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Preventing Mal-alignment In Tibial Shaft Fractures.

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Mal-alignment after intramedullary nailing of tibial shaft fractures is not uncommon. The frequency of Mal-alignment is more in metaphyseal fractures than in diaphyseal fractures.

Mal-alignment depends highly upon the location of the fracture and also on fracture configuration. Fractures near the middle of the shaft (isthmus) are less likely to go in to Mal-alignment than the fractures near the end of the bones for the simple reason that the medullary canal at the bone ends is wider and the nail doesn't fit snugly.

Mal-alignment in proximal tibial fracture is a rule rather than exception and one has to try hard to keep the Mal-alignment to less than 5 degrees of valgus or varus and anterior angulation (apex anterior).

The factors influencing the Mal-alignment are

(1) Fracture pattern. (2) Technique related factors

Fracture Pattern

Intra medullary space being wide the nail doesn't fit snugly in upper end fractures.

If there is comminution posteriorly or the posterior cortex of the proximal fragment is short, the nail is likely to go posteriorly in the proxymal fragment leading to anterior angulation Mal-alignment.

If there is short or comminuted lateral cortex of the proximal fragment the nail is likely to go laterally in the proximal fracture fragment leading to a valgus Mal-alignment.

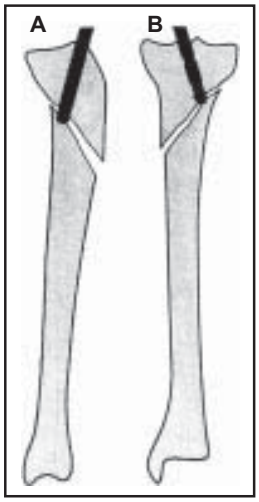

Fig. 1 : (A) Diagram showing the nail exiting posteriorly in a short oblique proximal fragment. (B) Diagram showing the nail exiting laterally in a short oblique proximal fragment.

Technique Related Factors

Medial entry point and laterally directed nail insertion can lead to valgus Mal-alignment. Similarly a more distal entry point in proximal fragment with the bent in the nail can cause anterior angulation Mal-alignment.

So the orthopaedic surgeon has to study the fracture pattern closely and chalk-out the plan of action pre-operatively to avoid intra-operative problems and ensuing Mal-alignment.

Special attention should be given to communition and obliquity of proximal tibia fractures.

Prevention of Mal-alignment in proximal tibial fractures

After studying the fracture pattern carefully one has to select the proper entry point and use the

blocking screws at appropriate levels and sites. These screws can help in aligning the fracture and also in stabilising it.

(I) To prevent apex anterior angulation : a blocking screw is placed just posterior to central axis of tibia. The nail is inserted anterior to this screw, aligning it properly to the long axis of proximal tibia in saggital plane. [Refer Fig. 2]

(II) To prevent valgus angulation : A blocking screw is placed just lateral to the central axis of proximal tibia. The nail is inserted medial to this screw aligning it properly with the long axis in the coronal plane. [Refer Fig. 3]

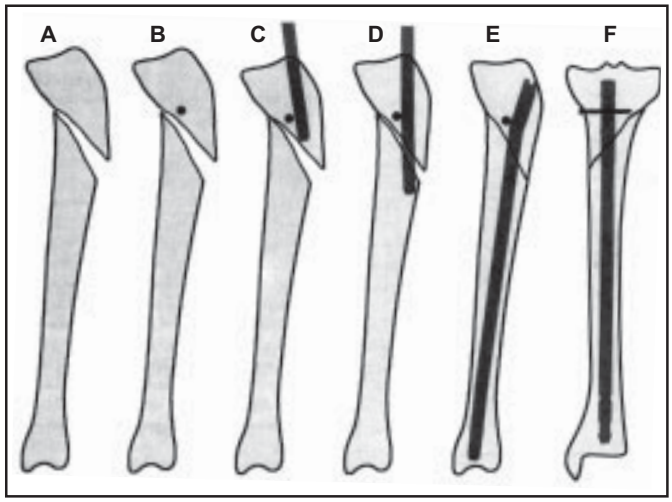

Fig. 2 : A posterior blocking screw helps prevent apex anterior angulation (A) Lateral view of a short oblique proximal third tibia fracture, (B) A blocking screw is placed just posterior to the central axis in a medial-to-lateral direction, (C) The nail is passed anterior to the blocking screw, (D) The apex anterior angulation begins to be corrected as the nail is passed across the fracture site, (E) The fracture is properly reduced after the nail is inserted completely, (F) AP view of the tibia following insertion of the nail and blocking screw.

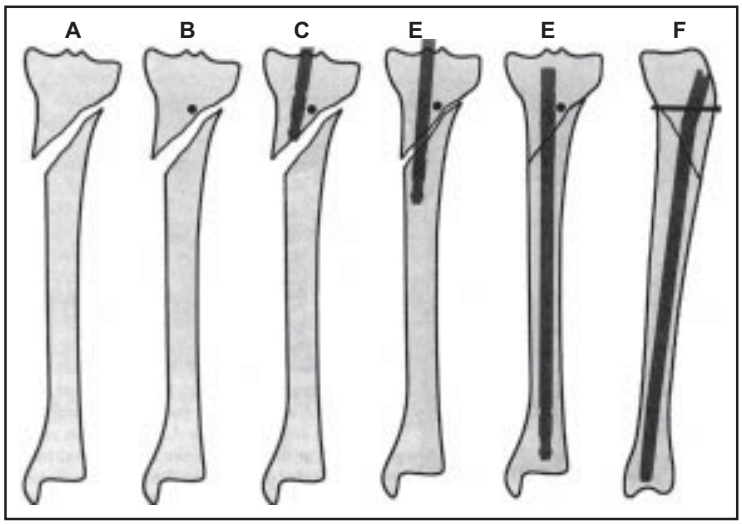

Fig. 3 : A lateral blocking screw helps prevent apex valgus angulation (A) AP view of a short oblique proximal third tibia fracture, (B) A blocking screw is placed just lateral to the central axis in an anterior to posterior direction, (C) The nail is passed medial to the blocking screw, (D) The valgus angulation begins to be corrected as the nail is passed across the fracture site, (E) The fracture is properly reduced after the nail is inserted completely, (F) Lateral view of the tibia following insertion of the nail and blocking screw.

Useful Technical Hints

• Nailing with the knee in semiextended position from a high entry point (using arthrotomy) in the long axis of the bone centrally can prevent anterior angulation

• Nailing with the knee in hyperflexed position and inserting the nailparallel to the anterior cortex can prevent the anterior angulation but as the extensor apparatus cant be retracted the entry point is medial and valgus Mal-alignment is difficult to controll.

• Using a femoral distracter - two schanz pins, one parallel to upper end tibia articular surface and the other parallel to ankle joint in distal tibia are connected to femoral distracter. The fracture is aligned preventing varus/valgus angulations and the nail inserted.

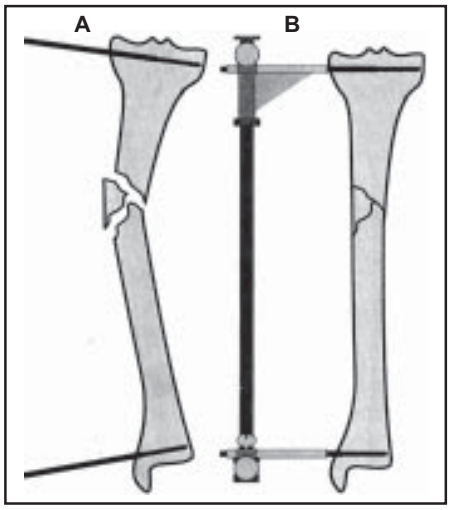

Fig. 4 : Use of a femoral distractor to help correct coronal plane malalignment. (A) Pins are placed parallel to the knee and ankle joints (B) Alignment is corrected after the femoral distractor is applied.

• Fracture should always be held in reduced position while inserting the guide-wire and reaming. This is important because the nail will always followthe tract created by reaming.

Preventing The Mal-alignment In Distal Tibial Fractures

Mal-alignment in distal fractures largly depends upon the insertion of nail in the center of the medullary canal in far distal fractures.

Varus/valgus angulations can be prevented by stabilising the fractures in reduced position using the medio-lateral distal locking.

Similarly antero-posterior angulation can be prevented by stabilising the reduced fracture using antero-posterior distal locking screw,

The presence or absence of the distal fibular fracture also influences the outcome.