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Original Research Article

A Comparative Study between DHS and PFN in the Management of Trochanteric and Subtrochanteric Femoral Fractures

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Abstract:

Background: Trochanteric and Subtrochanteric fractures occur most commonly due to high velocity trauma and trivial trauma. This is also due to sedentary lifestyle brought on by urbanization. The ideal choice is treatment with internal fixation. Two most commonly used methods are DHS and PFN. The aims of this study to comparison of PFN and DHS and evaluated the effectiveness and strength of PFN and DHS.

Methods: The present study was carried out in Orthopaedics Department of JLNMCH, Bhagalpur, Bihar from August 2019 to July 2020. The study consisted of total 40 adult patients of peritrochanteric fractures of femur. Out of this 20 patients were treated with PFN and DHS 20.This was a comparative study. All the peritrochanteric fractures were considered except grade 4 type of intertrochanteric fracture as per Boyd and Griffins classification and grade 5 according to seinsheimer classification. Minimum of 6 months of follow up.

Result: We have done follow up examination at the end of 6 weeks, 12 weeks, 18 weeks. Average time for which patients were admitted was 3 weeks i.e. 21 days. Average time of union in all our 40 patients was 18 weeks (range 12 to 20 weeks). PFN is better treatment modality considering its biomechanical properties. The claimed advantage with PFN is that a smaller exposure is required than for a sliding screw it may therefore be associated with less blood loss, shorter operating time and less morbidity. Also in osteoporotic bone PFN fixation carries definitive advantage over DHS fixation device.

Conclusion: DHS with side plate assemblies is a collapsible fixation device seeking its own position of stability. PFN is also a collapsible device but has additional rotational stability. This implant is a Centro medullary device, biomechanically more sound and a load bearing device.

Keywords: PFN, Management of unstable fracture and osteoporotic bone, Rotational stability, DHS.

Introduction

Fractures of the proximal femur are the most common fractures encountered in orthopedic traumatology. Most proximal femoral fractures occur in elderly individuals as a result of only moderate or minimal trauma. In younger patients these fractures usually result from high-energy trauma. High-velocity injuries are more difficult to treat and are associated with more complications than low velocity injuries. [1] Intertrochanteric fractures usually unite if reduction and fixation are properly done as wide area of bone is involved, most of which is cancellous, and both fragments are well supplied with blood. Although malunions may be a problem, late complications are rare. When a high-energy intertrochanteric fracture produces comminution, a large fragment of the posteromedial wall of the femur, often including the lesser trochanter, splits free. This bony buttress is important to the stability in the intertrochanteric region; therefore, its comminution results in an unstable fracture. [2] Subtrochanteric fractures, which account for 10% to 15% of proximal femoral fractures. [1] Following a fracture in the subtrochanteric region the proximal fragment to flexed, externally rotated and abducted. Distal fragment displaces medially and further aggravates the deformity and that's why conservative methods of treatment results in malunion with shortening and limitation of hip movement as well as complications of prolonged immobilization like bed sores, deep vein thrombosis and respiratory infections and furthermore the substance of the bone in the subtrochanteric region changes consistency as it progresses from the vascular cancellous bone of the intertrochanteric region to the less vascular diaphyseal cortical bone of the

proximal shaft. [1,3] Subtrochanteric fractures are associated with high rates of nonunion and implant fatigue failure because of the greater mechanical stresses in this region. The main goals for the treatment of these fractures are, to restore the prefracture activity status, to allow early full weight bearing.

Material and Methods

This study was conducted in Department of Orthopaedics, Jawaharlal Nehru Medical College and Hospital, Bhagalpur, Bihar from August 2019 to July 2020. Consent of all patients was taken. The study consisted of total 40 patients out of which 20 were treated by DHS and 20 by PFN. Patients from age group 18 yrs above were selected.

All the peritrochanteric fractures were considered except grade 4 type of intertrochanteric fracture as per Boyd and Griffin's classification and grade 5 according to seinsheimer classification.

Inclusion Criteria

- Type I, II and III of fracture pattern.
    - Boyd and Griffin's classification.
    - Evans classification.
    - Seinsheimers classification.
    - Tronzo's classification.
    - AO classification/OTA.
- Radiologically fractures with intact lateral cortex and intact entry point i.e. greater trochanter.
- Minimum 6 months of follow up.

Exclusion Criteria:

- Patients with type IV and V fracture pattern and patients who were unfit for surgery.

Hollow tubular nail was chosen. The nail was made up of AISI 316L stainless steel. Nail was of uniform of 25mm in all 20 cases. Proximal diameter of nail was 17mm while distal diameter ranging from 9 to 12mm.

Proximal femoral nail of 130 and 135 degrees with 10 degree of anteversion was used. Measurement of diameter of nail was done by taking conventional radiographs of normal femur and by measuring the inner diameter between the cortices of the level of the isthmus of femur. We also took help of ruler provision from the PACS system of X-rays which was used in our hospital.

Result

Comparative study of both the techniques showed that average time for which patient was admitted in our wards was 3 weeks. Average time of union in all our 40 patients was 18 weeks with an average range of 12 to 20 weeks. Harris Hip Scoring System (modified) was used.

Maximum Points Possible:-100. 2) Pain Relief:-44. 3) Function:-47. 4) Range of Motion:-5. 5) Absence of Deformity:-4.

Table 1: Scoring system rating

Score	Rating
1) 90-100.	Excellent.
2) 80-89.	Good.
3) 70-79.	Fair.
4) <70.	Poor.

Table 2: Stability Pattern of Intertrochanteric Fractures

Type of Fracture	PFN	DHS
Stable	06(42.85%)	10(62.5%)
Unstable	08(57.14%)	06(37.5%)
Total	14	16

With PFN, malrotation and deformity is less. PFN is useful in difficult fractures with subtrochanteric extension or reversed obliquity.

The rotational stability was higher with PFN. Also, we did not encounter any secondary femoral fracture in patients managed by PFN as compared to DHS. All the patients were followed up at an interval of 6 weeks till fracture union.

Then after once in 3 months till 1 year. Modified Harris Hip Scoring System was used for evaluation. PFN proved to manage unstable fracture more than DHS.

Figure 1: Pre-operative and Post-operative X-ray (PFN)

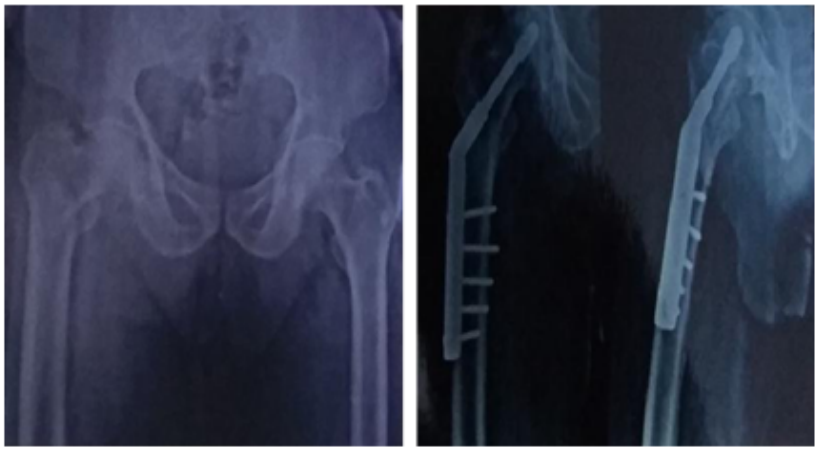

Figure 2: Pre-operative and post-operative X-ray (Dynamic Hip Screw)

Discussion

Hip fractures are the most commonly encountered fractures with trochanteric fractures seen in elderly individuals as a result of trivial trauma and unlike osteoporotic trochanteric fractures; subtrochanteric fractures are usually the result of high-energy trauma and often subjected to significant displacement and great difficulty in close reduction through traction.

Various implants are available for the fixation of these fractures with each having their own complications/failures which occur due to disregard for biomechanics, fracture type, associated injuries or due to overestimation of the implants capabilities to handle stress. [7]

The treatment choices of trochanteric and subtrochanteric fractures can be divided into two groups based on current management trends: cephalo meduallary hip nails and lateral plate-screw systems. The use of intramedullary nail fixation in these fractures has been increasing because it is easy and fast to apply and can guarantee stability even in inherently unstable fractures. The result of these fractures in young and middle aged individuals is also influenced by the amount of trauma suffered at the time of injury. [8] Dynamic hip screw a lateral plate screw system has been successfully over the past and is a gold standard for stable trochanteric fractures providing adequate compression at the fracture ends along with other surgeon advantages like less radiation exposure and shorter learning curve, but the use of it in unstable fractures without posteromedial support is associated with complications like varus collapse and lag screw cut out and partly associated with improper positioning of lag screw. Baumgaertner et al. showed that a small tip apex distance (TAD) – less than 25 mm – was associated with a lower probability for cutout. [9]

The DHS when used for subtrochanteric fractures, acts as a rigid load bearing construct as the fracture lies distal to the lag screw thereby locks the fracture in position. The fractures involving medial calcar or missing posteromedial corners or the fractures which are inadequately reduced result in high varus strains at the fracture implant interface which leads to progressive loosening of screws or implant breakage. Other complications include increased blood loss and infection. Proximal femoral nail has become the implant of choice for all trochanteric and subtrochanteric fractures due to

various reasons like- closed procedure, load sharing device, minimal incision, early mobilization, and decreased blood loss and due to its ability to provide stability to unstable fractures. [10]

PFN permits controlled collapse at the fracture site thus not making the fracture prone for varus collapse in cases of posteromedial discontinuity. The advantage of Proximal Femur Nailing fixation is that it provides a more biomechanically stable construct by reducing the distance between hip joint and implant. [11,12]

However the PFN does have its disadvantages like increased radiation exposure, Z-effect/reverse Z-effect, screw cut out, inability to place the lag and the anterotation screw in the femur neck due to narrow neck. The incidence of screw cut out can be minimized by placing the lag screw in the inferior portion of the neck in anteroposterior view parallel to the femoral neck calcar and centrally in lateral view and the tip at subchondral region. Herman et al. showed that the mechanical failure rate increased from 4.8% to 34.4% when the center of the lag screw was not in the second quarter of the head-neck interface line (the so-called "safe zone") ($p=0.001$) and that the lag screw insertions lower or higher than the head apex line by 11 mm were associated with failure rates of 5.5% and 18.6%, respectively ($p=0.004$). They suggested that placing the lag screw within the "safe zone" could significantly reduce the mechanical failure rate when PFN was used to treat intertrochanteric fractures. [13]

The cause for outer thigh pain is due to irritation of iliotibial band by the nail protruding above greater trochanter which can be eliminated by carefully selecting patients with long femur and using PFNA-2 in short stature patients.

Conclusion

Numerous modalities are available for treatment of proximal femoral fractures however PFN appears to be better treatment modality considering its biomechanical properties. Though there are some of the disadvantages like, High learning curve, Occurrence of ''Z'' effect and reverse ''Z'' effect producing varus collapse, limited indications due to presence of excessive comminution at lateral cortex and fracture site. Some uncommon incidences of implant failure have been noticed. Despite of these disadvantages PFN has began to compete with DHS and claimed as a better procedure due to less intraoperative blood loss, smaller incision, less intraoperative time and rotational stability.

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