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Open interlocking nailing of the fracture of the shaft of femur

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Abstract

Closed Interlocking intramedullary nails is now the standard in the treatment of femoral shaft fractures however use of traction table and image intensifier precludes its common use in developing countries. This study was done to evaluate the outcome of open interlocking nailing under heading of fracture union, early mobilisation and early functional return of the limb and complication. We retrospectively reviewed 36 patients with Fracture shaft of femur treated with open interlocking nailing. All fractures were simple transverse, short oblique. Serial follow up assessment was done for radiological and clinical union. Major complications encountered were infection, screws bend and delayed union. It was concluded that open interlocking nailing is a safe procedure for femoral shaft fractures, in the developing worlds with good functional and clinical results in the following situations: in hospitals with no traction table and image intensifier, in irreducible fractures and in female patients with pregnancy.

Keywords: Open interlocking nailing, distal locking zig, femoral shaft fracture

1. Introduction

Open Kuntscher nailing is no longer the common method of fixation of the femoral shaft now a day as interlocking nail offers good control of limb length and rotational alignments. However availability of image intensifier and traction table has been a major factor against the wide spread use especially in developing countries. We have done a retrospective study on 36 patients treated by open interlocking nail at rajendra institute of medical sciences, Ranchi, Jharkhand. This study was done to evaluate the use of open interlocking nail with regard to time of union, infection, limb length and range of motion at the knee without image intensifier with added benefits on surgeons part of less expertise, less surgery time, and good to excellent union rates and at the same time on patients part, avoidance of radiological exposure, being economical availability at the next door itself

2. Methods

Open interlocking nailing using proximal and distal locking zig was done in 36 patients during April 2015 to June 2016 at rajendra institute of medical sciences, Ranchi, Jharkhand, INDIA. Among 36 patient 28 patient was male and 8 patient was female having age between 19-45 years having 40 fracture of the shaft of the femur (4 patient having bilateral fracture). According to the X-ray, the fracture was classified according to the site, pattern & comminution. Open fractures and more comminuted fracture not included in the study. These 40 fractures were fixed within 6-7 days by open intramedullary nailing, locking done with distal locking zig without image intensifier.

2.1 Procedure

In this method exposure of the fracture site was done through lateral approach in lateral position. Guide wire was inserted through fracture in a retrograde manner and by making a 4-5 cm long incision over the tip of greater trochanter. Open reduction of the fracture was done and guide wire was passed up to the supracondylar region. The length of the nail was measured from tips of the greater trochanter to the upper pole of patella. The diameter of the nail was assessed according to the final reamer used at the time of surgery. The distal interlocking zig was mounted on the proximal end of the selected nail by bolt and tightened. The rotation and axis of the nail was checked with the position of the zig arm. All assembly was tightened snugly. The zig arm has holes at different distances for distal locking corresponding to the nail size used (fig 1). Through these holes, protection sleeve is inserted. Through a 2 cm incision on the distal thigh corresponding to the determined hole, sleeve was passed up to bone and then drilling was done with 4mm drill bit.

After confirming correct drill position by striking guide wire to drill bit, screw size was measured through the sleeve, and a proper size of 4 mm self tapping screws was inserted and tightened. Position confirmed by striking guide wire to bolt. Out of total 40 open interlocked nail, in 34 cases distal locking was done with the help of distal locking zig while in 6 cases it failed due to failed distal zig or misalignment of zig with distal femoral fragment or twisting of nail. After removal of guide wire, with the help of same zig insertion of proximal locking screw was done.

2.2 Post operative care & follow-up

Static quadriceps exercise was started the next post operative day. After removal of sutures on 13th post operative day hip and knee mobilisation exercises started. Partial weight bearing was allowed at 6 weeks. In some cases dynamisation was done at 8 wks and patient was ambulating with the help of crutches. Full weight bearing was allowed on the radiological evidence of callus consolidation. The patients were followed at monthly intervals for 3 months regularly, then at 6th month, 9th month and finally at 12th month.



Fig. 1: Distal locking zig arm has holes at different distances for distal locking and two proximal holes for proximal locking



Fig 2: Post op 2 month x-ray after dynamisation of same patient



Fig 3: Post op 1 month x-ray of 19 year old patient having fracture shaft of femur treated with open interlocking nailing (Missed distal screw position)



Fig 4: X-ray of the same patient after 15 month showing complete union

3. Result

Male to female ratio was 3.5: 1 and 30 patients were in the 3rd and 4th decades. According to the site of fracture, 8 were at proximal third, 20 at middle third and 12 were at distal third of femoral shaft. The union rate was 85%. The break up of union according to time is shown in table 1. The complications which were noted are shown in table 2. Range of motion at hip and knee was full after 12 weeks. Dynamization were done in 10 cases at 8 weeks post operatively. In one case screw bend occurs due to early weight bearing

Table 1

Time	No of cases	Percentage (%)
Within 3 months	01	2.5
Within 6 months	17	42.5
Within 9 months	28	70
Within 12 months	34	85
Non union	6	15
Total	40	100

Table 2

complication	No of cases	percentage
Non union	06	15
infection	02 deep,04 superficial	15
Screw bend	01	2.5
Failed distal lock	06	15
Failed proximal lock	01	2.5

4. Discussion

Various modalities of treatment have been suggested for treating fracture long bones. Closed nailing and closed interlocking were introduced after the advent of image intensifier. Majority of these fractures satisfactorily treated by close inter locking nail, but in Indian health infrastructure particularly at rural centres where the facility of image intensifier, high surgical expertise are not available and referral centres are situated at long distances, it is not the method of choice and open nailing with proximal and distal locking with the help of distal locking zig arm should be considered as the modality to treatment. Ours aim is targeting to that area of health system, so that the treatment of fracture shaft femur could be made available at the rural/basic health structure level. 85% fractures united in the present

series in the period of 12 months. Pati *et al* ^[1] and Meena *et al* ^[9] reported higher union rate compare to this study. Clawson *et al* ^[2] have reported an average time for appearance of bridging callus at 6 weeks with partial obliteration of fracture site as the time of union. Rockaen *et al* ^[6] have used the time elapsing between the accident and ability to walk without stick and return to work as the criteria for the progress of fracture healing. In this study nature of bridging callus with partial obliteration of fracture site has been used as time for union which was 8 weeks.

Open interlocking nailing with a predictable surgical time procedure is less expensive, easy and more convenient for less experienced newly qualified orthopaedic surgeon, only fewer instruments are required. Due to the direct observation of bone may lead to absolute anatomic reduction which some time not possible with close interlocking procedure. In comparison to the closed method, rotational mal-alignment is rare after open reduction. In non-union opening of the medullary canals of the sclerotic bone is easier, and it required simultaneous bone grafting can be considered.

But surgical skin scar, increased blood loss, loss of fracture haematoma (which is more important in fracture healing) increased infection rate, and complication rate and decreased rate of union has its own demerits in open IL nailing procedure.

We recommend modification in distal locking zig arm by means of providing intermediate arm support, in between the proximal and distal locking points to stabilize the free hanging of zig arm, during the distal locking of open interlocking nail, as was the need in failed distal locking 6 cases.

5. Conclusion

Closed Interlocking intramedullary nails is now the standard in the treatment of femoral shaft fractures however cost, use of traction table and image intensifier precludes its common use in developing countries. But an open version of this procedure, by which the fracture is stabilized by opening the fracture site and fixing it by retrograde method, became popular because of less complication and more predictable operating time.

Method of open nailing can be considered at rural health centres in Indian health scenario as comparably good results could be obtained with less expertise required and avoiding the radiological hazards and giving surgical assistance at a very economical basis. This additional benefit could be added by doing locking of the nail at proximal and distal levels with the help of distal locking zig arm without the help of image intensifier, without hampering the benefits of open nailing.

Keeping the multiple factors in mind like overcrowded orthopaedics wards with fracture femur, early disposal of the patient, less resources and unequipped peripheral hospitals (no facility of image intensifier and fracture table) and to avoid the hazards of radiation and various other benefits of open nailing, it was decided to conduct a study of open interlock nailing in fracture femur. Hence a plan was made to study the result of open-interlocking nailing.

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