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COMPARATIVE ANALYSIS OF FUNCTIONAL OUTCOME OF DYNAMIC HIP SCREW VERSUS PROXIMAL FEMORAL NAILING IN INTERTROCHANTERIC FRACTURES

Hemeshwar Harshwardhan[1], S K Bhaskar[2], Umesh Samria[3], Aswin G Ashok[4*]

[1,2]Senior Professor, Department of Orthopedics, J.L.N. Medical College and Hospital Ajmer Rajasthan
[3]Assistant Professor, Department of Orthopedics, J.L.N. Medical College and Hospital Ajmer Rajasthan
[4]Post graduate student, Department of Orthopedics, J.L.N. Medical College and Hospital Ajmer Rajasthan
***Corresponding author**
Aswin G Ashok, Post graduate student, Department of Orthopedics, J.L.N. Medical College and Hospital Ajmer Rajasthan
aswingashok@gmail.com

ABSTRACT

Aim: The aim of the present study was to comparatively analyze the functional outcome of dynamic hip screw versus proximal femoral nailing in intertrochanteric fractures.

Methods: A Hospital based prospective randomized comparative study was conducted and patients who were met the inclusion criteria and reported at Department of Orthopedics, JLN Medical College & Hospitals, Ajmer were included. 30 patients divided randomly among the two groups from November 2022 to December 2023.

Results: All of them belonged to the age group of 20-90. Most of them were a result of low velocity trauma. In our study 9 cases were results of road traffic accidents and 2 were due to fall from height.19 cases were a result of slip and fall. Out of the 30 patients selected from the study 20 were males and 10 were females. There were 17 cases with fracture over the left hip and 13 cases with fracture over the right hip. All fractures were classified according to Boyd and Griffin classification system. PFN had mean surgery duration of 90 minutes with a standard deviation of 17.76 minutes and DHS had a mean of 105 minutes and standard deviation of 12.74 minutes. There was no major difference in the time for union in both the groups and is not statistically significant.

Conclusion: DHS and the proximal femoral nail are two very effective surgical techniques for treating intertrochanteric femur fractures. Proximal femoral nail has an advantage over DHS in terms of less blood loss, shorter recovery times, earlier ambulation, and a lower rate of complications. Both of these methods produce results that are comparable in terms of functional outcomes (union of the fracture, return to functional activity, morbidity, and implant failure) and intraoperative parameters (total surgery duration, detailed intraoperative research regarding intraoperative blood loss and other intraoperative complication). Additionally, the PFN fared far better in terms of early walking capacity restoration in cases of unstable intratrochanteric fractures. Therefore, we believe that PFN, rather than DHS, may be a preferable fixation device for majority of the intertrochanteric fractures

Keywords: functional outcome, dynamic hip screw, proximal femoral nailing, intertrochanteric fractures

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1. INTRODUCTION

Intertrochanteric fractures are very common in the old age group, but infrequent in the younger age group. In intertrochanteric fractures treated conservatively which 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 the literature and used for the treatment of intertrochanteric fractures. Conservative treatment, however, resulted in a vicious callus with varus, external rotation with shortening resulting in the short limp gait of walking and a high mortality rate due to the complications when lying down and prolonged immobilization. The goal/aim for the treatment for intertrochanteric fractures will be to nearly restore pre-injury condition as early as possible. This has led to internal fixation to increase the patient comfort by facilitating nursing care, reducing hospitalization, early mobilization, and reducing complications.

High energy trauma causes intertrochanteric fractures in the younger population.[3] The main complications of not treating the trochanteric fractures adequately include the risk of both acute instability and mal-union with post-injury deformity. Intertrochanteric fractures increase the likelihood of vascular flow interruption to femoral head. Due to the pull of the muscles attached to the proximal fragment and the relatively high biomechanical stress placed on the sub-trochanteric region during normal weight bearing and ambulation, these fractures are particularly difficult to treat because of the higher risk of implant failure. Reducing the fracture and stabilizing with implants is the aim of treating such injuries in order to facilitate early mobilization and weight bearing throughout the healing process of fractures.[4]

Excellent outcomes have been obtained in many patients with simple intertrochanteric fracture using DHS/PFN. However, there are still a lot of unsolved problems regarding these implants' acceptability in unstable intertrochanteric fractures. Failure rates in unstable fracture patterns range from 8% to 25% and can reach upto 50% in the majority of unstable fractures.[5,6] The final result and any complications that may arise from the fracture and its fixation will depend on the type of implant that is used. Sliding plate devices and DHS are already often employed for fixation. However, if weight bearing is started too soon, especially in situations where there are complex and comminuted fractures, the implant may retract or pierce through the skull. The PFN is an intramedullary device which is often said to have helped with these fractures due to its position near the body's mechanical axis; this reduces the lever arm aspect on the implant. Additionally, they have very little blood loss during insertion, allow for early weight-bearing after surgery, and lessen the need for both short- and long-term follow-up.[7]

The aim of the present study was to comparatively analyze the functional outcome of dynamic hip screw versus proximal femoral nailing in intertrochanteric fractures.

2. MATERIALS AND METHODS

A Hospital based prospective randomized comparative study was conducted and patients who were met the inclusion criteria and reported at Department of Orthopedics, JLN Medical College & Hospitals, Ajmer were included. 30 patients divided randomly among the two groups from November 2022 to December 2023.

Inclusion criteria

- Age above 18 years
- Intertrochanteric fracture of femur

Exclusion Criteria

- Age <18 years

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- Medical contraindication for surgery
- Open fracture
- Patient refusal
- Pathological fracture

The study population was randomly divided into two groups with 15 patients each using computer generated table of random numbers

Group DHS (n=15): Fracture was managed by using of DHS

Group PFN (n=15): Fracture was managed by using of PFN

Protocol:

Proper history of the patient is taken, name, age, gender are recorded.

Mode of injury as well as time were noted. Proper clinical examinations were done to rule out any associated intrathoracic, intraabdominal or head injury. The limb affected was properly inspected to rule out any vascular or neurological injury. An AP and cross table lateral image of the affected proximal femur, as well as an anteroposterior radiograph of the pelvis, were acquired. In order to counteract the anteversion of the femoral neck, the affected leg was internally rotated by 15 degrees to obtain the true AP view. The affected side could be compared to the contralateral side using the AP view of the pelvis. To determine whether there is any posterior sag or comminution, a lateral image is acquired. An ipsilateral knee radiograph was acquired.

The injured leg was immobilized by employing skin tension with a 3 kg weight in order to reduce discomfort from the displaced fracture. To reduce the risk of surgery, all patients underwent medical evaluations for diabetes, heart disease, hypertension chronic obstructive pulmonary disease, cerebral vascular disease, and urinary tract infections prior to surgery. From the point of incision to the point of wound closure, the surgical time was recorded. The proforma that is included has all of the data pertaining to the patient's preoperative, intraoperative, and postoperative conditions as well as their follow-up at six, three, and six months. A record of every procedure-related issue was also kept.

Surgical Technique

The patient is placed supine on a fracture table, with the uninjured leg flexed and abducted at the hip in a well-leg holder, and a radiolucent, cushioned countertraction post between the patient's legs. Pad the peroneal nerve on the leg that is not injured in this position. A foot plate or boot fastened to the second leg extension of the fracture table supports the wounded leg. Prior to preparing for surgery, the sufficiency of the anteroposterior and correct lateral views should be confirmed.

Reduction technique:

Closed reduction by applying longitudinal traction, abduction and internal rotation. At the end, the limb should be 20 to 25 degrees abducted, and the foot should be 15 degrees internally rotated. It is recommended to obtain both lateral and anteroposterior X-rays. If the neck shaft angle is restored and the postero medial continuity is established, reduction is accepted.

Exposure

A straight lateral incision was made down the femur's shaft, two fingerbreadths below the vastus ridge and 5 cm distal. To draw the tensor fascia lata anteriorly, retract the cut fascial borders after cutting the fat and the underlying deep fascia. Take care to coagulate any perforating profunda femoris artery branches when splitting the vastus lateralis muscle along its longitudinal axis and lifting it away from the lateral intermuscular septum to disclose the bone.

Inserting the guide pin

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The angle at which the plate is utilized determines the level of insertion of the guiding pin. The proximal side of the osseous insertion of the gluteus maximus and the tip of the lesser trochanter, which are situated approximately 2 cm below the vastus lateralis ridge, can be used to estimate the level of entrance of a 135° angle plate. If a higher angle side plate is being used, move the entrance site 5 mm farther for every 5 degrees that the barrel angle is increased. Place the appropriate fixed-angle guide halfway on the lateral cortex so that the guide pin enters at the right level. The point where the subchondral bone and a line that passes through the middle of the femur intersect is known as the apex of the femur, and here is where the guiding pin should be aimed. Check the center position from the lateral and apex angles. By permitting a secure purchase and maximal screw collapse without coming into touch with the barrel, a central and deep location reduces the possibility of a mechanical fixation failure. In order to give unstable fractures some temporary stability—a reduction may be lost if the guide pin backs out after reaming—an additional parallel guide pin is introduced.

Reaming technique

After being introduced, the guiding pin serves as a derotational pin to prevent rotation of the proximal neck and head fragment during screw fixation and reaming. The channel in the head, neck, and lateral cortex is prepared for the side late barrel and lag screw using a power triple reamer. In order to prevent reaming from violating the subchondral bone in the femoral head, the reamer is set 5mm shorter than the measured lag screw length. After that, the triple reamer is advanced and withdrawn under fluoroscopic guidance to make sure the channel is reamed to the correct length, the guide pin is not withdrawn along with the reamer, and the guiding pin is not inadvertently advanced into the pelvis.

Selection of Lag Screw

A fully inserted Lag screw that matches the measured length will give 5 mm of fracture collapse or 5 mm of compression when the compression screw is used. A 5 mm shorter lag screw can provide an additional 5 mm of compression. The screw may not have enough covering inside the barrel if it is more than 10 mm shorter than the measuring gauge indicates. This can make it difficult for the screw to move freely inside the barrel.

Insertion of the plate and lag screw

To guarantee correct alignment, the cannulated lag screw is then placed over the guide pin using a T handle. Position the Lag screw using image intensification after advancing it to the desired level in the proximal femur. A 180° turn indicates a 1.5 mm advancement of the Lag screw. Verify the position and depth of the screw by using image intensification in both planes. Take off the T handle and slide the side plate onto the Lag screw shaft. Use the plate tamper to fully seat the plate. After that, the threaded guide pin is taken out.

Attachment of the plate

To clamp the plate to the shaft, use a plate clamp. traction is released to let fracture fragment impaction, particularly in cases of unstable intertrochanteric fractures. Plate to femur shaft attached with 4.5 mm cortical screws. The compression screw (typically the 19 mm screw) can be used to compress the fracture once all screws have been put and all traction has been released. The screw plate assembly must be compressed if a short barrel is being used in order to avoid possible disengagement. For patients with type 1 and type 2 fractures with stable fixation, partial weight-bearing with a walker was initiated on the third postoperative day; for patients with type 3 and type 4 fractures, weight-bearing was postponed until six weeks. Following active and passive hip flexion to a 90-degree angle, all patients were mobilized to their beds. Following surgery, a plain X-ray of the pelvis including both hips and a lateral image of the fractured hip were obtained and analyzed. The sutures were removed after two weeks.

PFN – TECHNIQUE

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IMPLANTS DETAILS

PFN is a third-generation cephalomedullary nail composed of an ultrahigh strength stainless steel alloy. Its longitudinal grooves promote the regeneration of the endosteal blood supply and its medio-lateral implant angle of 6 degrees facilitates easy insertion.

Nail sizes range from 9 to 12 mm in length, with a constant length of 250 mm.

One femoral neck screw, also known as a cervical screw, and one anti-rotation bolt, stabilization screw, are used to accomplish proximal cephalomedullary locking. Screws are arranged in a parallel fashion. The length of the 8 mm cannulated cervical screw ranges from 70 to 110 mm. The length of the 6.4 mm cannulated stabilization screw varies between 60 and 100 mm. Static and dynamic locking is possible with a distal setup. The angle between the nail and the distal locking screw, which is 4.9 mm in diameter, is either 130 or 135 degrees in this case.

Position of the patient:

The patient lies on the fracture table in a supine position. Flex the uninjured hip 15 to 30 degrees and adduct the affected extremity.

Reduction

Depending on the fracture type ,the fracture was reduced under image intensifier in AP and Lateral views by giving traction in neutral , mild internal or external rotation. The closed technique was used to reduce all fractures. Reduced weight bearing stability as well as corrected rotational and varaus abnormalities are the goals of reduction.

Method of Fixation

- A closed reduction was carried out to the closest possible anatomical position using an image intensifier.
- A 4-centimeter incision was proximal to the greater trochanter. An awl was positioned on the greater trochanter's medial tip and moved down the canal to the lesser trochanter's level.
- The medullary canal was reamed after a guide rod was pushed through it.

After the nail was seated, a 2 cm stab wound was made using the targeting device.

- The femoral head was penetrated with two Guide pins. The calibrated reamer was used to measure the pins' correct length.
- Lag and antirotation screws were positioned in the middle of the head or slightly inferiorly within 5 to 10 mm of the subchondral boundary.

For patients with type 1 and type 2 fractures with stable fixation, partial weight-bearing with a walker was initiated on the third postoperative day; for patients with type 3 and type 4 fractures, weight-bearing was postponed until six weeks.

Following active and passive hip flexion to a 90-degree angle, all patients were mobilized to their beds.

Following surgery, a plain X-ray of the pelvis including both hips and a lateral image of the fractured hip were obtained and analyzed.

The sutures were removed after two weeks.

Data analysis: The data was compiled in MS Excel in the form of master chart. The data will be analyzed as per aim & objective. Inference was drawn with the use of appropriate significant test (chi square test for qualitative data & unpaired t test for quantitative data). For significance 0.05 will be considered as cut off point.

3. RESULTS

Table 1: Patient characteristics

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	PFN		DHS	
AGE	**No**	**%**	**No**	**%**
20-40	0	0	3	20%
41-60	5	33%	2	13%
61-80	8	54%	8	54%
>80	2	13%	2	13%
GENDER				
MALE	9	60%	11	73.3%
FEMALE	6	40%	4	26.7%
MOI				
RTA	4	26.6%	5	26.7%
SLIP AND FALL	10	66.7%.	9	66.6%
FALL FROM HEIGHT	1	6.7%.	1	6.7%
Side				
Right	8	53.3%.	9	60%
Left	7	46.7%.	6	40%

All of them belonged to the age group of 20-90.The youngest patients was of 25 years and the eldest was of 90 years. Most of the patients were between the age of 60 and 80. There was no statistically significant relationship between age and outcome. The mean age of the PFN group was 68.06 ± 11.29 and that of the DHS group is 61.8 ± 21.24. Most of them were a result of low velocity trauma. In our study 9 cases were results of road traffic accidents and 2 were due to fall from height.19 cases were a result of slip and fall. Out of the 30 patients selected from the study 20 were males and 10 were females. There were 17 cases with fracture over the left hip and 13 cases with fracture over the right hip.

Table 2: Classification of fractures, duration of surgery, blood loss, C-arm shoots, time for union and average harris hip score

	PFN		**DHS**	
CLASSIFICATION	**No**	**%**	**No**	**%**
TYPE1	**5**	**33.30%**	**8**	**53.30%**
TYPE 2	**3**	**20%**	**5**	**33.40%**
TYPE 3	**4**	**26.70%**	**2**	**13.30%**
TYPE 4	**3**	**20%**	**0**	**0**
Duration of surgery	90±17.76		105±17.76	
BLOOD LOSS	2.26 ± 0.59		4.4 ± 0.67	
C-arm shoots	44 ± 6.37		24 ± 5.37	
Time for union	5.2 ± 0.83		5.73 ± 1.02	
HHS	83.6 ± 11.46		72.4 ± 10.9	

All fractures were classified according to Boyd and Griffin classification system. PFN had mean surgery duration of 90 minutes with a standard deviation of 17.76 minutes and DHS had a mean of 105 minutes and standard deviation of 12.74 minutes. More number of mops was used in case of DHS when compared to the minimally invasive PFN. The total number of C-arm shoots were comparatively higher in PFN (44 ± 6.37) when compared to that of DHS (24 ± 5.37). There was no major difference in the time for union in both the groups and is not

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statistically significant. An average score of 83.6± 11.46 was calculated for the PFN group which was higher when compared to the DHS group with an HHS of 72.4 ± 10.9.

Table 3: Outcome

	PFN		DHS	
OUTCOME	**No**	**%**	**No**	**%**
EXCELLENT	3	20	1	6.60%
GOOD	3	20	2	13.30%
FAIR	8	53.40%	10	66.70%
POOR	1	6.60%	2	13.30%

The outcomes were divided as Excellent, good, fair and poor. Out of the 30 cases 4 had excellent outcome, 5 had good outcome, 18 had fair and 3 patients had poor outcome.

Table 4: Complications

COMPLICATIONS	PFN	DHS
INFECTION	**0**	**2**
SHORTENING	**0**	**1**
SCREW CUT OFF	**2**	**0**
VARUS COLLAPSE	**1**	**0**
MALUNION	**0**	**1**

The major complications encountered in our study were Infection followed by shortening and malunion in the DHS group and screw cut off and varus collapse were the complications in the PFN group.

Figure 1: DHS

Figure 2: PFN

4. DISCUSSION

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Fractures involving the upper femoral end between the greater and lesser trochanters, which may extend into the upper femoral shaft, are known as intertrochanteric fractures. Among the most common injuries requiring hospitalization are trochanteric fractures and, regardless of the type they can result in significant morbidity and mortality, particularly in the elderly. About half of hip fractures in the elderly is comprised by intertrochanteric fractures, of which more than 50% are unstable. They are more common in women who are at risk for osteoporosis.[8,9] The incidence is predicted to quadruple by 2040 as a result of longer lifespans and an increase in road traffic accidents.[10]

The youngest patient was of 25 years and the eldest was of 90 years. Most of the patients were between the age of 60 and 90. There was no statistically significant relationship between age and outcome. The mean age of the PFN group was 68.06 ± 11.29 and that of the DHS group is 61.8 ± 21.24. There is no statistical significance since P value is 0.5. Whereas in a study by Prakash AK Prakash et al[7] the age of the youngest patient was 25 and the oldest was 90 with a mean age of 66. Out of the 30 patients selected for the study 20 were males and 10 were females. More number of males was seen in both groups individually. There is no statistical significance between gender and outcome of the surgery, P value > .05. Pravin Prakash et al[7] study had a total of 60 patients in which DHS group had 18 males and 12 were females and in PFN group 17 were male and 13 females.

The common modes of injuries resulting in intertrochanteric fractures are road traffic accidents and fall from height and slip and fall. Most of them were a result of low velocity trauma. In our study 9 cases were results of road traffic accidents and 2 were due to fall from height. 19 cases were a result of slip and fall. In Shukla R et al[11] study the most common mode of injury was Fall accounting for 55.8% in DHS group, 52.9% in PFN group and RTA accounting for 44.2% in DHS group and 47.1% in PFN group. Out of the 30 cases, 17 patients had left side injury and 13 had right sided injury. In DHS group 9(60%) had left sided and 6 (40%) had right sided injury whereas in PFN group 8(53.3%) had left sided and 7(46.7%) had right sided injury. In Shukla R et al[11] study 49.4% comprised left and 50.6% comprised right sided injury in the DHS group whereas 51.8% comprised left sided and 48.2% comprised right sided injury in the PFN group.

All fractures were classified according to Boyd and Griffin classification system. In the PFN group 33.3% accounted for type I, 26.70% accounted for type 3, 20% accounted for each of type 2 and type 4 fractures. In the DHS group 53.30% constituted type 1, 33.40% constituted for type2, 13.30% constituted type 3 fractures and type 4 fractures were not included in group DHS. In Prakash et al[7] study , DHS group comprised 39.13% of type 1, 34.78% type 2 , 21.74% type 3 and only 4.35% comprised type 4 whereas in PFN group 26.09% comprised type 1 , 56.52% comprised type 2, 8.70% comprised type 3 and 8.70% comprised type 4. We found in our study that as the type of fracture classification increased more time for reduction and implant fixation. PFN had a mean surgery duration of 90 minutes with a standard deviation of 17.76 minutes and DHS had a mean of 105 minutes and standard deviation of 12.74 minutes and this was found to be statistically significant as p value was less than 0.05. In Pravin Prakash et al[7] study the mean duration of surgery in DHS group was 1.35±0.3 hours and that of PFN group was 0.78±0.5 hours and was also statistically significant.

Blood loss during surgery was estimated with the number of fully soaked mops used during the entire procedure. More number of mops was used in case of DHS when compared to the minimally invasive PFN. There is statistically significant difference in blood loss between the two surgeries with a P value of less than 0.05. In Shiraz et al[12] study the average blood loss in DHS group was 169ml and that of PFN group was 189 ml. The total number of C-arm shoots were comparatively higher in PFN (44 ± 6.37) when compared to that of DHS (24 ± 5.37).

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There is statistically significant proof with a P value of less than .05(<.001) favouring lesser number of C- arm shoots in the DHS group whereas in Shukla R et al[11] study the mean number of shoots for DHS group was 88.59±14.79 and that of PFN group was 91.94±7.96. In our study the mean time for union taken in DHS group was found to be 5.73 and that of PFN group was found to be 5.2±0.83. An average score of 83.6± 11.46 was calculated for the PFN group which was higher when compared to the DHS group with an HHS of 72.4 ± 10.9. There is statistically significant difference in HHS in both the groups (P value 0.01). In Huang SG et al[13] study the mean Harris Hip score was 83.07±7.48 and that of PFN was 84.53±6.96.
In our study, among the DHS group 6.60% had excellent outcome, 13.30% had good outcome , 66.70% had fair outcome and 13.30% had poor outcome whereas in the PFN 20% had excellent outcome , 20% had good outcome , 53.34% had fair outcome and 6.60% had poor outcome. In Pravin Prakash et al[7] study among the DHS group 40% had excellent outcome, 50% had good outcome, 6.67% had fair outcome and 3.33% had poor outcome whereas in the PFN group 66.67% had excellent outcome, 26.66% had good outcome, 6.67% had fair outcome and no one had poor outcome. In the DHS group 2 cases had infection, 1 had shortening and 1 had mal union whereas in the PFN group 2 had screw cut off ,1 had varus collapse. In Pravin Prakash et al's study 2 in DHS group had infection, 3 had prolonged drainage , 1 had DVT , and 2 had reduction loss whereas in PFN group 2 had hematoma, 1 had prolonged drainage and 1 had DVT. Shukla R et al[11] study showed that of the patients in the DHS group, 65 (84.4%) experienced no problems. Three patients (3.9%) had superficial infection, five patients (6.5%) had shortening, and four patients (5.2%) had DVT. 75 patients (88.2%), in the PFN group had no problems, 2 (2.4%) patients had shortening, 4 (4.7%) patients experienced superficial infection, and 4 (4.7%) patients suffered lag screw cutout.

5. CONCLUSION

DHS and the proximal femoral nail are two very effective surgical techniques for treating intertrochanteric femur fractures. Proximal femoral nail has an advantage over DHS in terms of less blood loss, shorter recovery times, earlier ambulation, and a lower rate of complications. Both of these methods produce results that are comparable in terms of functional outcomes (union of the fracture, return to functional activity, morbidity, and implant failure) and intraoperative parameters (total surgery duration, detailed intraoperative research regarding intraoperative blood loss and other intraoperative complication). Additionally, the PFN fared far better in terms of early walking capacity restoration in cases of unstable intertrochanteric fractures. Therefore, we believe that PFN, rather than DHS, may be a preferable fixation device for majority of the intertrochanteric fractures. It is also a more technically complex technique that calls for more skill.

6. REFERENCES

1. Pajarinen J, Lindahl J, Michelsson O, Savolainen V, Hirvensalo E. Pertrochanteric femoral fractures treated with a dynamic hip screw or a proximal femoral nail. A randomised study comparing post-operative rehabilitation. J Bone Joint Surg Br. 2005 Jan;87(1):76-81.
2. Kaufer H, Matthews LS, Sonstegard D. Stable fixation of intertrochanteric fractures. J Bone Joint Surg Am. 1974 Jul;56(5):899-907.
3. Crenshaw AH. Campbell's operative orthopedics. Crenshaw AH (Ed.) 11th edition, 2007, p. 329- 330

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4. Mohan NS, Shivaprakash SU, Sridhar. "PFNA v/s PFN in the Management of Unstable Intertrochanteric Fractures". Journal of Evolution of Medical and Dental Sciences 2015; 4(24):4086-4091.
5. Kish B, Sapir O, Carmel A, Regev A, Masrawa S. Full weight bearing after unstable per and subtrochanteric fracture using proximal femur nail. J Bone Joint Surg Br. 2001;83:289.
6. Bienkowski P, Reindl R, Berry GK, Iakoub E, Harvey EJ. A new intramedullary nail device for the treatment of intertrochanteric hip fractures: Perioperative experience. J Trauma 2006;61:1458 62
7. Prakash AK, Nagakumar JS, Shanthappa AH, Venkataraman S, Kamath A. A comparative study of functional outcome following dynamic hip screw and proximal femoral nailing for intertrochanteric fractures of the femur. Cureus. 2022 Apr;14(4).
8. Gurung S, DC G. A comparative study of dynamic hip screw and proximal femoral nail in the management of intertrochanteric fractures of the femur. 2021 july
9. Shiraz S, Shujauddin M, Hasan K, et al. (January 04, 2023) Comparison of Dynamic Hip Screw and Proximal Femoral Nailing Techniques in Stable Intertrochanteric Fractures. Cureus 15(1): e33366. DOI 10.7759/cureus.33366
10. Jonnes C, Sm S, Najimudeen S.Type II Intertrochanteric Fractures: Proximal Femoral Nailing (PFN) Versus Dynamic Hip Screw (DHS). Arch Bone Jt Surg. 2016;4:23-8.
11. Shukla R, Pathak P, Choyal A. Comparative analysis of functional and radiological outcome of proximal femoral nail versus dynamic hip screw in treatment of intertrochanteric fractures. Journal of Orthopaedics, Traumatology and Rehabilitation. 2022 Jan 1;14(1):24-31.
12. Shiraz S, Shujauddin M, Hasan K, Elramadi A, Ahmed G. Comparison of dynamic hip screw and proximal femoral nailing techniques in stable intertrochanteric fractures. Cureus. 2023 Jan;15(1).
13. Huang SG, Chen B, Zhang Y, Nie FF, Ju L, Li M, Zhang YH. Comparison of the clinical effectiveness of PFNA, PFLCP, and DHS in treatment of unstable intertrochanteric femoral fracture. American Journal of Therapeutics. 2017 Nov 1;24(6):e659-66.