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ORIGINAL ARETICLE

COMPARATIVE STUDY OF THE MANAGEMENT OF INTER-TROCHANTERIC FRACTURES: PROXIMAL FEMORAL NAIL VERSUS DYNAMIC HIP SCREW

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ABSTRACT

Objectives: The aim of this study was to compare the outcome of intertrochanteric fractures treated with Dynamic Hip Screw and Proximal Femoral nail. **Methods:**This study was conducted on 28 cases of Intertrochanteric fractures of femur treated by a dynamic hip screw and proximal femoral nail. Patients were operated on standard fracture table under image intensifier control. The criteria selected for comparison of efficiency included duration of surgery, ease of procedure, intraoperative and postoperative complications, blood loss, rate of union, radiation exposure and functional outcome of harris hip score.**Results:** The average age of the patient was 62.3 years. Most common mechanism of fracture was domestic fall. Mean time of union in PFN was 9.8 weeks and DHS was 13.5 weeks, Duration of surgery was less with PFN with mean time 72.5 minutes and 83.3 minutes with DHS. Blood loss was less with PFN with mean 150 ml vs. 400 ml in DHS. Length of incision was small in PFN 8.5 cm while in DHS, the length of incision was 16cm. Post-operative complications were less with the PFN group as compared to DHS. **Conclusion**: In our study we have found that the unstable pattern was more common in old aged patients with higher grade of osteoporosis and PFN group has a better outcome in this unstable and osteoporotic fracture. PFN group has less blood loss and less operating time compared to DHS group. In PFN group patients have started early ambulation compared to DHS group.

1.INTRODUCTION

The incidence of intertrochanteric fractures has been increasing significantly due to the rising age of modern human populations [1,2]. Generally, intramedullary fixation and extramedullary fixation are the 2 primary options for treatment of such fractures. The dynamic hip screw (DHS), commonly used in extramedullary fixation, has become a standard implant in treatment of these fractures [3,4]. Proximal femoral nail (PFN) used in the intramedullary fixation for fixation of intertrochantric fratures is gaining popularity.Variety of different implants had been used either extramedullary or intramedullary in nature. Treatment options for hip fracture patients depends on the location and pattern of the fracture.

For many years, the sliding hip screw and plate had been the gold standard in treating pertrochanteric fractures. Nowadays, there is an increasing interest in intramedullary nailing. Intramedullary devices, although technically difficult seems to have a biomechanical advantage over laterally fixed side plates. Biological advantages include closed reduction, less soft tissue dissection and comparatively less blood loss. Fracture hematoma is preserved which aids in ntural healing process.

Intramedullary devices such as proximal femoral nail (PFN), are more stable under loading with a shorter lever arm.The distance between the hip joint and the nail is reduced compared with a lateral plate, thus diminishing the deforming forces across the implant. These are load sharing devices; so early weight bearing can be allowed. Biomechanical studies have shown that intramedullary devices are more stable under loading[5], although associated with more reoperation rates as shown in few studies[6]. Furthermore, the tip of the nail was redesigned to decrease the risk of intra and post-operative fractures of the femoral shaft by a significant reduction in bone stress[7].The clinical relevance of the presumed advantages and lower complication rates are still to be established. Many trochanteric fractures are still treated with a long plate sliding hip screw or other extramedullary devices. This study was designed to compare functional outcome and complications of the PFN device with those of a traditional

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extramedullary device, the dynamic hip screw (DHS), in patients with unstable trochanteric fracture.

2.MATERIALS AND METHODS

A prospective randomized and comparative study was conducted on the patients admitted in the Department of Orthopedics of Raja Muthiah Medical College Hospital. The study population mainly 28 patients with more than 50 years of age. The study period was 2 years from August 2012 to July 2014.

Eligibility criteria for the patients included in the study were as follows:

1) 1) Patients with intertrochantricfractures in the age group of more than 50 years of either sex,
2) 2) Intertrochanteric fracture type 1 to 4 (Boyd and Griffin classification) without any systemic or psychiatric illness
3) 3) Patients fit for anaesthesia.

The exclusion criteria were

1) Patients unfit for the surgery,
2) Compound or pathological fractures,
3) Admitted for re-operation
4) Those who were not willing for surgery.

The present study was undertaken in patients more than 50 years of age with the following objectives:

1) To compare the Dynamic Hip Screw and the Proximal Femoral Nail method of fixation in intertrochanteric fracture of femur in the adults with respect to intra operative parameters (total duration of surgery, intraoperative blood loss and intraoperative complication).
2. To compare the functional outcome with respect to union of the fracture, functional return, mortality and complications in the two groups.
3. To study the pattern of implant failure in the two groups and try to determine the cause and how to prevent failure.
4. To determine which implant would be ideal for which fracture type so as to provide the best results with the least complications
5. To study the long term follow up of the two groups with respect to any residual impairment of function, chronic infection and overall tolerability of implant.
6. To study in detail the types of fracture patterns seen in the intertrochanteric region with respect to mode of injury and age of the patients.

All the patients were carefully evaluated preoperatively which included detailed history to determine the cause of fracture and other associated diseases if any. The radiograph of pelvis with both hips AP and lateral view of the affected hip was taken. The fracture was classified using Boyd and Griffin classification. Skin traction was applied to all cases initially. Implant either DHS or PFN was randomly selected by operating surgeon. For DHS, length of compression screw is measured from tip of the head to the base of greater tronchanter on AP view X-ray subtracting magnification. Neck shaft angle and the length of the side plate is determined using goniometer on X-ray AP view on unaffected side . For PFN Nail diameter was determined by measuring diameter of the femur at the level of isthmus on an AP X-ray, Neck shaft angle was measured in unaffected side in AP X-ray using goniometer and a standard length PFN (250 mm) was used in all our cases.

All cases were operated on a standard fracture table under spinal anesthesia using standard operating technique of the implant chosen. The fracture table is essential to achieve reduction and as it allows free access for the C-arm in both views.

All patients in our study were treated with physical methods such as early mobilization, manual compression of the calf and elastic stockings. Patients were encouraged ankle and calf exercises from day one and mobilized nonweight bearing from the second postoperative day depending upon the physical condition of the patient. All drains were removed on third post op day.The wounds were inspected on the 3rd and 6th post operative day. Sutures were removed on the 12th day. Patients were followed up at one monthly interval till fracture union and then at 6 monthly interval for 1 year and then at yearly interval

3.RESULTS

The study involved 28 confirmed cases of intertrochanteric femur fracture of either sex from August 2012 to July 2014. Out of 28 cases, 13 were treated by proximal femoral nailing (group A) and 15 were treated by dynamic hip screw (group B).
In our study maximum age was 79 years and minimum was 51 years. The average age was 67.8 years. In both groups A and B 12 were male and 16 were female patients.
Among these patients 15 were under Type 1 &2 fractures and 13 were under Type 3 & 4. The results were statistically analyzed and the two tailed p values were evaluated.

Duration of surgery was more for DHS compared to PFN. The duration of surgery as calculated from the time of incision to skin closure was counted in each case. The average duration of surgery for the PFN (Avg. time 48.73 min) was significantly shorter then DHS (Avg. time 69.03 min).
Blood loss was measured by mop count and collection in suction drain. The average blood loss in the P.F.N group was 116 ml and in the DHS group was 213 ml. blood loss is less in PFN which is statistically significant.

There was no failure to achieve close reduction among all 13 patients. There was no iatrogenic fracture of lateral cortex among all 13 patients in group A.
In 1of 13 cases anti-rotation screw was failed to get fixed. It could not be accommodated in the neck after putting neck screw. There was no difficulties in distal locking. There were no instances of drill bit breakage or jamming of nail.

There were 2 cases of infection seen in the D.H.S group. They were seen within 13 days of surgery and were treated by local debridement and antibiotic and did not require implant removal. The average shortening in the P.F.N group was 5.35 mm as compared to 9.62 mm in the D.H.S group. So, shortening is less in PFN group which is statistically significant.

There was 1 of 13 case of implant failure in P.F.N group and revision surgery was required for it. The usual 'Z' pattern of implant failure was the reason. In the D.H.S group there were 1 of 15 cases of implant failure one was due to screw cut out and other was due to plate breakage. In both the cases revision surgery was required.

The mean length of hospital stay (11 days) did not differ statistically between the two treatment groups or with the different type of fracture. No statistically significant differences were found in the complication rate between the two treatment groups.

4.DISCUSSION

Currently surgical treatments are the preferred mode for intertrochanteric fractures, as they avoid complications related to prolonged recumbency. From a biomechanical point of view, the varieties of implants are available. The first one which is a load bearing implant, consists of sliding neck screw connected to a plate in the lateral femoral cortex. In unstable fractures, an additional anti-rotational screw is recommended and, in case of several fragments and / or impaired bone quality, a trochanteric stabilization should also be used [8,9]. The
other alternative is sliding neck screw that stabilizes head and neck fragments by means of intramedullary nail. This load sharing implant is inserted with the closed reduction technique [10,11,12].

The higher incidence of screw back outs after PFN showed that hold of the lag screw was not as good as in DHS. This may be due to the fact that, in PFN, we ream the whole tract with the same diameter of the drill, while in DHS, we use a graded drill, the triple reamer, with lesser diameter in its distal portion and greater diameter in proximal portion. This gives a better hold of the lag screw in the DHS and also better compression at fracture site.

PFN usually takes less operative time than DHS [15] though more technical expertise is required. This may be explained by the PFN being inserted by closed technique with minimum soft tissue dissection. A smaller incision in the PFN group has advantages such as less blood loss, less operative time, better cosmesis, minimum soft tissue dissection and early return to daily activities.
On the other hand, DHS requires greater exposure and soft tissue dissection, it also has complications related to screw cut out and implant breakage. Knee mobilization was delayed in the DHS group because of pain at incisional site. The PFN group took comparative lesser time to heal [17,18,19]. In this study, functionally and radiologically, DHS provided excellent to good results in stable type of fracture pattern while PFN provided more frequent excellent to good results in both type of fracture patterns. This is because PFN provided stable anatomical fixation of more comminuted fracture without shortening of abductor moment arm or changing
proximal femoral anatomy. With the fixation device within the medullary canal, the bending moment on it is considerably less than on standard compression screw and slide plate devices [18,21]. With such results PFN has been becoming a better implant for the unstable type of intertrochanteric fractures [11,12,18,22].

Deep and superficial infection both were higher in DHS group, which could be due to a longer skin incision, extensive tissue dissection and more operative time. Apart from implants, faulty technique and rehabilitation program may lead to complication in either group, like improper screw positioning,shortening,varus deformity and non-union. [22,23].

The therapeutic effect of DHS and PFN was similar in treating type 1and 2 inter-trochanteric fracture, but in type 3 and 4, PFN appeared to be biologically and biomechanically superior.

CASE 1


Pre op


Immediate post op


6 weeks old


3 months old


Pre op


Immediate post op


6 weeks old


3 months old

5.DISCUSSION

In conclusion, the PFN is an intramedullary load-bearing device that allows for immediate postoperative weight bearing, with an antirotation screw allowing controlled impaction of the metaphyseal fracture zone. Due to a shorter lever arm, additional anti-rotational screw, fluting nail tip to decrease stress concentration at the tip of the implant reduces the chances of implant failure. It has all the advantages of closed techniques i.e. preservation of fracture hematoma in situ, minimum soft tissue dissection and periosteal stripping which helps in the fracture healing and less post-operative infections as compared to DHS which requires larger incision and extensive soft tissue dissection. Patients with unstable intertrochanteric fractures treated with PFN had earlier radiological union, better functional outcome less complications and earlier weight bearing.

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