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Original Articles

Closed Intramedullary Nailing of Femoral Fractures

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SUMMARY

Closed intramedullary nailing was performed in 15 femoral fractures of which five cases were also interlocked considering the fracture unstable. The series included one open fracture, one segmental fracture, one comminuted fracture and three nonunion. All the fractures united which were followed for enough time (12-14 weeks). Five cases of interlocking nailing are still being followed (average 6 weeks). Range of motion achieved at follow up was 105°. There was no shortening or malrotation. After emergency measures, treatment consisted of strong pre-operative skeletal traction, accurate positioning on the fracture table selection of correct insertion point, use of properly sized nail and interlocking nail in unstable fractures. Good rehabilitation is also necessary for excellent results.

INTRODUCTION

The classical indication for an intramedullary nail is a closed transverse fracture in the middle one third of the femur. Using closed nailing techniques the fracture haematoma and periosteal blood supply are minimally disturbed and rapid healing of fracture occurs with little risk of infection, nonunion or shortening[1].

Comminuted fractures of the femur present a much more difficult problem. Options available for these fractures include skeletal traction, spica casts, cast bracing or roller traction. Though union occurs with these methods of treatment it requires prolonged hospitalization and there is significant risk of shortening and rotational malignant. Open intramedullary nailing with cerclage wiring or plating is another option but it increases the risk of infection and delayed union.

Interlocking nail has evolved as the treatment of choice for complex fractures of femoral shaft. Interlocking screws are passed proximally and distally across the bone and the nail with the help of jigs and an image intensifier. Locked intramedullary nails provide length and rotational stability to the fracture. Patient can be mobilized early and the risks of infection and delayed union are significantly reduced[2].

METHODS AND MATERIALS

Fifteen patients were subjected to closed intramedullary nailing between November, 1989 to November, 1991. Twelve cases were fresh fractures and three cases were of nonunion. All the patients were male with an average age of 25 years. Fracture was of left femur in twelve cases. Eight cases were involved in road traffic accident, three had a fall from height, one had a fall on level ground and the last one was trapped beneath a collapsed roof. Fourteen cases were closed injuries and one had grade II open fracture[4]. Ten fractures were in the midshaft with stable configuration. In these cases closed nailing was performed. The unstable fractures consisted of one segmental fracture, one comminuted fracture, and one fracture each in proximal and distal thirds. In these cases interlocking intramedullary nailing was done (Fig. 1).

There were three nonunion, two in the midshaft and one in the subtrochanteric region. Nonunion had resulted from inadequate fixation by intramedullary nails. In two cases fixation was improved by replacing the implants with a larger size nail and in the subtrochanteric nonunion dynamic interlocking nailing was done (Fig. 2).

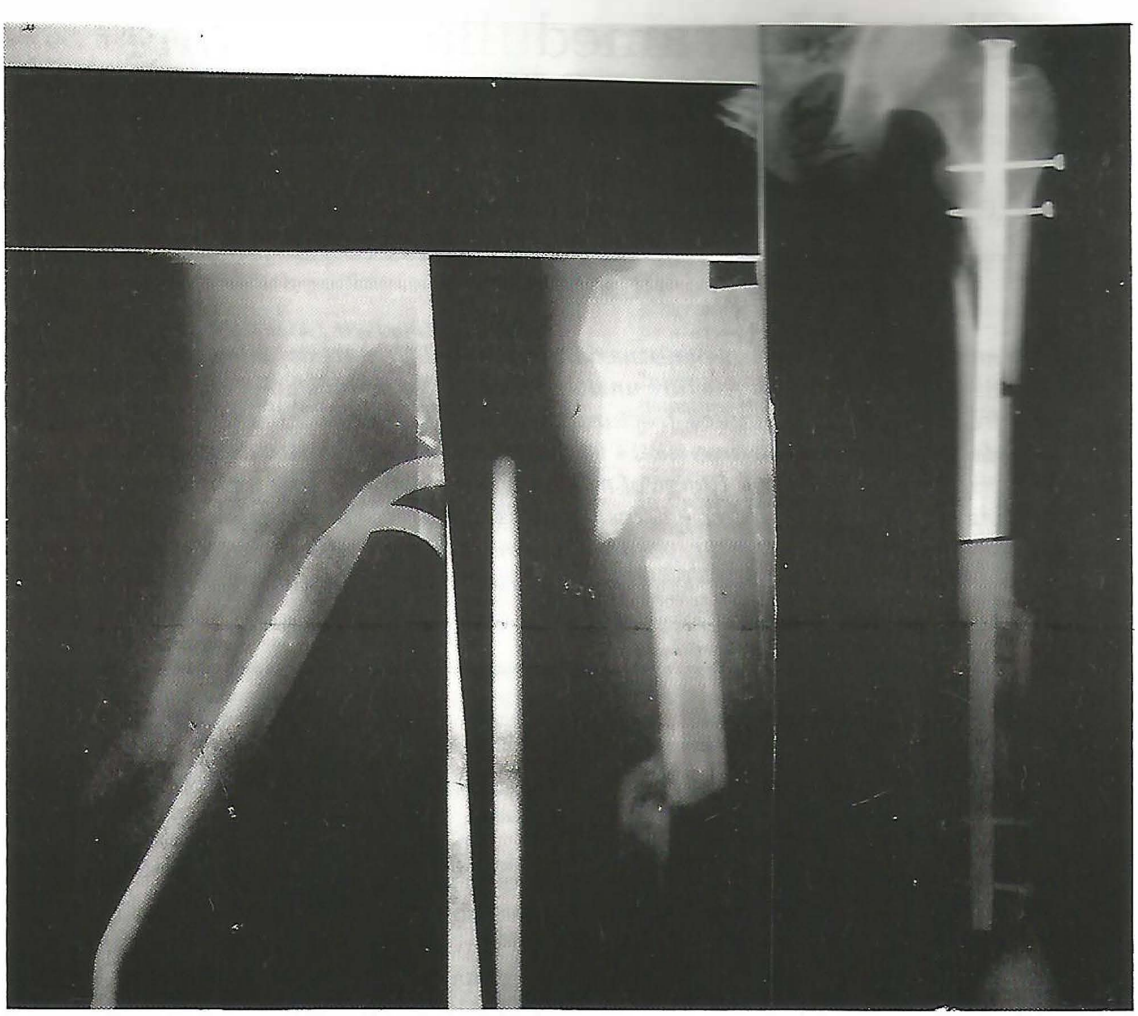

Fig. 1: Static interlocking for segmental fracture of femur shaft.

Operative Technique

After general anaesthesia the patient is fixed on the fracture table in lateral position. The injured limb is upper most, with twenty to thirty degrees of flexion at the hip & a little abduction. This position gives better access to piriform fossa and fracture reduction is easier. The uninjured limb is on the lower side with a little extension at the hip. This facilitates the movement of C-arms and fracture position monitoring on the T.V. screen. Traction is then applied through the tibial pin passed previously. The fracture is reduced by traction and external pressure. External pressure and levering may be obtained with the help of a crutch and a belt or F-clamp. Cleaning and draping is done after making sure that the fracture can be adequately reduced. A 4 inches long incision over the greater trochanter extending proximally in the direction of the gluteal muscle fiber is made. The gluteal muscles are split. Application of a Charnely self retaining clamp gives a good view of the piriform fossa. Opening is made in the piriform fossa just medial to the greater trochanter and a little behind the middle in the anteroposterior plane with a bone awl. Hand reamer 7 mm in diameter is then passed along the medullary cavity and its position is checked with C-arm. A beaded guide wire 3 mm in diameter is then introduced into the medullary cavity. The fracture is reduced by external pressure and the beaded guide wire is negotiated across the fracture site by manipulating the fracture externally and viewing it in the image intensifier. Placement of guide should be in the centre of medullary cavity in both planes to avoid eccentric reaming. Flexible reamers are used in increments of 0.5 mm to enlarge the medullary cavity. Over-reaming by one mm not only facilitates

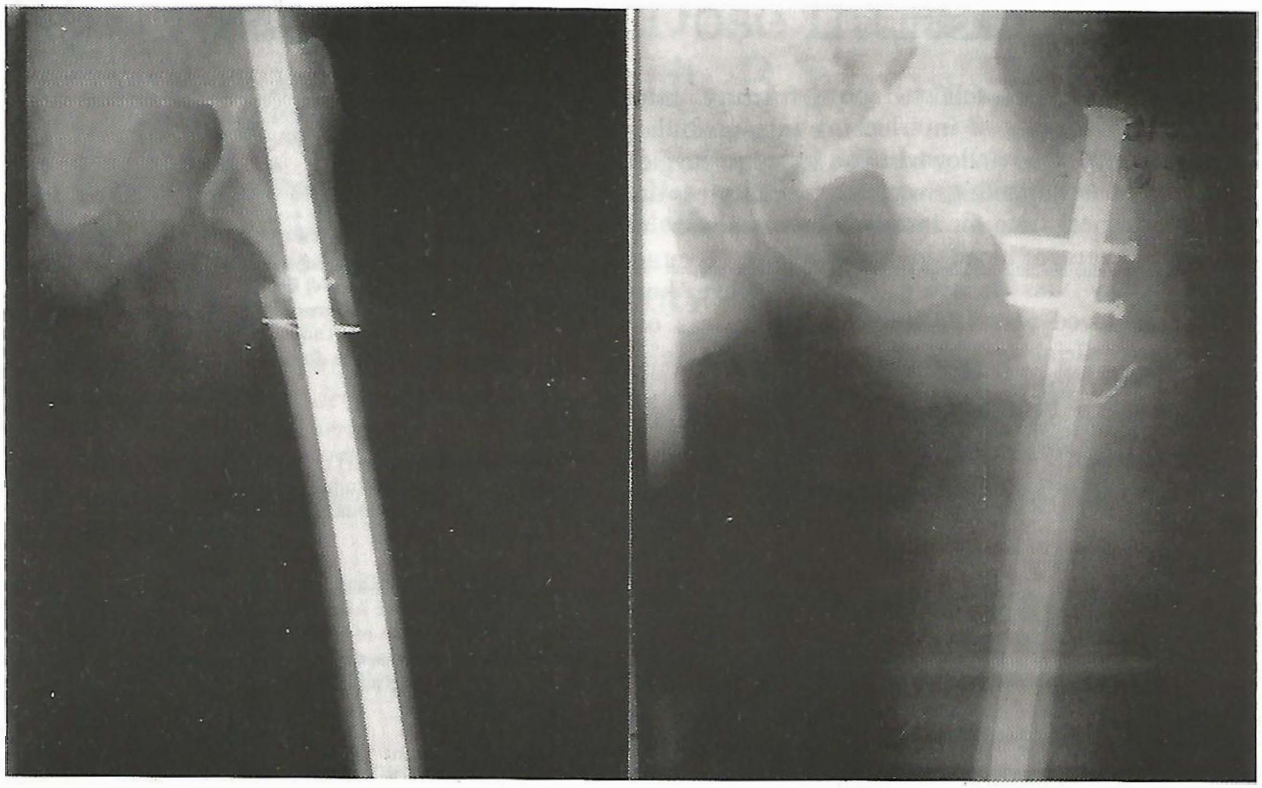

Fig. 2: Subtrochanteric pseudarthrosis fixed with dynamic interlocking.

introduction of the nail but also prevents its torsion thereby helping in distal interlocking. Reaming process should be constantly monitored especially as it crosses the fracture to avoid shattering of the cortices. Beaded guide is exchanged with nail guide wire using plastic tube. Nail is then driven over the guide wire being monitored by image intensifier. Proximal end of the nail is flushed with the greater trochanter if AO nail is used as it has threads for insertion or removal. Eye for the hook of extractor in the K nail is kept out of the greater trochanter. If AO interlocking nail is used, it is driven into the medullary cavity after fixing the proximal interlocking jig with it. Extent of distal end depends on the level of fracture. In fractures of the proximal or middle 3rd it is kept at the upper border of patella, if the fracture is lower down then it is driven into the subchondral bone for better stabilization. For proximal interlocking, through proximal jig trocar and cannula is introduced. Proximal cortex is drilled 4.5 mm and distal cortex 3.2 mm using specific sleeves. Most of the manufacturers have self taping interlocking screws. For distal interlocking, C arm is first adjusted to get a true round picture of the distal hole on the screen. This is then aligned with the hand held distal interlocking device. Distal interlocking screws are then fixed as were the proximal ones. In comminuted or segmental fractures which require control of both rotation and length static interlocking i.e both proximal and distal interlocking is done. In fractures requiring only rotational control like transverse fractures of proximal and distal thirds dynamic interlocking can be done in which only the proximal or distal interlocking is carried out whichever is closer to the fracture site. Position, extent of the nail, position and length of the screws are again checked in both planes before closing the wounds. Suction drain is required only in gluteal area.

Post-operatively limb is kept elevated preferably in 90-90 splint which helps regaining knee motion. Drains are removed and prophylactic antibiotics are stopped after 48 hours. Physiotherapy in the form of range of motion, muscle strengthening exercises and crutch ambulation is started. In stable fractures early weight bearing can be started. In unstable fractures weight bearing is delayed till callus appears.

RESULTS

Ten cases were followed until fracture union occurred. Five cases of interlocking intramedullary nails are still being followed. The average surgical time for closed nailing was sixty minutes and average surgical time for interlocking nails was 130 minutes. Average blood loss was 300cc. Average hospital stay was fourteen days. Average knee motion achieved was 105 degrees. There was one case of superficial wound infection. There were no cases of shortening or rotational malignant. One patient had iatrogenic comminution of the fracture. As the nail being used was ordinary Kuntscher, patient was given a derotation boot and eventually he did well.

DISCUSSION

Closed intramedullary nailing is the treatment of choice for closed middle one third fractures of femoral shaft. Unstable fractures continued to be problem fractures until interlocking nails became popular. The interlocking nail is a technically difficult procedure and requires extensive experience. Immediate stabilization is achieved which allows early mobilization and decreases hospital stay[3]. The incidence of nonunion and infection are low with closed intramedullary nailing. Length and rotation of the limb should be confirmed before inserting nail and interlocking screws.

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