Nailing in Proximal Tibial Fractures and Use of Poller Screws

By.

Dr. B. Shivashankar. MS Orth

Chief, Iyer Orthopaedic and Physiotherapy Centre, SOLAPUR

Intramedullary nailing for the long bone fractures has been one of the standard treatment modality since Kuntscher's K nail. With the advent of Interlocking technique to get better rotational stability and also with the easy availability of the C arm image intensifier, the indications for nailing have increased tremendously. The results of interlocking nailings have been so good especially for shaft and peri isthmial fractures, that many nails have been designed specially for metaphysial fractures. The problem of nailing a metaphyseal fracture like upper third tiba or supra condylar part of the femur is that the medullary capacity is very voluminous in this expanded portion of the bone. The size of the nail will be limited by the narrow isthmus portion of the medullary canal leading to a very thin nail trying to fix this metaphyseal fracture leading to deformity. Typically in the proximal tibial fractures it goes into valgus and procurvatum deformity.

To reduce the space available for the nail in this voluminous metaphyseal area Krettek et al started using blocking screws. This concept of blocking the medullary canal by screws to direct the nail properly , they called "Poller screws". Because the screws guided the nail like the "Poller" traffic control devices to guide traffic.

We shall take the problem of proximal tibial fracture and discuss how it can be nailed best. Normally the fracture line extends more superiorly on the lateral cortex. When these fractures are nailed by regular nails with low Herzog's bend, the nail from the regular central top entry point will go more laterally leading to valgus deformity at the fracture site and similarly as the nail is advanced into the distal fragment, due to the bend in the nail, the distal fragment will get translated behind. Both these factors will cause valgus and procurvatum at the fracture site and the end result will be an un acceptable reduction.

So in proximal tibial fractures one should plan carefully regarding the position of the patient, entry site, reaming , nail selection, etc. Poller screws will come handy in achieving the desired goal.

Position: Regarding the position of the patient, it is advocated to use semi extended position so that the quadriceps mechanism will not lead to anterior pulling of proximal fragment. In the literature there are few reports of using supra patellar approach: by subluxating the patella entry being made on the top of tibia. But, I use a fully flexed knee over a towel in the popliteal fossa to push the tibia anteriorly to make an easy entry at the top and the assistant with constant posterior pressure at the fracture site avoids the procurvatum happening at fracture site. One can use few K Wires to fix the fracture or insert

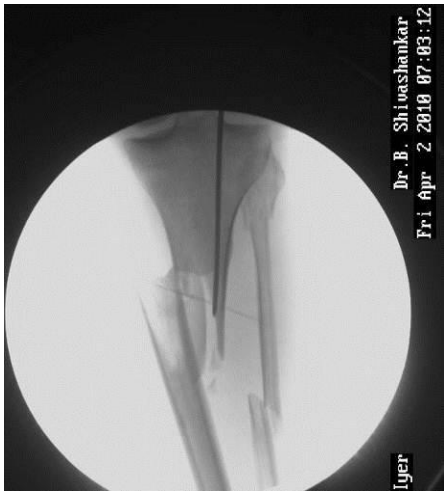
a small plate with unicortical screws to reduce these fractures. We are not going to discuss further the advantages or disadvantages about these methods here.

Fig 1 &2 Position of the patient at the end of a simple table for Proximal Tibial nailing.

Entry Site: In majority of the cases, the fracture line extends proximally more on the lateral cortex and hence we assume that the proximal tibial fracture is of this variety and advocate a more lateral entry. But there are few instances when the fracture extends more proximally on the medial cortex and such fractures with nailing can lead to varus angulation and in such fractures it will be ideal to take a more medial entry (Fig 13& 14). These fractures can be recognised by having fibula fracture distal to the tibial fracture site and also have varus alignment pre operatively.

Always plan your exact entry site by extra-polating a line 5mm parallel to the lateral cortex of the tibia where you expect your subsequent nail to stay. This 5 mm is arbitrarily taken considering that subsequently a 10 mm thick tibial nail will be inserted and 5 mm being its radius or half the thickness.

The curved awl to make an entry has the tendency to go more posterior and in turn making a false tract for the subsequent reamers to go, hence use a straight awl for making an entry. If you do not have a straight awl, you can just pass a guide pin and the make the entry by drilling with Cannulated drills. Always pass this guide pin from the top entry parallel to lateral cortex in AP view and parallel to anterior cortex in lateral view. Once this position of Guide pin is confirmed in the proximal canal, then subsequent opening of the proximal canal with Cannulated drills and reamers can be done. If care is not taken here, then canal will be opened in wrong direction and subsequently the reamers and the nail will go through this false passage leading to unacceptable reduction. So always make it a point to pass a guide pin properly then only open the canal to enlarge. By this way, the cancellous bone surrounding this properly prepared canal itself will act as block or Poller and thus prevent wrong passage of nail.



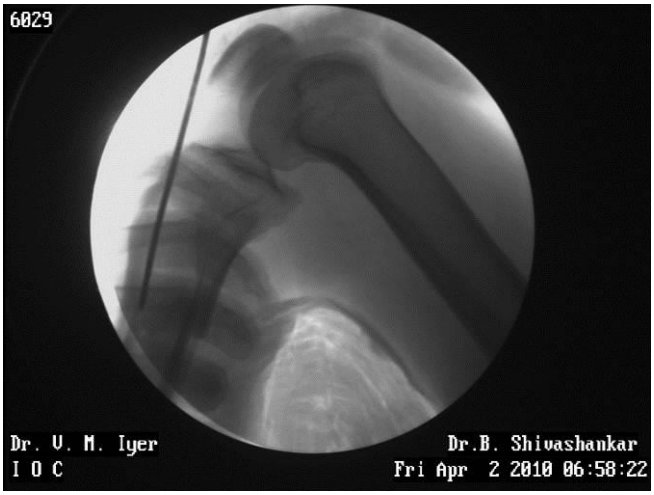
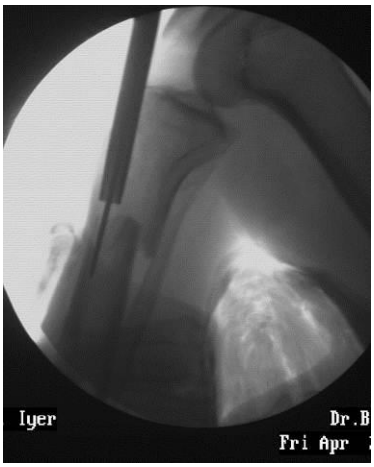


Fig 3&4. AP and Lateral Picture showing Top Entry being done with a guide pin. Note the more lateral entry in AP and also the Guide pin parallel to Lateral Cortex in AP and parallel to anterior cortex in Lateral view. Also note the shadow of towel in the popliteal fossa to push the proximal fragment anteriorly.



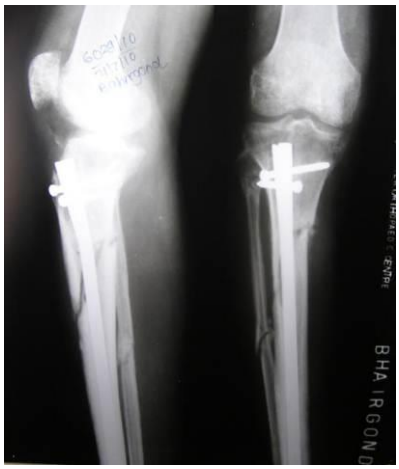


Fig 5, 6 &7. Intra op and Follow Up X ray of the above case. No Poller screws used.

Another way of directing the nail properly will be by inserting Poller Screws or Poller Wires. In these proximal tibial metadiaphyseal fractures, the nail is typically significantly smaller than the intramedullary canal at this level. This leads to the proximal segment to drift into valgus and procurvatum, as the nail will not have good purchase on this small segment. So by placing these Poller screws, one can reduce the effective medullary canal size and also enhance the stability of fixation by placing these screws. This inturn leads to passage of the nail in the canal of the proximal trumpet-shaped metaphyseal fragment in the desired direction and maintaining the nail in that position till the fracture unites. Poller screws should be applied to facilitate maintaining the nail in correct alignment in the short proximal segment. One rule of thumb is to apply the screws on the concave side of a deformity. Similarly the nail

has a tendency to go posteriorly in the proximal wide medulallary canal. This can be prevented by inserting medio lateral blocking screw placed more posteriorly to redirect the nail more anteriorly. This will prevent anterior translation and procurvatum deformity at these fracture site. Some times by placing a single blocking screw in one plane may not be sufficient. In such cases one can add few more blocking screws in the same plane. This technique is called as "Pallisade".

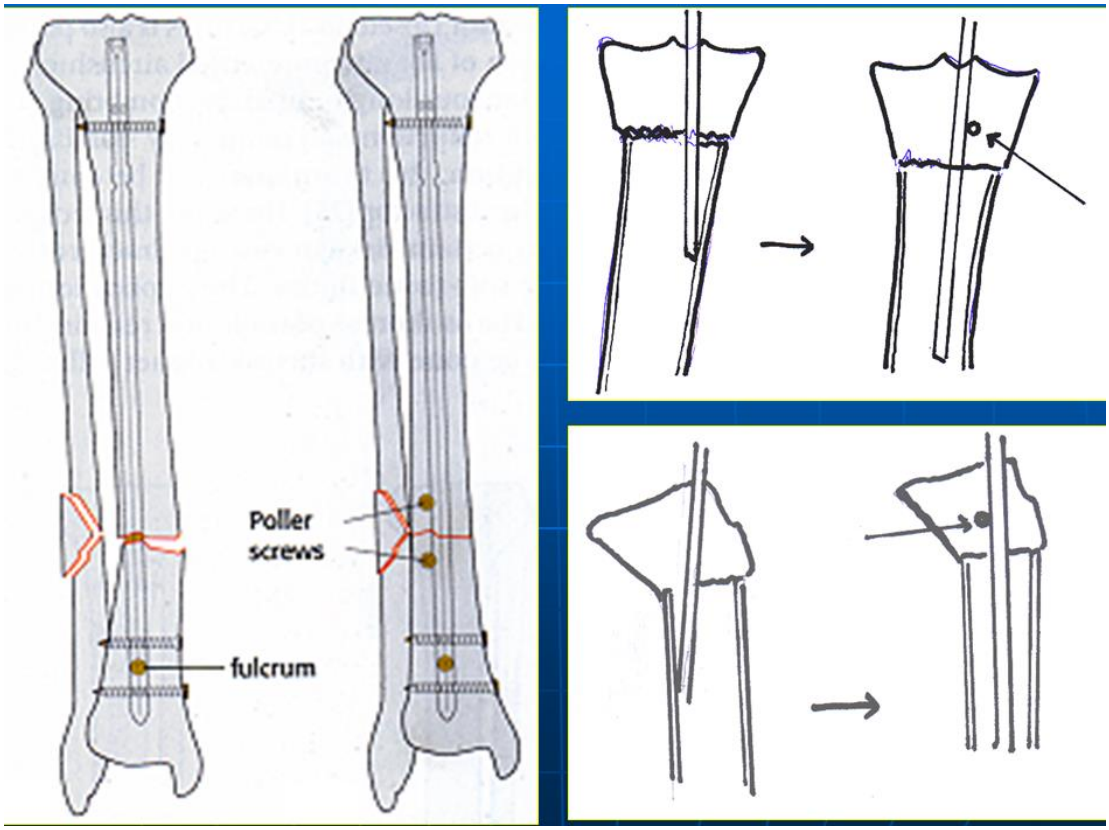


Fig 8. Demonstration of use of Poller screw.

Here are some steps of passing Poller screws in proximal tibial fractures.

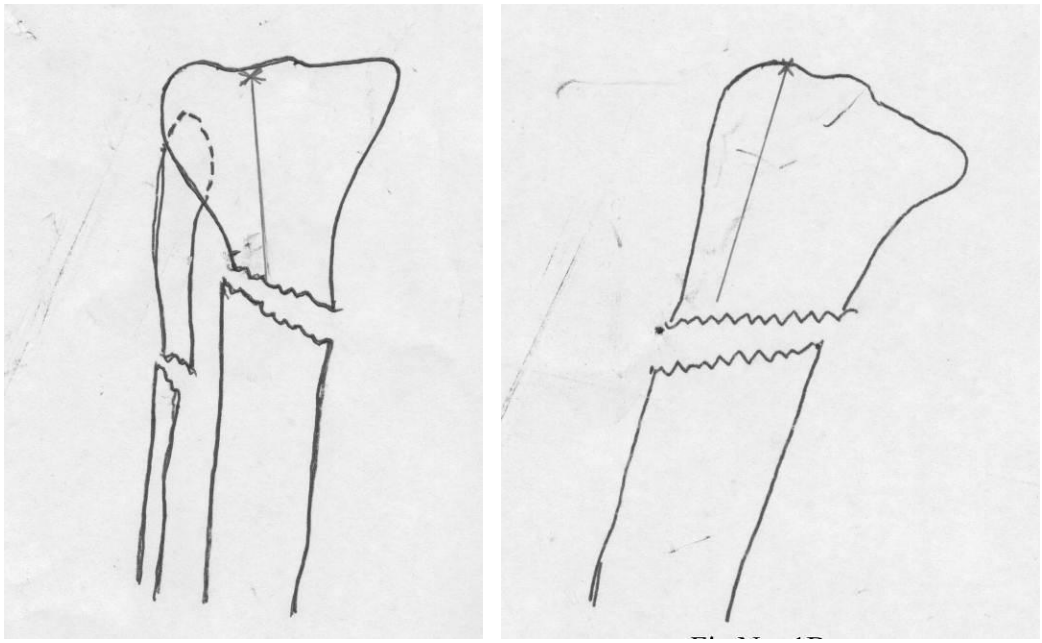


Fig 9a & 9b. Marking of entry site by drawing a line parallel Lateral cortex in AP and Anterior cortex in Lateral views, about 5 mm away. (approximately the radius of the 10 mm nail to be used later)

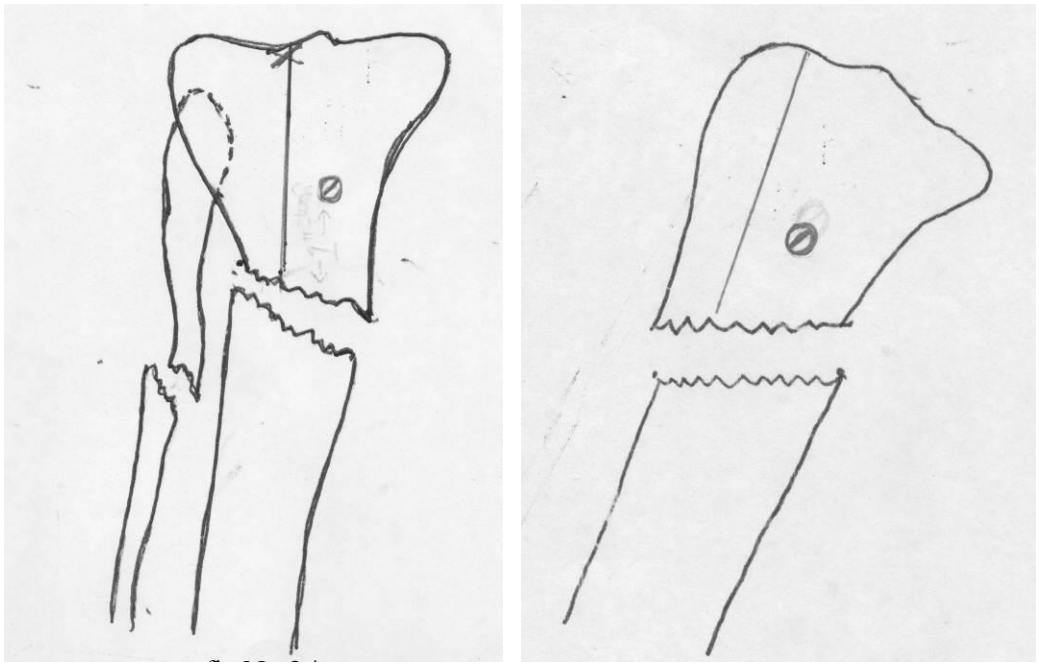


Fig 10a & 10b.After marking the entry point, pass Poller screw about 3/4th inch to 1 inch above the fracture site in AP antero posterior screw about 5 mm medial to the line drawn above and similarly another one mediolateral about 5 mm behind the tentative nail direction line as shown in the picture.

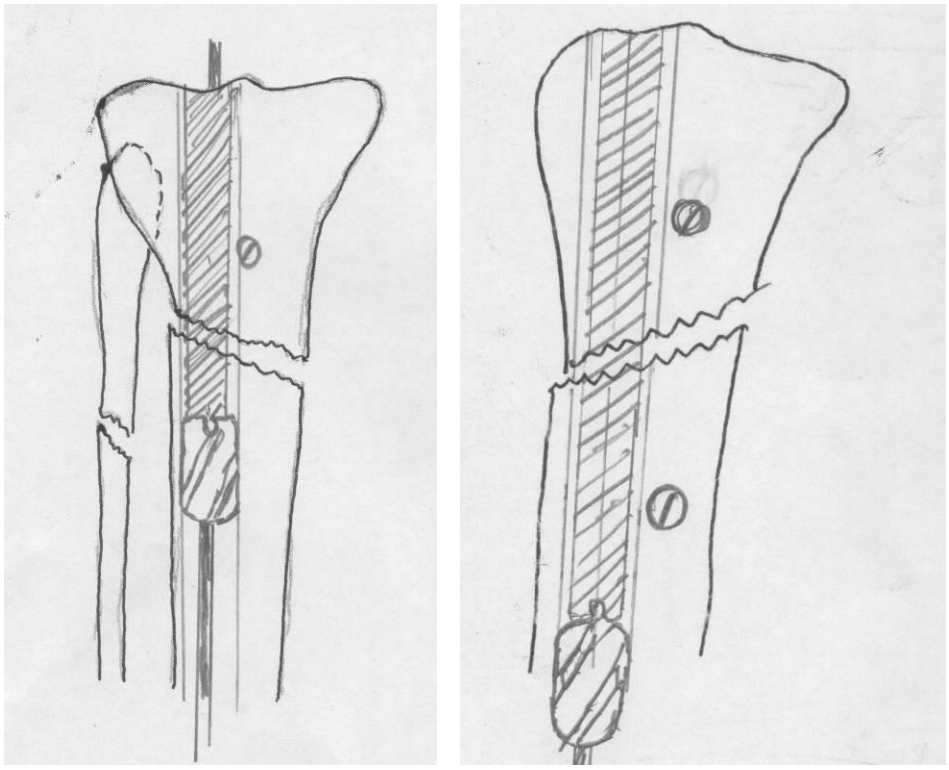


Fig 11a & 11b. Showing reaming in progress over beaded guide wire with Poller screw in situ. Additional Poller screw can be passed in the distal fragment also to align the reduction and the position of nail by them as shown in 11b.

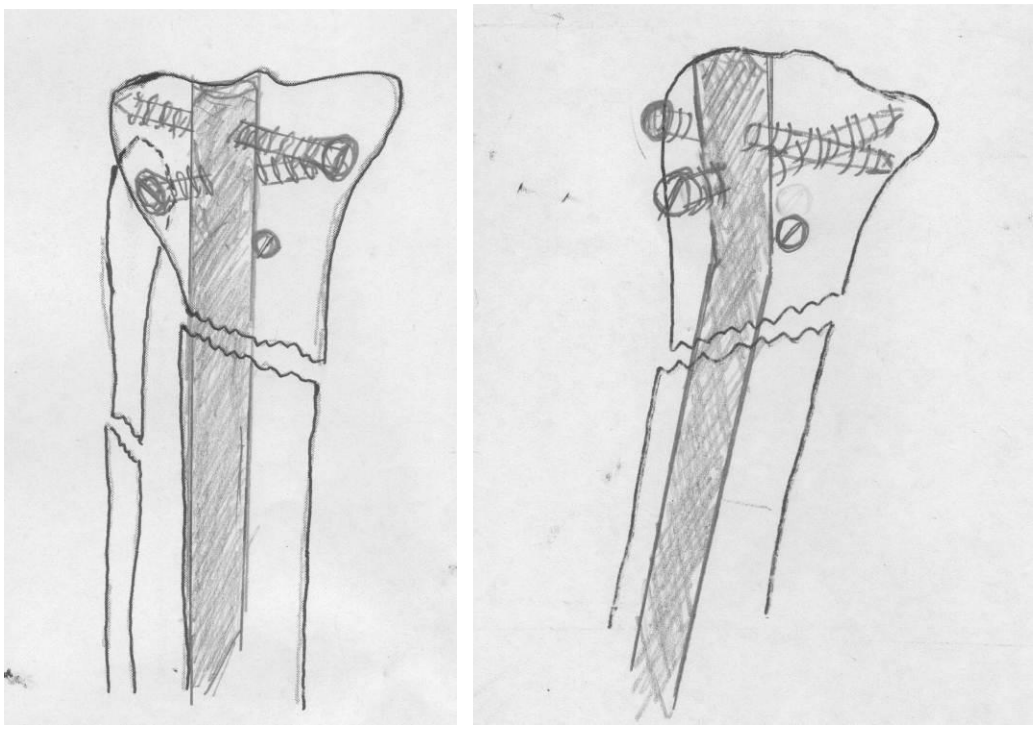


Fig 12a & 12b. Final position of the fracture fixation with high bent nail with Poller screws in position.

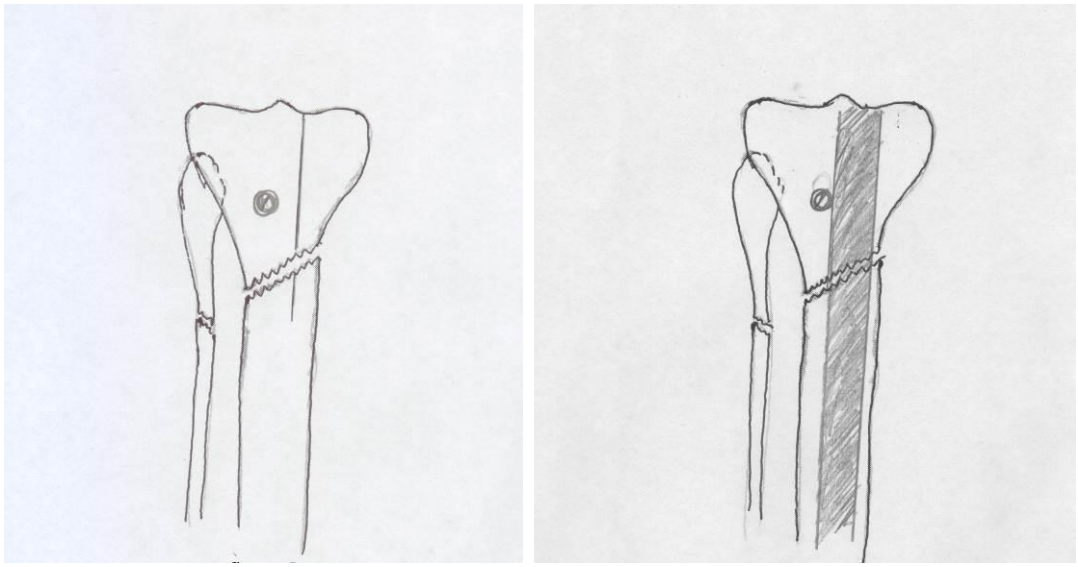


Fig 13 and 14.If the fracture extends proximally more on medial aspect, then a more medial entry can be taken as shown in the picture

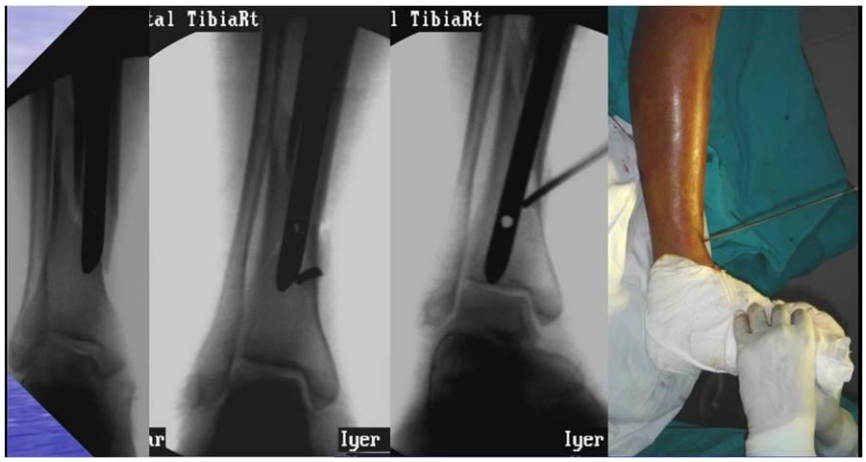


Fig 15. Use of K wire as blocking wire to guide the nail properly in a distal tibial fracture.

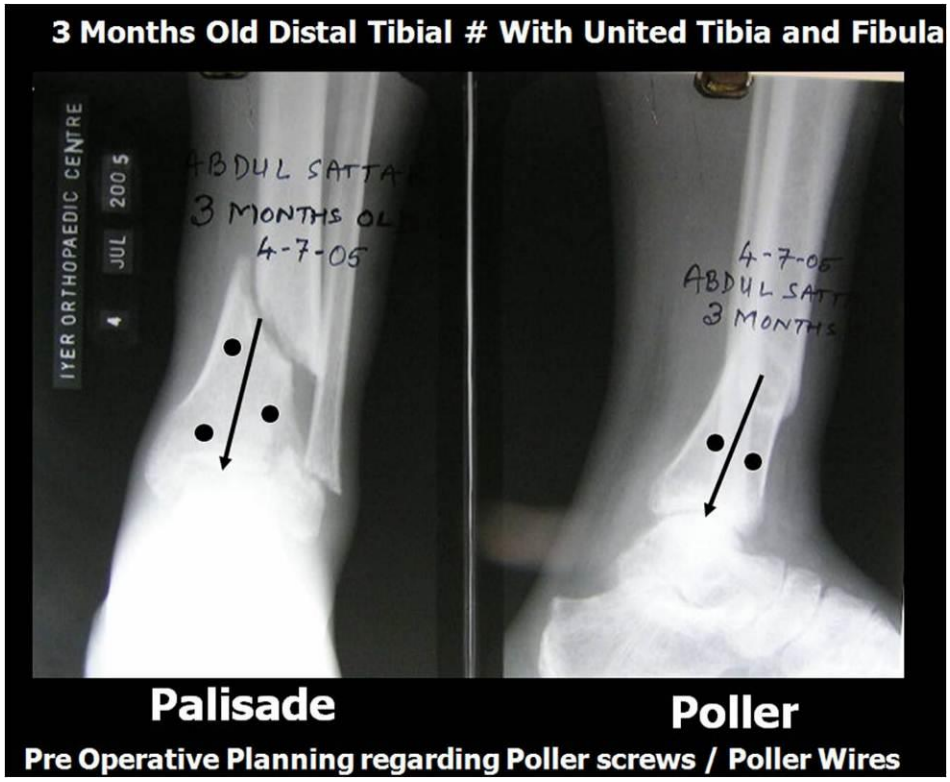


Fig 16. Pre operative planning of passing Poller screws for fixing a months old distal tibail fracture.

Fig 17. Intra and Immediate Post operative pictures of Poller and Pallisade technique usage.

Fig 18. Use of Blocking screws as a Pallisade to reduce the canal size in distal fragment. Picture Courtesy:Dr. Alexander Chelnekov, Russia

Fig 18. Use of Poller screws to centralise the nail.

The nail for proximal tibial fracture should have very high bend like GK type of nails. It will be better to have multi directional locking facility as locking in only one plane may not be able to control the deforming forces. Though these blocking screws can be removed once the interlocking is carried out, it will be better to retain them in place till the fracture unites as they definitely give additional stability to the fixation and also reduce the working length.

Normally if poller screw is placed laterally in proximal fragment, it will be placed medially in distal fragment. Similarly if placed posteriorly in proximal fragment it will be placed anteriorly in distal fragment. All these are to align the central portion of the bone with the other fragment. But these rules are not always a must to get good anatomical alignment. Sometimes in wide metaphyseal bone, we may put two pollers on either side of the nail. Some times to buttress the nail to one side of the canal, we may put poller on the opposite side both in proximal and distal fragment. Over all polers are useful to reduce the wide medullary canal. These should be left in place till the fracture unites as definitely they increase fracture stability by reducing the canal size.