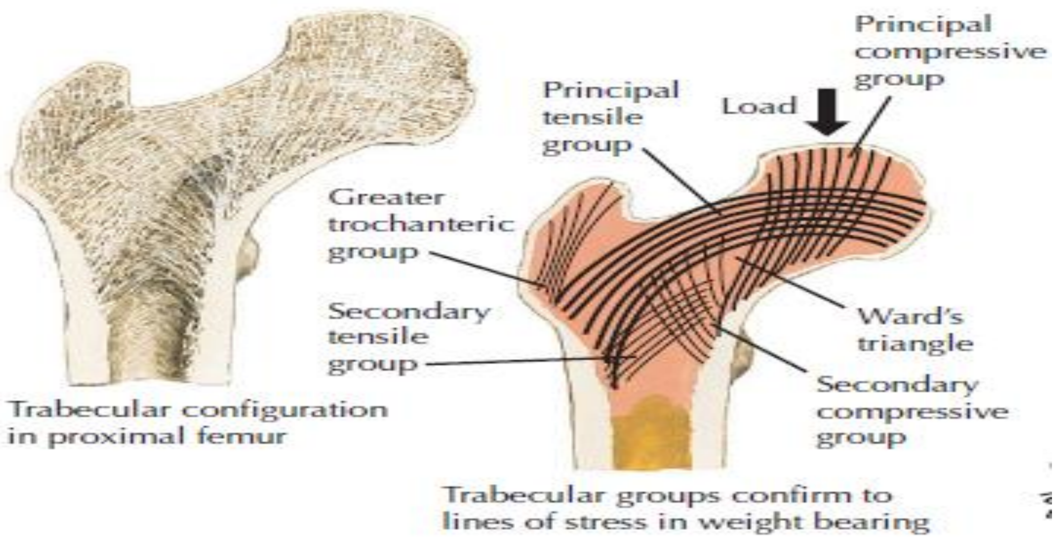


Figure-10: porous pattern and trabecular pattern of proximal femur[49]

THE TRABECULAR PATTERN: In the year 1838, Ward described that the trabecular bone system of head and neck of the femur. The trabeculae pattern spans/fibres are oriented along the stress lines. There are normally five groups of trabeculae that are described by Ward in a healthy person.

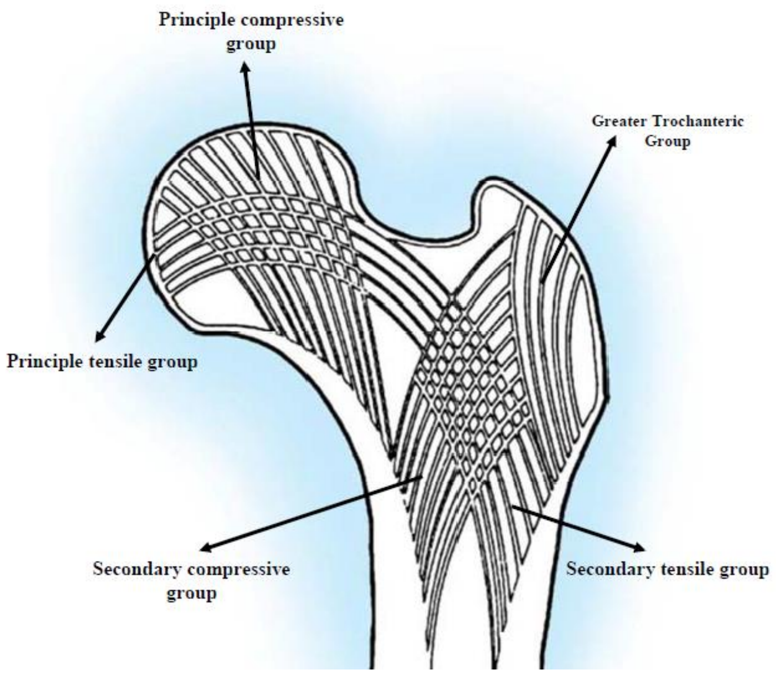


Figure-11: Trabecular pattern of proximal femur[49]

Primary Compressive Trabeculae : These are an most resistant and strong trabeculae, extent starting from the medial femoral cortex at the very base of the femoral neck till the subchondral bone of superomedial portion of the femoral head.

Primary tensile trabeculae: They extend starting from an inferior aspect of the foveal region, through the head of femur and the upper/superior part of neck of femur to the greater trochanter, then to the lateral femoral cortex.

Secondary Compressive Trabeculae: These compressive fibres extend starting from the medial femoral cortex in the lesser trochanteric region to the greater trochanteric region of the proximal femur.

Secondary Tensile Trabeculae: These fibres extend starting from the lateral aspect of femoral cortex, below the primary tensile group of trabeculae to center of the neck of femur.

Trabeculae in Greater trochanter: These trabeculae extend from the upper edge of the greater-trochanter to the base of greater-trochanter.

The triangular area bound by primary compressive and tensile band/ trabeculae and the secondary compressive band/ trabeculae is known as **Ward's triangle**. The **calcar femorale** is dense vertical bone-plate that extends from medial posterior portion of the femoral shaft below the lesser trochanter of femur and radiates laterally to greater trochanter, there by strengthening the posteroinferior aspect of femoral neck. The calcar is thicker in the medial aspect and becomes progressively thinner as it passes to the lateral aspect. It is used to absorb compressive stress loads in this region.

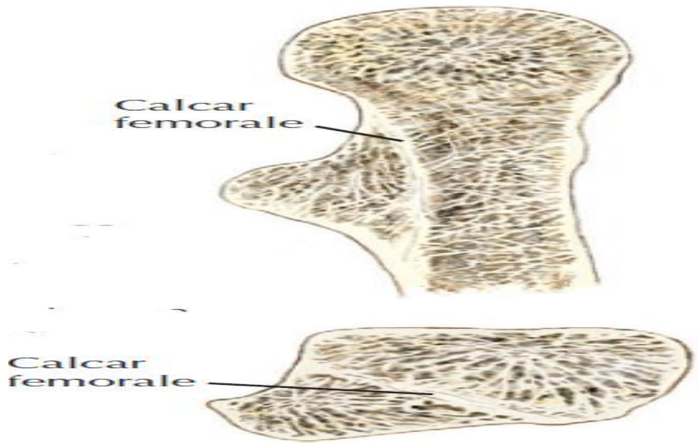


Figure 12: Calcar femorale[49]

Vascular Anatomy: The arterial supply to proximal end of the femur has been extensively studied. The description of the Crock HV[56] seems most appropriate.

The arteries at proximal end of the femur are described basically in three groups:

A. An Extracapsular arterial ring at base of neck of femur.
B. Ascending cervical branches of extracapsular arterial ring that is there on the surface of the neck of femur.
C. The minor arteries of the round ligament.

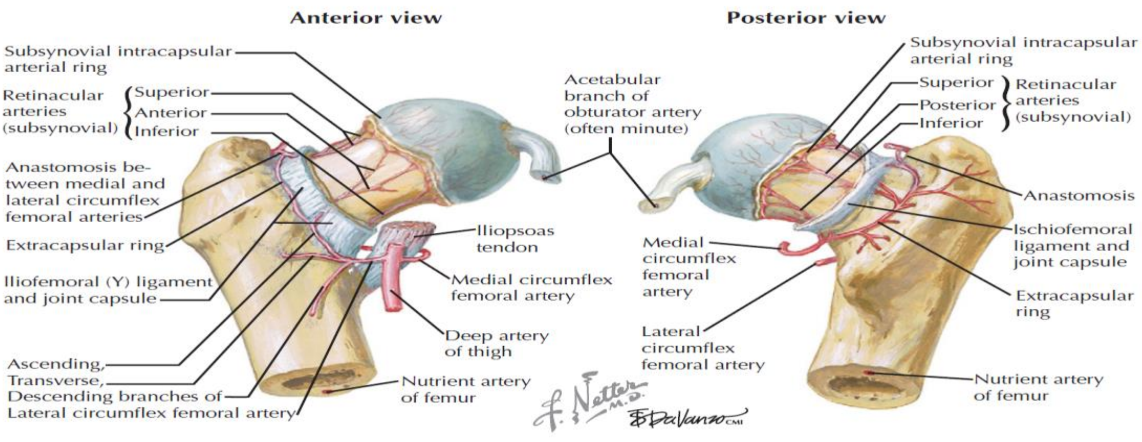


Figure -13: Vascular Anatomy of Proximal Femur [49]

Extracapsular Arterial Ring: It is formed posteriorly by a large branch of the medial circumflex artery and anteriorly by the branches of the lateral circumflex part of femoral artery. The upper and lower gluteal arteries also make small contributions to this ring.

Ascending cervical branches: Originate from extracapsular arterial ring. later, in the anterior aspect they penetrate and enter the capsule of the hip-joint at the level of inter-trochanteric line, then they posteriorly pass under the orbicular fibres of the capsule.

These branches ascend under the synovial reflections and fibrous extensions of the capsule to the articular cartilage. These arteries are called retinacular arteries. They send many small branches to the metaphysis in the neck of femur. The neck receives additional blood from extracapsular arterial ring and may also include anastomosis with intramedullary branches of the superior nutrient artery.

The ascending cervical arteries has been divided into four groups [anterior, medial, posterior, lateral], depending on its relation to neck of femur. The lateral group of vessels provides most of the vascular blood supply to head and neck of femur. At the edge of femoral head articular cartilage on the surface aspect of femoral neck, these vessels form a second ring, Chung's[56] intra-articular sub-synovial artery ring. This ring was originally called Circulus Articuli Vasculosis coined by William Hunter in the year 1743. Treuta and Harrison[57] mentioned an incomplete arterial ring in the year 1953. From the sub-synovial ring, epiphyseal arterial branches that arise and enter the femoral head of the proximal aspect of femur.

The round ligamentous teres artery (foveolar / medial epiphyseal artery) is the branch of the obturator artery or medial circumflex femoral artery. They are only responsible for the small part of the subsynovial vascularity.

HIP JOINT RELATIONSHIPS

Anteriorly: The tendon of the psoas major separates the joint capsule from the femoral artery and more medially the pectineus is interposed inbetween the hip joint capsule and the femoral vein. The femoral nerve is located lateral to femoral artery in a groove between the iliac and psoas tendons. Iliacus is partially separated from the joint capsule by a bursa.

Superiorly: The reflected heads of the rectus femoris muscle (medial) and gluteus minimus (lateral) are in contact with the capsule.

Inferiorly: The obturator externus rolls under the capsule to the posterior part of neck of femur.

Posteriorly: There is the piriformis and, below the obturator internus muscle and the gamelus, separates the sciatic nerve from the joint capsule.

Laterally: The capsule mixes/fuses with the iliotibial band/tract.

Medially: The acetabular fossa laterally forms the part of the lateral wall of pelvis and in the female ovary is adjacent to it, separated by the obturator internus muscle, the obturator nerve, and the blood vessels and peritoneum in abdomen.

BIOMECHANICS INVOLVEMENT IN THE HIP ARTICULATION

The hip joint is a joint formed inbetween the head of femur and the acetabulum of pelvis and is a ball and socket type of joint. Hip movement occurs in all directions:

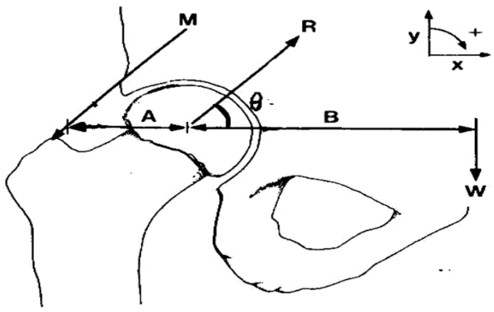
- Movement in an sagittal plane ranging from 0 to 140degrees of hip flexion and 0 to 15 degrees of extension.
- Movement in the frontal plane ranges from 0 to 45 degrees of hip abduction and 0 to 25 degrees of adduction.

- Movement in the transverse plane ranges from 0-70 to 90 degrees of the external rotation and 0-40 to 70 degrees of the internal rotation (with the hip in flexed position).
- **The muscles involved in hip movement:**
- **Flexion**: The greater psoas and the iliacus , assisted by the rectus femoris, the sartorius and the pectineus muscle.
- **Extension**: Gluteus maximus at the end stage and hamstrings act in the intermediate-stage of movement.
- **Adduction**: Pectineus, adductor longus, adductor brevis and adductor magnus and gracilis.
- **Abduction**: The gluteus medius muscle and the gluteus minimus muscle fibres assisted by the tensor fascia lata and the sartorius.
- **Internal rotation**: The anterior fibers of the gluteus medius muscle and minimus muscle, assisted by the tensor fascia latae.
- **External rotation**: The piriformis, the internal obturator and gamelli, the quadratus femoris muscle and the external obturator, aided by the gluteus maximus muscle and the sartorius.

To perform most daily activities of the day to day living, we need 124degree of hip flexion, 28degree of abduction, and almost 33degree of external rotation of hip are required. Walking processes requires nearly about 40degrees of hip flexion, 5degrees of extension, and about 10degree of movement in the frontal and transverse planes. Maximum hip-joint flexion occurs during the swing phase just before the heel strike and during the heel strike. The maximum hip extension occurs in the middle of the stance phase of walking cycle. Adduction movement and internal rotation movement occur during the stance phase of the cycle and change to abduction and external rotation movement during swing phase of the cycle.

When weight bearing, compressive pressure forces that are acting are transmitted to head of femur and neck of femur at variable angle of 165degree to 170degree, regardless as the current position of the pelvis. Plane of joint force coincides with the highly developed trabeculae located in the medial part of neck of femur and extending upto the superomedial plane of the head of femur.

The combined forces that are passing through the hip joint are large, which are very greatest during any of the dynamic activities, and are not negligible when standing on one leg. While supporting both limbs, the pelvis maintains itself in the position of relative equilibrium, then the total load on each of the head of femur being half the total body weight.



'W' is force produced by body weight

'M' is force produced by the abductors of the hip

'R' is the joint reaction force

Figure 14: Biomechanics of Hip[52]

In the one-legged stance, only muscle strength begins to play a role, especially the abductors, mainly in maintaining the pelvis. The abductor muscles that act on greater trochanter that must balance the entire body weight by acting on the midline of the body. Equilibrium is achieved when the force on one side of fulcrum that is multiplied by the exact distance from the fulcrum equals to the force on the other side of that fulcrum that is that is multiplied by the distant from its fulcrum.

At the joint of hip, this fulcrum of femur acts on the center point of the hip-joint, the two individual forces that act are the total body weight and the tension in the abductor group muscles, and the exact distance is from the midline to the epicentre of the head of femur and from greater-trochanter of proximal femur to the center of the femur directly. The distance calculated from the greater-trochanter to center of the head of femur is much lesser than the distance calculated from the midline of the body, so that the abductor muscle must exert more force greater than the total weight of the body just to balance hip/pelvis.

Variations that are seen in the angle inbetween the femur neck and shaft of femur (thigh or femoral valgus) will affect the main relative-ratio of the lever-arm distance that is present inbetween the midline aspect of the femur and the head of the femur, (i.e., the trochanter and the head of the femur), and thereby the efficiency of the femoral abductor muscles.

If the hip is in valgus, the total distance from the greater-trochanter to the epicentre of the head of femur is reduced; therefore, the muscles have to work harder just to balance the pelvis. If the hip is in varus, the distance from the greater-trochanter to the center of the head of femur is increased; muscles therefore have to work less hard just to balance the pelvis. Reducing the abduction force will decrease the combined reaction force.

The total force applied to the hip during the unilateral position is approximately 2-2.5times of the total weight of the body. Force statistical analysis shows that direction of the combined resultant force during the unilateral position is 75-80 degree from the horizontal plane.
During dynamic exercises/activities that might require more agonist and the antagonist muscle activity, the load on the hip joint increases dramatically. Experimental studies done have shown that in normal men an average hip-joint reaction force of approximately 4 times

total body weight occurs immediately after initial heel strike, with another peak of 7 times total body weight before foot withdrawal. In females, the amplitudes of the joint response are reduced, with the first peak being about 2.5times body weight and the second peak being about 4 times body weight. Stair climbing showed peaks of 7 times body weight acting on the hip joint.

The total joint reaction force rapidly increases with speed. Instrumentation or hip joint prostheses and implants like nail, plates reveal significant stress on the hip joint (up to approx. four times the total body weight) during the patient care activities in the bed and during passive physiotherapy. Aids can reduce the joint total forces on the hip joint. A stick used for a sore hip can create a moment to balance the total body weight and reduces the need for the abductor muscle pull.

TROCHANTERIC FRACTURES

DEFINITION

Trochanteric fracture is generally defined as a fracture in which the fracture plane of bone separation passes through the tip of the greater-trochanter obliquely downwards, into or through the lesser trochanter. Trochanteric fractures occur in the region just below the capsule of hip joint and above the isthmus area of the medullary canal.

INJURY MECHANISM

Trochanteric fractures in a young adult are often due to the outcome/result of high-energy trauma such as a traffic accident or an fall from a height, whereas in the elderly population/people they are the result of a simple fall.

Certain confirmed studies have shown that trivial fall in an elderly person from the standing position generally generates upto at least 16 times the energy needed to cause fracture the proximal femur. The tendency of trivial fall gradually increases with the age and is exacerbated by several factors, such as:

- Poor visibility.
- Decreased muscle strength.
- Labile blood pressure.
- Decreased reflexes.
- Vascular diseases
- Coexisting musculoskeletal pathology.

Most trivial falls might not result in a trochanteric fracture. The mechanics of the trivial fall are very important in determining whether a fracture will occur, the 4 factors that help determine whether a particular type of fall results in a trochanteric fracture are:

A. The trivial fall should be directed so that person lands on or near the hip so the energy of the fall is transferred to the proximal aspect of femur. Falling to the lateral most aspect of the thigh or buttock near the greater trochanter is much more likely that can cause a trochanteric fracture than elsewhere. These trivial falls are more likely when there is little or no forward movement, such as when the person is standing still or walking slowly.

B. Protective reflexes must be sufficient to reduce the fall energy below a certain threshold. In the elderly, the reaction time is longer and protective reactions are often very weak and late.

C. Local shock absorbers such as muscle and fat around the hip should be sufficient. The skin, fat and the muscles around the hip can absorb large amounts of energy from the impact. The age-related decrease in muscle mass around the hip may explain the increased incidence of inter-trochanteric fractures in the elderly population.

D. Bone /density strength at the hip must be sufficient. Trochanteric fractures can also be a result of cyclic mechanical stresses. Repeated loads cause a decrease/reduction in the bone's breaking strength. In elderly people whose resistance to bone fatigue is reduced due to osteoporosis, osteomalacia, or other illnesses, even lower loads (including those resulting from normal activities) or cycles of less stress can lead to bone failure. These types of stress fracture are considered an insufficiency fracture.

BIOMECHANICS OF TROCHANTERIC FRACTURE

Trochanteric fractures mainly involve the cortical and compact porous bone. Due to the complex configuration of stresses in this trochanteric region and the non-homogeneous bone structure and its geometry, the inter-trochanteric fractures might occur along the path of the very least resistance through the proximal aspect of femur. Total amount of the impact energy that is absorbed by dense bone determines the outcome like whether the fracture is a single fracture (two parts) or is more characterized by an extensive pattern of fragmentation.

Bone is much stronger under compression stress than under the tension. Cyclic or repeated loading of bone with loads below the tensile strength can cause stress fracture. Each weight bearing load causes the microscopic damage to the bone structure, essentially that forms microscopic cracks that can fuse into a single macroscopic fracture/crack, which inturn acts as an tension elevator. Thus, failure can occur if healing of these microfractures does not occur. During repeated loading stress, fatigue process is influenced by frequency of loading stress as well as the magnitude of the load bearing stress and the number of repetitions of that stress.

Muscle forces play an very important role in the hip biomechanics of the hip joint. When walking or standing, bending movements that are applied to the femoral neck by the body's weight, resulting in stress and tension in the upper cortex. Contraction of the gluteus medius muscle generates tension and axial compressive stress in the neck of femur that acts as a counterweight to tension and traction stress. When the gluteus medius is fatigued, unhindered stress occurs on the femoral neck. Stress fractures are usually sustained as the result of continuous strenuous physical activity that causes the muscles gradually to fatigue and lose their ability to contract and neutralize the stress on bone.

DEFORMITY

The degree of clinical deformity in patients with a trochanteric fracture reflects the degree of the displacement of fracture site. The deformation in inter-trochanteric fractures is determined by the direction of the forces responsible for the fracture and the tensile force of the muscle insertions. The proximal fragment is in full external rotation when the short external rotators remain attached to the proximal fragment of the fracture. If the occurred fracture is proximal to the fixation of the short external rotator muscles, the distal fragment exhibits external rotation. The hamstrings and gluteus maximus, which have a greater mechanical advantage over the rectus femoris, produce an angulation in sagittal plane with the apex pointed forward. The lesser trochanter is highly separated by a compression-extension lesion. The angulation of the proximal femur is produced by the gluteus medius muscle and minimus muscle tilting the proximal fracture fragment and drawing of the adductors into the distal fragment.

RADIOGRAPHY

The diagnosis of a inter-trochanteric fracture should always have be confirmed by an x-ray.

The standard x-ray examination of the hip includes:

- Anteroposterior (AP) view of the pelvis, including both hip joints.
- Anteroposterior (AP) view of the involved femur proximal aspect.
- Lateral view of the proximal femoral table of the affected side.

The AP-view of the pelvis allows the affected side tobe compared with the contralateral/opposite side and can help identify Undisplaced and impacted fractures.

The AP-view of the affected hip must be obtained in internal rotation 10 to 15degree. This compensates for the anteversion of neck of femur and provides a true AP-view of the proximal aspect of femur.

The lateral-view of the cross table allows to appreciate the posterior reduction of the proximal femur.

When the inter-trochanteric fracture is suspected but not visible on the standard x-rays, other useful exams include:

• Technetium bone scan, a positive bone scan in elderly patient with a trochanteric fracture, usually takes two to three days.

• Computed tomography (CT) with thin 3mm incisions.

• Magnetic resonance imaging (MRI).

CLASSIFICATION OF INTERTROCHANTERIC FRACTURES

Boyd and Griffin[57] categorized intertrochanteric fractures based on how easy the reduction was to achieve and maintain. Evans[59] gave a simple classification based on the presence of mechanical instability associated with minor or major detachments of the trochanter. He recognized stable fractures as having an intact or reducible posteromedial buttress that prevents varus collapse.

The Evans classification system was adapted by Jensen and Michaelsen[48-60] to improve its predictive value, such to indicate which fractures could be anatomically reduced and which fractures were at risk for secondary dislocation/displacement after fixation.

Jensen[33] argued that a standard classification system should contain valid information on the ability to achieve stable reduction of primary and anatomical fractures and predict the risk of any secondary fracture displacement after the internal fixation. He founded the modified Evans classification to be the most accurate in this aspect of measurement.

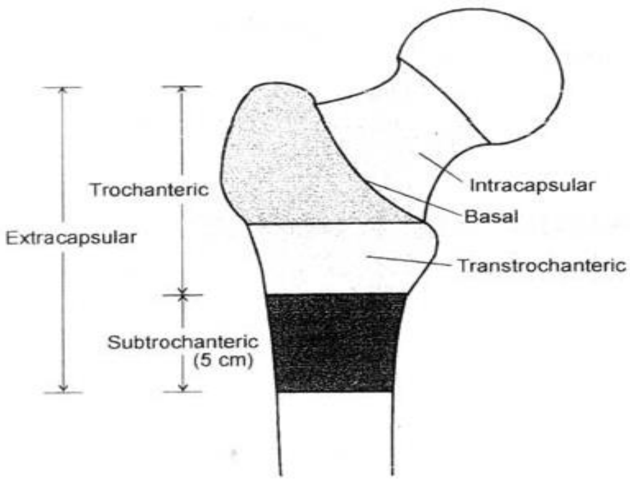


Figure 15: Anatomical classification of proximal femur fractures [57]

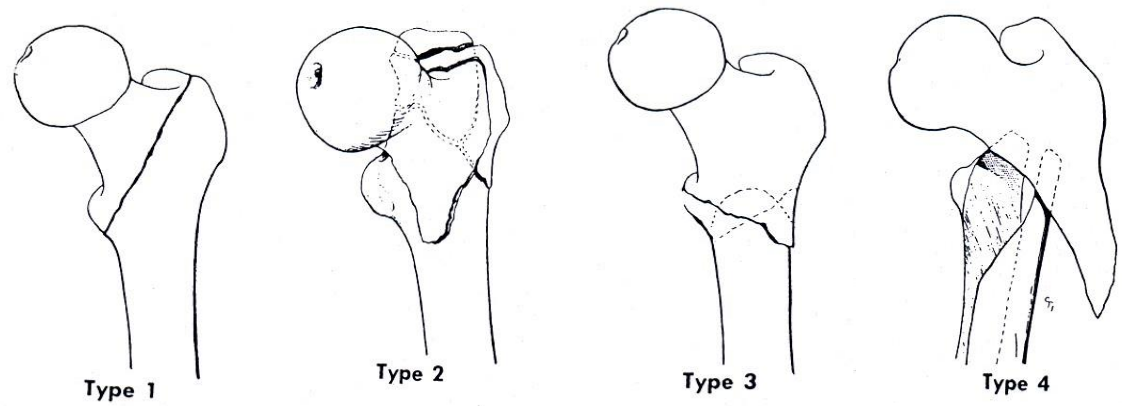


Figure 16:Boyd and Griffin[58] Classification of Intertrochanteric Fractures

Type-1: Fractures along the inter-trochanteric line extending from the major trochanter to the lesser trochanter

Type-2: Communited fracture pattern, the main fracture is along the intertrochanteric line, but with multiple fracture lines along the cortex.

Type 3: Predominantly subtrochanteric fractures with at least one fracture passing from the proximal end of femur shaft immediately distal or close to the lesser trochanteric region. The fracture line runs obliquely from superomedial to inferolateral (inverted oblique fracture).

Type 4: Fractures of the inter-trochanteric region and the proximal shaft with the main fracture line in at least two planes.

Evans[59] Classification of intertrochanteric fractures:

Evans was the very first to classify trochanteric fractures based on their inherent stability. His classification scheme has recognized two basic types of fracture.

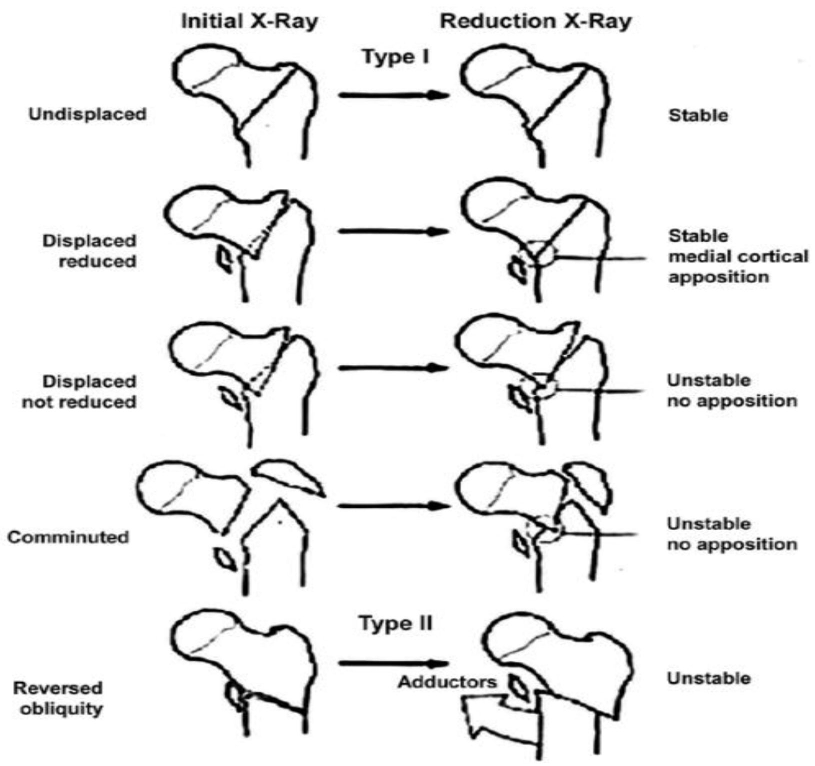


Figure 17: Evans Classification of intertrochanteric fractures[59]

Type-I - Where the main fracture line is parallel to the intertrochanteric line.

Type-II - Where the inter-trochanteric fracture line has a inverted slope (reversed obliquity)

Type I fractures are divided into four subtypes that are based on their inherent fracture stability.

The first two subtypes of fractures are stable because there is posteromedial cortical opposition or can be repaired by reduction. The second 2 subtypes are apparently unstable and has a marked high tendency to collapse into the varus-deformity due to the discontinuity of the postero-medial cortex.

Type II fractures include an inverted oblique tilt in the fracture line that allows the medial displacement of shaft of femur due to unhindered traction of the adductors and, therefore, they are unstable.

Jensen and Michaelsen [48,60] modification of the Evans classification:

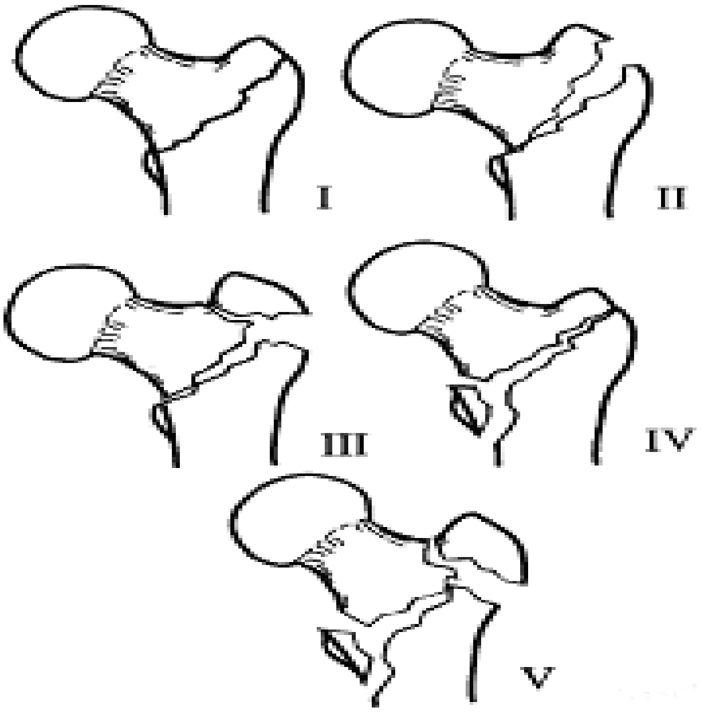


Figure 18: Jensen and Michaelsen modification of the Evans classification [48]

Type-I: Two fragment fracture without any displacement, stable type.

Type-II: Fracture of two fragments with displacement, stable.

Type-III: Fracture in three fragments with the displacement of the greater-trochanter (lack of lateral support), unstable.

Type IV: Three-part fracture with the displacement of lesser trochanter or medial cortical bone (without medial support), unstable.

Type V: Fracture with four fragments, including the greater-trochanter and lesser trochanter or medial femoral cortex (without lateral and medial support).

AO classification[69,73] of trochanteric fractures

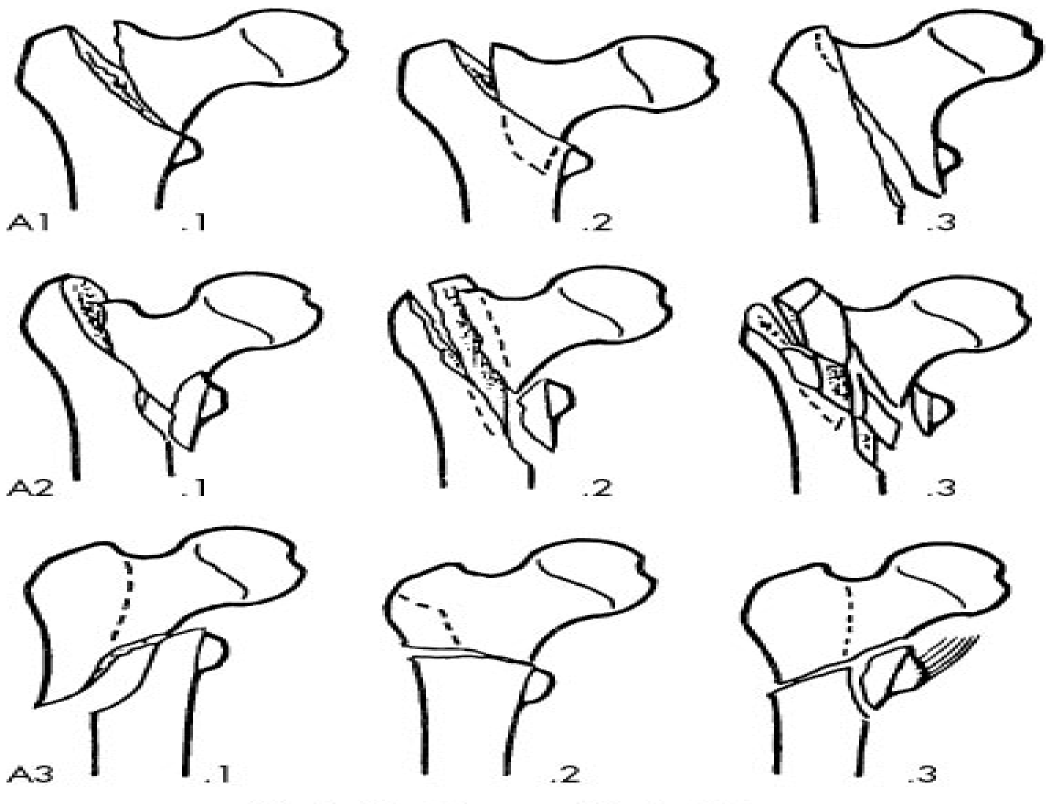


Figure 19: AO classification of trochanteric fractures[73]

Group A1: simple fracture in two parts;

Group A2: The fracture extends over two or more levels of the medial cortex;

Group A3: The fracture extends through the lateral aspect of femoral cortex in the femur

A1: Simple two-part trochanteric fracture.

A1.1 - Cervicotrochanteric.

A1.2 - Pertrochanteric.

A1.3 - Trochanterodiaphysis.

A2: Pertrochanteric, multi-fragmentary. The fracture extends over two or more levels of the medial cortex.

A2.1 - An intermediate fragment.

A2.2 - Two intermediate fragments.

A2.3 - More than two intermediate fragments.

A3: Intertrochanteric. The fracture extends through the lateral cortex of the femur.

A3.1 - Reversed, simple.

A3.2 - Transvrse, simple.

A3.3 - With additional fracture of the medial cortex.

MATERIAL & METHODS

MATERIAL AND METHODS

The clinical methodology for the study consists of 46 cases of Inter-trochanteric fractures of femur that meet the inclusion criteria and exclusion criteria, admitted to R L Jalappa Hospital, Tamaka, Kolar between November 2019 and July 2021.

Inclusion criteria

- Patients aged above 45years diagnosed with closed intertrochanteric fracture that are less than 3 weeks duration who were able to walk prior to fracture

Exclusion criteria

- Patients with malignancy, neurological, psychiatric illness and patients associated with co-morbid conditions like uncontrolled diabetes mellitus, uncontrolled hypertension, hyperthyroidism etc.
- Patients with active infections of hip joints

Once the patient was admitted, a detailed history was elicited and head to toe patient examination was done. The patient's radiographs of pelvis with bilateral hip-joints in AP-view were taken. The confirmed diagnosis of the patient was made by clinical and radiological examination. Static traction was then applied in the form of skin traction or skeletal traction. The required information given by the patient was recorded as per the given proforma as mentioned below.

Patients were taken for surgery after obtaining the written informed consent about the nature and complications of the surgery. The selected patients were taken up once clearance for surgery was taken from the anaesthetist and physician/cardiologist if required.

All patients were prophylactically started on 3rd generation cephalosporins (inj ceftriaxone 1gm IV, 1/2 to 1 hour prior to start of surgery.

SURGICAL TECHNIQUE

A. DYNAMIC HIP SCREW:

Patient Positioning: The patient should lie on their back on a fracture table with the radiolucent, padded rod with counter-traction between the patient's legs in the groin region and the uninjured leg, flexed and abducted at hip level in a hip support. well padding filled leg holder. These positions allow the C-arm to be placed between the patient's legs to obtain antero-posterior and lateral hip joint images.

Figure 20: Positioning of the Patient

Reduction technique: Inter-trochanteric fractures can be reduced to neutral, slightly internal rotation force or an external rotation with adduction of affected limb. The rotation depends on the reduction in the size of the posterior femoral cortex. Internal rotation of the involved femur 10 to 15 degrees compensates for the anteversion of femoral neck and provides true AP-view of the proximal femur. Traction is carefully adjusted to achieve reduction; excessive traction is avoided as it can cause valgus over-reduction. Controlled reduction of antero-posterior and the lateral views, with particular attention to the medial and posterior cortical contact.

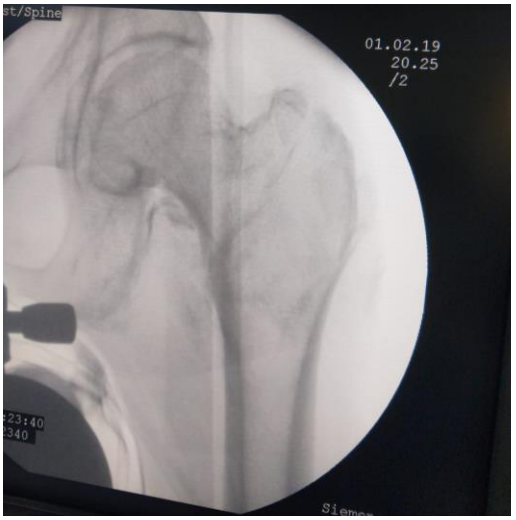


Figure 21: Closed reduction

Coverage: The skin above the hip is prepared after exfoliation with 7.5% povidone-iodine solution and Savlon's antiseptic solutions. The lateral femoral aspect of the hip from the pelvic iliac crest to the distal aspect femur is lined with towels and drapes.

Figure 22: Draping

Exposure: lateral approach from the proximal femur of the greater-trochanter extend distally. The total length of the taken incision depends totally on the length of required implant to be used. The perforating arterial branches of the deep femoral artery have been cauterized.

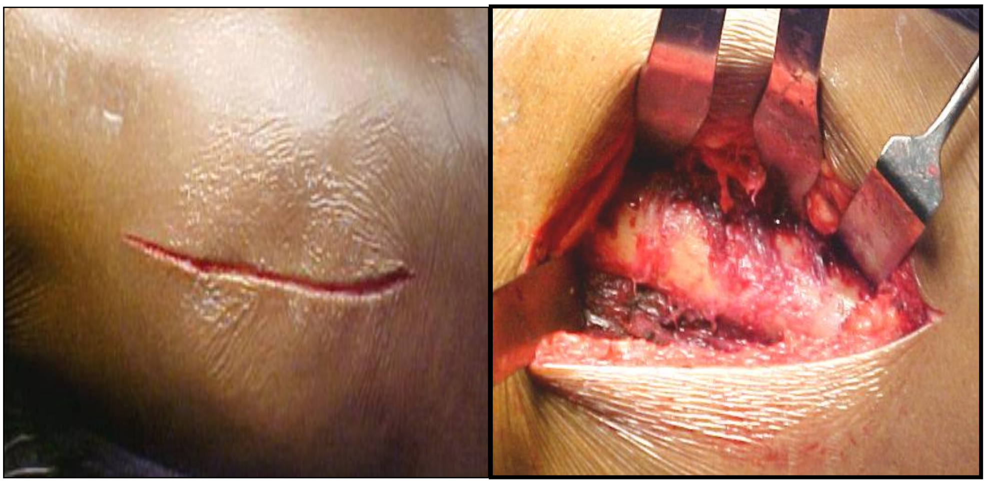


Figure 23 and 24: Incision and dissection and exposure

Guidewire insertion: The initial level of guidewire insertion varies depending on the angle of the plate used. The proximal aspect of the bony insertion of the gluteus maximus muscle and the tip of the lesser-trochanter, which is about 2 cm below the vastus lateralis ridge, identify the input level of a plate at 135-degree angle. The guide wire connected to the power supply drill is routed. If the plate angle was determined prior to guidewire insertion, an appropriate fixed-angle guide was placed in the middle on the lateral cortex so that the guidewire penetrates at the indicated level. The guide wire was directed toward the apex of the femoral head, the point where a line parallel and at the center of femoral neck crosses the subchondral bone. Central positioning also confirmed in side view.

Peripheral placement in both directions is avoided because only the lag screw centred in both views allows the threaded screw to be very safely advanced up to 10mm from the joint without the risk of penetrating the joint. The deep, central placement ensures a secure purchase of the best available bone and maximum screw collapse without the threads colliding with the barrel, two factors that reduce the risk of mechanical fixation failure.

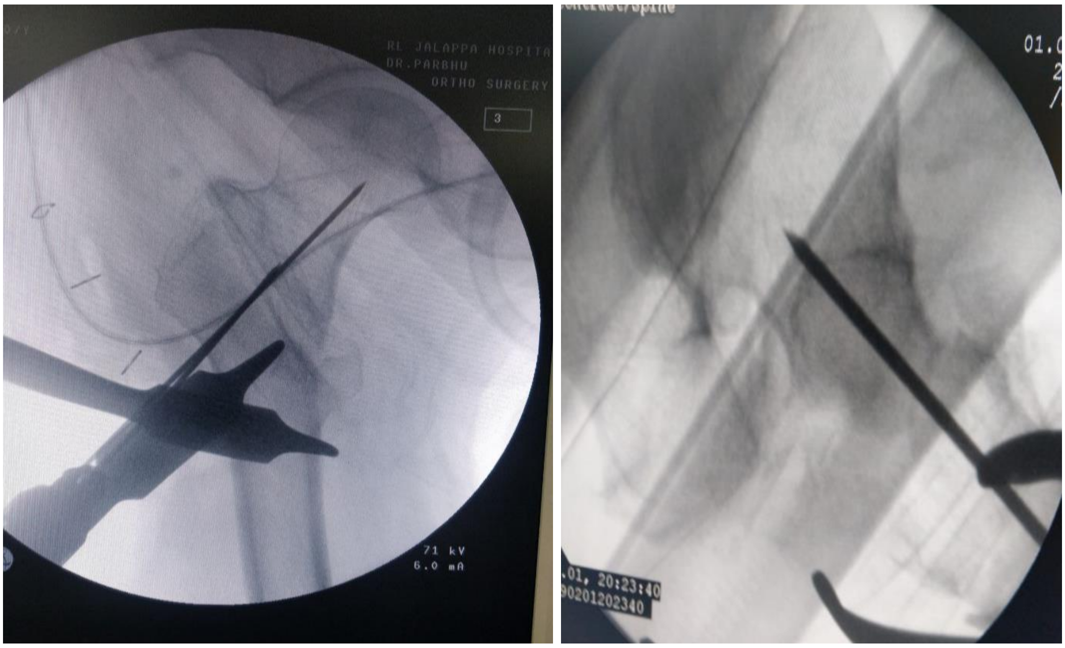


Figure 25: Insertion Of Guide Wire – Ap And Lateral View

Ream the femur: After the guidewire is inserted and measured, a 5mm is advanced into the subchondral bone, drilled to exact measurement the length of threaded bolt and a threaded bolt corresponding to the length has been selected the measure. A lag screw must match the countersunk length used.

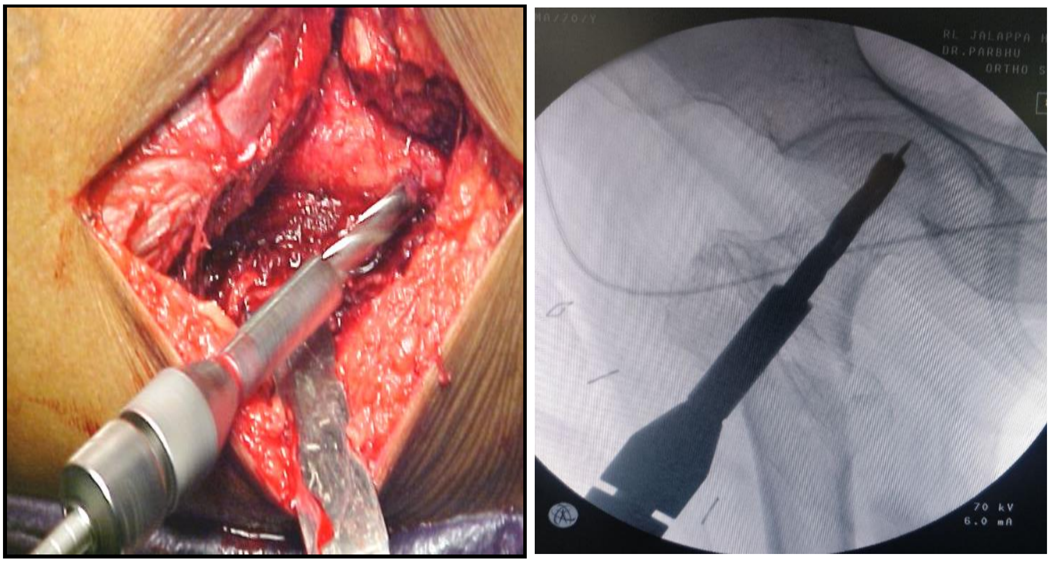


Figure 26: Proximal reaming

Tapping of the femoral head: Generally screws inserted into osteoporotic bone do not tapping is required, but tapping is indicated in younger patients or in patients with abnormal bone sclerosis to avoid excessive torque on the wrench and to reduce risk of accidental malrotation of the femoral head fragment when placing the final screw. Quickly connect the "T-handle" attached to the lag screw tap and adjust it to its correct lag screw faucet length.

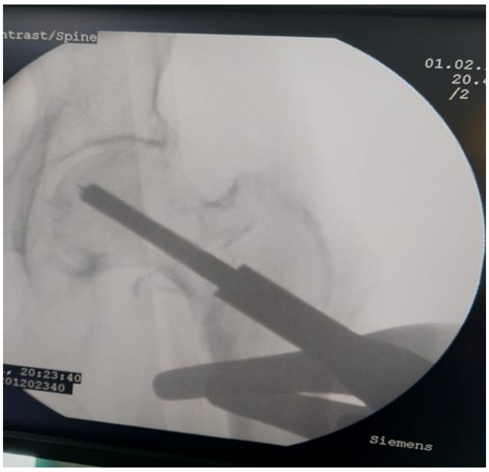


Figure 27: Tapping Of Femoral Head

Sliding screw selection: a fully inserted sliding screw equal to the length determined by the direct gauge allows 5mm of compression when the compression screw is used or the 5mm fracture collapses before the screw shaft begins to retract or back out of the barrel.

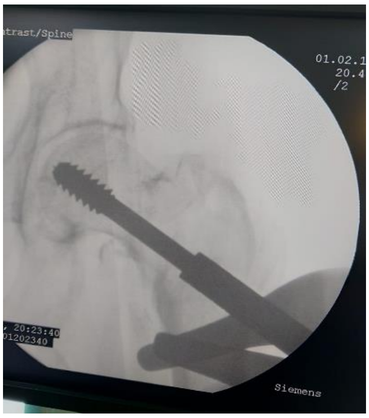


Figure 28: Passing Of Lag Screw

Placement of plate, lag bolts and screws: the good classic plate and lag screws mounted on the Classic insertion wrench. The distal cephalic screw retaining rod the end of the lag-screw is screwed in until a firm connection is obtained. The assembly will be placed on the guide wire and introduced into countersunk hole. A 180-degree turn represents a 1.5mm advance of the threaded screw. The position and depth of the screws are confirmed on the image intensifier in both planes.

Figure 29: Passing of Plate Over Lag Screw

Mounting the Plate: The clamp is used to secure the plate to the femoralshaft. Bone screw holes have been drilled. The correct length of the cortical screw determined with the screw depth gauge. The screw is inserted using the hexagonal screwdriver.

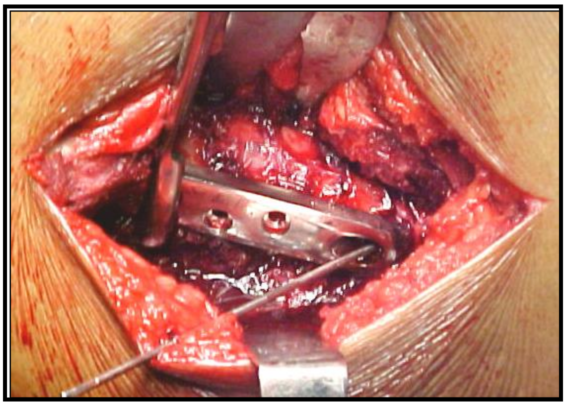


Figure 30: Attachment Of Plate

Insertion of the compression screw: After all screws are installed and tightened, the traction is released slowly. The fracture site is compressed as soon as the compression screw is tightened. A 4.5 mm cortical screw in the screw hole. The screw will engage through the distal portion of the screw hole, away from the fracture.

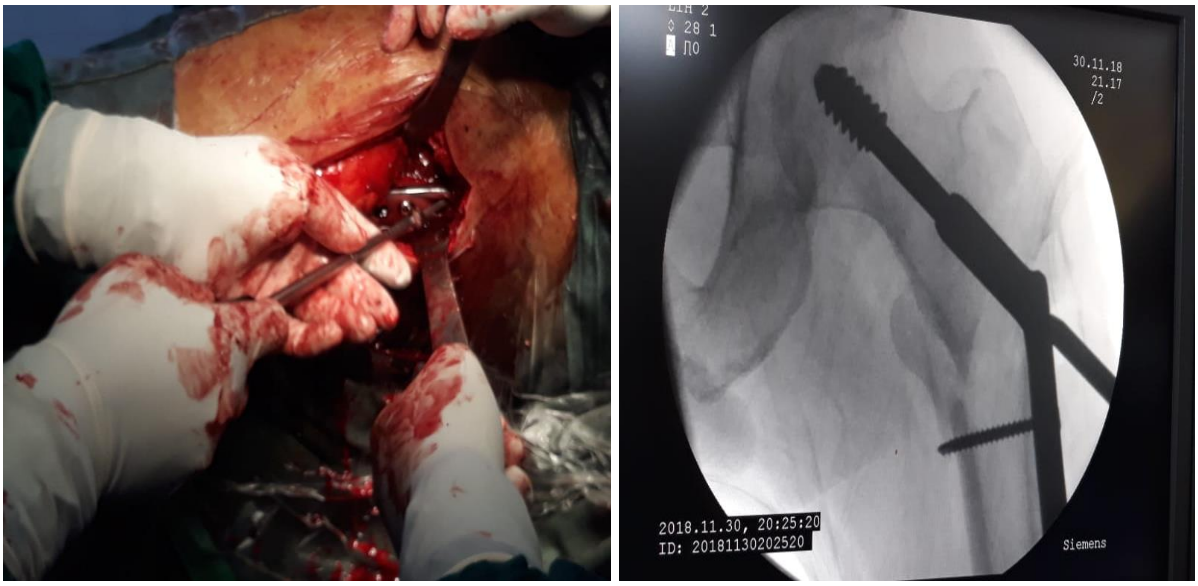


Figure 31: Insertion of Compression Screw

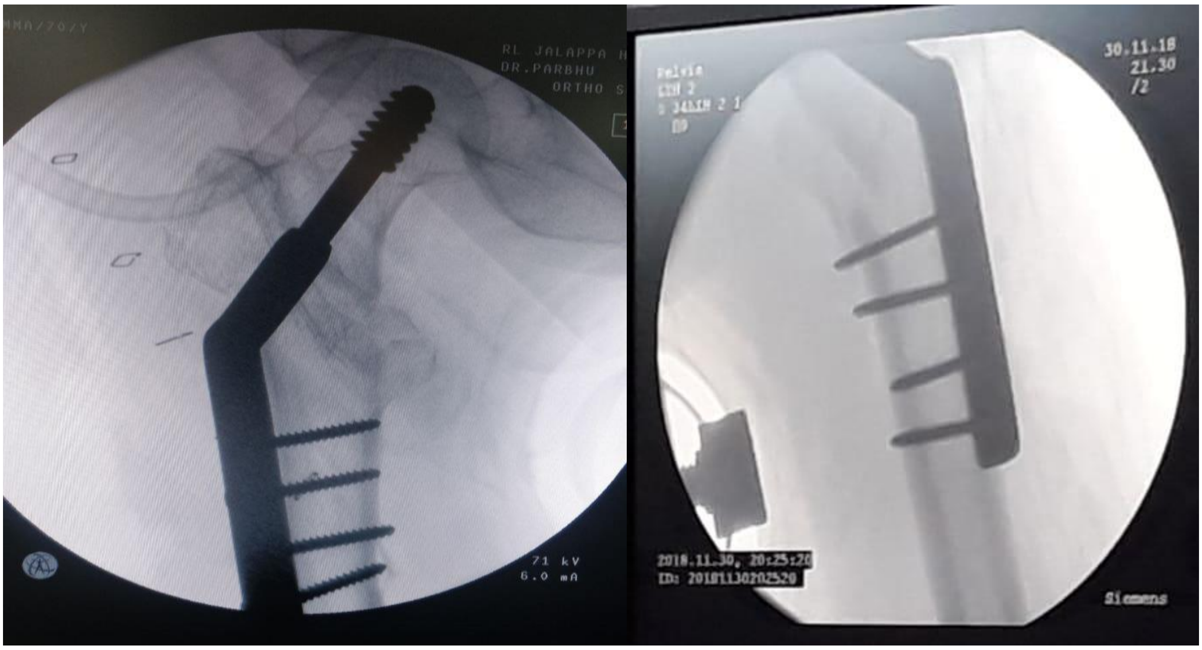


Figure 32: Fluoroscopy Images After Complete Fixation

B. PROXIMAL FEMORAL NAILING

Patient positioning: The patient lies on a standard fracture table. the affected femur adduction to access the trochanteric region. Before starting the operation- procedure, the fracture was reduced. Reduction of trochanteric fractures is usually achieved by traction and internal rotation. Most subtrochanteric fractures are reduced by a small amount of external rotation. If the fracture is not reduced by the closed method, open the reduction is made. The operational field is prepared in the usual way.

Figure 33: position and Draping

Incision: The lateral incision is made in the same way as all intramedullary femoral procedures. The skin incision extends proximally from the very tip of the greater-trochanter to 5 cm distally. The aponeurosis of the gluteus maximus is bifurcated in the extension line of its fibres. This views a small pad of fat that sits between the very tip of the greater-trochanter and the piriformis fossa region. Then, the gluteus medius is split in its line of its fibres. If open reduction is required, surgical approach is extended distally to allow the anterior approach to the hip capsule and fracture. It is essential that the head fragment is reduced to the shaft fragment in the lateral plane.

Figure 34: Incision marking

Femoral preparation: The entry point of the intra-medullary nail passes through the tip of the greater-trochanter. After sufficient exposure, an entry point was made at the very tip of the greater-trochanter with the curved bone awl and a curved-beaded end guidewire inserted into the proximal aspect of femur. The wire is advanced into the femoral canal beyond the subtrochanteric region. The position of guide-wire was confirmed radiographically in the anteroposterior and lateral planes. The proximal reaming will be used to open the proximal aspect of femur to accommodate the proximal aspect of the nail. The hip intramedullary screw is available in two angles: 130degrees and an 135degrees. The final decision on angle of the lag screw is a matter of the years of experience. Most patients need a 135-degree angle.

Figure 35: Entry Point Made Using Bone Awl

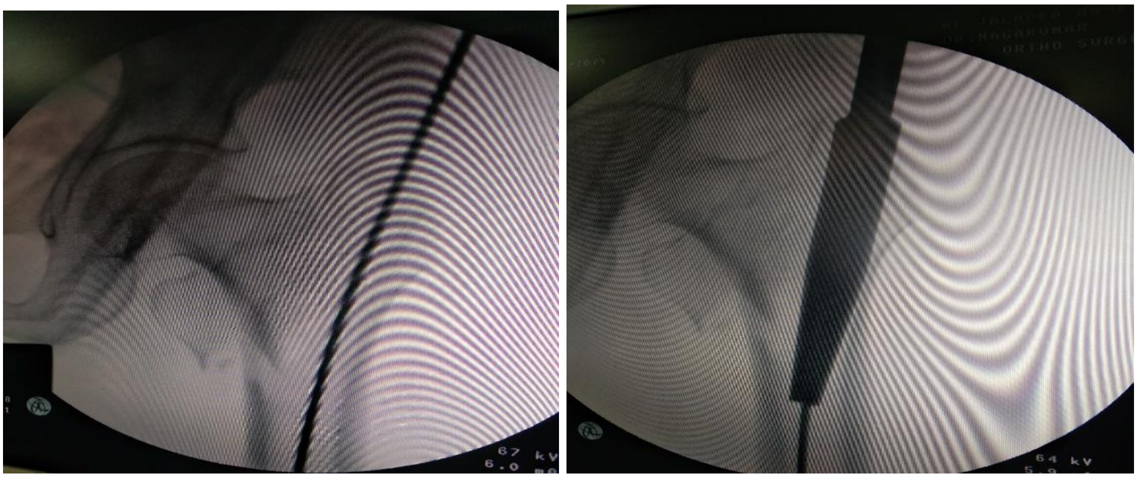


Figure 36: Passing of The Guide Wire and Proximal Reaming

Assembling the jig and nail: It is recommended to mount the angle-guide accessory on the template before inserting the intramedullary screw of the hip. Nail can be short(180mm-250mm) or long(300-420mm). First, the jig is attached to the jig handle and assembled. The selected angle guide attachment is attached to the jig with the angle guide mounting screw and then tightened. Then the correct nail is attached to the jig with the conical bolt. Then the driver is attached to the jig. Correct assembly is confirmed by the passing of the sleeve reamer through the drill sleeve and through the proximal drilled hole of the proximal femoral nail.

Figure 37: Passing of Nail Over the Guide Wire

Nail Insertion: After milling is complete, an exchange tube is passed over the coiled guidewire and replaced with a normal guidewire. The nail tip was inserted into the prepared proximal aspect of femur and pushed through the nail. This is done under the guidance of the wire.

Proximal Locking: Correct nail positioning is essential to ensure offset the screw is placed in center of the head of femur, both antero-posteriorly and laterally planes. Two drill sleeves are well available for the use with the jig angle instrument set. When the nail is in the correct desired position, the drill guide is screwed/threaded into the angle-guide attachment. Incision made to allow the screwing of the drill sleeve chosen at level of the template. The guidewire sheath is inserted until it rests on lateral femoral cortex of the femur. It is very important that the sleeve fits snugly over the femur. This is confirmed by anteroposterior fluoroscopy and is used to estimate the exact/approximate position of the threaded screw. A guidewire inserted through the guidewire sheath and into the neck and head of the femur

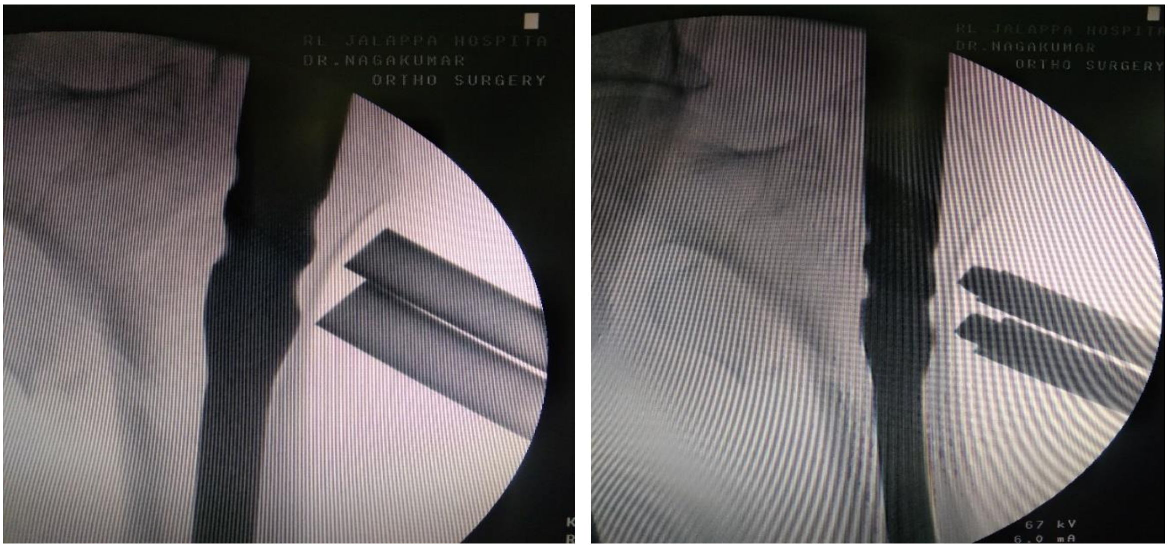


Figure 38: Attachment of Drill Sleeves

Guide screw selection: After inserting the guide wire, the drill bit sleeve is removed so that the guide screw measurement length can be correctly determined.

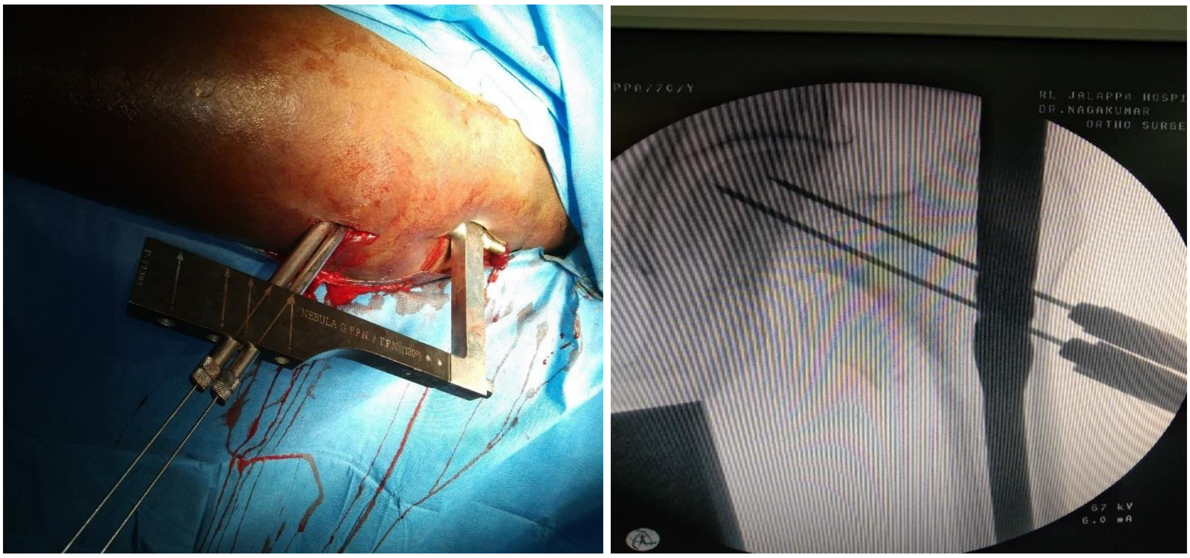


Figure 39: Guide pin placement

The total length of the lag screw: Depth gauge is positioned so that it might rest against the guide wire and aligned with the drill sleeve. The total length of the lead screw is read directly from the guide wire.

Reaming for the guide screw: Using the reamer for the guide screw rod in the neck of femur is prepared the guide screw. The correct depth that's needed for the reaming bore is 5mm less than the stud length of the guide pin measured previously. This reduces the chances/risk of the guide wire being pulled out with the reamer. The Screw Shaft Reamer is adjusted to the correct length and advanced through the drill sleeve and then into the head of femur till the positive stop contact with the drill guide. Position confirmed using the c-arm and the lag screw reamer shaft has been removed. Then remove the sleeve reamer.

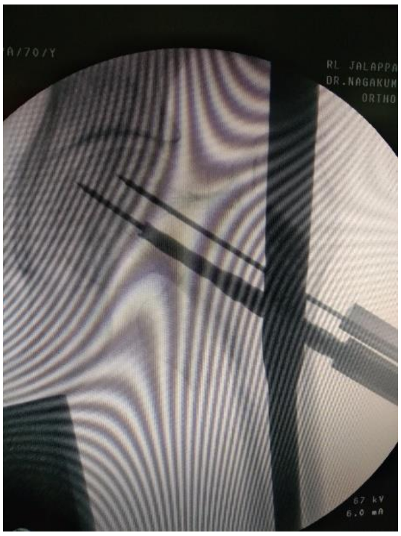


Figure 40: proximal screw drilling

Lag Screw Tap: The lag screw tap is set to the same length as lag screw shaft of the reamer from the rod (5mm less than the guidewire measurement) and insert it through the drill guide.

Selection of locking screws: The very tip of the threaded screw should be inside the subchondral bone, 5 mm from the particular surface of the head of femur. The bone in this area is denser than compared to the epicentre of femoral head and makes cutting the screw less likely. 8mm lag screw inserted to the distal part of proximal locking. The length given by the measurement already allows 5mm of compression. In most trochanteric fractures, compression is only effective temporarily and is not considered necessary.

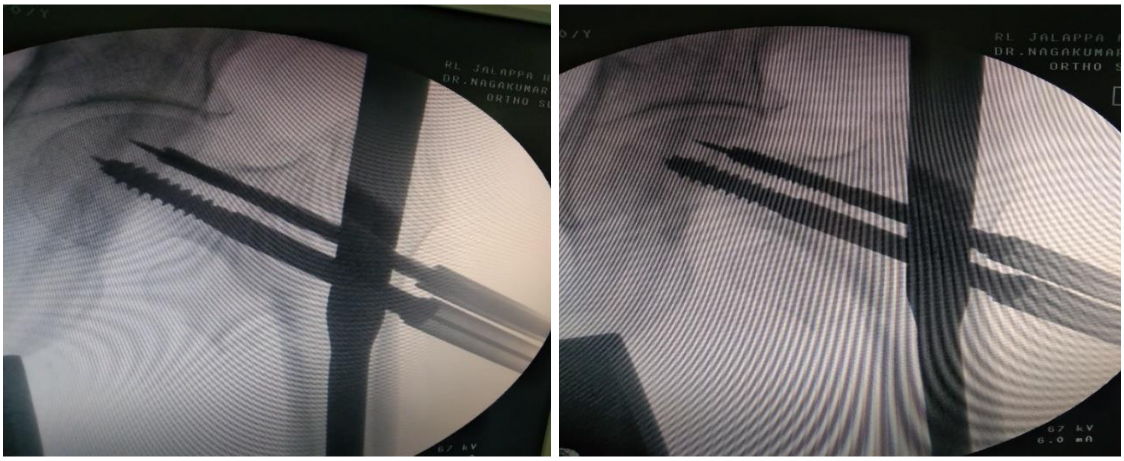


Figure 41: Proximal Locking Screws

Insert guide screw, sleeve and adjusting screw: Centering sleeve mounted on lag screw wrench for insertion. The correct lag screw attached to the wrench and tightened. The assembly is passed over guide wire and through the drill sleeve. The threaded screw was moved into the proximal aspect of femur to the desired level using the orientation with the fluoroscopic C-arm. The handle of the wrench should be perpendicular to the exact axis of the femoral axis to ensure maximum strength of the threaded screw. An anteroposterior view with the arch will confirm that the centering sleeve is centered on the rod. Once the centring sleeve is fixed with the set screw, the lag screw will no longer turn but may slide. The socket wrench for the lag-screw and the drill socket will be removed.

Insertion of the De-rotation/correction screw: Using the drill guide inserted above the lag screw. A guide wire is passed through the drill guide up to 10mm less than the drill guide. 6.4mm de-rotational screws used. The reamer is then guided to that end of the guide wire, then the orientation is set and derotation screw is advanced over it with the orientation with the c arm guidance.

Distal locking: The distal end of the long intramedullary hip-screw locked for 4.5 mm cortical screws.

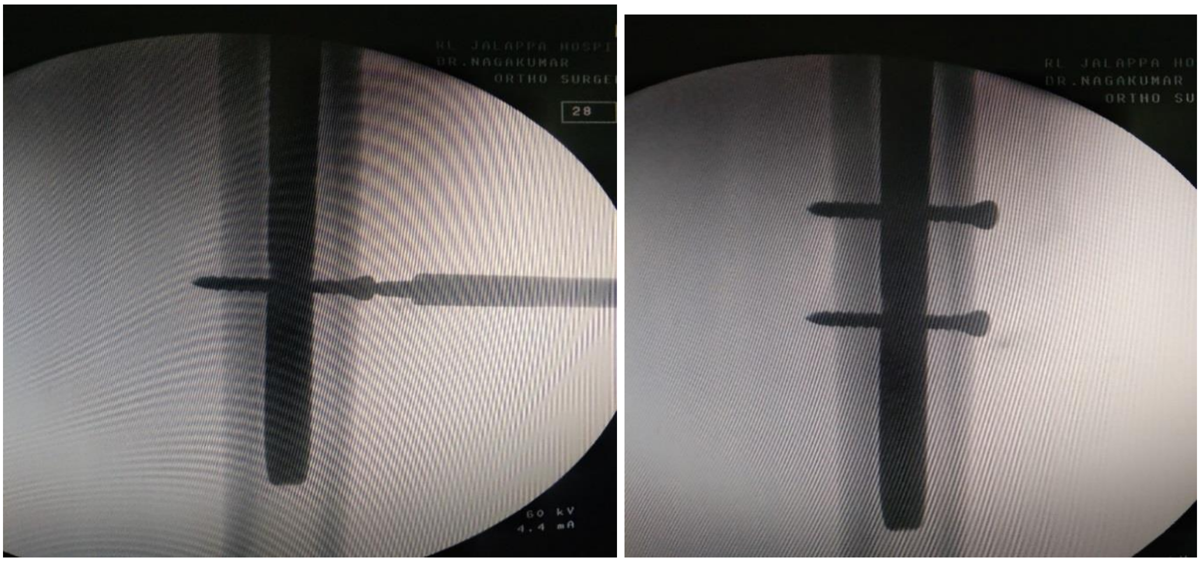


Figure 42: Distal Locking screws

Closure: The tensor fascia lata is carefully approached and closed with an interrupted suture in proximal wounds. For distal wounds, only skin occlusion and a compression bandage were applied.

POST-OPERATIVE CARE

All patients received postoperative injectable antibiotics, intravenous cephalosporins for 5 days, followed by oral antibiotics until the sutures were removed. Low molecular weight heparin was initiated on the very first postoperative day after 24hrs in patients at high risk of deep vein thrombosis. The patients were then allowed to sit upright in bed on the second postoperative day. Static quadriceps strengthening exercises were started on the second or third postoperative day. The drain if placed was later removed after the third postoperative day. The sutures were removed after 10 to 14 days. The patients were mobilized without support as soon as localised pain or general patient condition permitted. Partial support was started 6 weeks after clinical and radiological assessment and full support was performed 12 weeks after assessment. And recalled after 6 months for the final follow-up and assessment using Harris hip score.

Harris Hip Score

Pain *(check one)*

1. None or ignores it (44)
2. lightly, occasional, but no compromise in activities (40)
   Mild pain, with no effect on average activities, rarely moderate
3. Pain with unusual activity; may take aspirin (30)
   Moderate Pain, likely tolerable but makes concession to pain.
   Some limitation to ordinary daily activity or to the work but might require
4. Occasional pain medication required is stronger than aspirin (20)
5. Marked pain or serious limitation of daily activities (10)
6. Totally disabled or crippled or pain in bed or bedridden (0)

Limp

1. None(11)
2. Slight (8)
3. Moderate (5)
4. Severe (0)

Support

1. None (11)
2. Cane for long walks (7)
3. Cane most of time (5)
4. One crutch (3)
5. Two canes (2)
6. Two crutches or completely not able to walk (0)

Distance Walked

1. Unlimited (11)
2. Six blocks (8)
3. Two to three blocks (5)
4. Indoors only (2)
5. Bed to chair only (0)

Sitting

1. Comfortably in ordinary chair for almost one hour (5)
2. On a high seated chair for 30 minutes (3)
3. Unable to sit nearly comfortably in any chair (0)

Enter public transportation

1. Yes (1)
2. No (0)

Stairs

1. Normally not using a railing (4)
2. Normally using a support of railing(2)
3. In any possible manner(1)
4. Unable to even stand on stairs (0)

Put on Shoes and Socks

1. With ease (4)
2. With difficulty (2)
3. Unable (0)

Absence of Deformity (All yes = 4; Less than 4 =0)

1. Less than 30° fixed flexion contracture □ Yes □ No
2. Less than 10° fixed abduction □ Yes □ No
3. Less than 10° fixed internal rotation in extension □ Yes □ No
4. Limb length discrepancy less than 3.2 cm □ Yes □ No

Range of Motion (*indicates normal)*

Flexion (*140°) ________

Abduction (*40°) ________

Adduction (*40°) ________

External Rotation (*40°) ________

Internal Rotation (*40°) ________

Range of Motion Scale

1. 211° - 300° (5)
2. 161° - 210° (4)
3. 101° - 160° (3)
4. 61° - 100 (2)
5. 31° - 60° (1)
6. 0° - 30° (0)

Range of Motion Score ____________

Total Harris Hip Score ___________

Name: Is recorded for identification and familiarity of patient .

Age: To record incidence of age in trochanteric fractures. It is important, as trochanteric fracture is common noticed in the elderly age group.

Sex: To record the incidence of gender of trochanteric fractures in this study.

UHID No: It is noted in the proforma and also for the hospital records.

Address : Is asked and recorded to communicate and see for endemicity with the patient for follow up.

Admission date:

Date of Surgery:

Date of Discharge:

} for the better efficiency of patient search

Nature of Trauma: To record how the injury originally occurred

Mechanism of Injury: To exactly know the type and severity of trauma, and assess the exact state of bone. The trauma causing the injury may be –

A) Trivial trauma such as -

- ➢ Missing a step and fall.
- ➢ Sudden slip and fall.

B) Forceful trauma, such as -

- ➢ Fall from a height.
- ➢ Road Traffic accident.

More severity of the trauma, there will be very gross comminution of the fracture site which in turn hinders the anatomical reduction and affects the bone healing. Comminution depends also on the quality of bone.

Duration since Injury: To record duration the patient's injury before brought to the hospital after injury.

Past History (drug and surgical history): To record the existing comorbidities in the patient that could have led to possible complications.

General Physical Examination: To assess and record the vitals of the patient at the time of admission

Systemic Examination: To assess the cardiovascular, respiratory, per abdomen and central nervous systems clinically.

<u>Local Examination</u>

Inspection:

Attitude: Flexion, Abduction, External Rotation and Shortening: The usual deformities present in the fracture of the proximal femur.

Swelling: In the trochanteric region, present or absent is recorded. In a fresh fracture swelling is always present.

Palpation:

Greater Trochanter: Position of the greater-trochanter is checked when compared to the normal side. In a trochanteric fracture the greater-trochanter is proximally migrated.

Tenderness: To evaluate the severity of pain.

Movements: To know if any restriction of movements and crepitus associated with movements.

Measurements of limbs: To know the shortening on the side of the trochanteric fracture. **Investigations:** Routine Blood investigations (Hb%, TC, DC, ESR.), Blood Sugars, Blood Urea, Serum Creatinine, Blood Grouping & Typing, HIV, HBsAg, HCV, ECG, Chest X-Ray, 2D ECHO(if required), Urine Routine examination were carried out and were noted in the proforma

X-Ray of the Hip: The anteroposterior radiograph view of the pelvis with hips were taken. The fracture was classified according to **Boyd and Griffin Classification** and was noted in the proforma.

Diagnosis: The probable diagnosis as inferred by the clinical assessment was noted.

Treatment Procedure: The first day treatment with traction in the form of skeletal or skin traction and treatment with analgesics was noted. It was also noted whether the patient was given general anaesthesia/spinal anaesthesia. Intraoperatively the fractures were reduced by either closed or open reduction under C-arm image intensification and internal-fixation with Dynamic Hip-Screw System (DHS) or The Proximal Femoral-Nail(PFN) was done. Intraoperative complication If occurred were also recorded.

Postoperative Period: Postoperatively all the cases were well managed as mentioned earlier. If any complications occurred, they were recorded in the proforma.

Follow-up: All the cases were regularly followed up at 6^{th} week, 12^{th} week and 24^{th} week. The patients were assessed with regard to the following parameters during the follow up and the findings were recorded in the proforma:

Pain at the fracture site: Presence of pain in the hip is noted.

Deformity: Deformity and measurements of the limb is done and if there is any discrepancy it is mentioned.

Tenderness at the fracture site: Presence of tenderness at the fracture site is noted.

X-ray findings: X-rays is taken at every follow-up to know the position of implant and the fracture union.

Complications: Complications which include Infection or Implant failure or any other complications that may have occurred were recorded for final result purpose.

Final results: The final result is based on the Harris Hip Score. The domains covered are pain, function of the joint, absence/presence of deformity, and range of movements. The pain domain measures pain severity and its effect on activities and need for pain medication. The function part of domain consists of daily activities like (staircase use, using public transportation, sitting, tying/managing shoes and socks) and gait (limp, support needed, and walking distance). Deformity takes these factors into account such as hip flexion, adduction, internal rotation, and extremity length discrepancy. Range of motion measures hip flexion, abduction movement, adduction, external and internal rotation.

The HHS score gives a maximum of 100 points. Pain receives 44 points, function 47 points, range of motion 5 points, and deformity 4 points. Function is subdivided into activities of daily living (14 points) and gait (33 points). The higher the HHS, the less dysfunction. A total score of <70 score is considered a poor result; 70–80 is considered as fair, 80–90 is good, and 90–100 is an excellent result.

Statistical analysis:[92-94]

Data was entered into Microsoft excel data sheet and was analyzed using SPSS 22 version software. Categorical data was represented in the form of Frequencies and proportions. **Chi-square test** was used as test of significance for qualitative data. Continuous data was represented as mean and standard deviation. **Independent t test** was used as test of significance to identify the mean difference between two quantitative variables and qualitative variables respectively.

Graphical representation of data: MS Excel and MS word was used to obtain various types of graphs such as bar diagram and line diagram.

p value (Probability that the result is true) of <0.05 was considered as statistically significant after assuming all the rules of statistical tests.

Statistical software: MS Excel**,** SPSS version 22 **(**IBM SPSS Statistics, Somers NY, USA) was used to analyze data.

RESULTS

RESULTS

1.Age

Table 1: Mean Age Comparison between two groups

	Group				p value
	DHS		PFN		
	Mean	SD	Mean	SD	
Age	61.09	11.69	65	14.98	0.329

Mean Age in Group DHS was 61.09 ± 11.69 and in Group PFN was 65 ± 14.98.

There was no that significant difference in mean Age comparison between two groups.

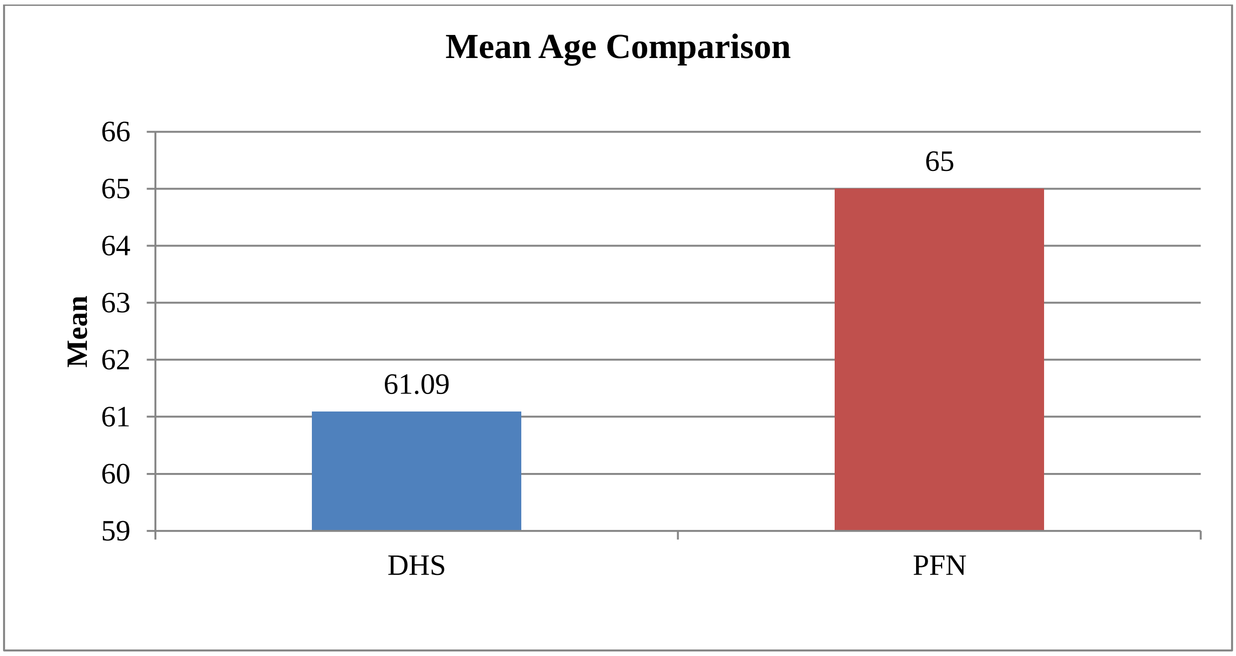


Figure 1: Bar Diagram Showing Mean Age Comparison between two groups

2.Sex

Table 2: Gender Distribution between two groups

		Group			
		DHS		PFN	
		Count	Column N %	Count	Column N %
Gender	Female	14	60.87%	11	47.83%
	Male	9	39.13%	12	52.17%

$\chi2 = 0.789$, $df = 1$, $p = 0.375$

In Group of DHS, 9 out of 23patients were male that amounts to 39.13% and 14 out of 23patients were female patients that amounts to 60.87%.

In Group of PFN, 12 out of 23patients were male which amounts to 52.17% and 11 out of 23patients were female which amounts to is 47.83%.

There was no that significant difference in Gender Distribution between two groups.

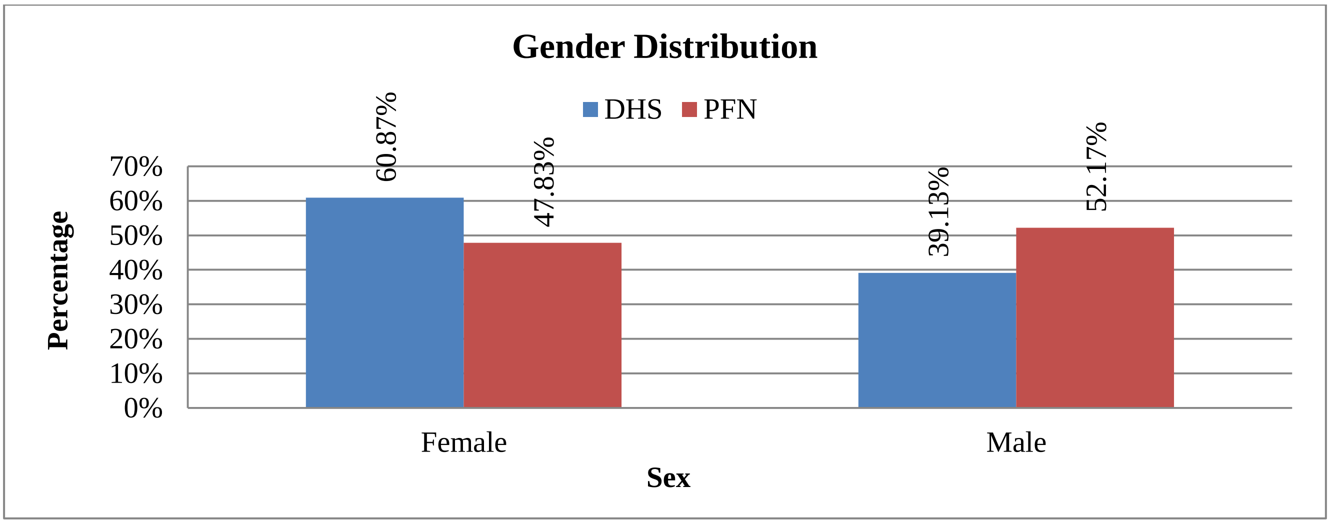


Figure 2: Bar Diagram Showing Gender Distribution between two groups

3.Mean score comparison between groups

Table 3: Mean Score Comparison between two groups

	Group				p value
	DHS		PFN		
	Mean	SD	Mean	SD	
6 weeks	34.43	3.23	34.35	2.5	0.919
12 weeks	54.65	2.69	62.17	5.99	< 0.001*
24 weeks	84.3	7.68	89.26	6.53	0.023*

Mean 6 weeks score in Group DHS was 34.43 ± 3.23 out of 100 and in Group PFN was 34.35 ± 2.5 out of 100.

There was no much significant difference in mean 6 weeks comparison between two groups.

Mean 12 weeks score in Group DHS was 54.65 ± 2.69 out of 100 and in Group PFN was 62.17 ± 5.99 out of 100. There was a significant difference in mean 12 weeks comparison between two groups. Mean 24 weeks score in Group DHS was 84.3 ± 7.68 out of 100 and in Group PFN was 89.26 ± 6.53 out of 100. There was a significant difference in mean 24 weeks comparison between two groups.

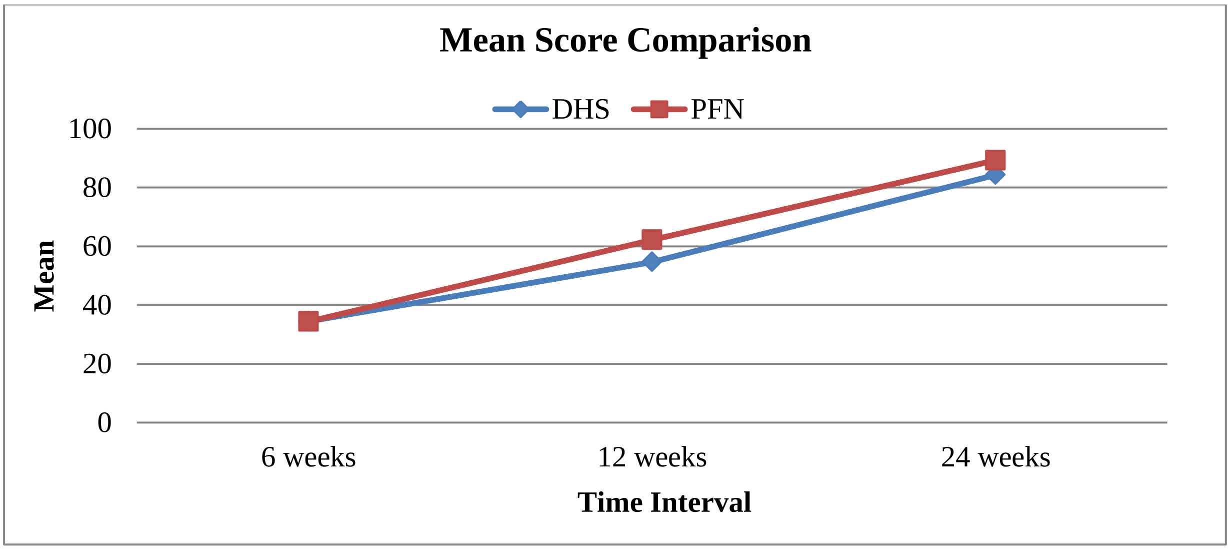


Figure 3: Line Diagram Showing Mean Score Comparison between two groups at different intervals of time

4.Mean Harris Hip Score

Table 4: Mean Harris Hip Score Comparison between two groups

	Group				p value
	DHS		PFN		
	Mean	SD	Mean	SD	
Harris Hip Score (/100)	84.3	7.68	89.26	6.53	0.023*

Mean Harris Hip Score in Group DHS was 84.3 ± 7.68 out of 100

Mean Harris Hip Score in Group PFN was 89.26 ± 6.53 out of 100.

There was a significant difference in mean Harris Hip Score (/100) comparison between two groups.

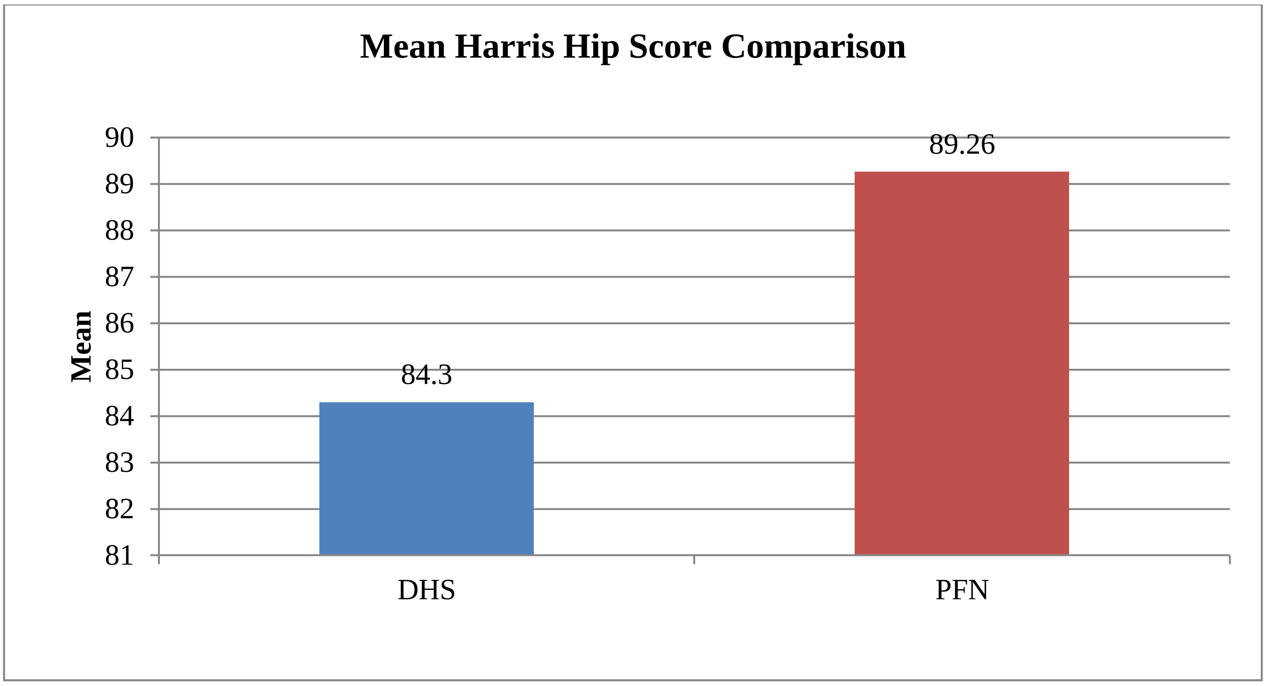


Figure 4: Bar Diagram Showing Mean Harris Hip Score Comparison between three groups

5.Side Distribution

Table 5: Side Distribution between two groups

		Group			
		DHS		PFN	
		Count	Column N %	Count	Column N %
Side	Left	12	52.17%	9	39.13%
	Right	11	47.83%	14	60.87%

$\chi 2 = 0.789$, df = 1, p = 0.375

In Group DHS, 52.17% had Injury on Left Side and 47.83% had on Right Side.

In Group PFN, 39.13% had Injury on Left Side and 60.87% had on Right Side.

There was no much significant difference in Side Distribution between two groups.

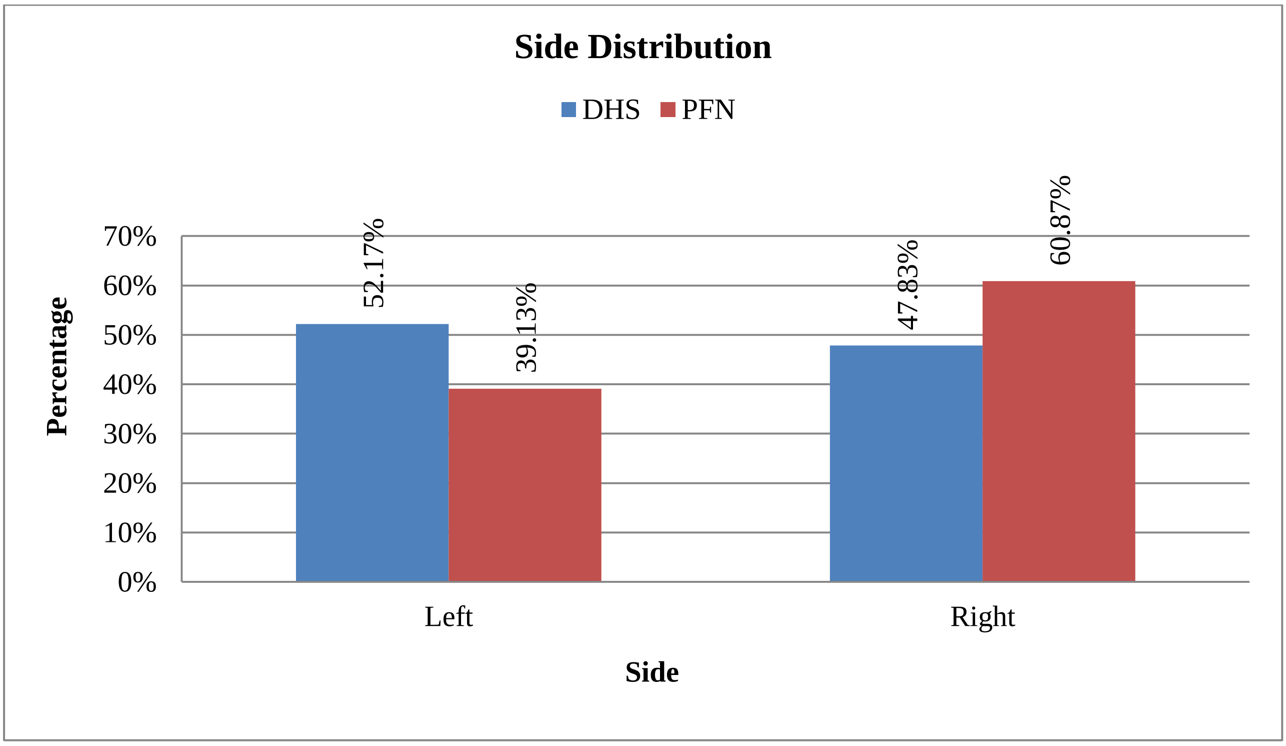


Figure 5: Bar Diagram Showing Side Distribution between two groups

6.Mode of Injury

Table 6: Mode of Injury Distribution between two groups

		Group			
		DHS		PFN	
		Count	Column N %	Count	Column N %
Mode of Injury	RTA	1	4.35%	6	26.09%
	Self-Fall	5	21.74%	17	73.91%
	Trivial Fall	17	73.91%	0	0.00%

$\chi 2$ = 27.117, df = 2, p = < 0.001*

In Group DHS, Mode of Injury was RTA in 1 patient 4.35% out of 23 patients,

In Group DHS, Mode of Injury was Self Fall in 5 patients in 21.74% out of 23 patients

In Group DHS, Mode of Injury was Trivial Fall in 17 patients in 73.91% out of 23 patients.

In Group PFN, Mode of Injury was RTA in 6 patients 26.09% out of 23 patients

In Group PFN, Mode of Injury was Self Fall in 17 patients 73.91% out of 23 patients.

There was a significant difference in Mode of Injury Distribution between two groups.

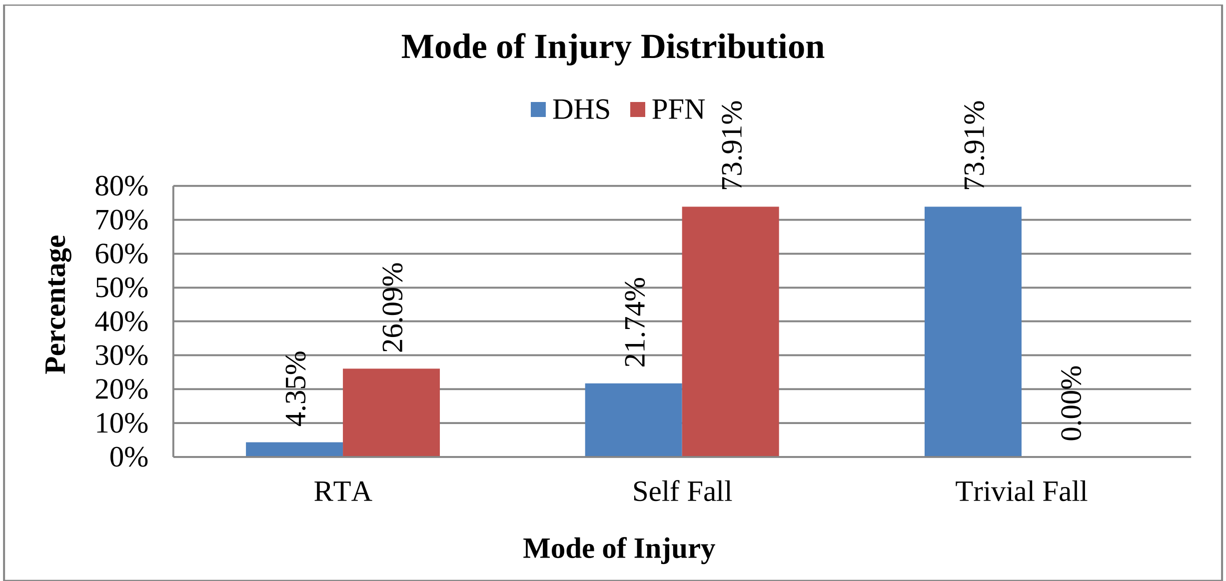


Figure 6: Bar Diagram Showing Mode of Injury Distribution between two groups

Table 7: Boyd and Grifiith Classification Distribution between two groups

		Group			
		DHS		PFN	
		Count	Column N %	Count	Column N %
Boyd and Grifiith Classification	Type-1	6	26.09%	9	39.13%
	Type-2	13	56.52%	8	34.78%
	Type-3	2	8.70%	5	21.74%
	Type-4	2	8.70%	1	4.35%

$\chi 2 = 3.41$, df = 3, p = 0.333

In Group DHS,

26.09% had Type -1,(6 patients out of 23 patients)

56.52% had Type – 2 (13 patients out of 23 patients)

8.70% had Type – 3 (2 patients out of 23 patients)

8.70% had Type – 4. (2 patients out of 23 patients)

In Group PFN,

39.13% had Type -1, (9 out of 23 patients)

34.78% had Type – 2, (8 patients out of 23 patients)

21.74% had Type – 3 (5 patients out of 23 patients)

4.35% had Type – 4 (1 patients out of 23 patients)

There was no much significant difference in Boyd And Grifiith Classification Distribution between two groups.

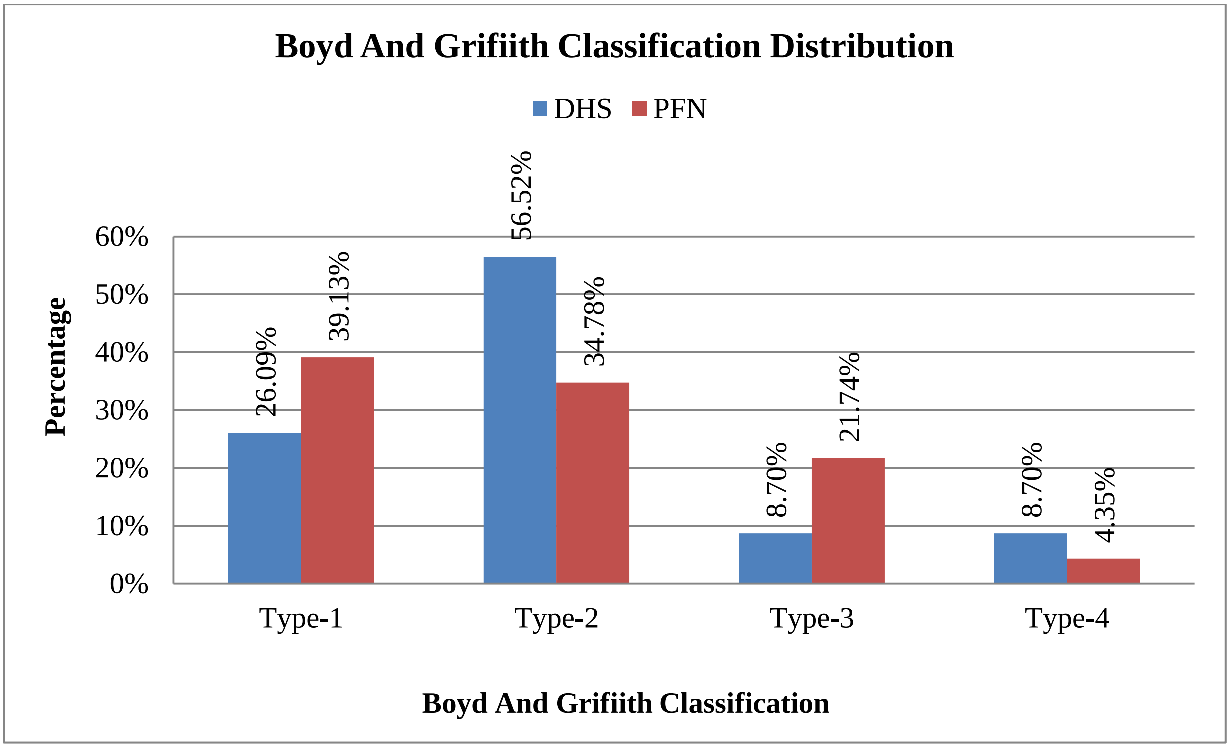


Figure 7: Bar Diagram Showing Boyd And Grifiith Classification Distribution between two groups

8.Final outcome

Table 8: Results Distribution between two groups

		Group			
		DHS		PFN	
		Count	Column N %	Count	Column N %
Result	Excellent	8	34.78%	13	56.52%
	Good	10	43.48%	8	34.78%
	Fair	4	17.39%	2	8.70%
	Poor	1	4.35%	0	0.00%

$\chi 2 = 3.079$, df = 3, p = 0.380

In Group DHS, Results were

Excellent in 34.78%, (8 patients out of 23 patients)

Good in 43.48% (10 patients out of 23 patients)

Fair in 17.39% (4 patients out of 23 patients),

Poor in 4.35% (1 patients out of 23 patients).

In Group PFN, Results were

Excellent in 56.52% (13 patients out of 23 patients)

Good in 34.78%.(8 patients out of 23 patients)

Fair in 8.70% and (2 patients out of 23 patients)

There was no much significant difference in Results Distribution between two groups

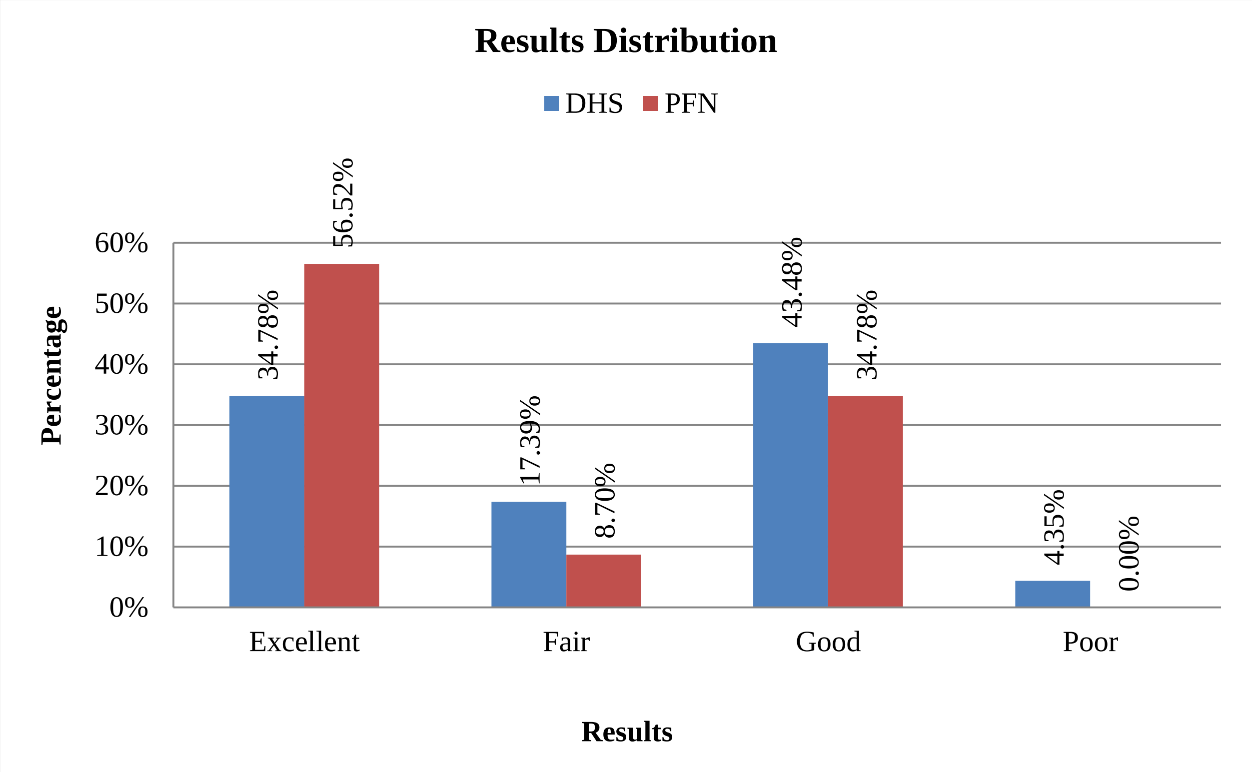


Figure 8: Bar Diagram Showing Results Distribution between two groups

<u>Functional outcome</u>

Out of the 46 cases in the study, out of the 46 cases which had an excellent outcome 23 were treated with PFN and 23 were treated by DHS. 13 cases treated by PFN and 8 cases treated by DHS had an excellent result. 8cases treated by PFN and 10 cases treated by DHS had a good result. A fair result was recorded in 2 cases treated by PFN and 4 cases treated by DHS. 1 patient which was treated by DHS had a poor functional outcome.

DISCUSSION

DISCUSSION:

Fractures of inter-trochanteric region of femur have been recognized as a major challenge by the Orthopaedic-community, not just only for achieving fractures union, but for also restoration of optimal function in the least short possible time with very minimal complications. The aim of fracture management accordingly has drifted to achieving very early mobilization, rapid rehabilitation and quick return of the individuals to pre-morbid home and work like environment as a functionally and psychologically independent unit.

Operative/surgical treatment in the form of internal fixation permits very early rehabilitation and offers the best chances of functional recovery, and hence has become gold standard treatment of choice for virtually all fractures in the inter-trochanteric region. Amongst the various types of implants available i.e., fixed nail plate devices, sliding nail or the screw plate and intra-medullary devices, the compression hip- screw is most commonly used (still remains the gold standard) but recently surgical techniques of closed intra-medullary nailing have gained very high popularity.

In this study an attempt was made for survey, evaluate, document and quantify our success in the management of such individuals by using the Proximal femoral nail (PFN) and the Dynamic Hip-Screw (DHS) implants and then compare the results in these two groups. The study was conducted on forty-six patients (23 cases by PFN and 23 cases by DHS) of proximal femoral fractures attending outpatient/causality department of Orthopaedics, RLJH hospital, constituent hospital of SDUMC, SDUAHER, Deemed to be university for a period of two years.

Profile of subjects in the study: In the study the factors such as age, gender, side of injury, mode of injury and Type of Fracture were matched to eliminate selection bias.

Age Distribution:

In the present study Mean Age in Group DHS was 61.09 ± 11.69 and in Group PFN was 65 ± 14.98. This signifies the that patients from these age group are involved in low energy trauma like fall (fall at home).

The reason why trochanteric region is the most common site of senile osteoporosis as the age advances. Hip joint being a major joint n the mechanism of weight bearing, this already weakened part cannot withstand any sudden abnormal stress. The space between bony trabeculae is enlarged and loaded with fat, whilst unsheathing compact tissue is thinned out and calcar is atrophied. Due to early fixation of such inter-trochanteric fractures and early mobilization, these patients could gain full range of movements at an early date with very minimal loss of productivity.

In a study of 40patients conducted by **Amandeep et al,** **(96)** the mean age in the DHS group was 60.3 and that in the PFN group was 56.85. In another study of 52 patients conducted by Kushal et al (97), the the mean age in the DHS group was 65 and that in the PFN group was 70.2. Our study has statistics similar to that of Amandeep et al. (96)

STUDY	AGE criteria (in years)	MEAN AGE (in years)	
		DHS	PFN
Amandeep et al [96]	20-80	60.3	56.85
Kushal et al [97]	20-80	65	70.2
PRESENT STUDY	>45 years	61.09	65

Table 9: Age Comparison with Other Studies

Gender Distribution:

In Group DHS, 39.13% were Male and 60.87% were female. In Group PFN, 52.17% were Male and 47.83% were female. Hence a female predominance was seen for Intertrochanteric fractures.

The Following reasons were given by **Cleveland et al[(98)]** for female preponderance

- **a.** Females have slightly wider pelvis with a tendency to having coxa vara.
- **b.** They are usually less active and are more prone to senile osteoporosis.

In the comparative study by Pan et al[(99)], the males comprised 75% of the study group. In his study of 80 cases, Shakeel et al[(101)] found that 66% of his study group were males. Zhao et al[(100)] describes the male incidence his study at 40%. In his study of 80 cases, Gill et al[(102)] found that males comprised only 32% of the study group. Our study has findings similar to that of Gill et al and Zhao et al with female prepondarance [(100)].

STUDY	MALES (in %)	FEMALES (in %)
Pan et al	75	25
Zhao et al	40	60
Shakeel et al	66	33
Gill et al	32	68

Table 10: Gender Comparison Between Other Studies

Side Distribution:

In Group DHS, 52.17% had Injury on Left Side and 47.83% had on Right Side. In Group PFN, 39.13% had Injury on Left Side and 60.87% had on Right Side.

Mode of Injury Distribution

In Group DHS, Mode of Injury was RTA in 4.35%, Self-Fall in 21.74% and Trivial Fall in 73.91%. In Group PFN, Mode of Injury was RTA in 26.09%, and Self Fall in 73.91%.

This can be attributed to the following factors, listed by Cummings and Nevitt in 1994 [(103).] Insufficient shielding reflexes to reduce fall energy below a certain critical threshold. Insufficient local shock absorbers, for example. muscle and fat around the hip. Insufficient bone strength in the hip due to osteoporosis or osteomalacia.

Young patients with inter-trochanteric or sub-trochanteric fractures have suffered trauma as a result of a traffic accident or a fall from a height, reflecting the need for high-velocity trauma to cause fractures in young people. Keneth J. Koval and Joseph D. Zuckerman noted that 90% of hip fractures in older people are the result of a simple fall. Hip fractures in young adults are often the result of high-energy trauma such as motor vehicle collisions or falls from a height.

In his study of 30 cases, Mundla et al[(104)] described 70% of his cases as a result of trivial fall while 23% was due to RTA. Jonnes et al[(105)] conducted a study on 30 cases where he described 77% of his cases as a result of trivial fall while the remaining 23% was due to RTA. In his study on 80 patients, Gill et al[(102)] concluded that 66% of his cases were a result of trivial fall while the remaining were due to RTA. Our study also highlights that trivial fall is perhaps the important contributing cause of IT fractures.

STUDY	Mechanism of Injury		
	Trivial Fall	**RTA**	**Self-fall**
Mundla et al	70%	23.3%	-
Jonnes et al	77%	23%	-
Gill et al	66%	34%	-

Table 11: Mechanism of Injury Comparison Between Other Studies.

Type of fracture: We have classified Intertrochanteric fracture based on Boyd and Griffin classification.

In Group DHS, 26.09% had Type -1, 56.52% had Type – 2, 8.70% had Type – 3 and 8.70% had Type – 4. In Group PFN, 39.13% had Type -1, 34.78% had Type – 2, 21.74% had Type – 3 and 4.35% had Type – 4.

According to Mervyn Evans et al(106) the Inter-trochanteric fractures are considered stable or un-stable depending on the integrity of the posteromedial cortex. Fractures with intact posteromedial cortex are considered stable fractures, while fractures with loss of the posteromedial cortex are considered unstable fractures. The posteromedial cortex is primarily the lesser trochanter.

Harris Hip score:

In the present study at 6 weeks score in Group DHS was 34.43 ± 3.23 and in Group PFN was 34.35 ± 2.5. There was no significant difference in mean 6 weeks comparison between two groups.

Mean 12 weeks score in Group DHS was 54.65 ± 2.69 and in Group PFN was 62.17 ± 5.99. There was a significant difference in mean 12 weeks comparison between two groups.

Mean 24 weeks score in Group DHS was 84.3 ± 7.68 and in Group PFN was 89.26 ± 6.53. There was a significant difference in mean 24 weeks comparison between two groups.

In a study of 40 patients conducted by Amandeep et al[96], the mean HHS in the DHS group was 83.75 and that in the PFN group was 84.4. In his study of 80 cases, Shakeel et al[101] found that the mean HHS in the DHS group was 73.73 while in the PFN group, it was 83.5. In a study of 60patients conducted by Sharma et al[107], the mean HHS in the DHS group was 88.7 and that in the PFN group was 82.2.

	Mean Harris Hip Score	
	DHS	**PFN**
Amandeep et al	83.75	84.4
Shakeel et al	73.73	83.5
Anmol Sharma et al	88.7	82.2
Present Study	84.3	89.26

Table 12: Mean Harris Hip Score Comparison Between Other Studies

Functional outcome:

In Group DHS, Results were Excellent in 34.78%, Fair in 17.39%, Good in 43.48% and Poor in 4.35%. In Group PFN, Results were Excellent in 56.52%, Fair in 8.70% and Good in 34.78%.

The range of movement calculated by the Harris Hip Scoring system treated by both the implants i.e. PFN and DHS was good and was almost the same. The range of movements namely flexion, extension, external and internal rotation was good in most cases, excellent in a few. Very few there were fair results. The fair result was attributed to other associated factors namely a long interval between trauma and surgery & development of postoperative infection.

Kushal et al[97] in his study of 52pts noted that in the DHS group, excellent results were seen in 6(23%), good results seen in 5(19%), fair results seen in 13(50%) and poor results seen in 2(8%).

In the PFN group, excellent results were seen in 4(15%), good results seen in 14(54%), fair results seen in 7(27%) and poor results seen in 1(4%).

	Method of Fixation	
	DHS	**PFN**
Excellent	6(23%)	4(15%)
Good	5(19%)	14(54%)
Fair	13(50%)	7(27%)
Poor	2(8%)	1(4%)

Table 13: Mean Harris Hip Score Comparison Between Other Studies

Harish et al[108] in his study of 30pts noted that in the DHS group, excellent results were seen in 6(50%), good results seen in 2(13.33%), fair results seen in 2(13.33%) and no poor results were seen.

In the PFN group, excellent results were seen in 8(72.73%), good results seen in 1(9.1%), fair results seen in 1(9.1%) and no poor results were seen.

	Functional outcome	
	DHS	**PFN**
Excellent	6(50%)	8(72.73%)
Good	2(13.33%)	1(9.1%)
Fair	2(13.33%)	1(9.1%)
Poor	2(13.33%)	1(9.1%)

Table 14: Functional Outcome in Our Studies

Gill et al[102],in his comparative study of 80 patients using the Locking DHS and PFN, he noted that in the DHS group, excellent results were seen in 6 (15%), good results seen in 14 (35.0%), fair results seen in 12 (30.0%) and poor results seen in 8 (20.0%).

In the PFN group, excellent results were seen in 8 (20.0%), good results seen in 130 (75.0%), fair results seen in 2 (5.0%) and no poor results were seen.

Gill et al in their study observed that

	Functional outcome		**Total**
	DHS	**PFN**	
Excellent	6 (15.0%)	8 (20.0%)	12 (27.272%)
Good	14 (35.0%)	30 (75.0%)	30 (68.181%)
Fair	12 (30.0%)	2 (5.0%)	0 (0.0%)
Poor	8 (20.0%)	0 (0.0%)	2 (4.545%)
Total	20 (100.0%)	24 (100.0%)	44 (100.0%)

Table 15: Functional Outcome in Other Studies

COMPLICATIONS:

In the present study in both groups none of the patients had any complications.

Shakeel et al[101] and Gill et al[102] noted high incidence of superficial infection in the DHS group which they attributed to the lengthier incision associated with DHS. This is similar to the findings of our study.

STUDY	COMPLICATION (in %)											
	Superficial Infection		Malunion		Implant Failure		Non-union		Screw Cut-out		Delayed Union	
	DHS	PFN	DHS	PFN	DHS	PFN	DHS	PFN	DHS	PFN	DHS	PFN
Venkatesh et al[109]	1.25	-	5	1.25	0.83	1.25	0.83	1.25				
Shakeel et al[101]	10						7.5	2.5	2.5			
Gill et al[102]	10	5							5			
Present Study	0	0	0	0	0	0	0	0	0	0	0	0

Table 16: Complications Comparison Between Other Studies

CONCLUSION

CONCLUSION:

From the Study it can be concluded that Proximal Femoral Nailing had better Outcome in Intertrochanteric fractures compared to DHS. This was concluded based on the Final outcome, range of movements and Harris Hip score. Highest percentage of subjects in PFN group had Excellent to Good Outcome and none of them had poor outcome when compared to DHS group. PFN group had higher scores of Harris Hip score at 12 weeks, 24 weeks and at the end of follow-up.

RECOMMENDATIONS:

From the study it can be recommended that Proximal Femoral Nailing is an ideal treatment of choice for Intertrochanteric fracture of femur due its excellent functional outcome, low rates of complications and recurrence. Hence PFN is recommended for first choice of treatment in feasible conditions for Intertrochanteric fractures.

LIMITATIONS:

1. In the study long term complications were not studied
2. Smaller sample size due to the ongoing Covid pandemic
3. Factors affecting the outcome were not studied in both the groups. E.g. Influence of surgeon's expertise.
4. Cost of both the procedures were not compared.

SUMMARY

SUMMARY:

A prospective, comparative, observational study was conducted among patients approaching orthopaedic services in RLJH with age above 45years diagnosed with closed intertrochanteric fracture of less than 3 weeks duration, who were able to walk prior to fracture were included for study after taking written informed written consent. Patients were followed up at 6, 12, 24weeks.

1. Mean Age in Group DHS was 61.09 ± 11.69 and in Group PFN was 65 ± 14.98.
2. In Group DHS, 39.13% were Male and 60.87% were female. In Group PFN, 52.17% were Male and 47.83% were female. Hence a female predominance was seen for Intertrochanteric fractures.
3. In Group DHS, 52.17% had Injury on Left Side and 47.83% had on Right Side. In Group PFN, 39.13% had Injury on Left Side and 60.87% had on Right Side.
4. In Group DHS, Mode of Injury was RTA in 4.35%, Self-Fall in 21.74% and Trivial Fall in 73.91%. In Group PFN, Mode of Injury was RTA in 26.09%, and Self Fall in 73.91%.
5. In Group DHS, 26.09% had Type -1, 56.52% had Type – 2, 8.70% had Type – 3 and 8.70% had Type – 4. In Group PFN, 39.13% had Type -1, 34.78% had Type – 2, 21.74% had Type – 3 and 4.35% had Type – 4.
6. The above factors such as age, gender, side of injury, mode of injury and Type of Fracture were matched to eliminate Selection bias.
7. Harris Hip score: Mean 6 weeks score in Group DHS was 34.43 ± 3.23 and in Group PFN was 34.35 ± 2.5. There was no significant difference in mean 6 weeks comparison between two groups.

Mean 12 weeks score in Group DHS was 54.65 ± 2.69 and in Group PFN was 62.17 ± 5.99. There was a significant difference in mean 12 weeks comparison between two groups.

Mean 24 weeks score in Group DHS was 84.3 ± 7.68 and in Group PFN was 89.26 ± 6.53. There was a significant difference in mean 24 weeks comparison between two groups.

8. Functional outcome:

In Group DHS, Results were Excellent in 34.78%, Fair in 17.39%, Good in 43.48% and Poor in 4.35%. In Group PFN, Results were Excellent in 56.52%, Fair in 8.70% and Good in 34.78%.

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ANNEXURE

ANNEXURES-I- IMPLANTS

DYNAMIC HIP SCREW SYSTEM

Richard's Compression Screw

Cortical Screws

Barrel Side Plate- 135°

135° Fixed Angle Guide

Threaded Guide Wires

Triple Reamer

Richard's Screw Tap

Richard's Screw Insertion Wrench

Bone Awl and The Proximal Locking Drill Bits

PFN Jig and The Nail

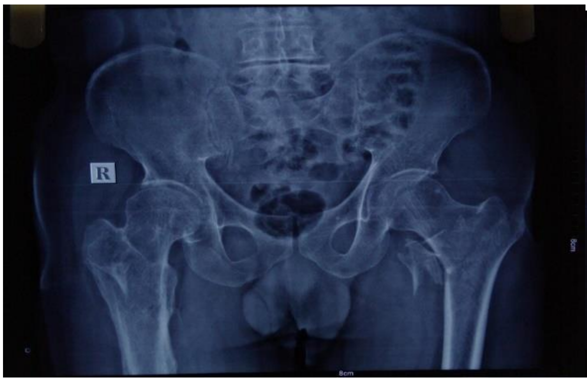
Mallet And the Proximal Locking Screws

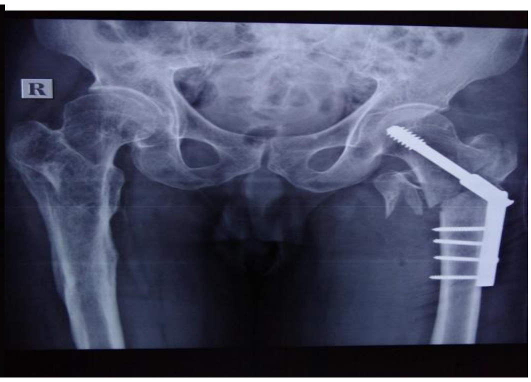
Proximal Rigid Reamer and The Drill and Reaming Gun Set

Short Proximal Femoral Nails and Cortical Screws

Drill Sleeves, Drill Bits and Guide Wire Jig, Screw Drivers and Conical Bolt

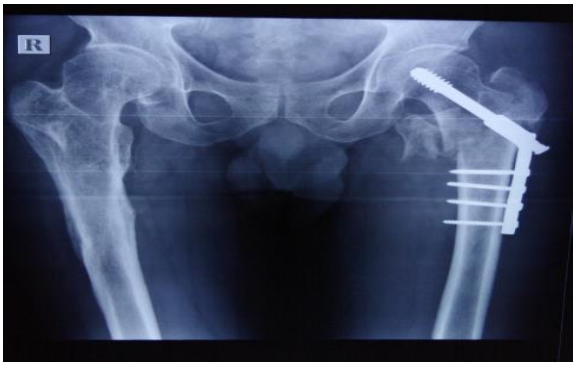
DHS Case 6 Images:





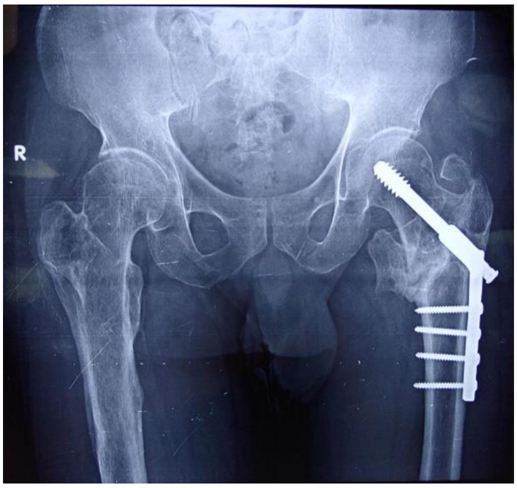
PRE OP

POST OP



6 WEEKS

12 WEEKS



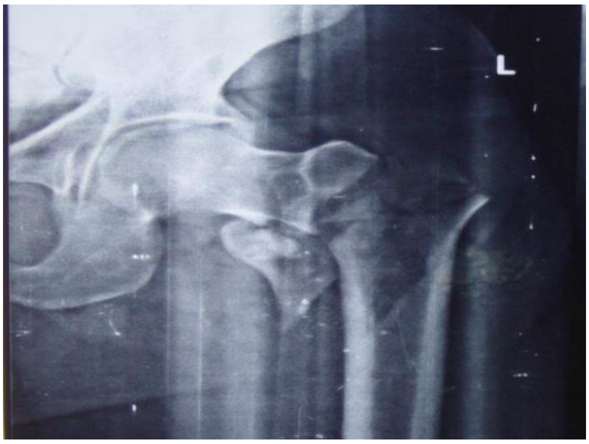
24 WEEKS

FLEXION **ADDUCTION**

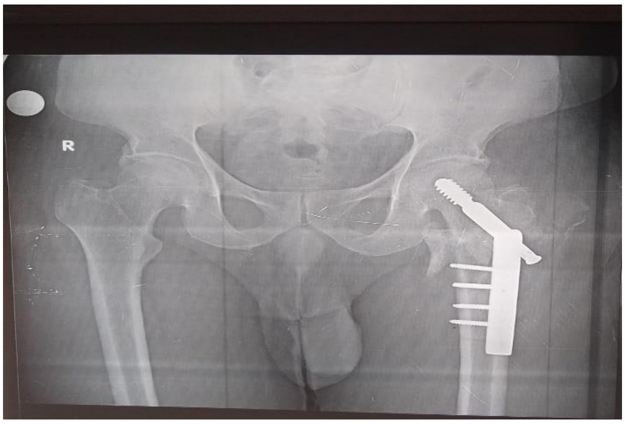
ABDUCTION **SITTING CROSS LEGGED**

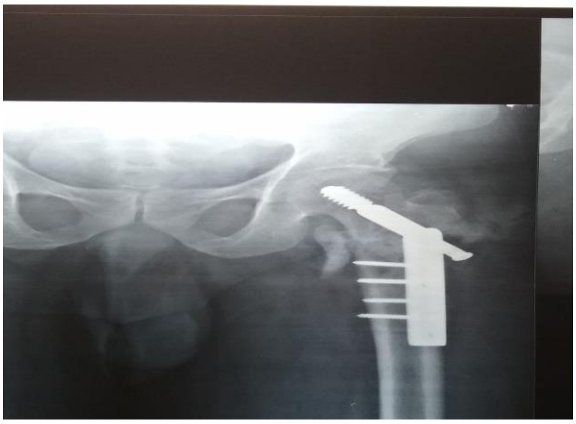
CASE 6 CLINICAL IMAGES

DHS Case 18 Images:

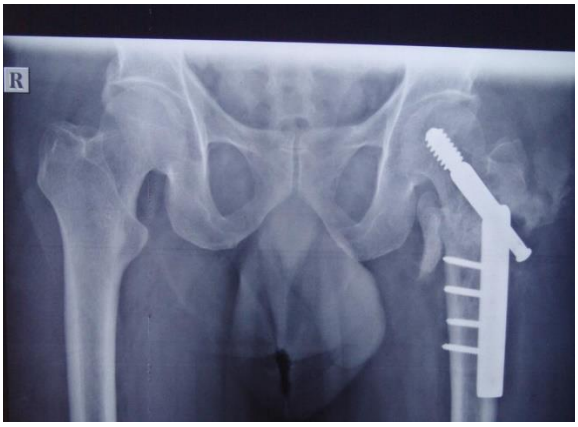


PRE OP **POST OP**





6 WEEKS **12 WEEKS**



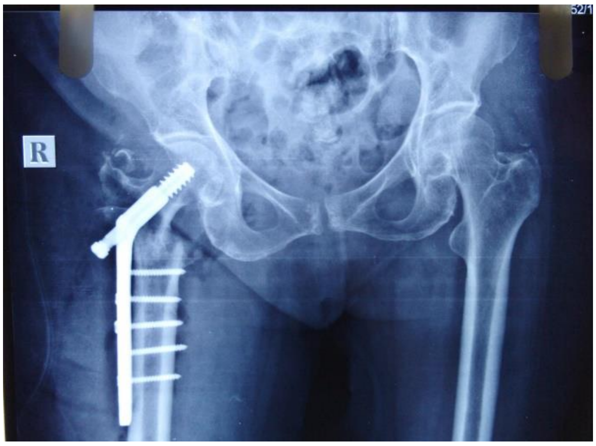
24 WEEKS

STRAIGHT LEG RAISING **FLEXION**

ABDUCTION **ADDUCTION**

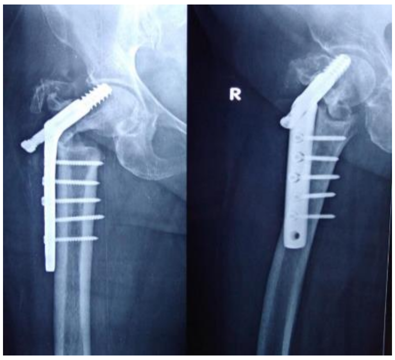
CASE 18 CLINICAL IMAGES

DHS Case 20 Images:



PRE OP **POST OP**

6 WEEKS **12 WEEKS**



24 WEEKS

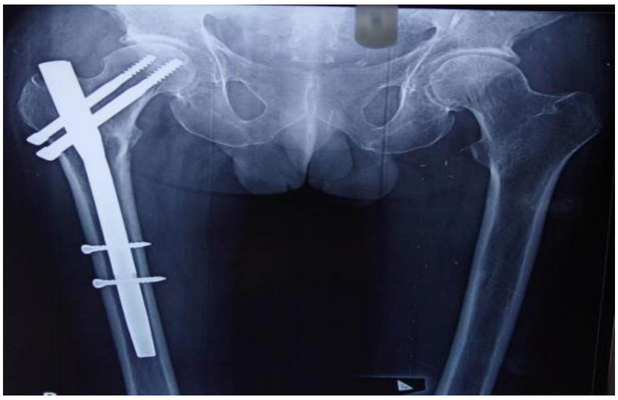
STRAIGHT LEG RAISING **SCAR**

ABDUCTION **ADDUCTION**

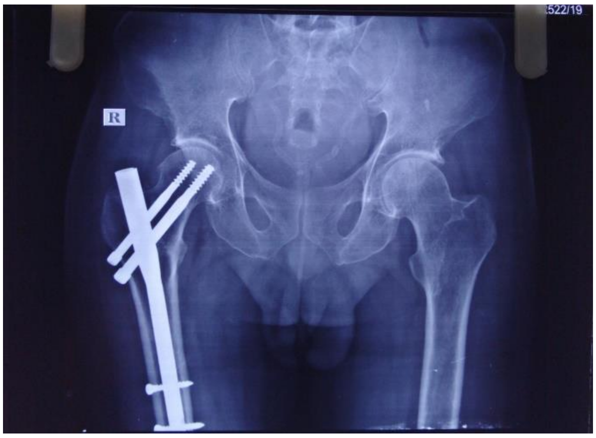
CASE 20 CLINICAL IMAGES

PFN Case 8 Images:

PRE OP **POST OP**



6 WEEKS **12 WEEKS**



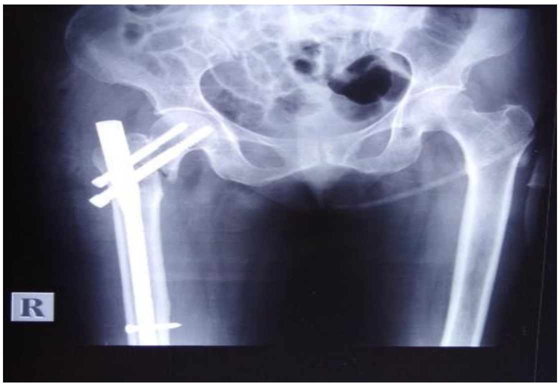
24 WEEKS

FLEXION **CROSS LEGGED**

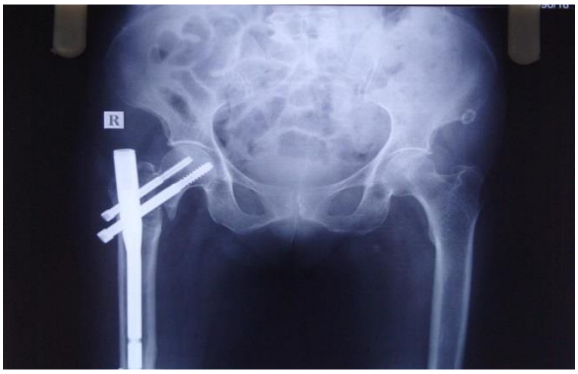
EXTERNAL ROTATION **INTERNAL ROTATION**

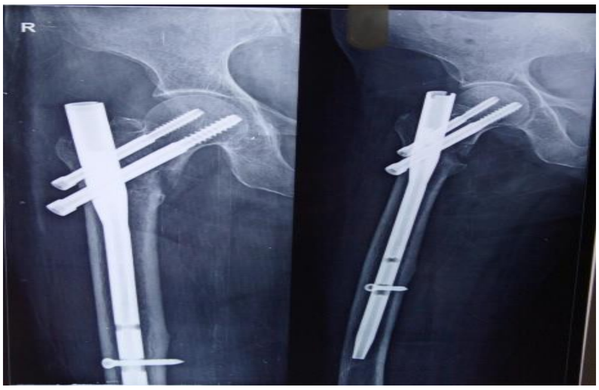
CASE 8 CLINICAL IMAGES

PFN Case 14 Images:

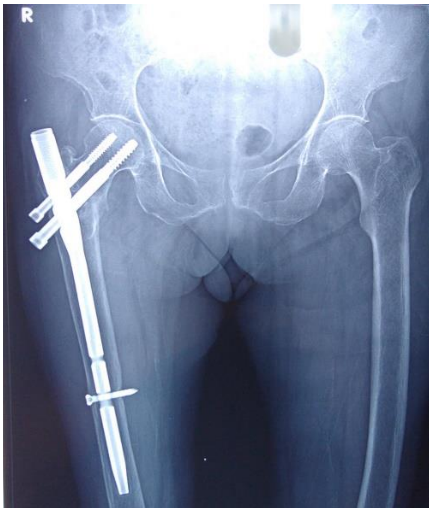


PRE OP **POST OP**





6 WEEKS **12 WEEKS**



24 WEEKS

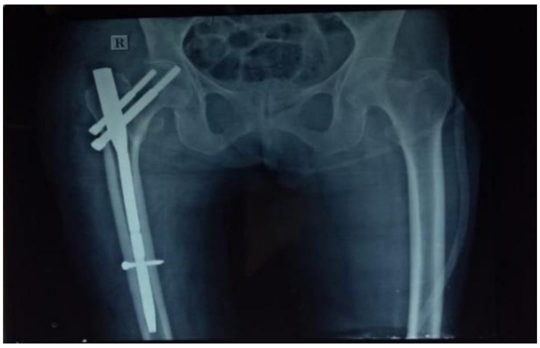
STRAIGHT LEG RAISING **FLEXION**

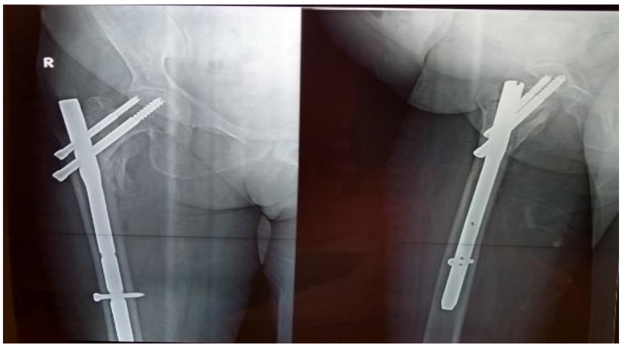
ABDUCTION **ADDUCTION**

CASE 14 CLINICAL IMAGES

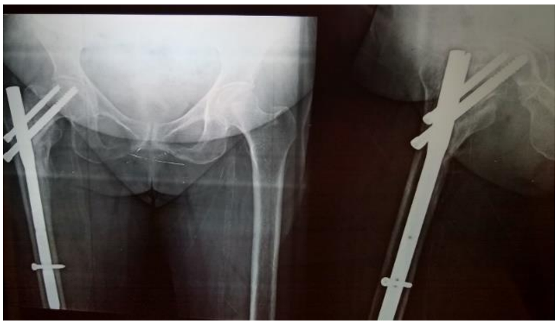
PFN Case 21 Images:

PRE OP **POST OP**





6 WEEKS **12 WEEKS**



24 WEEKS

ABDUCTION

ADDUCTION

STRAIGHT LEG RAISING

CASE 21 CLINICAL IMAGES

ANNEXURES-II

SRI DEVARAJ URS ACADEMY OF HIGHER EDUCATION AND RESEARCH
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PROFORMA

1. **BASIC DATA**

Name:

Age/Gender:

Address:

Occupation:

Mobile No:

Date of Admission/OP:

Date of Procedure:

HISTORY

Pain: Location – over the hip joint

Mode of injury: RTA /trivial fall

Duration of symptoms:

Involvement of other joints:

Preexisting systemic illness

Diabetes / TB/ Hypertension/bronchial asthma /epilepsy /others

Treatment history of present illness

Previous medical/ surgical history:

NSAID's / drugs

2. **LOCAL EXAMINATION:**

Attitude of limb: flexion/ abduction/ external rotation/ lateral border of foot touching the couch / apparent limb shortening

Tenderness: present at ___________

Movements at hip joint:

Flexion: Extension:

Abduction: Adduction:

External Rotation: Internal Rotation:

Active knee, ankle, toe movements:

Distal pulsations and sensations:

NVD

3. INVESTIGATIONS

DATE	**Hb: g/dl**	**WBC: T/mm³**	**PLT: l/mm³**	**BU: mg/dl**	**SC; mg/dl**	**Na+: mEq/L**	**K+: mEq/L**	**RBS: mg/dl**

HIV, HBsAg:

X-ray pelvis with bilateral hip – Antero posterior and lateral view:

OTHERS:

4. DIAGNOSIS:

5. TREATMENT

CRIF/ORIF + DHS/PFN

Antibiotics as per orthopedics department antibiotic policy

NSAID's

6. POST PROCEDURE

Observation in post-operative ward

Limb elevation

Antibiotics as per orthopaedics department antibiotic policy

NSAID's

7. TIME OF DISCHARGE:

ROM assessment

Overall functional assessment according to modified Harris hip score Score

8. FOLLOW UP: HARRIS HIP SCORE

HARRIS HIP SCORE	6 WEEKS	12 WEEKS	24 WEEKS
PAIN			
GAIT: LIMP			
SUPPORT			
DISTANCE WALKED			
STAIRS			
SOCKS/SHOES			
SITTING			
PUBLIC TRANSPORTATION			
ABSENCE OF DEFORMITY			
RANGE OF MOTION			
TOTAL SCORE			

Total points: <70- poor 70-79-fair 80-89-good 90-100-excellent

Outcome:

Harris Hip Score

Hip ID:	
Study Hip: ☐ Left ☐ Right	
Examination Date (MM/DD/YY): / /	
Subject Initials: |____|____|____|	
Medical Record Number:	

Interval: ______________

Harris Hip Score

Pain *(check one)*

☐ 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 concession to pain. Some limitation of ordinary activity or work. May require Occasional pain medication 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 time (5)
☐ One crutch (3)
☐ Two canes (2)
☐ Two crutches or not able to walk (0)

Distance Walked

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

Sitting

☐ Comfortably in ordinary chair for one hour (5)
☐ On a high chair for 30 minutes (3)
☐ Unable to sit comfortably in any chair (0)

Enter public transportation

☐ Yes (1)
☐ No (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)

Absence of Deformity (All yes = 4; Less than 4 =0)

Less than 30° fixed flexion contracture	☐ Yes	☐ No
Less than 10° fixed abduction	☐ Yes	☐ No
Less than 10° fixed internal rotation in extension	☐ Yes	☐ No
Limb length discrepancy less than 3.2 cm	☐ Yes	☐ No

Range of Motion (**indicates normal*)

Flexion (*140°) ________
Abduction (*40°) ________
Adduction (*40°) ________
External Rotation (*40°) ________
Internal Rotation (*40°) ________

Range of Motion Scale

211° - 300° (5)	61° - 100 (2)
161° - 210° (4)	31° - 60° (1)
101° - 160° (3)	0° - 30° (0)

Range of Motion Score ____________

Total Harris Hip Score ____________

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PATIENT INFORMATION SHEET

Study title: A prospective comparative study of functional outcome of Dynamic hip screw and Proximal femoral nailing for intertrochanteric fractures of the femur.

Study site: R.L Jalappa hospital, Tamaka, Kolar.

Aim- To assess the functional outcome of the DHS and PFN for the treatment of Intertrochanteric hip fractures using Harris hip score.

Patient with intertrochanteric facture of femur will be selected. Please read the following information and discuss with your family members. You can ask any question regarding the study. If you agree to participate in this study, we will collect information (as per Performa) from you. Routine and Relevant blood investigations, radiological investigation will be carried out if required. This information collected will be used for dissertation and publication only. All information collected from you will be kept confidential and will not be disclosed to any outsider. Your identity will not be revealed. This Study has been reviewed by the Institutional Ethics Committee and you are free to contact the member of the Institutional Ethics Committee. There is no compulsion to agree to this study. The care you get will not Change if you don't wish to participate. Patient has the liberty to withdraw from the study participation anytime without any reason. You are required to sign/ provide thumb impression only if you voluntarily agree to participate in this study.

For any further clarification you can contact the study investigator:

Dr. Anil Kumar p
Mobile no: 8553664578, 9986156466
E-mail id: anilprakashvenom@gmail.com

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ರೋಗಿಯ ಮಾಹಿತಿ ಹಾಳೆ

ಅಧ್ಯಯನದ ಶೀರ್ಷಿಕೆ: ಫೆಮರ ಇಂಟಟ್ರೊಕಾಂಟೆರಿಕ್ ಮುರಿತಗಳಿಗೆ ಡೈನಾಮಿಕ್ ಹಿಪ್ ಸ್ಕ್ರೂ ಮತ್ತು ಪ್ರಾಕ್ಸಿಮಲ್ ತೊಡೆಯೆಲುಬಿನ ನೀಲ್ ಕ್ರಿಯಾತ್ಮಕ ಫಲಿತಾಂಶದ ನಿರೀಕ್ಷಿತ ತುಲನಾತ್ಮಕ ಅಧ್ಯಯನ.

ಅಧ್ಯಯನದ ಸ್ಥಳ: ಆರ್.ಎಲ್ ಜಲಪ್ಪ ಆಸ್ಪತ್ರೆ, ತಮಕ, ಕೋಲಾರ.

ಗುರಿ- ಹ್ಯಾರಿಸ್ ಹಿಪ್ ಸ್ಕೋರ್ ಬಳಸಿ ಇಂಟಟ್ರೊಕಾಂಟೆರಿಕ್ ಹಿಪ್ ಮುರಿತದ ಚಿಕಿತ್ಸೆಗಾಗಿ ಡಿಹೆಚ್ಎಸ್ ಮತ್ತು ಪಿಎಫ್ಎನ್‌ನ ಕ್ರಿಯಾತ್ಮಕ ಫಲಿತಾಂಶವನ್ನು ನಿರ್ಣಯಿಸುವುದು.

ಫೆಮರ ಇಂಟಟ್ರೊಕಾಂಟೆರಿಕ್ ಅಸ್ಥಿಬಂಧ / ಮುರಿಥಾ ಹೊಂದಿರುವ ರೋಗಿಯನ್ನು ಆಯ್ಕೆ ಮಾಡಲಾಗುತ್ತದೆ. ದಯವಿಟ್ಟು ಈ ಕೆಳಗಿನ ಮಾಹಿತಿಯನ್ನು ಓದಿ ಮತ್ತು ನಿಮ್ಮ ಕುಟುಂಬ ಸದಸ್ಯರೊಂದಿಗೆ ಚರ್ಚಿಸಿ ತಿರ್ಮನಾ ತೆಗುಧುಕೊಲ್ಲಾಬಹುಧು. ಇ ಅಧ್ಯಯನಕ್ಕೆ ಸಂಬಂಧಿಸಿದಂತೆ ನೀವು ಯಾವುದೇ ಪ್ರಶ್ನೆಯನ್ನು ಕೇಳಬಹುದು. ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸಲು ನೀವು ಒಪ್ಪಿದರೆ ನಾವು ನಿಮ್ಮಿಂದ ಮಾಹಿತಿಯನ್ನು ಸಂಗ್ರಹಿಸುತ್ತೇವೆ (ಪ್ರದರ್ಶನದ ಪ್ರಕಾರ). ನಿಯತಕ್ರಮ (ಸಿಬಿಸಿ, ಸಿಆರ್‌ಪಿ, ದಿನಚರಿ ತನಿಖೆ) ಮತ್ತು ಸಂಬಂಧಿತ ರಕ್ತ ಪರೀಕ್ಷೆ, ಅಗತ್ಯವಿದ್ದರೆ ವಿಕಿರಣ ಶಾಸ್ತ್ರದ ತನಿಖೆ ನಡೆಸಲಾಗುವುದು. ಸಂಗ್ರಹಿಸಿದ ಈ ಮಾಹಿತಿಯನ್ನು ಪ್ರಬಂಧ ಮತ್ತು ಪ್ರಕಟಣೆಗೆ ಮಾತ್ರ ಬಳಸಲಾಗುತ್ತದೆ. ನಿಮ್ಮಿಂದ ಸಂಗ್ರಹಿಸಲಾದ ಎಲ್ಲಾ ಮಾಹಿತಿಯನ್ನು ಗುಪ್ತಾವಾಗಿಡಲಾಗುತ್ತದೆ ಮತ್ತು ಯಾವುದೇ ಹೊರಗಿನವರಿಫೆ ಯಾರಿಗು ಬಹಿರಂಗಪಡಿಸುವುದಿಲ್ಲ. ನಿಮ್ಮ ಗುರುತು ಬಹಿರಂಗಗೊಳ್ಳುವುದಿಲ್ಲ. ಸಾಂಸ್ಥಿಕ ನೈತಿಕ ಸಮಿತಿಯು ಇ ಅಧ್ಯಯನವನ್ನು ಪರಿಶೀಲಿಸಿದೆ ಮತ್ತು ಅಗತ್ಯವಿಧಲ್ಲಿ ನೀವು ಸಾಂಸ್ಥಿಕ ನೈತಿಕ ಸಮಿತಿಯ ಸದಸ್ಯರನ್ನು ಸಂಪರ್ಕಿಸಲು ಮುಕ್ತರಗಿರುತಿರಾ. ಈ ಅಧ್ಯಯನವನ್ನು ಒಪ್ಪಿಕೊಳ್ಳಲು ಯಾವುದೇ ಬಲವಂತವಿಲ್ಲ. ನೀವು ಈಧರ ಭಗ್ಗೇ ಯವುಧೆ ರಿಧಿಯಾ. ಕಾಳಜಿ ಪಡೆಯುವ ಅಗತ್ಯವಿಲ್ಲ.

ನೀವು ಇ ಅದ್ಯನಾಧಲ್ಲಿ ಭಾಗವಹಿಸಲು ಬಯಸದಿದ್ದರೆ ಯವುಧೆ ಸಮಯ ಡಲ್ಲಿ ಹೊರಾಫೆ ಹೊಗಾಬಹುಧು . ಯಾವುದೇ ಪುನರಾವರ್ತನೆಯಿಲ್ಲದೆ ಯಾವುದೇ ಸಮಯದಲ್ಲಿ ಅಧ್ಯಯನ ಭಾಗವಹಿಸುವಿಕೆಯಿಂದ ಹಿಂದೆ ಸರಿಯುವ ಸ್ವಾತಂತ್ರ್ಯ ರೋಗಿಗೆ ಇದೆ .ಈ ಅಧ್ಯಯನದಲ್ಲಿ ಭಾಗವಹಿಸಲು ನೀವು ಸ್ವಯಂಪ್ರೇರಣೆಯಿಂದ ಒಪ್ಪಿಕೊಂಡರೆ ಮಾತ್ರ ನಿಮ್ಮ ಹೆಬ್ಬೆರಳು ಗುರುತಿನಾ ಸಹಿ ಪಡೇಯ ಬಹುದಾಗಿಧೆ.

ಯಾವುದೇ ಹೆಚ್ಚಿನ ಸ್ಪಷ್ಟೀಕರಣಕ್ಕಾಗಿ ನೀವು ಅಧ್ಯಯನ ತನಿಖಾಧಿಕಾರಿಯನ್ನು ಸಂಪರ್ಕಿಸಬಹುದು:
ಡಾ.ಅನಿಲ್ ಕುಮಾರ್ ಪಿ
ಮೊಬೈಲ್ ಸಂಖ್ಯೆ: 8553664578, 9986156466
ಇ-ಮೇಲ್ ಐಡಿ: anilprakashvenom@gmail.com

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TAMAKA, KOLAR-563103

INFORMED CONSENT FORM

- I, ____ aged _____________ ,after being explained in my own vernacular language about the purpose of the study and the risks and complications of the surgery, hereby give my valid written informed consent without any force or prejudice for closed reduction/ Open reduction and internal fixation with DHS/PFN, which is a operation to be performed on me under any anesthesia deemed fit. The nature and risks involved in the procedure (surgical and anesthesia) have been explained to me to my satisfaction.
  I have been explained in detail about the Clinical Research on "A prospective comparative study of functional outcome of dynamic hip screw and proximal femoral nailing for intertrochanteric fractures of the femur" being conducted. I have read the patient information sheet and I have had the opportunity to ask any question. Any question that I have asked, have been answered to my satisfaction. I consent voluntarily to participate as a participant in this research. I hereby give consent to provide my history, undergo physical examination, undergo the surgery, undergo investigations and provide its results and documents etc to the doctor / institute etc.
  For academic and scientific purpose, the operation / procedure, etc may be video graphed or photographed. All the data may be published or used for any academic purpose. I will not hold the doctors / institute etc responsible for any untoward consequences during the procedure / study.
  A copy of this Informed Consent Form and Patient Information Sheet has been provided to the participant

(Signature & Name of Pt. Attendant) (Signature/Thumb impression & Name of patient)

(Relation with patient) ---------

Witness: ---------------------------

(Signature & Name of Research person /doctor) -------------

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TAMAKA, KOLAR-563103

ತಿಳವಳಿಕೆಯ ಸಮ್ಮಿತಿ ನಮೂನೆ

ಕ್ರಮ ಸಂಖ್ಯೆ: ದಿನಾಂಕ:

ಆಸ್ಪತ್ರೆ ಸಂಖ್ಯೆ:

ಹೆಸರು:

ನಾನು, ________________ ವಯಸ್ಸಿನ ______________, ಕನ್ನಡ ಭಾಷೆಯಲ್ಲಿ ವಿವರಿಸಲ್ಪಟ್ಟ ನಂತರ ಅಧ್ಯಯನದ ಉದ್ದೇಶ ಮತ್ತು ಕಾರ್ಯವಿಧಾನದ ತೊಂದರೆಗಳು ಮತ್ತು ತೊಡಕುಗಳ ಬಗ್ಗೆ ವಿವರಿಸಿದ ನಂತರ, ಮುಚ್ಚಿದ ಕಡಿತ ಮತ್ತು ಆಂತರಿಕ ಸ್ಥಿರೀಕರಣ / ಓಪನ್ನ ಯಾವುದೇ ಬಲದ ಅಥವಾ ಪೂರ್ವಾಗ್ರಹವಿಲ್ಲದೆ ನನ್ನ ಮಾನ್ಯವಾದ ಲಿಖಿತ ವಿರೋಧಿ ಸಮ್ಮತಿಯನ್ನು ನೀಡಿ ನನ್ನ ಮೇಲೆ ನಡೆಸಬೇಕಾದ ರೋಗ ವಿಧಾನ ಮತ್ತು / ಅಥವಾ ಚಿಕಿತ್ಸಕ ಪ್ರಕ್ರಿಯೆ / ವರ್ಗಾವಣೆ / ಕಾರ್ಯಾಚರಣೆ ಅಥವಾ ಯಾವುದೇ ಅರಿವಳಿಕೆ ಅಡಿಯಲ್ಲಿ __ ಡೈನಾಮಿಕ್ ಹಿಪ್ ಸ್ಕ್ರೂ / ಪ್ರಾಕ್ಸಿಮಲ್ ಫೆಮರಲ್ ನೈಲಿಂಗ್ ಸಂಪ್ರದಾಯವಾದಿ ನಿರ್ವಹಣೆಗೆ ಒಳಪಡಿಸುವುದು ಯೋಗ್ಯವಾದವು. ಕಾರ್ಯವಿಧಾನದಲ್ಲಿ (ಶಸ್ತ್ರಚಿಕಿತ್ಸಾ ಮತ್ತು ಅನಾಸ್ಥೆಟಿಕ) ಒಳಗೊಂಡಿರುವ ಸ್ವಭಾವ ಮತ್ತು ಅಪಾಯಗಳು ನನ್ನ ತೃಪ್ತಿಗೆ ನನಗೆ ಅರ್ಥವಗುವಾ ಭಾಷೆಯಲ್ಲಿ ವಿವರಿಸಲಾಗಿದೆ. "ಎಲುಬಿನ ಇಂಟರ್ಟ್ರೊಚಾಂಟೆರಿಕ್ ಮುರಿತಗಳಿಗೆ ಡೈನಾಮಿಕ್ ಹಿಪ್ ಸ್ಕ್ರೂ ಮತ್ತು ಪ್ರಾಕ್ಸಿಮಲ್ ಫೆಮರಲ್ ನೈಲಿಂಗ್ ಶಸ್ತ್ರಚಿಕಿತ್ಸೆಯ ಫಲಿತಾಂಶದ ನಿರೀಕ್ಷಿತ ತುಲನಾತ್ಮಕ ಅಧ್ಯಯನ " ಕುರಿತು (ಕ್ಲಿನಿಕಲ್ ರಿಸರ್ಚ್) ನಾನು ವಿವರಿಸಿದ್ದೇನೆ. ನಾನು ರೋಗಿಯ ಮಾಹಿತಿ ಹಾಳೆಯನ್ನು ಓದಿದ್ದೇನೆ ಮತ್ತು ಯಾವುದೇ ಪ್ರಶ್ನೆ ಕೇಳಲು ನನಗೆ ಅವಕಾಶವಿದೆ. ನಾನು ಕೇಳಿದ ಯಾವುದೇ ಪ್ರಶ್ನೆಯನ್ನು ನನ್ನ ತೃಪ್ತಿಗೆ ಅನುಗುನವಗಿ ಉತ್ತರ ಮಾಡಲಾಗಿದೆ. ಈ ಸಂಶೋಧನೆಯಲ್ಲಿ ಪಾಲ್ಗೊಳ್ಳುವವರಾಗಿ ಭಾಗವಹಿಸಲು ನಾನು ಸ್ವಯಂಪ್ರೇರಣೆಯಿಂದ ಸಮ್ಮತಿಸುತ್ತೇನೆ. ನನ್ನ ಇತಿಹಾಸವನ್ನು ಒದಗಿಸಲು, ದೈಹಿಕ ಪರೀಕ್ಷೆಗೆ ಒಳಗಾಗಲು, ಇಂಜೆಕ್ಷನ್ ಪ್ರಕ್ರಿಯೆಗೆ ಒಳಗಾಗಲು, ತನಿಖೆಗೆ ಒಳಗಾಗಬೇಕು ಮತ್ತು ಅದರ ಫಲಿತಾಂಶಗಳು ಮತ್ತು ದಾಖಲೆಗಳನ್ನು ವೈದ್ಯರಿಗೆ / ಇನ್ಸ್ಟಿಟ್ಯೂಟ್ಗೆ ನೀಡುವಂತೆ ನಾನು ಒಪ್ಪಿಗೆ ನೀಡುತ್ತೇನೆ.

ಶೈಕ್ಷಣಿಕ ಮತ್ತು ವೈಜ್ಞಾನಿಕ ಉದ್ದೇಶಕ್ಕಾಗಿ ಕಾರ್ಯಾಚರಣೆ / ವಿಧಾನ, ಇತ್ಯಾದಿ ವೀಡಿಯೊಗ್ರಾಫ್ ಛಾಯಾಚಿತ್ರ ಮಾಡಬಹುದು. ಎಲ್ಲಾ ವಿವರನೇಗಲನ್ನು ಯಾವುದೇ ಶೈಕ್ಷಣಿಕ ಉದ್ದೇಶಕ್ಕಾಗಿ ಪ್ರಕಟಿಸಬಹುದು ಅಥವಾ ಬಳಸಬಹುದು. ಕಾರ್ಯವಿಧಾನ / ಅಧ್ಯಯನದ ಸಮಯದಲ್ಲಿ ಯಾವುದೇ

ಕೆಟ್ಟ ಪರಿಣಾಮಗಳಿಗೆ ನಾನು ವೈದ್ಯರು / ಇನ್ಸ್ಟಿಟ್ಯೂಟ್ ಇತ್ಯಾದಿಗಳನ್ನು ಹೊನಾಯೋಗಿಸಿರುವುದಿಲ್ಲ.

ಈ ಮಾಹಿತಿಯುಕ್ತ ಸಮ್ಮತಿಯ ಫಾರ್ಮ್ ಮತ್ತು ರೋಗಿಯ ಮಾಹಿತಿ ಹಾಳೆಯನ್ನು ಪ್ರತಿಸ್ಪರ್ಧಿಗೆ ಒದಗಿಸಲಾಗಿದೆ.

_________________________ _________________________________

(ರೋಗಿಯಪರಿಚಾರಕನ ಸಹಿ & ಹೆಸರು) (ರೋಗಿಯ /ರಕ್ಷಕಸಹಿ /ಹೆಬ್ಬೆಟ್ಟಿನಗುರುತು&ಹೆಸರು)

(ರೋಗಿಯಸಂಬಂಧ)

(ಸಂಶೋಧಕನ / ವೈದ್ಯರಸಹಿ&ಹೆಸರು)

ಸಾಕ್ಷಿ : _________________________

(ಸಹಿ ಮತ್ತು ಸಂಶೋಧನಾ ವ್ಯಕ್ತಿ / ವೈದ್ಯರ ಹೆಸರು) : __________________

KEY TO MASTER CHART

DOS= DATE OF SURGERY

UHID= UNIQUE IDENTIFICATION NUMBER

MODE OF INJURY = SELF FALL OR RTA

TYPE OF INJURY = BOYD AND GRIFFITH CLASSIFICATION

RESULT = EXCELLENT/GOOD/FAIR/POOR

MASTER CHART

DHS

SL NO	NAME	AGE	SEX	UHID	DOS	SIDE	MODE OF INJURY	Follow up 6weeks	Follow up 12weeks	Follow up 24weeks	Type of fracture	HARRIS HIP SCORE (/100)	RESULT
1	CASE -1	75	MALE	802653	26/12/2019	LEFT	TRIVIAL FALL	38	59	90	TYPE-2	90	EXCELLENT
2	CASE -2	85	FEMALE	784141	28/10/2019	RIGHT	SELF FALL	30	59	92	TYPE-4	92	EXCELLENT
3	CASE -3	48	MALE	808499	6/1/2020	LEFT	TRIVIAL FALL	32	59	89	TYPE-2	89	GOOD
4	CASE -4	55	MALE	864020	8/9/2020	RIGHT	TRIVIAL FALL	32	55	86	TYPE-2	86	GOOD
5	CASE -5	46	FEMALE	700114	8/4/2020	LEFT	TRIVIAL FALL	33	53	87	TYPE -1	87	GOOD
6	CASE -6	52	MALE	848924	14/11/2019	LEFT	TRIVIAL FALL	37	52	90	TYPE-2	90	EXCELLENT
7	CASE -7	45	FEMALE	866914	31/12/2019	RIGHT	SELF FALL	37	52	76	TYPE-4	76	FAIR
8	CASE -8	75	FEMALE	871122	10/1/2020	RIGHT	TRIVIAL FALL	38	56	90	TYPE -1	90	EXCELLENT
9	CASE -9	65	FEMALE	835665	10/1/2020	LEFT	TRIVIAL FALL	34	53	88	TYPE -1	88	GOOD
10	CASE -10	75	FEMALE	869364	14/01/2020	LEFT	TRIVIAL FALL	37	52	78	TYPE-3	78	FAIR
11	CASE -11	65	MALE	875705	21/02/2020	LEFT	SELF FALL	33	50	87	TYPE-2	87	GOOD
12	CASE -12	60	FEMALE	775648	28/02/2020	LEFT	SELF FALL	38	53	75	TYPE -1	75	FAIR
13	CASE -13	55	FEMALE	892510	15/03/2020	LEFT	TRIVIAL FALL	37	51	90	TYPE-2	90	EXCELLENT
14	CASE -14	62	FEMALE	898128	25/03/2020	RIGHT	TRIVIAL FALL	40	55	87	TYPE-2	87	GOOD
15	CASE -15	79	FEMALE	735655	10/10/2019	RIGHT	TRIVIAL FALL	39	54	74	TYPE-2	74	FAIR
16	CASE -16	45	MALE	869172	15/04/2020	RIGHT	TRIVIAL FALL	28	57	92	TYPE-2	92	EXCELLENT
17	CASE -17	62	MALE	878852	22/04/2020	RIGHT	SELF FALL	35	55	83	TYPE -1	83	GOOD
18	CASE -18	65	FEMALE	864952	25/05/2020	RIGHT	RTA BIKE	33	53	90	TYPE -1	90	EXCELLENT
19	CASE -19	50	FEMALE	894612	16/06/2020	LEFT	TRIVIAL FALL	34	57	84	TYPE-2	84	GOOD
20	CASE -20	67	FEMALE	87985	24/06/2020	LEFT	TRIVIAL FALL	33	53	90	TYPE-2	90	EXCELLENT
21	CASE -21	54	MALE	899623	19/08/2020	LEFT	TRIVIAL FALL	32	55	81	TYPE-2	81	GOOD
22	CASE -22	50	MALE	854632	21/09/2020	RIGHT	TRIVIAL FALL	32	59	80	TYPE-2	80	GOOD
23	CASE -23	70	FEMALE	89684	12/12/2020	RIGHT	TRIVIAL FALL	30	55	60	TYPE-3	60	POOR

PFN

SL NO	CASE	AGE	SEX	UHID	DOS	SIDE	MODE OF INJURY	Follow up 6weeks	Follow up 12weeks	Follow up 24weeks	Type of injury	HARRIS HIP SCORE (/100)	RESULT
1	CASE-1	50	MALE	752411	14/8/2019	RIGHT	SELF FALL	34	63	96	TYPE-1	96	EXCELLENT
2	CASE-2	73	MALE	757525	23/8/2019	LEFT	SELF FALL	36	61	93	TYPE-3	93	EXCELLENT
3	CASE-3	75	FEMALE	765769	23/9/2019	LEFT	SELF FALL	32	61	80	TYPE-1	80	GOOD
4	CASE-4	70	FEMALE	774926	4/10/2019	LEFT	SELF FALL	36	62	89	TYPE-1	89	GOOD
5	CASE-5	85	FEMALE	787235	7/11/2019	LEFT	SELF FALL	37	65	81	TYPE-2	81	GOOD
6	CASE-6	92	FEMALE	822119	4/2/2020	LEFT	SELF FALL	36	65	95	TYPE-3	95	EXCELLENT
7	CASE-7	75	MALE	824977	13/2/20	LEFT	SELF FALL	32	62	97	TYPE-1	97	EXCELLENT
8	CASE-8	41	MALE	827619	17/2/20	RIGHT	RTA	34	63	93	TYPE-2	93	EXCELLENT
9	CASE-9	60	FEMALE	827158	19/2/20	RIGHT	SELF FALL	35	62	84	TYPE-2	84	GOOD
10	CASE-10	60	MALE	827197	19/2/20	RIGHT	SELF FALL	35	62	86	TYPE-2	86	GOOD
11	CASE-11	92	FEMALE	835567	13/3/20	RIGHT	SELF FALL	29	42	78	TYPE-2	78	FAIR
12	CASE-12	42	MALE	866308	22/9/20	RIGHT	RTA	32	62	92	TYPE-1	92	EXCELLENT
13	CASE-13	50	MALE	870907	10/10/2020	RIGHT	RTA	34	66	95	TYPE-1	95	EXCELLENT
14	CASE-14	80	FEMALE	887502	7/1/2021	RIGHT	SELF FALL	37	51	74	TYPE-3	74	FAIR
15	CASE-15	72	MALE	895388	12/2/2021	RIGHT	SELF FALL	32	68	94	TYPE-1	94	EXCELLENT
16	CASE-16	65	MALE	898574	27/2/21	RIGHT	SELF FALL	37	68	95	TYPE-2	95	EXCELLENT
17	CASE-17	45	MALE	904405	22/3/21	RIGHT	RTA	37	66	89	TYPE-4	89	GOOD
18	CASE-18	65	FEMALE	906962	1/4/2021	LEFT	SELF FALL	34	63	82	TYPE-1	82	GOOD
19	CASE-19	75	FEMALE	909092	15/4/21	RIGHT	SELF FALL	36	63	93	TYPE-2	93	EXCELLENT
20	CASE-20	60	FEMALE	917123	20/5/21	LEFT	SELF FALL	36	67	94	TYPE-3	94	EXCELLENT
21	CASE-21	48	MALE	879406	26/11/2020	LEFT	RTA	38	68	87	TYPE-2	87	GOOD
22	CASE-22	65	FEMALE	813843	16/01/2020	RIGHT	SELF FALL	31	54	92	TYPE-1	92	EXCELLENT
23	CASE-23	55	MALE	812109	07/01/202	RIGHT	RTA	30	66	94	TYPE-3	94	EXCELLENT