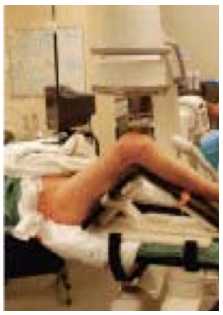
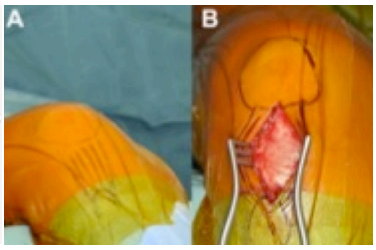
TECHNIQUE



1.Positioned supine, with the leg draped free at 90 degrees over an adjustable radiolucent "A" frame.

2. **Foot:** leave it free with assistant is available. Otherwise, fixed the foot with a tap to the foot attachment.

3. **Drapping;** usually tourniquet is not required



4. **Skin incision**: Anterior midline proximal to tibial tuberosity to the distal pole of the patella

5. **Deep:** Split patellar tendon and medial to patellar tendon. For proximal fracture: lateral parapatellar approach is preferred.

6. Achieve hemostasis; avoid damage to infrapatellar branch of sephanous nerve and apply self retaining retractor.

7. **Reduction**

Traction

Manual

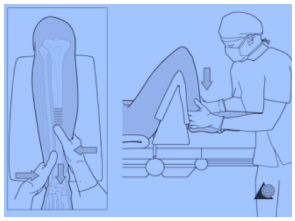
Distractor

Joystick

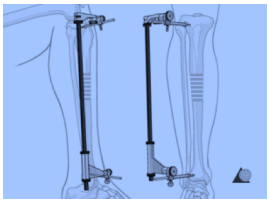
Reduction clamp

Nailing is easy when reduction is achieved prior to passage of guide wire. Sometimes reduction cannot be achieved initially. In such situation, ream the proximal fragment and pass the temporary nail or Hand from the TAN set in the proximal fragment and then align the proximal fragment in relation to distal fragment and push the guide wire distally

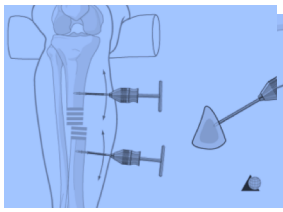
Reduction Manual



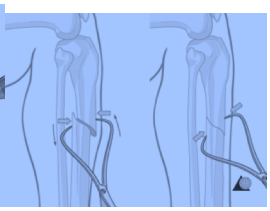
Distractor



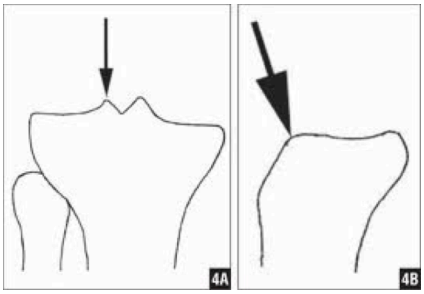
Joystick



Reduction clamp



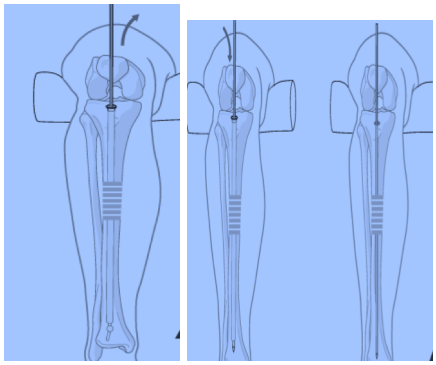
8. **Entry point**



The extra-articular high starting point can then be identified by palpation behind the patellar tendon,

A curved awl is then introduced behind the patellar tendon.

The awl should be aligned parallel to the crest of the tibia. . The starting point should be just medial to the lateral **tibial** spine high on the superior-anterior tibia.



The awl is then introduced into the tibia. As this is done, one needs to push posteriorly on the awl handle to

direct the awl tip anteriorly within the bone. This must be corrected so that the awl progresses in line with the tibial shaft. Once the awl has been inserted and has created a starting hole, a T-handled reamer with a slight distal anterior curve is introduced into the tibia [avoid perforation of the posterior cortex.

9. G**uide wire** is passed and check this position is checked fluoroscopically with anteroposterior and lateral views above and below the **fracture** site, ensuring that (a) position of the distal tip.

10.. **Reaming**. Starter reamer [cutter] of 7 mm and then sequential reaming is then done in 0.5 mm increments.

The reamer is then removed; exchange tube over the guide wire.

Now take out the ball tipped guide wire and insert guide wire without ball tip.

11. **Nail sizing:** Note the length of the nail and select tibial nail, which is 1.5 mm narrower than the last reamer.

Most **tibial** shafts will allow passage of a 9 to 11 mm diameter nail.

The nail is then mounted on a handler and introduced into the tibia. Most nail systems come with a proximal cross lock screw insertion jig that can be applied to the insertion handle of the nail. It is important to check prior to inserting the nail that the holes on the jig line up with the cross screw holes within the nail. The nail is then introduced over the guide wire.

12. **Introduction of the nail:** The surgeon should be careful that the nail does not rotate as it progresses into the tibia. To ensure this, the proximal Herzog bend of the nail should be kept in the sagittal plane. Once the nail is inserted, it is important to check the overall alignment of the **fracture** and the position of the nail fluoroscopically.

Once the nail transgress the distal fragment, release the traction and give counter force to achieve impaction at the fracture and also note appropriate rotation is present.

13 **Distal cross screws** are then inserted with the image intensifier using a freehand technique. This can be done with a radiolucent or regular drill through a percutaneous incision. A Steinmann pin can be used to locate the center of the circle [artery forceps].

The Steinmann pin is tapped with a mallet, and it makes a divot in the appropriate place to allow for drill placement.

The drill is then aligned with the image intensifier beam and a hole is made in the near cortex and into the nail. Prior to penetration of the far cortex, it is important to check that the drill is indeed in the hole of the nail.

The screw is then inserted into the tibia and the image intensifier is used to check that it is appropriately placed.

14. If there is distraction at the **fracture** site, the distal cross screws can be inserted first and then used to **"back slap"** the distal fragment to the proximal fragment. However, newer nail designs allow for more controlled compression by the use of a compression screw placed inside the nail.

15. **Proximal screw:** With the distal cross screws in place and one proximal cross screw placed in an oblong hole in the dynamic position, the compression screw will push on the proximal cross screw and draw the distal tibia proximally.

Rotational check

Clinical: Cable technique

(Cautery cable - centre of hip, knee and ankle)

Radiological: Lesser trochanter shape sign.

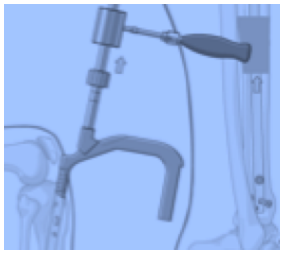
Cortical step sign

Diameter difference sign

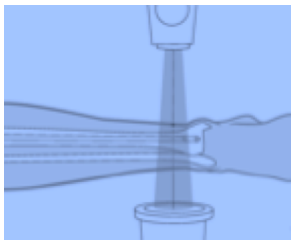
Postoperative Management

We routinely allow range of motion of the ankle and knee immediately postoperatively. Weight

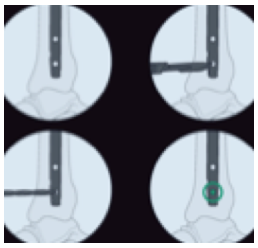
bearing as tolerated postoperatively if good cortical contact has been obtained. Otherwise, partial weight bearing. In cases where there is an intra-articular **fracture** that was internally fixed, the patient is asked to remain nonweight bearing for approximately 6 to 8 weeks.



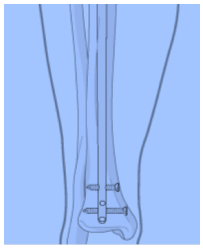
Introduce Nail



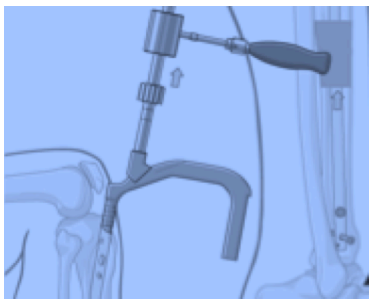
I.I positioning



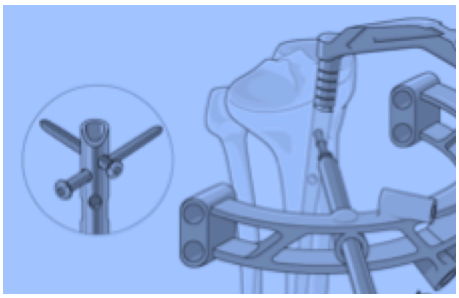
Distal Screw fixation



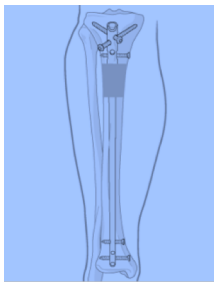
Distal fixation



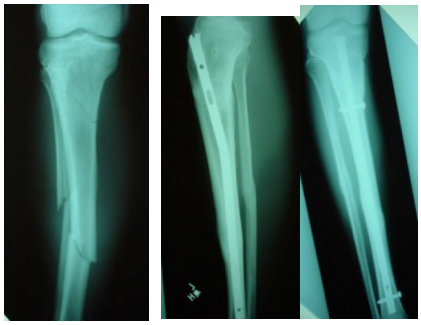
Back Slap



Proximal Fixation



Final appearance



Straight forward Nailing for a fracture tibia

Proximal and Distal Third Fractures

If unable to insert two proximal cross screws, then proceed to minimally invasive plating with a proximal **tibial** locking plate.
Common problem: 35%-80% malunion. It has been reported that 40% chances of needing bone grafting or exchange nailing in literature. Common deformity is valgus in coronal plane and flexion deformity or posterior translation in the sagittal plane. More
with single proximal screw

Blocking screw

Can be avoided by:

1. Starting point: more proximal and lateral entry. It is important to use image intensification to confirm the starting point when nailing high proximal diametaphyseal fractures.

2. Nailing in semiflexed position: This allows for manual reduction of a proximal **fracture** and also allows permits more lateral movement of the patella such that the awl and reamer can be kept close to the anterior cortex.

3. Blocking screws: 4.5-mm cortical screws placed just off the midline opposite to the apex of the deformity.
To prevent valgus: an AP screw just lateral to the midline in the anteroposterior plane.
If there is a flexion deformity, the blocking screw is placed just posterior to the midline in the lateral image
intensifier projection.

4. Another method of obtaining the reduction is to use a small unicortical plate.

When nailing very distal diametaphyseal **tibial** fractures, it is important to be able to obtain at least two cross screws in the distal **fracture** fragment. It is imperative that the guide wire be placed in the center of the **tibial** plafond, and it is important to follow the principle of "ream where you wish the nail to go."

In distal third diametaphyseal fractures, there may be an associated posterior malleolar **fracture**, and it is important to check for this using intraoperative fluoroscopy. Fixation of undisplaced, posterior malleolar fractures with anterior to posterior lag compression screws is required prior to nailing.