

E-ISSN: 2395-1958
P-ISSN: 2706-6630
IJOS 2022; 8(1): 42-45
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www.orthopaper.com
Received: 07-11-2021
Accepted: 25-12-2021

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Results of ender's nailing in intertrochanteric fractures femur

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DOI: <https://doi.org/10.22271/ortho.2022.v8.i1a.2989>

Abstract

Condylocephalic nailing in intertrochanteric fractures was very popular in the past because it has advantages like short operative procedure, minimally traumatic, little blood loss, negligible risk of infection and risk of delayed union or non-union is also reduced. However due to complications such as irritation at the knee, decreased range of knee motion, distal and proximal migration of nails, their use has decreased recently. We feel that it was not the implant's fault which led to the complications, but it was the surgeon's fault who did not do it properly. So we conducted this study to see if the ender's nail done properly in the intertrochanteric fracture can give good results or not. Our conclusion was that it significantly reduces the operative time and blood loss and also giving wonderful functional results to the patients in terms of union and decreased risk of complications.

Keywords: Ender's nail, intertrochanteric femur fracture, osteoporosis

Introduction

The goal of the fracture treatment has shifted from just union of the fracture to the maximal functional recovery of the limb as early as possible. One of the most common fractures has been proximal femoral fracture, as emphasized by this anecdote -"human beings come in the world through the pelvis and leave the world through the broken hips." Various modalities of management, ranging from conservative to different surgical procedures with different implants have been described for the treatment of intertrochanteric fractures, with merits and demerits of each [1-3]. However, after the introduction of the ender's nail in 1969 for the treatment of intertrochanteric fractures, it is the only device which is still being used by many orthopaedic surgeons, especially in elderly age group, without any modification. Advantages of using ender's nailing over other implants are ease of the procedure, decrease operative time as well as blood loss with early mobilization. The aim of this study was to assess functional outcomes in patients having intertrochanteric fractures as per Harris hip score and to note any complications developed.

Materials and Method

This was a prospective study including 50 cases of intertrochanteric femur fractures, which was conducted in B.J. Medical College, Civil Hospital, Ahmedabad between 2017 and 2019. Written and informed consent of each of the patients was taken. The majority of patients fell at home. We used ender's nail made of stainless steel in our study and of 4.5mm diameter and of appropriate length. However, elastic nails are made of titanium alloy are also available. Elastic nails are available in various diameters: 2mm, 2.5mm, 3mm, 3.5mm, 4mm and 4.5mm. Available lengths range from 18cm to 50cm. The principle of using the ender's nail in Fracture shaft femur in pediatric patients is Three-point fixation. However, Principle of using ender's nailing in intertrochanteric fracture – Fanning, Spanning and Jamming. All the types of intertrochanteric fracture were included in the study. However local site infection, muscle weakness and any other associated fractures were kept as exclusion criteria.

The technique of Ender's nailing

The patient shifted to the operation theatre. After the patient was positioned on the fracture table, the fracture was reduced under C Arm and the table was locked. The procedure was performed under all aseptic precautions.

The procedure was performed under spinal or general anesthesia.

In most intertrochanteric fractures, over reduction in the internal rotation was considered desirable and was accomplished by positioning the patella 20 to 30 degrees internally from the middle position.

Nailing usually was performed from the medial side. A longitudinal incision was made 3-4 cm from the proximal adductor tubercle, the muscles were bluntly separated, a bone holding clamp was applied and the window was opened in the bone using the awl. Size of the ender nail is determined by keeping it over drapes under C-Arm. For stable intertrochanteric fracture, the proximal tip of the inserted nail should reach up to within 1 cm of the subchondral plate of the femoral head. For unstable fracture, in which sliding of the fragments might be expected, the tip of the selected nail should reach up to the center of the femoral head. The first pair of nails to be inserted were bent at the tip, not only to

enable them to negotiate the curve of the femoral calcar but also to place their tips inferior to those of subsequent nails so as to spread out the nails in the femoral head and trochanter. The distal 1/3rd shaft is held with bone holding forceps to prevent complication such as an iatrogenic supracondylar femur fracture. The second or subsequent nails were only slightly bent and were aimed to the centre and proximal part of the femoral head. The nails used were bent 10-15 degrees 5-6 centimeter distal to the tip, in order to increase the rotational stability of the assembly. Traction was released after one or two nails had crossed the fracture site [7].

Postoperatively, the patients were given a derotation boot or cast for a period of 15 days to prevent rotation. The patient was allowed to sit up in the bed immediately. Knee mobilization and non weight bearing mobilisation was started after 2 weeks. Partial Weight-bearing was started after 4 weeks post operatively.



Table 1: Technique of Ender's nailing

Results

The patients with an intertrochanteric femur fracture, 50 in total out of which 22 were male and 28 were female with ages ranging from fifty to a hundred years, were included in the study.

The average delay from injury to nailing was 2 days, and the average hospital stay was 5 days. The estimated average operative blood loss was 30 ml, the average operative time

was twenty-five minutes.

Complication and mortality: There were no early postoperative complications. However, 7 patients had shortening of average 1.5cm and external rotation deformity at final follow-up. Patients were followed for from every month for up to 6 months post operatively.

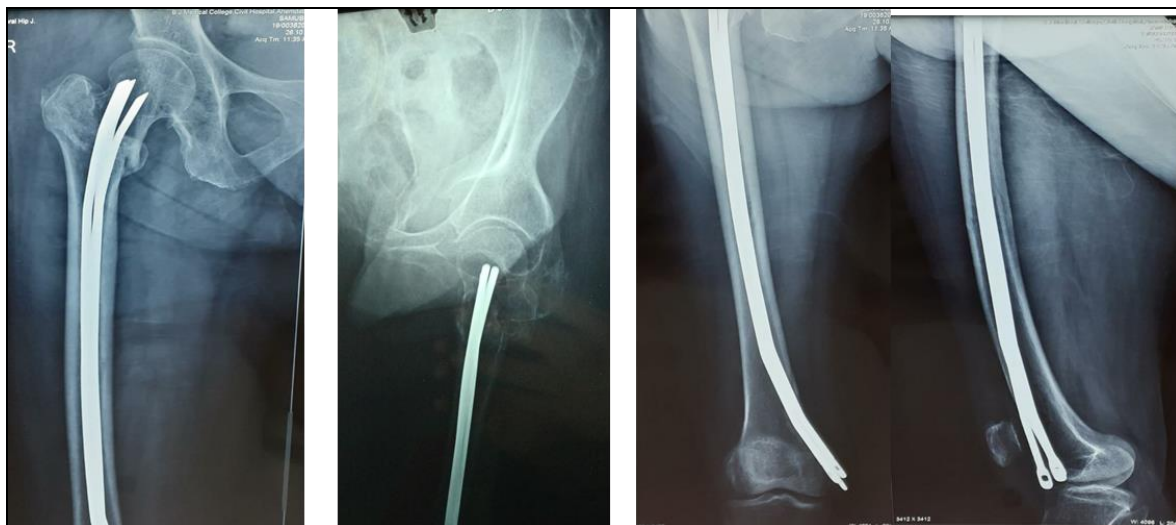


Table 2: Post-operative x-ray at final follow-up.

Discussion

It is generally well known that posteromedial cortical instability and osteoporosis increase the failure rate of fixation

of intertrochanteric and subtrochanteric fractures, and this knowledge has led to the development of various kinds of treatment. Various treatments involve specialized nails

designed with the purpose of either diminishing the stress at the fracture site or making the nail strong enough to sustain that stress until the fracture is healed. Pankovich *et al.* used the term dynamic controlled motion to describe the favorable extent of motion of fracture fragments fixed with Ender nails.

As for the number of Ender nails, we chose to use 3 nails with an anteversion as opposed to the 4-5 Ender nails recommended to fill the medullary cavity completely. In the Ender nail surgery performed in our previous studies, we observed that while the first of the nails were sent to the femoral neck with no problem, the sending of the 4th and 5th nails became more difficult. To undo perforation that may occur along the fracture of the femoral neck, Waddell suggested that the nails be pulled back and redirected for better assessment. Unfortunately, this prolongs the operation and the duration of X-ray exposure. Moreover, the bone window in the femoral supracondylar area must naturally be opened wider. In the operations we performed using the classic method of filling the medullary cavity completely with Ender nails, we observed that in most cases, additional fissures occurred in the bone window. As a result, one may encounter unexpected complications, including the loss of stability, distal migration of the nails, or an additional supracondylar fracture due to the fissures in the femoral supracondylar region. These potential results contraindicated our expectations of more stability.

In our study, we were able to send Ender nails to the medullary cavity more rapidly by opening a hole in the bone with an awl instead of a window, and by making a 3-4 cm mini-incision in the femoral supra-condylar area. Moving along the fracture line in an intramedullary direction, the nails adapt easily to the anteversion angle because they are so few in number in the femoral neck, and because they are flexible, as Pankowich stated.

We prefer Ender nails as fixation materials in our technique, as they utilize the biomechanical advantages of the nails, thereby resulting in a more rapid treatment process. Because Ender nails are flexible, their proximal tips are anatomically suited to the arch shaped structure in the proximal femur; this ability is unmatched by other methods. As Ender nails perform with a three-point principle, reduction and assessment occur more often in the valgus. Furthermore, it was found in Pauwell's biomechanical studies of the hip that flexing momentum is the highest in the subtrochanteric area, where the compound force from the femoral proximal in a healthy hip while standing or walking intersects with the long axis of the femoral shaft in this area. These measures show that in plate screw systems such as the Dynamic Hip Screw, the level of the flexing force becomes elongated, while in intramedullary nails such as Ender nails, the lever shortens. Despite their advantages, the rotational stability of Ender nails is weak. Because the external rotator muscles of the hip force the hip into an external rotation motion, particularly in unstable fractures, we neutralized it by using a Derotation brace.

Rigid plate screws, however, caused complications, including delayed union and non-union, wound infections and implant failure. In addition to bone fragments being devascularized, healing by callus formation is slow in the open reduction with DHS. Postoperative varus collapse, limb shortening and medial displacement of the distal fragment, as critical complications, were reported with DHS, which is one of the most widely used techniques for intertrochanteric fractures. Furthermore, plate fracture secondary to failure in a bending mode may occur. Intramedullary nails have a biomechanical

advantage over DHS due to the fixation device within the medullary canal and also as it is load sharing. The bending strength is considerably less than with DHS. Therefore, the use of long intramedullary nails that end at the supracondylar region of the femur has been advocated^[9, 10].

In this study we confirmed that there is a high rate of complications in intertrochanteric fractures in osteoporotic bones. Erroneous driving of the distal end of the nails into the medullary cavity usually resulted in extended operative time, required for nail retrieval. Anterior placement of the portal holes and consequent protruding of the nail ends contributed to discomfort in the knee. Most of these problems could have been avoided by careful technique.

In Ender nailing of intertrochanteric fractures, the nails are subject to minimum bending stress due to their central position within the bone. Therefore fatigue fracture is unlikely to occur.

Theoretically, delayed union and non-union are unlikely to occur after ender nailing because the nails provide some pistoning of the fracture fragments and to some degree rotational and bending motion. Pistoning of the fragments, however responsible for migration and penetration of nails into the hip joint, possibly some fragments were nailed in a distracted position.

Fracture of femoral neck can happen if nails were not placed in a fan shaped manner and were too short and straight and the femoral canal was not well stacked. There are variation in the regimens of postoperative management of intertrochanteric fractures and ambulation, according to method of fixation used. The regimen may range from extended non weight bearing to immediate full weight bearing. In the present study, patients given derotation boot for four weeks, started the knee range of motion at two weeks and partial weight bearing at four weeks postoperatively.

These results regards functional rehabilitation are better than other studies where devices other than Ender nails were used. Jones *et al.* noted that in 1/3rd of their patients an external rotation deformity developed following Ender nailing. They explained the deformity as a result of rotation of fracture fragments relative to each other. The ender nails were curve in one plane only, and were inserted in femoral head while the distal fragment are held in some internal rotation, but during reduction of the fractures the neck loses all anteversion. Complication and failures after ender nailing still are relatively frequent. In order to keep them at a minimum, Ender emphasized that careful selection of nails of appropriate length is of the greatest importance. The nails have to be just long enough so that their tips reach the subchondral bone in the femoral head. Fan shaped placement of the nails in the femoral head is also important so are stacking the nails in the femoral canal in order to prevent their proximal and distal migration, accurate placement of the portal holes, and proper positioning of the distal end of each nail.

Conclusions

It appears from the present study that there are four main advantages of ender nailing method. Short operative procedure, little blood loss, negligible risk of infection and risk of delayed union or non-union is also reduced.

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