DHS VERSUS PFN IN STABILIZATION OF INTERTROCHANTERIC FRACTURES- A COMPARATIVE STUDY

Vijaya Bhushanam Meesala[1], Ashok Padala[2], Sivananda Pathri[3]

[1]Associate Professor, Department of Orthopaedics, Maharajah's Institute of Medical Sciences, Nellimarla, Vizianagaram, Andhra Pradesh.
[2]Assistant Professor, Department of Orthopaedics, Kamineni Institute of Medical Sciences, Narketpally, Hyderabad, Telangana.
[3]Professor and HOD, Department of Orthopaedics, Rajiv Gandhi Institute of Medical Sciences, Srikakulam, Andhra Pradesh.

ABSTRACT

BACKGROUND

Inter trochanteric fracture is the extra capsular fracture of the proximal femur, involving the two trochanters. It is most commonly seen in the older age group due to trivial injury, resulting in hip fracture owing to osteoporosis and in the youth due to high velocity road traffic accident. The ultimate aim of treatment of IT fracture in older people is early mobilization, early weight bearing and to prevent the complications of prolonged recumbency. Surgical treatment of intertrochanteric fractures of femur by Dynamic Hip Screw or by Proximal Femoral Nail provides better results. This study aims to compare the radiological union and functional results of DHS and PFN in the fixation of intertrochanteric fracture of femur.

MATERIALS AND METHODS

This was a prospective multicentre study of 40 cases, from June 2016 to June 2017 admitted in the Department of Orthopaedics, at Maharajah's Institute of Medical Sciences, Nellimarla, Vizianagaram and Rajiv Gandhi Institute of Medical Sciences; Srikakulam. 18 cases were treated by PFN and 22 cases were treated by DHS. Patients were followed up at 6, 12, 18 and 24 weeks, then 3 monthly till 1 yr. The results were compared for union rate, time for weight bearing, functional outcome using Harris hip score and also for various complications.

RESULTS

In our study mean perioperative blood loss was 70.52 ml in PFN and 154.03 ml in DHS group. Mean duration of surgery is 94.6 min. for PFN and 67.2 min. for DHS. C arm exposure was greater for PFN compared to DHS. PFN group showed significant early mobilization and early weight bearing than DHS group. PFN had better Harris Hip Score in the early post-op period but at the end of 12th month, there was not much difference in the functional outcome between the two groups.

CONCLUSION

Surgical treatment of IT fractures of femur requires proper implant selection based on the pattern of the fracture. Dynamic hip screw fixation with attached barrelled plate and proximal femoral nail are the two surgical options available. DHS fixation takes less time for surgery, less radiation exposure with 'C Arm' and has moderate risk of infection, but has much higher blood loss than PFN. Whereas, PFN surgery has the advantages of early mobilization, early weight bearing, minimal blood loss and with minimal risk of infection. When compared to the results of DHS surgery, PFN has got better surgical outcome with paramount results both in stable and unstable IT fractures, with few failure rates and with successful restoration of hip bio mechanics.

KEYWORDS

DHS, PFN, Intertrochanteric Fractures, Stable Fractures, Unstable Fractures.

HOW TO CITE THIS ARTICLE: Meesala VB, Padala A, Pathri S. DHS Versus PFN In Stabilization of Intertrochanteric Fractures - A Comparative Study. J. Evid. Based Med. Healthc. 2018; 5(46), 3183-3186. DOI: 10.18410/jebmh/2018/648

BACKGROUND

IT fracture is the extra capsular fracture of the proximal femur, with high incidence in the older age group with osteoporotic bones having the history of trivial injury due to low grade trauma.[1] Increased geriatric population, with higher incidences of osteoporosis are the causative factors for the increased incidences of IT fractures in the recent period and in the near future also.

The ultimate aim of treating IT fracture patients in older age group is to encourage early mobilization and early weight bearing, thereby preventing the various complications of prolonged bed rest. To achieve this aim, a variety of implants for internal fixation have been employed with variable success. Among these, Dynamic hip screws (DHS) and Proximal Femoral Nails (PFN) are the most successful fixation devices employed in stabilizing these fractures.[2]

DHS fixation in IT fracture is a reliable time-tested surgery since it is an eccentric load sharing device, but

Financial or Other, Competing Interest: None.
Submission 03-10-2018, Peer Review 06-10-2018,
Acceptance 22-10-2018, Published 06-11-2018.
Corresponding Author:
Dr. Ashok Padala,
#C5, Quarter, C- Block,
Staff Quarters, Kamineni Institute of Medical Sciences,
Narketpally, Nalgonda- 508254, Telangana.
E-mail: ashokpamc@gmail.com
DOI: 10.18410/jebmh/2018/648

involves extensive soft tissue dissection. These disadvantages can be overcome by using PFN.[3,4] PFN is a better implant than DHS with better bio mechanical properties like axial loading, short lever arm, good implant length with de-rotational screw in the head and neck of femur which gives additional stability.

The present prospective study was conducted among the IT fracture patients, both stable and unstable with surgical methods by DHS fixation or PFN technique and to evaluate the operative time, per operative blood loss, infection rate, functional outcome, radiological union and implant failure.

MATERIALS AND METHODS

The present study was conducted in the Department of Orthopaedics, at Maharajah's Institute of Medical Sciences, Nellimarla, Vizianagaram and Rajiv Gandhi institute of medical sciences; Srikakulam from June 2016 to June 2017. 42 patients with Intertrochanteric fractures who satisfy the inclusion criteria were selected. During the study period we lost 2 patients to follow up and results of the 40 patients were assessed and analysed. Among the selected, 18 patients were treated with PFN and 22 patients treated with DHS.

Inclusion Criteria

Age more than18 years.
Fractures less than 2 weeks of duration.

Exclusion Criteria

Pathological fractures.
Polytrauma.
Fractures more than 2 weeks of duration
Medically Unfit to Undergo Surgery

All the IT fracture cases were admitted, and thorough clinical evaluation was undertaken, and haemodynamic stability was achieved. Radiographs of antero-posterior view of pelvis with both hips in 15-degrees internal rotation and a lateral view of the involved hip were taken. Preliminary skin traction was applied till surgery. Routine laboratory investigations were done for all patients. Fitness was obtained for anaesthesia and surgery. Hospital ethical committee permission was secured. They were all operated as per the standard surgical technique. Routine antibiotics and anti inflammatory drugs were given after the surgery. Active quadriceps exercises were started on 1st post-operative day with active knee ankle and toe movements as far as patient was comfortable. Partial weight bearing with walker was started (toe touch walking) once patient had regained quadriceps control and straight leg raising

Patients were sent home after suture removal. Patients were followed up in the outpatient department at 6wks., 12wks., 18 wks., 24 wks. then three monthly for 1yr. On every visit, local site was examined for any signs of local inflammation or infection, range of motion at the hip joint was assessed, and both anteroposterior and lateral radiographs were taken of the hip joint to look for the progress of union.

FIGURE 1: PRE OP ,IMMIDIATE POST OP AND COMPLETE UNION AFTER TREATMENT WITH PFN

FIGURE 2: PRE OP ,IMMIDIATE POST OP AND COMPLETE UNION AFTER TREATMENT WITH DHS

RESULTS

40 patients with intertrochanteric fracture were included in the study, among these 42.5% were male patients and 57.5% were females. Nearly 85% sustained a fracture due to a fall and 15% sustained a fracture due to road traffic accident. According to AO classification 25% were A1, 55% were A2 and 20% were A3. 25% fractures were Boyd & griffin type 1 and 55% fractures were Boyd & griffin type 2 fractures. There were 10 Boyd & Griffin type 1 and 12 Boyd & griffin type 2 fractures in DHS group. In PFN group there were 10 Boyd & griffin type 2 fractures, 3 type 3 fractures and 5 type 4 fractures. According to AO classification 10 A1 and 12 A2 fractures were treated with DHS and 10 A2 fractures and 8 A3 fractures were treated with PFN.

Of the 40 cases included in our study, 18 cases were treated with PFN and 22 cases were treated with DHS. Mean age of patients treated with PFN was 58.9 and DHS was 60.45. Mean operating time (94.6 minutes for PFN and 67.2 minutes for DHS; $p < 0.001$). Mean number of radiation exposure with C arm (194.44sec for PFN and 90.40sec for DHS; $p < 0.001$) was found to be significantly higher for the PFN group. There was significantly increased mean perioperative blood loss in DHS group 154.03 ml Vs. 70.52 ml in PFN respectively, $p < 0.001$).

Compared to the DHS group, PFN group had significantly less time to mobilization. On post-operative day 2, all the PFN cases could be mobilized compared to 22.7% DHS ($P<0.001$). Partial weight bearing was significantly earlier in PFN group compared to DHS. By 2nd week all PFN cases could partially weight bear compared to 69.5% of DHS ($p=0.002$). Full weight bearing was significantly earlier in PFN group compared to DHS. By 4th week all PFN cases could completely weight bear compared to 56.5% of DHS ($p=0.002$). All patients in our study had radiological union at 6 months, some with good callus and some with fair callus response.

3 patients in the DHS group and none in the PFN group developed superficial wound infection, which were subsided by using I.V antibiotics ($P>0.05$). At 6 months, significantly more patients in DHS group were having pain around hip (4

in DHS and 2 in PFN). In our study we found 2 cases of implant failure (screw cut out) in DHS group. The implant was removed, and the patient was managed conservatively due to decreased life expectancy and high morbid status of the patient and the fractures were united. No screw migration was seen in the PFN group patients

Regular follow ups were performed, and functional recovery was assessed by using Harris hip score and radiological evaluation at three, six, nine & twelve months postoperatively. At the end of 3 months, we found that the functional results calculated using the Harris hip score in patients of DHS group, scored an average of 32.67 compared to PFN group that showed 52.87 (P=0.001). Scores increased to 67.6 and 85.4 for DHS and PFN group respectively at the end of 6 months (P=0.001). But at the end of 12th month, the average functional scores in the DHS group increased to 89.08 as compared to PFN groups which was 90.33 (P=0.31). There was not much significance between the two groups (figure 3).

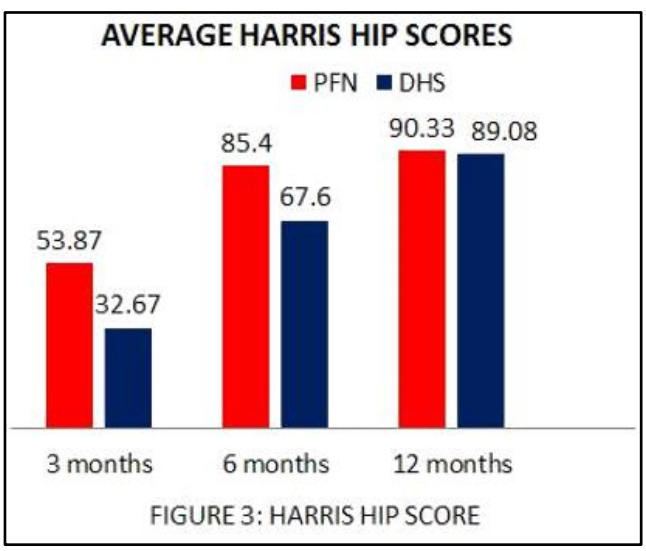

FIGURE 3: HARRIS HIP SCORE

DISCUSSION

IT fracture is the extra capsular fracture of the proximal femur causing minimal interruption of blood supply with greater risk of displacement of fractured fragments. Most of the IT fractures in the older age groups are due to trivial fall. In younger age IT fractures can occur due to high velocity RTA and fall from heights.[5] The aim of treating IT fracture in older age group is to attain early mobilization, early weight bearing and to prevent the complications of prolonged recumbency. Number of implants are available for treating IT fractures, each implant having its own metal failure rates and complications due to disrespect to bio mechanics, fracture type, inability of the implant to handle the stress and associated injuries.[6] The current treatment modalities for Trochanteric and Sub-trochanteric fractures can be of two types- cephalomedullary nails and lateral plate screw systems. Intra medullary nail fixation in IT fractures has been the popular choice now, because of its easy application and guaranteed stability even in unstable fractures. The final outcome of these IT fractures in young and middle-aged patients will be proportional to the severity of trauma at the time of injury.[7]

DHS fixation with lateral plate screw system was a gold standard treatment for stable IT fractures, which had stood the test of time. It provides adequate compression at fracture site, less radiation exposure and shorter learning curve. But application of DHS in unstable IT fractures without posteromedial cortex support will result in varus collapse and cut out of lag screw and improper positioning of lag screw. According to the study by Baumgaertner et al, small TAD (Tip Apex Distance) of less than 25mm will be associated with low incidence of cut-out of lag screw.[8] In our study two cases showed lag screw cut-out due to varus collapse. IT fracture with medial calcar comminution or missing posteromedial cortex or improper reduction results in high varus strain at the fracture/ implant interface, which leads to subsequent loosening of screws or implant breakage. Apart from metal failure, per operative blood loss and infection are the other complications. In our study, we observed higher mean operating time for PFN compared to DHS, the findings of which are similar to the report by Little et al.[9]

Radiation exposure with 'C arm' for PFN was higher than DHS (P value <0.001), with similar findings reported by little et al. But, shorter operating time was reported for PFN by Neuber et al and Leung et al.[10,11] incidence of wound infection after surgical treatment of IT fracture varies from 1.7% to 16.9%, according to the literature. Three of our DHS surgeries (13.6%) developed superficial infection and they were successfully treated with IV antibiotics.

Proximal femorale 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, decreased blood loss and due to its ability to provide stability to unstable fractures. PFN permits controlled collapse at the fracture site[12] thus not making the fracture prone for varus collapse in cases of posteromedial discontinuity. PFN is advantageous in providing a biomechanically stable construct by reducing the distance between hip joint and the implant.[13,14] The disadvantages with PFN fixation are prolonged radiation exposure, Z effect, reverse Z effect, screw cutout and inability to place the lag screw and de-rotation screw in the narrow femorale neck. Lag screw cutout can be decreased by placing the screw in the inferior part of the femorale neck in the AP view keeping parallel to the calcar femorale and centrally in the lateral view with the tip of the screw sub-chondrally. According to Herman et al, the mechanical failure rate increased from 4.8% to 34.4%, when the placement of the center of lag screw was not in the second quarter of the head-neck interface line i.e., safe zone (pre value = 0.001), and the placement of the lag screw lower or higher than the head apex line by 11mm were associated with failure rates of 5.5% and 18.6% respectively (P value = 0.004). Placement of lag screw within the safe zone markedly reduce the mechanical failure rate with PFN, according to Hermon et al.[15] In our study, time taken for initial mobilization and

weight bearing is less in PFN compared to DHS. Which is similar to study of Nuber et al and Leung et al.[10,11]

In the present series of patients, union was achieved in all cases treated with DHS and PFN groups. The functional outcome showed higher mean Harris hip scores for PFN at 3months and 6 months but no significant difference at 12 months.

CONCLUSION

IT fracture of the proximal femur requires a proper selection of the implant, based on the fracture pattern. DHS fixation of IT fracture takes less operative time, less radiation exposure but with higher blood loss. Whereas, PFN has the advantages of early mobilization, early weight bearing with minimal infection rate. So PFN, is a stable implant, shows better results in both stable/unstable IT fractures with low failure rates and gives successful restoration of hip bio mechanics when compared to DHS fixation.

REFERENCES

[1] Dimon JH, Hughston JC. Unstable intertrochanteric fractures of the hip. J Bone Joint Surg Am 1967;49(3):440-450.
[2] Radford P, Needoff M, Webb JK. A prospective randomised comparison of the dynamic hip screw and the gamma locking nail. J Bone Joint Surg Br 1993;75(5):789-793.
[3] Gadegone WM, Salphale YS. Short proximal femoral nail fixation for trochanteric fractures. J Ortho Surg (Hong Kong) 2010;18(1):39-44.
[4] Canale ST, Beaty JH. Campbell's operative orthopaedics. 11th edn. Elsevier 2008: p. 3239.
[5] Friedman RJ, Wyman ET. Ipsilateral hip and femoral shaft fractures. Clin Orthop Related Res 1986;208:188-194.
[6] Pavelka T, Kortus J, Linhart M. Osteosyntehsis of proximal femoral fractures using short proximal femoral nails. Acta Chir Orhtop Traumatol Cech 2003;70(1):31-38.
[7] Alho A, Ekeland A, Grogaard B, et al. A locked hip screw-intramedullary nail (cephalomedullary nail) for the treatment of fractures of the proximal part of the femur combined with fractures of the femoral shaft. J Trauma 1996;40(1):10-16.
[8] Baumgaertner MR, Solberg BD. Awareness of tip-apex distance reduces failure of fixation of trochanteric fractures of the hip. J Bone Joint Surg Br 1997;79(6):969-971.
[9] Little NJ, Verma V, Fernando C, et al. A prospective trial comparing the Holland nail with the dynamic hip screw in the treatment of intertrochanteric fractures of the hip. J Bone Joint Surg Br 2008;90(8):1073-1078.
[10] Nuber S, Schönweiss T, Rüter A. Stabilisation of unstable trochanteric femoral fractures. Dynamic hip screw (DHS) with trochanteric stabilisation plate vs. proximal femur nail (PFN). Unfallchirurg 2003;106(1):39-47.
[11] Leung KS, So WS, Shen WY, et al. Gamma nails and dynamic hip screws for peritrochanteric fractures. A randomised prospective study in elderly patients. J Bone Joint Surg Br 1992;74(3):345-351.
[12] Setiobudi T, Ng YH, Lim CT, et al. Clinical outcome following treatment of stable and unstable intertrochanteric fractures with dynamic hip screw. Ann Acad Med Singapore 2011;40(11):482-487.
[13] Kish B, Sapir O, Carmel A, et al. Full weight bearing after unstable per and subtrochanteric fracture using proximal femur nail. J Bone Joint Surg Br 2001;83-B:289.
[14] Steinberg EL, Blumberg N, Deke S. The fixation proximal femur nailing system: biomechanical properties of the nail and a cadaveric study. J Biomech 2005;38(1):63-68.
[15] Herman A, Landau Y, Gutman G, et al. Radiological evaluation of intertrochanteric fracture fixation by the proximal femoral nail. Injury 2012;43(6):856-863.