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ORIGINAL ARTICLE

MANAGEMENT OF INTERTROCHANTERIC FRACTURE BY P.F.N VS D.H.S: A COMPARATIVE STUDY

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ABSTRACT: BACKGROUND: DHS fixation has remained a well-established gold standard in intertrochanteric fractures of femur for a long time.[1] However, it has shortcomings and pitfalls. In inter-trochanteric fractures of femur, DHS fixation has shown higher failure rates. PFN is a new fixation device proposed for fixation of unstable intertrochanteric fractures.[1] Being intramedullary, it is a biomechanically advantageous device which should allow better fixation of unstable intertrochanteric translating into lesser failure rates of fixation and also permitting early mobilization and faster rehabilitation especially in elderly patients. We present a study comparing outcomes of managing unstable intertrochanteric fractures with PFN and DHS. **MATERIALS AND METHODS:** We evaluated 30 (PFN: 15;DHS: 15) cases of intertrochanteric fractures of femur out of which 28 were unstable and 2 stable type, from January 2013 to June 2014, with minimum 12 months follow up period. Mean age was 58 years for both PFN and DHS group. We studied the surgical complications in both groups and also compared functional and radiographic results of both groups. **RESULTS:** There was significantly more clinical shortening in DHS group than in PFN group (average 1- 1.9 cm versus 0.5-0.9 cm). There were 3 cases of superficial and 2 cases of deep infection in the DHS group while there was one case of infection in PFN group. There was no case of implant failure in the DHS group compared to one case in PFN group (due to screw breakage). Harris hip score at follow up was fair to excellent in PFN as compared to DHS. This difference was statistically significant. **DISCUSSION**: DHS despite remaining a gold standard for fixation of intertrochanteric fractures of femur for a long time[2], it may not be suitable for certain fracture patterns and in older age groups with more medical co-morbidities and osteoporosis. PFN is a biomechanically sound device for fixation of comminuted intertrochanteric fractures of femur[2] which has lesser surgical morbidity and should be especially beneficial in elderly, osteoporotic and medically compromised patients. Its load sharing capability provides a more stable fixation allowing early mobilization and rehabilitation.[3] **CONCLUSION**: PFN is unequivocally a better choice of implant for fixation of unstable intertrochanteric fractures of femur, especially in osteoporotic and medically compromised patients as compared to DHS fixation device.

KEYWORDS: Proximal femoral nail, Dynamic hip screw, Unstable intertrochanteric fracture, A.O's classification.

INTRODUCTION: Intertrochanteric fractures are one of the commonest fractures especially in the elderly with osteoporotic bones, usually due to low energy trauma like simple fall.[3]It occurs most commonly in age group above 70 years.[4] The overall increase in the incidence of trochanteric fracture can be attributed to two factors: increased life expectancy which increases the aged population; and high energy trauma which victimizes more number of young adults.[5] Due to these reasons both developing and developed countries are facing a sort of epidemic of peri-trochanteric fractures.

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With an aging population, an even larger proportion of our resources will be dedicated to treating these hip fractures in the coming years.[6] Preventing complications is of utmost importance to help these frail patients get back to a functional level as early as possible.

It is universally agreed that the treatment of intertrochanteric fractures is stable internal fixation as early as possible.[7] Being a region of high mechanical stress transfer, stable fixation is the keystone of successful union of trochanteric fractures. Kaufer, Matheull, & Sonstegard[8] listed the variables that determine the strength of fracture fragment–implant assembly, these are:

1. Bone quality
2. Fragment geometry
3. Reduction
4. Implant design
5. Implant placement.

Factors under the Control of Surgeon are:

1. Good reduction,
2. Proper choice of implant,
3. Proper surgical technique, and
4. Availability of modern operation rooms, entire set of implants, instrumentation and image intensifier.

The Factors Most Significant for Instability and Fixation Failure are: (i) Loss of posteromedial support, (ii) Severe comminution, (iii) Subtrochanteric extension of the fracture, (iv) Reverse oblique fracture. (v) Shattered lateral wall (vi) Extension into femoral neck area and (vii) Poor bone quality. Osteoporosis is particularly important in deciding the fixation of proximal femoral fractures.[8]

Excessive collapse occurs due to excessive sliding when bony stability is not achievable as in comminuted lateral wall fracture, posteromedial discontinuity, and reverse oblique pattern.[9]

Dynamic Hip Screw has been the gold standard for trochanteric fractures. Still with all the qualities of an ideal implant DHS exhibits moderate failure rate in unstable fracture patterns as it offers little resistance to collapse. Proximal Femoral Nail, on the other hand is an intramedullary device which is load-sharing.[10] And being intramedullary, it also restricts collapse to the point when the proximal fragment abuts against the nail and distal fragment construct.[10] Both these advantages are likely to provide ability to mobilize earlier and prevent uncontrolled collapse precluding shortening and abductor lurch.

MATERIALS AND METHODS: This study was conducted in Department of Orthopaedics at SRMS-IMS from January 2013 to June 2014. Institutional Board Review was done and permission obtained.

Inclusion Criteria:

1. All intertrochantric fractures.
2. Age above 18 years.
3. Recent fracture within a period of 2 weeks.

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Exclusion Criteria:

1. Pathological intertrochanteric fractures.
2. Compound intertrochanteric fractures were excluded.
3. Patients with less than 18 years of age.
4. Polytrauma.
5. Patients with other medical or surgical problems contraindicating surgery.

A total of 30 patients (PFN: 15, DHS: 15) were included in the study. All patients underwent routine pre-operative investigations as appropriate for age and medical co-morbidities. All fractures were operated in fracture table under C-arm guidance. Standard lateral approach to proximal femur was used in all cases of DHS while all cases of PFN fixation were operated through a minimally invasive approach. Post operatively, patients were mobilized on 2nd post-operative day with toe-touch weight-bearing. NWB in days in DHS mean (13-34), PWB (6-16 WEEKS), FWB (12-20 WEEKS), PFN, NWB in days (2-10), PWB in (4-10) weeks, FWB in (10-18) weeks. There was late starting of PWB and FWB in DHS as compared to PFN.

Sutures were removed at 14 days after surgery. Patients were followed up in the OPD at 3weeks, 6 weeks and every month thereafter till clinical and radiological union was seen. Subsequent follow-up was done at every three months. Hip function was assessed at the time of union and at every subsequent visit thereafter.

Data from both groups with respect to time to union, complication rate, final limb length discrepancy and Harris Hip Score were recorded and statistically analyzed.

Table 1. A.O's Classification:

A1: Simple (2-fragment) Pertrochanteric Area Fractures:

A1.1 Fractures along the intertrochanteric line.
A1.2 Fractures through the greater trochanter.
A1.3 Fractures below the lesser trochanter.

A2: Multi-fragmentary Pertrochanteric Fractures:

A2.1 With one intermediate fragment (lesser trochanter detachment).
A2.2 With 2 intermediate fragments.
A2.3 With more than 2 intermediate fragments.

A3: Intertrochanteric Fractures:

A3.1 Simple, oblique.
A3.2 Simple, transverse.
A3.3 With a medial fragment.

OBSERVATIONS AND RESULTS: Average age of the patient in this series was 58.20 yrs, which is significantly lower as compared to various studies published. [Cleveland[10] (1947)–75 yrs, Boyd & Griffith (1949)–65 yrs, Evans (1949)–62.2 yrs, Sarmiento (1957)–76 yrs, Frilberg (1990)–76 yrs, Parker (1993)–71.5 yrs, Bhatti (2004)–71 yrs]. Females in the present study are of same number as the Males. This finding in the present study doesn't matched to various published reports [Cleveland[10] (1947), Boyd & Griffith (1949), Evans (1949), Sarmiento (1957), Anderson (1971),

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Kuderna (1976)] which indicate a preponderance of female patients, 18 patients had trauma due to trivial fall, while 11 out of 30 patients had sustained fracture intertrochanteric femur because of road traffic accidents and 1 sustained after fall from height. 21 patients had sustained fracture on right side and 9 patients had fracture on left side. According to AO classification in our study we have found A1.2=1, A2.1=1, A2.2=13, A2.3=8, A3.1=7 Morihara T[11] (2007) Out of 87 A2 (n=45), followed by A1 (n=36) and A3 (n=6). Gardner MJ (2005) 27% A1, 36.5 A2 and 25.3% A3. In our study all the cases with TAD index less than 20 mm was maintained., blood loss in PFN mean 97.33ml in DHS 151.33 ml mean, hospital stay in DHS Median 14 days and PFN median 5 days, operative time in DHS was mean 125.33 mins and PFN mean was 102.33.

Which is almost same with other studies. 3 patients in our study suffered from Superficial infection 3 in DHS, 0 in PFN, (Treated with i/v antibiotics), deep infection 2 in DHS, In our study NWB in days in DHS mean(13-34), PWB(6-16 WEEKS), FWB(12-20 WEEKS), PFN NWBin days (2-10), PWB (4-10 WEEKS), FWB (10-18 WEEKS). There was late starting of PWB and FWB in DHS series as compare to PFN series. Sliding of more than 15mm leads to a higher prevalence of fixation failure.[11] In our study we have found sliding 10-15mm in DHS and 6-11mm sliding in PFN series.

Bendo et al reviewed 142 intertrochanteric fractures treated with a sliding hip screw, 80 of which (56%) were unstable. Of the 80 unstable fractures, 22 (28%) had moderate or severe collapse of the fracture fragments, all of which developed abductor weakness, a Trendelenburg sign, and gait disturbance. All patients required ambulatory aids (None required an aid preoperatively) and 9 patients required shoe lifts for limb shortening of up to 3 cm. Intramedullary devices limit the amount of fracture collapse and minimize these complications. In our study more shortening was found in cases of DHS series (1 to 1.9 cm) as compare to PFN (0.5 to 0.9) where less shortening was seen. In our study also sliding was 1-1.5 cm in DHS group and PFN group has 0.6 – 1.1 cm sliding and shoe lift was required in 7 cases of DHS for shortening upto 3 cm. which is similar to this study.

DISCUSSION: Peritrochanteric hip fractures still are a major orthopaedic challenge, and those that are unstable have the poorest prognosis. Peritrochanteric fractures AO type 31-A2.2–A3.3 are unstable & have poorest prognosis. This extremely unstable fracture results in a severe and prolonged period of postoperative disability. Fracture collapse is one of the postoperative complications reported in association with these fractures. Average age of the patient in this series was 58.20 yrs, which is significantly lower as compared to various studies published. [Cleveland[11](1947)–75 yrs, Boyd & Griffith (1949)–65 yrs, Evans (1949)–62.2 yrs, Females in the present study are of same number as the Males. This finding in the present study doesn't matched to various published reports [Cleveland (1947), Boyd & Griffith (1949), Evans (1949), Sarmiento (1957), 18 patients had trauma due to trivial fall, while 11 out of 30 patients had sustained fracture intertrochanteric femur because of road traffic accidents and 1 sustained after fall from height.

21 patients had sustained fracture on right side and 9 patients had fracture on left side.

According to AO classification in our study we have found A1.2=1, A2.1=1, A2.2=13, A2.3=8, A3.1=7. In our study all the cases with TAD index less than 20 mm was maintained and in 91% cases lag screw was inserted in infero-central quadrant. In our study one case of screw breakage in PFN reported in cases of type A 2.3. Which comes in unstable fracture, no cut out reported in DHS group. 3 patients in our study suffered from Superficial infection 3 in DHS, 0 in PFN, (treated with i/v antibiotics), deep infection 2 in DHS, 1 PFN (6.7%) required debridement 1 week post operatively and i/v antibiotics in all three cases. We had bony union in 98% cases in an average of 12.33 weeks

(4 months) with no iatrogenic femoral fractures in our PFN series. Sliding 10-15mm in DHS and 6-11mm sliding in PFN series. In our study more shortening was found in cases of DHS series (1 to 1.9 cm) as compare to PFN (0.5 to 0.9). In our study also sliding was 1-1.5 cm in DHS group and PFN group has 0.6 – 1.1 cm sliding and shoe lift was required in 7 cases of DHS for shortening upto 3 cm. In our study no trochanter stabilizing plate was used and in cases of unstable type that is type A 2.3 to 3.1. PFN has given a better result in terms of functional and anatomical outcomes as compare to DHS.

The PFN is a good minimal invasive implant of unstable proximal femoral fractures, if closed reduction is possible. If open reduction of the fracture becomes necessary and several fragments are found (especially of the greater trochanter), a dynamic hip screw (DHS) with the trochanter stabilizing plate is preferred. PFN has given a better result in terms of functional and anatomical outcomes as compare to DHS.

Intramedullary Nailing is widely used for fixation of such fractures with claims of less operating time, minimized wounds, immediate weight bearing, faster mobilization and less morbidity in terms of prevention of excessive collapse and limb length discrepancy and implant failure.[11] Considering all above studies Intramedullary Fixation Nail appears to be a better option for unstable inter-trochanteric femur fracture.

CONCLUSION: We conclude that in unstable intertrochanteric fracture PFN helps in achieving biological reduction, imparts stability enabling early mobilization and prevents excessive collapse. This results in faster union and lesser incidence of limb shortening. Thus it helps in achieving overall good functional outcome.

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CASE 1

Pre op X-ray	Immediate post op X-ray AP view
	
At 3 Months follow up showing union in progress	**Final follow**
	

Final follow up X-ray lat. view


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Flexion	Extension
	
Abduction	**Adduction**
	
Standing on both limbs	**Standing on affected limb**
	

Squatting	Sitting cross legged
	

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CASE 2

Pre op X-ray	Immediate post op X-ray
	
At 3 months follow up showing union in progress	Final follow up AP view
	

Final follow up lat. View


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Flexion	Extension
	
Abduction	**Adduction**
	
Standing on both limbs	**Standing on affected limb**
	

Squatting	Sitting cross legged
	

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