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Outcomes of Intertrochanteric Fractures Treated with Long Proximal Femur Nail done without Distal Locking

KEYWORDS: PFN , without distal lock , intertrochanteric fractures

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ABSTRACT *Background: Proximal femur nailing has become the standard of care in treatment of intertrochanteric femur fractures. These fractures often occur in patients having multiple comorbodities such that anesthesia time becomes valuable. We investigated our belief that stability provided to nail by the anatomically narrow portion of femoral medullary canal called isthmus is sufficient to facilitate fracture healing. The time saved with avoiding distal lock saves valuable anesthesia time.*

Materials and Methods: 50 patients with intertrochanteric femur fractures were treated with long proximal femoral nail without distal locking. Distal locking was omitted when a tight fit of an unreamed PFN was felt in the medullary canal by the operating surgeon. The results were evaluated with Modified Harris Hip Score and analyzed with appropriate statistical method.

Results: 40 patients were followed up clinically and radiologically for 2 years.

Conclusions: Omission of distal locking in select patients doesn't affect the outcome of fracture fixation. It does significantly shorten the duration of surgery with minimal additional complications in select patients

Introduction

The incidence of fractures in the trochanteric area has risen with the increasing numbers of elderly persons with osteoporosis[1,2]. One line of modern research is going along the lines of primary arthroplasty in proximal femur factures.[3] However osteosynthesis is still the preferred option for most surgeons.[4,5]

There are two main types of implants available for the treatment of these fractures, namely extramedullary and intramedullary implants. The intramedullary implants have a huge variety of choices with the earliest being the short gamma nail followed by the trochanteric gamma nail and long gamma nails. The latest of them is proximal femoral nails with two lag screws in neck of femur. Common to all of these intramedullary implants is the distal fixation advised into the femoral shaft. In spite of several advances in nail technology and technique no foolproof method of facilitating distal locking has been designed.[6,7]

It continues to be tricky and time consuming.There is exposure to excessive radiation.[9] Several complications are known to occur intraoperatively and in post op period. Although the PFN system developed by the AO/ASIF overcame many of the previously mentioned limitations of the Gamma nail, it still has some disadvantages.

Articles are seen pointing out problems associated with distal locking of any intramedullary device used for fixation of pertrochanteric fractures [12,13,14,15]. As a result, many researchers have reduced their indications for distal locking in trochanteric fractures [16,17,18] or they do not use it at all [18,19]. Some researchers have tested the torsional stiffness of a distal unlocked intramedullary nail used to treat hip fractures. It has been postulated that in an distal unlocked fracture construct the stability to an intramedullary nail is provided by the friction of the nail against a tight fitting medullary canal wall, which in turn provides a controlled dynamic stability as against rigid fixation with a interlocking bolt. This in turn allows controlled vertical collapse.

Distal locking screws can act as stress risers that cause subsequent implant breakage. If recommended techniques are not followed considerable damage to soft tissues can cause post operative pain. Their insertion requires considerable skill and experience with no sure shot method for insertion. Consequently their insertion increases the surgery time considerably accompanied with the radiation exposure.

Thus, in this prospective study, we tried to find out drawbacks of omitting distal lock in pertrochanteric fracture fixation and whether this any way influences operative time and post operative morbidity.[6]

Materials and Methods

This prospective study involved 40 patients with intertrochanteric fractures presenting to our hospital from May 2011 to May 2013. The average age of patients was 64.88 with 65 percent having unstable and rest having stable fracture configurations(as per Evans classification). All patients were ambulant before sustaining fractures, except two hemiparetic patients who needed support to walk. All patients were treated within four days of the fracture. The intertrochanteric fractures considered for study were fresh fractures and included after due consent was taken. After the approval of the institute's ethical committee they were treated with long PFN done without distal locking. Patients were seen postoperatively at regular intervals of first month, third month, sixth month and then annually. All the patients were evaluated for peroperative parameters like duration of screening time (in seconds), operating time (in minutes), blood loss during surgery (in mililitres), ease of procedure; possible intraoperative complications like malreduction/failure of reduction, fracture displacement. Blood loss during surgery included blood loss due to fracture and operative losses. Here screening time meant the time during which a particular fracture was screened under image intensifier during surgery. Postoperatively they were assessed for pain, range of movement, rehabilitation malunion, delayed union, general and local complications and any additional

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/revision surgery required. Also, they were assessed for date out of bed to chair, state of ambulation, ambulatory status at discharge, requirement of ambulatory assistant devices, weight-bearing status at discharge and length of hospital stay. Radiographic assessment of fracture fragment position, lag screw position, nail alignment and extent of fracture healing was made. Overall outcome was assessed, categorizing the result as Excellent, Good, Fair and Poor [per Modified Harris Hip score].

OPERATIVE PROCEDURE

After preoperative assessment patient was taken on the traction table under spinal anesthesia. Reduction was verified on image intensifier TV control. The tip of the greater trochanter was identified by palpation and a 5-cm incision extended proximally from it. Care was taken not to extend the incision too proximally as this would damage the inferior gluteal nerve. Incision was deepened through fascia lata, splitting the abductor muscle for approximately 3cm immediately above the tip of the greater trochanter, thus exposing its tip. Entry point was taken with awl / guide pin over protector sleeve at the tip of greater trochanter in AP view and midpoint of greater trochanter in lateral view. Reaming was done only of the proximal part one size greater than the size of the nail to be inserted. Size of nail was measured under IITV and nail is prepared for insertion and fixed with zig. Nail was introduced manually until sufficient depth of insertion was reached, confirmed under IITV. The surgeon determines the feel of nail fitting in the medullary canal. If it was tight fitting enough to withstand moderate rotational stress it is deemed fit for my study and distal locking is omitted. Otherwise it fits the exclusion criteria and surgeon decides to perform distal locking after inserting proximal neck screws.

Quadriceps strengthening exercises were encouraged from the first postoperative day. Non-weight bearing ambulation touch toe using a walker was permitted in self confident patients by the 10th post-operative day. Patients were called for review after a month and assessed clinically for any limb length discrepancy and mal alignment of the limb. Radiological assessment was done to verify the position of the implant as a check to compliance with the postoperative ambulation protocol. During the first followup at one month xray pelvis with both hips anteroposterior (AP) view and involved hip lateral was done. Partial weight bearing was initiated after the sixth week. It was gradually progressed to full weight bearing as per tolerance and absence of radiological evidence of collapse. Successive reviews were done at six-week intervals during which rotations in flexion/extension, limb length discrepancy and knee range of motion were assessed. In the event of patient complaining knee pain, X-ray distal femur with knee AP was done.

Results

The average skin incision size was 5.7 cm and duration of surgery was 59 minutes.the Average fluoroscopy time was less than 3 minutes of total exposure. It was tried to obtain at least a valgus reduction in unstable fractures .But due to various reasons 11.9 percent patients had varus reduction with one of them having additional external rotation. 22.9 percent had a satisfactory valgus reduction and majority of patients at 62.9 percent had neutral reduction.

Later it was found that the initial alignment obtained had an influence on incidence of implant complication and ultimate outcome of patient. Patients stayed an average of 9.1 days post op with us when they were given knee physiotherapy and gait training of non weight bearing as and when allowed

After discharge patients were followed up initially at 1 month, 3 months and 6 months interval .Some of them developed complications like deep venous thrombosis in one patient and shaft fracture in two patients. Both patients had trivial fall and sustained a spiral fracture, one in subtrochanteric region other in middle third shaft femur. No incidence of superficial or deep infection was present with one patient developing pressure sore on sacrum which healed uneventfully.

On an average radiological union occurred at 3.6 months but was delayed in patients having inadequate or varus fixation. One of them had hypertrophic nonunion also and one had delayed union. During the course of fracture healing many patients had implant related complications. 23.2% patients had implant related complications of which z effect occurred in one patient, collapse occurred in 6% patients. Cut out or superior migration was seen in one patient or 3%. Excessive collapse with superior cutout happened in three patients or 8.6 percent. One of them implant penetrating into the joint. Implant broke in one patient in form of derotation screw breakage which paradoxically facilitated fracture union

At final followup 45.7% patients had slight pain which occurred after strenuous activity. 22.9% patients had mild pain demanding occasional use of analgesics. 17.1% had moderate pain and these were the patients with implant related complications like bursitis or prominent proximal end or malaligned fixation. 14.3 patients were absoulutelycormfortable with their fractures and had no pain 57 % walked without support on final followup. 14.3% had a significant limp with 20% having an obvious limp not affecting speed of walking. 5.7% had mild limp with majority ie 54.3% having slight limp and 2 patients with no limp. Abductor weakness was found to be a major cause of slight limp. The ability to walk was also poor with 25.7% patients restricted indoors. Pain and socioeconomic conditions were equally responsible. 22.9% were able to walk around the house to 100 meters.Thus almost 48.6% had a bad result considering their mobility. Shortening and abductor limp combined and independently played a role in this inability. three of the five patients withsevere limp had shortening. One patients out of seven patients with moderate limp had shortening. But other factors like hemiparesis (two patients) , bilateral osteoarthritis of knee (three patients) also contribute to limp in spite of good fracture union. Abductor limp also caused a limp in patients with or without shortening. 9 patients out of 12 patients with moderate to severe limp had abductor weakness. Abductor weakness was present bilaterally in all patients with severe osteoarthritis and patients with hemiparesis had generalized weakness. Abductor weakness occurred not only due to fracture or broken greater trochanter but also due to painfull fixation or backing out screws irritating fascia lata as seen in three patients out of 12 with abductor limp. However in such cases it iis difficult to determine if the limp is due to the failing implant or the associated shortening or due to abductor weakness.37.1% could walk 500-800 meters and 14.3% could walk unlimited distance. It was seen young patients had good walking ability and often returned to their occupation

On assessing ability to crossleg sit 68.6% could sit easily,

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22.9% required assistance and had difficulty while8.6 percent were unable to sit crossleg. Ability to squat was also restricted with only 51.4% squatting easily. 37.1% squatted with difficulty and 11.4% were unable to squat. 54.3% used stairs normally, 22.9 had difficulty in stepping up the stairs and 22.9 were unable to use it.

On examination it was found that 10 patients had shortening with three patients having shortening more than 2 cm. These were the patients with the most severe implanted related complications. Seven patients with shortening less than 2 cm were treated with shoe raises. The average range of motion score was 221. The movement most common and most severely affected was internal rotaion with average internal rotation being 20 degrees .Two patients had fixed external rotation deformity with no internal rotation capacity.

After calculating the Harris hip score it was found that 40% had poor result, 37.1% had good result, 20% had fair result and only one patient had excellent result. The type and degree of instability of fractures were found to influence the outcome. Majority of poor results were seen in A2.3 (11.6 %) and A2.2 (8.7%)A3.3 (5.8%) fractures. The adequacy of reduction and immediate postfixation alignment had a major bearing on the outcome. Varus fixation took longer to unite , the average being 5.7 months. They also had more implant related complications , 66% of all implant related complications. The average Harris hip score was poor at 55. Compared to this, valgus fixation united quickly in an average 2.7 months. They also had no implant related complications and fared better in Harris hip score at 72.5. Neutral fixation united in average 3.3 months and had 2 implant related complications. The Harris hip score was fair at 66.6.

Discussion

Union in intertrochanteric femur fractures is a race between implant failure and bone union. Given the old age at which the fractures occur it is not advisable to keep the patients immobilized in bed for long. This brings about undue load on the implant while the fracture is yet to unite in early postoperative period.

A good reduction and a reasonable fixation is required to give a headstart to bone union. The implant can withstand only limited stress before it fails. Implant failure at elderly age is costly and must be avoided at all costs[10,11].

Fixing a intertrochanteric femur fracture requires expertise and sound understanding of proximal femur anatomy and mechanics. Fracture has to be reduced by closed means and fixed in minimally invasive method.

Accuracy of reduction in intertrochanteric fractures is important. Anatomic or favorable reduction with a miniopen technique is better than poor reduction in closed means. We should be careful never to start the procedure before confirming reduction in AP and lateral Care has to be taken while entering through the greater trochanter so as not to damage what is already broken[20]. In osteoporotic bones reaming is often not required and nail inserted after appropriate widening of entry should suffice.

Placement of screws in correct position and to the correct depth is the key[21,22]. Screw placed in lower half in center of head is ideal. Derotation guidepin should be in place while placing the lag screw. In osteoporotic bone there is limited number of attempts so we should be careful in selecting direction and size of screw.

If the nail was found to be tight in canal while insertion, distal locking can be omitted. Average union time was late without distal locking and chances of spiral fracture are there in PFN done without distal locking.

Omitting distal lock had less complications when used in stable fractures then when used for unstable and reverse oblique fracture patterns. This has been related to difficulty in achieving and maintaining reduction.

A long proximal femoral nail is being considered an overkill by most surgeons nowadays after an initial wave of enthusiasm. A short PFN has lesser inventory as it is not side specific. Often it was noticed especially in old short females that the femoral bow did not match the nails curve and we had to convert to short PFN.

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