

A Hospital Based Prospective Study to Find the Efficacy of Proximal Femoral Nailing (PFN) and Dynamic Hip Screw (DHS) Fixation in the Treatment of Intertrochanteric Fractures

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Abstract

Background: Unstable fractures accounts for approximately 50 to 60% of all intertrochanteric fractures. Failure rates of (DHS) dynamic hip screw for unstable fracture patterns are as high as 50%. Proximal femoral nail is technically more demanding surgery and also associated with complications like implant failure, femoral shaft fracture, improper reduction, screw cut-out and non-union. With this aim of stable surgical reconstruct of intertrochanteric fracture this study was done to find the efficacy of proximal femoral nailing (PFN) and dynamic hip screw (DHS) fixation in the treatment of intertrochanteric fractures. **Materials & Methods:** A prospective study done on 50 patients with unstable trochanteric femur fracture admitted in department of orthopedic in Government Medical college, Pali, Rajasthan, India during one year period. All patients were regularly followed up in OPD at an interval of 10,14,18 weeks. In patients with stable inter-trochanteric fractures, either treated with PFN or DHS, partial weight bearing was started early. Unstable inter-trochanteric fracture cases treated with PFN, partial weight bearing will be started at 2-4 weeks while those treated with DHS partial weight bearing was started between 6-8 weeks depending upon reduction and stability of fracture. Full weight bearing was started in all cases only after radiological union. **Results:** Our study showed that mean time of full weight bearing in the DHS group and the PFN group were found to be 13.28 and 10.34 respectively. Mean Harris Hip Score among the patients of DHS group and the PFN group were found to be 81.26 and 83.92 respectively. No- Significant results were obtained while comparing the mean HHS in between the DHS group and the PFN group (P value > 0.05). Good functional outcome according to Harris hip score was occurred in maximum patients in both groups. In the DHS group, skin puckering with superficial infection was seen in 2 (8%) patients while in the PFN group Nonunion occurred in 2 (8%) patients. **Conclusion:** We concluded that Proximal Femoral nail gives better results in intertrochanteric fractures in terms of Amount of blood loss during surgery, Early mobilization, Duration of surgery.

Keywords: Harris Hip Score, Intertrochanteric Fracture, DHS, PFN, Functional Outcome.

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Introduction

Intertrochanteric fracture line involves along extra capsular basilar neck region to region along the lesser trochanter, undisplaced fractures and fractures with intact posteromedial cortex are said to be stable[1]. Unstable contribute to about 50%-60% of all intertrochanteric fractures[2,3].

Most frequent fractures of proximal femur are intertrochanteric fractures which involve upper end of femur between both trochanters with or without extending into the upper femoral shaft occurring commonly in geriatric patients[4].

Since general life expectancy of population has increased in the past two decades incidence of fractures of proximal femur are also increasing. In 1990 of overall hip fractures 26% occurred in Asia. This is expected to rise upto 37% in 2025 and 45% in 2050[5,6].

Only moderate or minimal trauma is enough to cause proximal femur fractures in geriatric patients. Simple self-fall causes intertrochanteric fractures in elderly people due to osteoporosis and increased incidence of self-fall with increasing age is due to decreased muscle power, decreased reflexes, poor vision and labile blood pressure. In younger patients it requires high energy trauma.

There are five variables described by Kaufer which are found to affect the biomechanical strength of the repair. Bone quality and fracture pattern which are surgeon independent along with Implant choice, quality of fracture reduction and positioning of implant which are surgeon dependent[7].

Main weight bearing bone of lower limb is femur. Intertrochanteric fractures cause patients to be bedridden for prolonged period of time and they are more prone for urinary tract infection, respiratory tract infection, bed sores and joint stiffness etc. To avoid these complications operative treatment is indicated.

In 1930 Jawett nail was introduced by Jawett[8] to provide immediate stability of fracture segments and early mobilisation and is failed due to lack of controlled impaction. In 1950 first sliding screw was used by Earnest roll in Germany. In 1962 Sliding device was modified by Masie to allow collapse and impaction of fragments. Dynamic hip screw was first produced by Richard manufacturing company of USA[9].

Reconstruction intramedullary nail for peritrochanteric and subtrochanteric fractures were introduced by Russell Taylor in 1984. Parker first advocated the importance of lateral wall in preventing varus collapse. Trochanteric fractures are treated with dynamic hip screw and intramedullary nailing. Dynamic compression screw permits proximal fragment to collapse. Failure rates of DHS in unstable fracture is as high as 50% and in stable fractures the value drastically reduces to 5%[10,11].

With this aim of stable surgical reconstruct of intertrochanteric fracture this study was done to find the efficacy of proximal femoral nailing (PFN) and dynamic hip screw (DHS) fixation in the treatment of intertrochanteric fractures.

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Materials & methods

A prospective study done on 50 patients with unstable trochanteric femur fracture admitted in department of orthopedic in Government Medical college, Pali, Rajasthan, India during one year period.

Inclusion Criteria

1. Clinical diagnosis of unstable trochanteric femur fracture.
2. Age above 40 years and below 80 years

Exclusion Criteria

1. Compound fractures, Pathological fractures.
2. Polytrauma patients.
3. Patients non ambulant before the fracture.
4. Previous surgery done on proximal femur.
5. Reverse oblique fractures and fractures with subtrochanteric extension.
6. Patients with cognitive disorders, on steroids or immunosuppressants.

Methods

Evaluation of the patient was done with x-rays and blood investigations.

Surgical Procedure

Patient prepared on the morning of day of surgery. Single dose preoperative antibiotic given after test dose. Under suitable anaesthesia patient was placed on fracture table with unaffected leg in flexion and abduction attitude by using lithotomy post. Affected leg placed in traction boot and fracture reduced by traction & internal rotation/external rotation along with adduction or abduction. C arm checked and placed in optimal position relative to patient's position to ensure better visualization of fracture reduction in both Anteroposterior and lateral projections.

DHS with TSP

Surgical approach: Under aseptic precautions affected limb painted and draped in standard fashion for hip surgery in supine position. Fracture site is exposed by standard lateral approach to hip joint. Skin and subcutaneous tissue incised, tensor fascia lata and vastus lateralis was split and proximal part of femur exposed. Inadequate reduction corrected under C arm guidance. Approximately 2 cm below vastus ridge guide wire is inserted under C arm guidance and it passed through CCD angle inferiorly in AP view and central in lateral view. This allows correct placement of antirotation screw. 5mm beneath subcondral bone guide wire is placed. Then guide wire length measured and by using triple reamer, reaming done and lag screw inserted. To lag screw a 5 hole barrel plate fixed then it fixed to femoral shaft using cortical screws in 2nd and 5th hole of plate. TSP fixed to 1st, 3rd and 4th hole using 4.5mm cortical screws. Guide wire inserted for 6.5 mm cancellous screw under C-arm guidance and

Screw fixed after drilling with appropriate drill bit. If necessary greater trochanter fixed by using SS wire or 4mm cancellous screw. Drain inserted. By using vicryl vastus lateralis, tensor fascia lata and subcutaneous tissue closed and skin closed using ethilon. Dressing applied.

Proximal femoral nail

Skin incision made about 2-3cm over tip of greater trochanter extending up to plumb line dropped from anterior superior iliac spine. Entry made through modified medial portal entry with patient in fracture table and traction applied to ipsilateral leg. Guide wire inserted and serial reaming done according to intraoperative chattering. Appropriate sized nail inserted. Guide wires inserted and checked in both AP and lateral projections. First 8mm lag screw placed and 6.3mm. anti-rotation screw of size 15mm less than lag screw fixed proximally. 2x4.9mm locking screws both fixed distally using distal aiming device and wound closed in layers.

All patients were regularly followed up in OPD at an interval of 10,14,18 weeks.

In patients with stable inter-trochanteric fractures, either treated with PFN or DHS, partial weight bearing was started early. Unstable inter-trochanteric fracture cases treated with PFN, partial weight bearing will be started at 2-4 weeks while those treated with DHS partial weight bearing was started between 6-8 weeks depending upon reduction and stability of fracture. Full weight bearing was started in all cases only after radiological union.

Clinico-radiological assessment of the patient was done and comparison was done in terms of:

- Duration of surgery
- Total amount of blood loss (during surgery + drain output)
- Timing of early mobilization and full weight bearing
- Radiological assessment for callus formation and bony union.
- Complications with technical and implant failure.
- Harris hip score for clinical and radiological assessment at end of 6 months

Statistical Analysis

All the results were analyzed by SPSS software. Chi-square test, Mann-Whitney U test and student t test were used for assessment of level of significance. P-Value of less than 0.05 was taken as significant.

Results

A Total of 50 subjects were included in the present study, out of which, 25 underwent DHS treatment while the remaining 25 underwent PFN treatment. 86% patients were aged more than 50 years and 14% below 50 yrs in which 52% male and 48% females and 62% of cases were due to low velocity and 38% due to high velocity trauma and right side (54%) most common involvement (table 1).

Table 1: Demographic profile of patients

| Demographic profile | DHS group (N=25) | PFN group (N=25) |
|-------------------------|------------------|------------------|
| Age group (yrs) | | |
| 40-50 yrs | 3 (12%) | 4 (16%) |
| 51-60 yrs | 6 (24%) | 8 (32%) |
| 61-70 yrs | 12 (48%) | 10 (40%) |
| >70 yrs | 4 (16%) | 3 (12%) |
| Sex | | |
| Male | 11 (44%) | 12 (48%) |
| Female | 14 (56%) | 13 (52%) |
| Side involvement | | |
| Right | 14 (56%) | 13 (52%) |
| Left | 11 (44%) | 12 (48%) |

Mean blood loss among the subjects of the DHS group and the PFN group were found to be 170.8 and 59.39 ml respectively. Significant results were obtained while comparing the mean blood loss in

between the subject group of control group respectively (P-value < 0.05) (table 2).

Mean duration of surgery in the patients of DHS group and the PFN group were found to be 87.9 and 63.70 minutes respectively. Significant results obtained while comparing the mean duration of surgery in between the subjects of the DHS group and the PFN group (P- value < 0.05) (table 2).

Mean time of full weight bearing in the DHS group and the PFN group were found to be 13.28 and 10.34 respectively. Significant results were obtained while comparing the mean time of full weight

bearing in between DHS group and PFN group (Pvalue < 0.05) (table 2).

Mean Harris Hip Score among the patients of DHS group and the PFN group were found to be 81.26 and 83.92 respectively. No- Significant results were obtained while comparing the mean HHS in between the DHS group and the PFN group (P value > 0.05). Good functional outcome according to Harris hip score was occurred in maximum patients in both groups (table 2 & 3).

Table 2: Operative details of intertrochanteric fractures

| Variables | DHS group (N=25) | PFN group (N=25) | P-value |
|------------------------------------------------|------------------|------------------|---------|
| Mean time of operation after fracture in days | 7.56±1.23 | 7.18±2.31 | >0.05 |
| Mean duration of operation | 87.9±10.12 | 63.7±9.76 | <0.05* |
| Mean blood loss in ml | 170.8±1877 | 59.39±16.26 | <0.05* |
| Mean duration of hospital stay in days | 6.87±1.39 | 5.23±1.98 | >0.05 |
| Average duration for full weight bearing (wks) | 13.28±2.56 | 10.34±2.18 | <0.05* |
| Mean Harris hip score | 81.26±4.312 | 83.92±10.25 | >0.05 |

Table 3: Functional outcome of Harris hip score

| Functional outcome | DHS group (N=25) | PFN group (N=25) |
|--------------------|------------------|------------------|
| Excellent | 7 | 6 |
| Good | 16 | 17 |
| Fair | 2 | 1 |
| Poor | 0 | 1 |

In the DHS group, skin puckering with superficial infection was seen in 2 (8%) patients while in the PFN group Nonunion occurred in 2 (8%) patients (table 4).

Table 4: Complications

| Complications | DHS group (N=25) | PFN group (N=25) |
|-----------------------------------------|------------------|------------------|
| Superficial wound infection | 2 | 1 |
| Urinary tract infection | 2 | 2 |
| Varus collapse with shortening of >1 cm | 2 | 0 |
| Persistent thigh pain | 1 | 0 |
| Persistent hip pain | 1 | 2 |
| Non-union | 0 | 2 |
| Peri implant fracture | 0 | 1 |

Discussion

Intertrochanteric femoral fractures contribute to more than half of total hip fractures in elderly osteoporotic patients ageing over 60 years.

With increasing life expectancy due to advancements in medical care, the incidence of intertrochanteric fractures are also increasing.

Fall from standing height is the most common mode of injury in these patients. Diminished vision, reduced reflexes, poor muscle tone and balance also contribute to the increased incidence in elderly.

Various modalities of treatments are available which include dynamic hip screw, cephalomedullary nail, dynamic condylar screw, cemented hemiarthroplasty with or without augmented calcar reconstruction, proximal femoral locking plate and trochanteric stabilization plate.

The ultimate goal of the treatment being early mobilization of the patients preventing the complications of fracture disease. Sliding hip screw is still most widely used implant for these cases. But in unstable fractures due to posteromedial and lateral wall comminution it has the disadvantage of recurring varus collapse and screw cut out. It also has a disadvantage of having only a single point fixation in head and neck.

Our study showed that 86% patients were aged more than 50 years and 14% below 50 yrs in which 52% male and 48% females and 62% of cases were due to low velocity and 38% due to high velocity trauma and right side (54%) most common involvement. The difference in current study is probably because the male to female ratio is measured amongst operated fractures only and not for the actual sex incidence for all trochanteric fractures, which was similar results found by Amandeep Singh Bakshi et al (2018)[12].

Mean blood loss among the subjects of the DHS group and the PFN group were found to be 170.8 and 59.39 ml respectively. Mean duration of surgery in the patients of DHS group and the PFN group

were found to be 87.9 and 63.70 minutes respectively, although the duration of implant fixation was almost similar in both the groups, time required for wound closer was significantly longer in DHS group probably due to larger incision and extensive dissection as compared to the percutaneous technique of PFN, which was similar results found by Amandeep Singh Bakshi et al (2018)[12].

The walking ability between both the groups was assessed using Harris Hip Score. Mean Harris Hip Score among the patients of DHS group and the PFN group were found to be 81.26 and 83.92 respectively. It was found to be not statistically significant and shows that long term results of both intramedullary and plate fixation are similar, which was similar results found by Amandeep Singh Bakshi et al (2018)[12].

But at 6 months most of cases in PFN belongs to excellent and good groups but in DHS most of cases belongs to good and fair group of harris hip score. No statistically significant difference between patients operated with Dynamic Hip Screw with Trochanteric Stabilization Plate and Proximal Femoral Nail in terms of radiological union, varus collapse and functional outcome at six months follow up, which is consistent with Rho et al study[13] & Patil et al study[14].

Conclusion

We concluded that Proximal Femoral nail gives better results in intertrochanteric fractures in terms of Amount of blood loss during surgery, Early mobilization, Duration of surgery. There is no difference between the two modalities in terms of Number of per operative and post-operative Complications, Long term mobility, Fracture union, But as this study involved small number of patients (n=50), so its results cannot be projected to the general population, for which a trial involving large number of cases is required.

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