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FREE HAND TECHNIQUE OF INTERLOCKING NAILING OF TIBIA

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ABSTRACT: INTRODUCTION: Intramedullary interlocking nailing is the standard treatment method for closed and grade I & II open fractures of the long bone diaphysis of tibia and femur. Free hand technique of interlocking nailing of tibia with distal locking without image intensifier is a challenge for the orthopedic surgeons. This technique is very much useful in the emergency where the image intensifier is not available especially in the rural Hospitals and where the facilities are still lagging. In our study we have not used the image intensifier or x-rays for locking the distal screw. The indications for the free hand technique of interlocking nailing of tibia are closed fractures with or without comminution, and open fractures of Grade I & II. With this free hand technique of distal locking of tibia we can avoid exposure to the radiation, associated relative risk of cancer (Radiation induced cancer). **MATERIALS AND METHODS:** In our study 120 cases were treated by this method during 2010 to 2014 without image intensifier control. Cases were followed up to 2 years and results were compared with the standard method. **RESULTS:** 120 cases were treated with this technique. There were 110 males and 10 females. Reporting time was varying from 2 hours to 10 hours. Age group ranging from 25 years to 65 years. In our study we observed that mode of injury was road traffic accidents in all patients. Closed fractures were in 90 patients grade 1 compound in 20 patients and grade 2 compound were in 10 patients. Cases were followed up to 2 years. Minor complications like postoperative bleeding from distal screw was noted in 5 cases and screw loosening in 2 cases. All cases had fracture union. **DISCUSSION:** Initially when we started this technique it was very difficult in locking the distal screw. As we were continuously and patiently trying for distal locking we were able to do distal locking without image intensifier control? So technical expertise is required for this technique and there is no radiational exposure as we are not using the image intensifier. It is very useful technique in the treatment of closed, grade 1 and grade 2 compound fractures of shaft of tibia in emergency where the image intensifier is not available especially in rural hospitals. Results are similar like standard technique of using image intensifier. **CONCLUSION:** This method of free hand technique of interlocking nailing of tibia is of great advantage in emergency situation where image intensifier or portable x rays are not available. The results are similar to the standard technique of using image intensifier. No radiation exposure with this technique. So we can avoid exposure to the radiation and associated relative risk of cancer (Radiation induced cancer). Technical expertise is required and we can minimize the cost of surgery as we are not using image intensifier.

KEYWORDS: Free hand, interlocking, nail tibia.

INTRODUCTION: Intramedullary interlocking nailing is the standard treatment method for closed and grade I & II open fractures of the long bone diaphysis of tibia and femur.⁽¹⁾ Free hand technique of interlocking nailing of tibia with distal locking without image intensifier is a challenge for the orthopedic surgeons.⁽²⁾ This technique is very much use full in the emergency where the image intensifier is not available especially in the rural Hospitals and where the facilities are still lagging. A number of techniques and systems have developed to minimize the exposure of the radiation to the

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surgeons and accompanying staff.⁽³⁻⁶⁾⁽⁷⁻⁹⁾ There is no study available till date about this technique of insertion of distal interlocking screws without the use of image intensifier or X-rays. In our study we have not used the image intensifier or x-rays for locking the distal screw. The indications for the free hand technique of interlocking nailing of tibia are closed fractures with or without comminution, and open fractures of Grade I & II.^(1,2) With this free hand technique of distal locking of tibia we can avoid exposure to the radiation, associated relative risk of cancer (Radiation induced cancer).⁽³⁻⁶⁾

INDICATIONS:

- Closed fractures (Simple and comminuted)
- Open fractures (Grade I, Grade II).

MATERIALS AND METHODS:

- In our study 120 cases were treated by this method during 2010- 2014 without image intensifier control. Cases were followed up to 2 years and results were compared with the standard method i.e., with the use of image intensifier. The first and the foremost thing required is the surgeon who is well versed with this technique and written consent is taken from the patient regarding the complications of surgery. We need routine surgical instruments and interlocking set.
- INSTRUMENTATION: Different sizes of interlocking nails (ILN), guide-wire, guide-wire holder, Proximal zig, bone awl, two sets of drill sleeves, 3mm Steinmann pins, drill bits, Electric or hand drill, bonetap, 2mm, 2.5mm K-wires, different sizes of screws of 3.9mm and 4.9mm, hexagonal screw-driver of different sizes, spanner, bone wax, Washer

INSTRUMENTATION:

Fig. 1

Pre-operative Planning^(1,2): As image intensifier is not available, the pre-op planning determines the outcome of the surgery to a large extent. The length of the nail (L) which is desired should be measured accurately. This can be measured by two methods:

- a. Using pre op X-ray: measure the length of tibia from X-ray i.e., from knee joint-line to ankle joint line (L), subtract 10% magnification (M) and 2 cm, this will give the exact length of nail.

$$\text{Length} = L - M - 2\text{cm}.$$

Fig. 2

- b. Using normal limb: palpate for the medial joint line and mark it proximally, and the distal point till the tip of the medial malleolus, then subtract 2cm from the total length.

NOTE: These lengths are measured should be confirmed per-operatively using the guide-wire.

Fig. 3

- Procedures ^(1,2): Under spinal anaesthesia, patient is on operating table the limb is painted and draped. After thorough draping and taking all aseptic precautions with tourniquet control, and the patient in supine position, flex the knee, take a mid-line vertical incision from lower pole of patella to tibial tuberosity. Identify the patellar tendon, split longitudinally in the line of incision. Appreciate the joint-line and make an entry port 1-1.5 cm below the articular surface of joint and on the medial side of the tibial tuberosity with the bone awl. Bone awl is directed posteriorly upto the half way and then change the direction in line of shin of tibia thus connecting medullary canal. Hang the leg by the side of the table. Then Pass an 8 number reamer, gently ream till the fracture line and pass a guide-wire holding the fracture in reduction. The surgeon holds the reduction pulling the leg down and stabilizing the foot on his lap, while an assistant surgeon applies counter-traction in upward direction holding the thigh. If the table has a knee post, then counter-traction is not needed by an assistant, just hang the leg over the knee post.

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- The placement of guide-wire^(1,2) within the distal fragment is confirmed by pushing the guide-wire and feeling for a gritting feel and restriction of propagation of wire. If the guide-wire is out one can palpate it subcutaneously by gripping the leg just above the ankle. Once guide-wire is in, push the reamer across the fracture site and ream the distal fragment. Serial reaming done and inter-locking nail one number less than the larger reamer is selected.

Fig. 4: Guide Wire is passed inside

When the reamer is inside, remove the guide-wire and confirm the length of inter-locking nail as measured pre-operatively. length of nail =length of guide wire inside.

OR

90cm - length of guide wire out of the tibia

Load the zig with Interlocking nail, check the zig by placing drill sleeves in zig and allow the drill bit to fall freely through it and the proximal holes of nail. Place the Interlocking nail, over the guide wire, pass it into tibia by gently rotating the zig. Once nail is completely in, the zig should be rotated to medial side. Now keep the leg in figure of '4' and place similar length nail (External nail) over the medial side of leg fixing the one (Internal nail) which is inside.

Then take two sets of drill sleeves and 3 mm steinmenn pins and place it in the zig and lock the proximal holes in the external nail as shown in the figure.

Fig. 5: Thus external nail gets fixed in its position

Fig. 6: Palpate for distal tibia, the anterior and posterior borders and place the external nail exactly in the centre, then make a mark on the skin through the hole in the external nail.

Fig. 6

Fig. 7: Take an incision, separate the tissues with an artery forceps and place the external nail over it and drill through the distal hole of the external nail.

Fig. 7

Fig. 8: We should observe that drill bit at distal hole and stienmen pins in the zig are parallel.

Fig. 8

Drill only the near cortex, remove the external nail placed over the leg and take a K-wire and look for the distal hole in internal nail. Once K-wire is placed in the hole, confirm it by hitting with the guide-wire.^(10,11) When K-wire is in the distal hole of nail, and it moves with each stroke of guide-wire and there will be a metallic sound heard. In that direction, the far cortex is drilled, screw-length measured and the screw is inserted. Proximal locking is done with the zig as usual.

COMPLICATIONS: Only minor complications were noted:

- Bleeding from the distal screw.
- Screw loosening.

ADVANTAGES:

- Decreased time for surgery.
- Decreased hospital stay.
- No radiation exposure.

RESULTS AND ANALYSIS: 120 cases were treated with this technique during 2010-2014 without image intensifier control. There were 110 males and 10 females. Reporting time was varying from 2 hours to 10 hours. Age group ranging from 25 years to 65 years. In our study, we observed that mode of injury was road traffic accidents in all patients. Closed fractures were seen in 90 patients and grade 1 compound fractures were in 20 patients and grade 2 compound fractures were seen in 10 patients. All 120 patients in our study were evaluated and investigated preoperatively for free hand technique of interlocking nailing of tibia. Cases were followed up to 2 years and compared with the standard method. Minor complications like postoperative bleeding from distal screw was noted in 5 cases and screw loosening in 2 cases. All cases had fracture union.

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Case 1: Satyanarayana, GrII # tibia M/3rd. PRE-OP.

Fig. 9

Fig. 10

Fig. 11: Post-operative X-ray

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Case 2: NASAR ALI, # B.B LEG U-M/3rd.

Fig. 12: Pre-operative X-ray

Fig. 13: Post-operative X-ray

Case 3: Sk. Afroz, # B.B Leg L-M/3rd. **Fig. 14: Pre-operative X-ray** **Fig. 15: Post-operative X-ray**

DISCUSSION: Initially, when we started this technique when the image intensifier was not available. We had very difficult in locking the distal screw. As we were continuously trying for distal locking after 5 or 10 cases then it has become easy to identify the distal bone and lock the distal screw. So, technical expertise is required for this technique.⁽¹⁾ If we understand the technique properly and if we place the external nail correctly then distal locking is not difficult.⁽¹²⁻¹⁵⁾ And there is no radiational exposure as we were not using the image intensifier.⁽³⁻⁶⁾ It is very useful technique in the treatment of closed, Grade I and Grade II compound fracture shaft of tibia in emergency where the image intensifier is not available especially at area hospitals& rural hospitals where the facilities are still

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lagging. Results are similar like standard technique of using image intensifier. For locking of distal screw, 2 or 3 times drilling was made into the bone that caused the post-operative bleeding from distal screw incision was noted in 5 cases. Screw loosening was observed in 2 cases.

CONCLUSION: This method of free hand technique of interlocking nailing of tibia is of great advantage in emergency situation where image intensifier or portable x rays are not available. The results are similar to the standard technique of using image intensifier. No radiation exposure with this technique. So we can avoid exposure to the radiation and associated relative risk of cancer (Radiation induced cancer).⁽³⁻⁶⁾ Technical expertise is required and we can minimize the cost of surgery as we are not using image intensifier.

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