

Achieving distal locking without an image intensifier

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ABSTRACT

The tibia is commonly fractured bone frequently caused by high energy trauma leading to the complications and major disabilities. Different types of intramedullary nails have been employed by surgeons over 500 years. Today, the intramedullary interlocking tibial nailing is the leading modality of treatment because of its biomechanical advantage over the other modalities. This procedure is done in the advanced centers under the C-arm image intensifier. Yet, there is no facility of C- arm image intensifier in the operation theatre at the tertiary level public hospitals in Nepal. Most of the peripheral hospitals do not have portable X- ray facility. The purpose of this study was to study the success rate of distal locking in the intramedullary nailing of tibial shaft fractures with the aid of distal aiming device (DAD). The distal locking were done in 65 tibial shaft fractures. In this technique the distal hole was directly visualized after proper drilling. All the distal locking could be done without image intensifier. So this technique can be useful where the imaging facilities are not available and even in the advanced centers to avoid radiation hazards.

Keywords: Fracture tibia, intramedullary nail, C-arm image intensifier, distal aiming device.

INTRODUCTION

The tibia is more commonly fractured and sustains an open fracture than any other long bones due to its subcutaneous position. Such fractures are frequently caused by high-energy trauma. The blood supply of tibia is relatively poor, therefore, complications and major disability are frequent out comes.^{1,2}

The treatment in our hands has been filtered through many different methods from time to time. Now, due to possibility of early ambulation and weight bearing of interlocking intramedullary nailing, it has been the modality of treatment for the diaphyseal fracture of tibia.³⁻⁶ Closed reduction under image intensifier and intramedullary interlocking tibial nailing is the most advanced development of Kuntscher nailing, introduced in 1940s.

Various studies regarding the safety and effectiveness of the closed interlocking nailing has been done. Locking nailing has shown biological and biomechanical advantage in comparison with plate osteosynthesis.⁷ Closed reduction under C-arm image intensifier and interlocking tibial nailing for the treatment of diaphyseal tibial fracture has been done in advance centers.⁸ In our set up, there is no facility of C- arm image intensifier in the operation theatre at the tertiary level public hospitals. Eighty percent of the peripheral hospitals of Nepal do not have portable X- ray facility. In this study an Indian make intramedullary tibial nailing instrument set has been used with indigenous modification of the guide wire insertion, a jig for proximal locking and distal aiming device (DAD) for distal locking screws in the treatment of the diaphyseal tibial fractures by intramedullary interlocking tibial nailing. This study was conducted to study the success rate of distal locking with the use of distal aiming device for the distal locking screws in the treatment of tibial shaft fractures without image intensifier.

MATERIALS AND METHODS

This is a hospital based prospective study carried out in the department of Orthopedics, Bheri zonal hospital and Lumbini zonal hospital, Nepal. The duration of the study was 2003 to 2006 A.D. There were 65 tibial fractures. This studies the success rate of distal locking with the use of distal aiming device (DAD) in the treatment of diaphyseal tibial fractures by interlocking tibial nailing.

All displaced closed fractures shaft of tibia 5cm away from the joints, which failed closed reduction and open fracture Gustilo types I and II without infection and above the age of 18 years were included.

Other tibial shaft fractures with involvement of ipsilateral femur or contra-lateral femur, open fracture type III A and above, pathological fracture were not included.

Distal locking of tibial nailing technique

Spinal or general anaesthesia is given and patient is placed supine at the operation table. Preoperative prophylactic antibiotic, first generation cephalosporin, Cefazoline 1 gm intravenously is given to all cases. The table is folded and knee is folded over the edge of the table with sand bag beneath the distal thigh. The hip is flexed 30 degrees, and thigh is supported with pad. Manual traction is applied to the leg, and tibia is reduced to its proper length alignment if the fracture is comminuted, the contra lateral tibia is measured to recheck the preoperatively planed proper nail size. The intramedullary nailing is done under the standard technique. Minimal open reduction was done if closed reduction failed. The proximal bolts are inserted first. To insert the proximal bolts, after drilling with the standard drill the near cortex is drilled with 5 mm drill bit, fine tube suction is used to visualize the hole of the nail. When the hole is visualized, distant cortex is drilled with the 3.2 mm drill bit. Length of the locking bolt is measured with the depth gauze. For the distal bolts, small nick is given with the help of Distal Aiming Device. Soft tissue is retracted with the fine retractors and drilled with the standard drill and try to visualize the hole of the nail with the use of fine suction tube. If it is not in the centre of the hole of the nail the anterior cortex is drilled with 5mm drill bit. If there is difficulty in localizing the hole of the nail, a K-wire is used as a marker and per-operative check X-rays are done (Fig. 1b).

RESULTS

A total of 65 of tibial diaphyseal fractures were included in this study, out of which 62 tibial shaft fractures were successfully treated with the intramedullary interlocking tibial nailing with the aid of distal aiming device. In the initial cases in Bheri zonal hospital, Nepalgunj, distal locking were difficult. Per-operative X-rays were done to localize the hole. The K-wire was used as a marker on per-operative check X-ray. In all cases, the distal locking was done without image intensifier. The average length of the surgery was one and half hours.

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DISCUSSION

Interlocking nailing is the leading modality of treatment for tibial shaft fractures.⁸⁻¹⁰ It's biomechanical advantage of preventing rotation, maintaining length of the limb as well as early ambulation and weight bearing out weight the other modalities of treatment.¹⁰⁻¹² Interlocking intramedullary nailing under image has been the standard procedure for the treatment of unstable diaphyseal closed tibial fracture and Gustilo type I and II. Of late this interlocking intramedullary tibial nailing is also being used in Gustilo type III open tibial fractures with success.¹³

As such before the invention of C-arm intramedullary nailing of long bones have long been carried out by open reduction. Kuntscher conventional closed intramedullary nailing represents a good procedure in a treatment of mid diaphyseal fracture of femur and tibia. It is only since late seventy C-arm is being increasingly used for closed reduction and intramedullary nailing. C-arm is a necessity for those who are now totally dependent on it.^{14,15} But it is still a matter of luxury for those who cannot afford its expense wise and those who want to avoid radiation hazards.^{15,16}

In this series there were 63 patients with having 65 diaphyseal fractures out of which 63 were successfully distally locked with the aid of distal aiming device (DAD) and 3 cases per-operative check X-ray were used but all were successfully distally locked without image intensifier. To conclude, this study shows that the distal can be done without image intensifier which has the advantage of no radiation and the benefit of intramedullary interlocking tibial nailing in the treatment of tibial shaft fractures.

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Fig. 1 (a) Fracture middle third of tibia and proximal third of fibula (1)



Fig. 1 (b). Direct visualising the hole of the nail



Fig. 1 (c). Post-operative check X-ray