Humeral Interlocking Pearls

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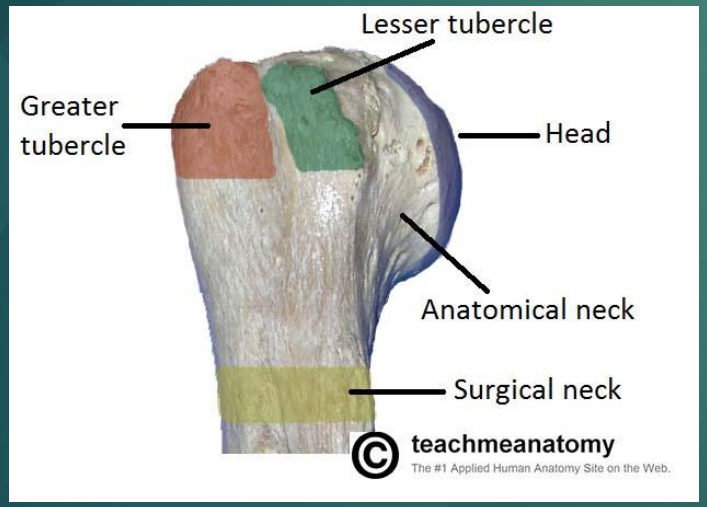
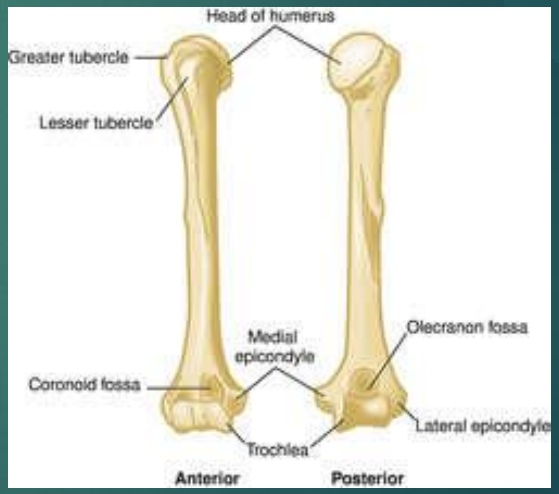
Cross View

- Unlike femoral and tibial fractures interlocking nailing is not recommended as a standard method of management for humeral diaphyseal fracture.

BECAUSE ….

- of the funnel shape of the humeral shaft, a true interference fit is difficult to obtain after Nailing ?





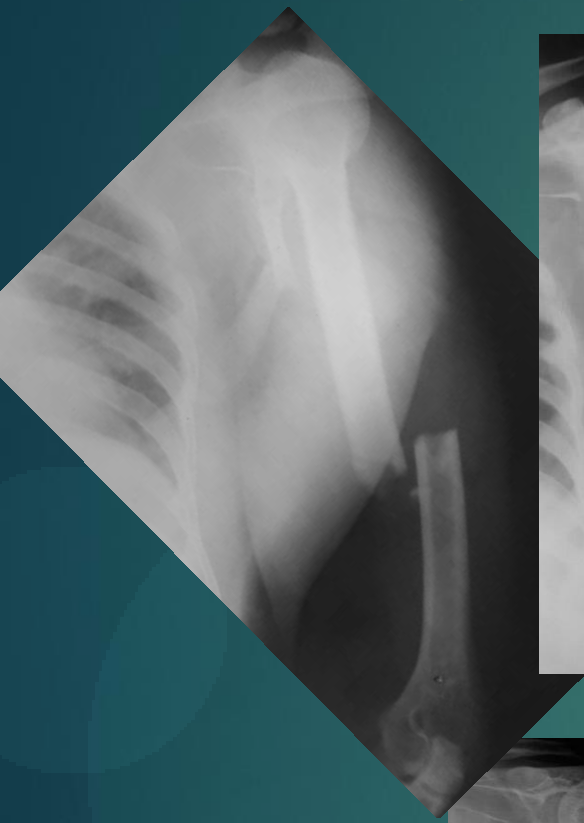
POINTS AGAINST NAILING.

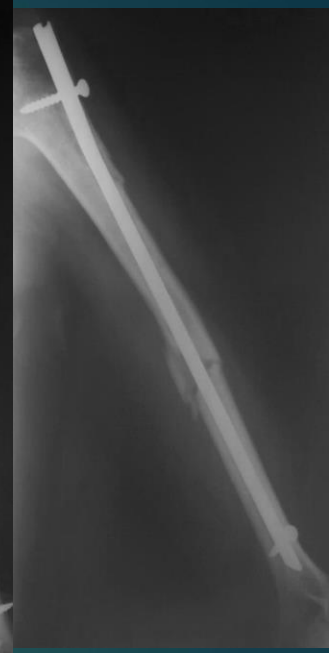
- Severe impingement.
- Adhesive capsulitis / Shoulder stiffness.
- Intra-operative comminution.
- Nonunion .

Listed by

McCormack JBJS 52Bp336

Nailing of humerus





Fallacies in this operation

Fallacies in this operation

- Wrong entry point.
- Protruded proximal end and violation of supraspinatus tendon.
- Mismatch canal caused fracture of proximal humerus and Stiffness of shoulder.

Antegrade Humerus Nailing.

- Pearl to avoid complications.

Position of the patient supine or beach chair position.

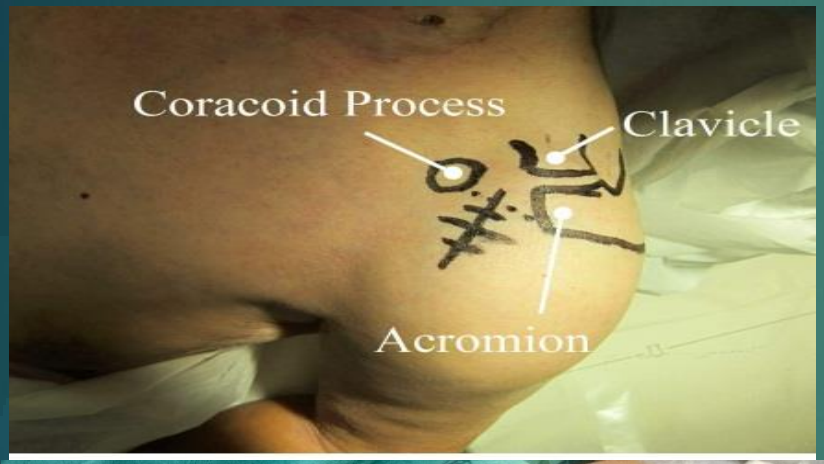
Good Access from Head End for the surgeon

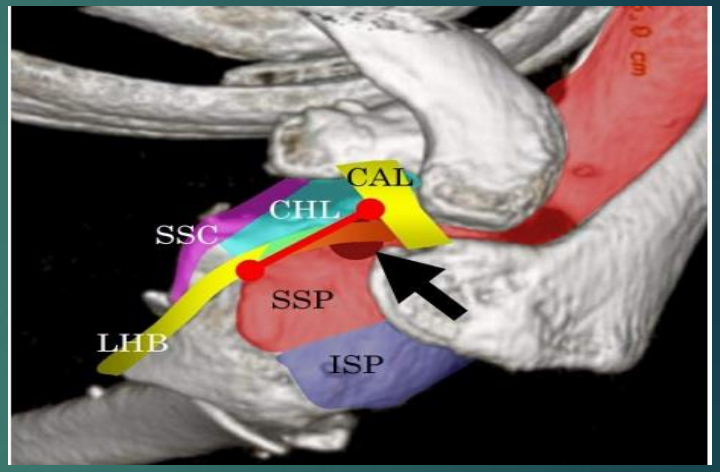
Design of nail
Proximal bent nail/Proximal Straight Nail.

- Design rationale.
- 4 degree herzog curve.
- Multiplanar proximal locking.

Two entry points

[1]ANTERIOR ENTRY POINT. SUPRASPINATUS SPARING.



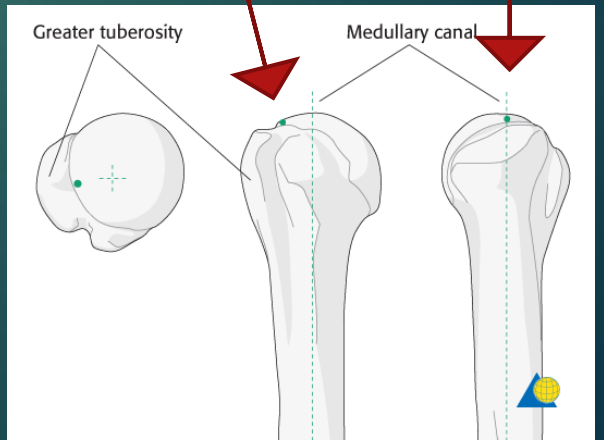


[2] ENTRY THROUGH MID SUPRASINATUS TENDON

MOST COMMONLY USED

A supraspinatus split is necessary.

- The nail insertion site lies on the axis of the humeral shaft.
- It is located at the bone-cartilage junction of the humeral head.
- It is not more lateral on the greater tuberosity.
- It is slightly anterior to the center of the greater tuberosity.



POSITION OF THE PATIENT

Patient supine with ipsilateral shoulder at edge of bed and pillow under-neath.

Extend shoulder by 30º

.

Reduction

Reduction of fracture by gentle traction and adduction of limb. Press the proximal fragment medially.

Entry portal

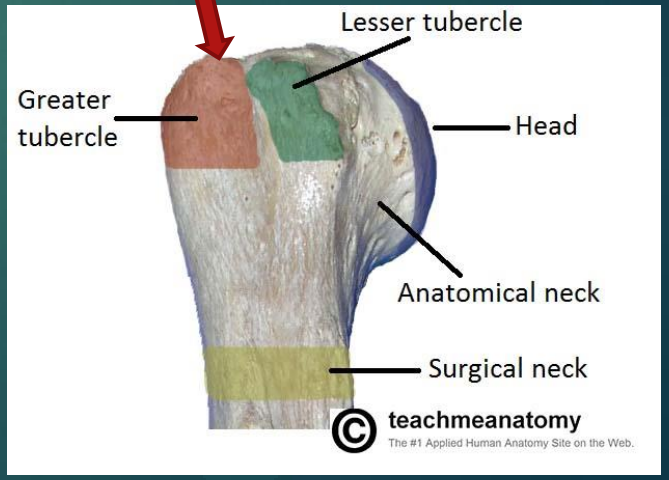
- Anterolateral approach to shoulder.

Incision 2-3cm along anterolateral aspect of acromion,

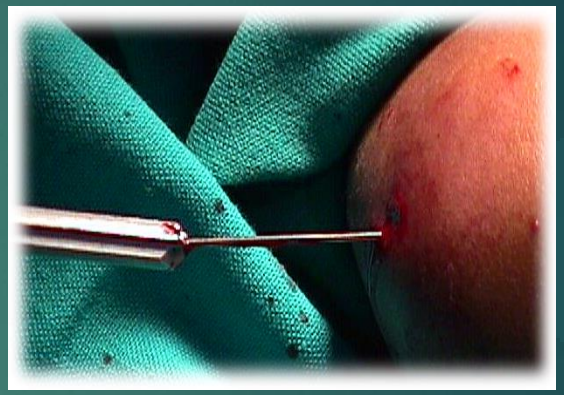
Entry portal

- Deltoid muscle split in line with its fibers ,
- Sub-acromial bursa cleared .
- Then supraspinatus tendon incised.

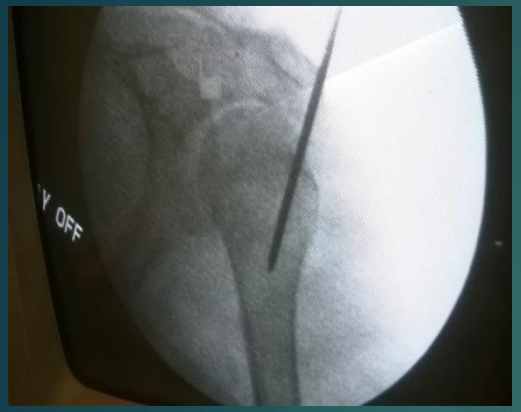
- Incision in line with fibers of supraspinatus.



K –wire or bone awl introduced ↓ C-arm control ,Just medial to greater tuberosity ,entry Canal enlarged.



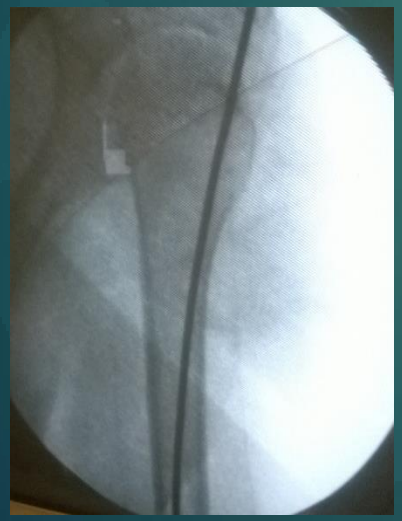
Reduction and Guide-wire Insertion.



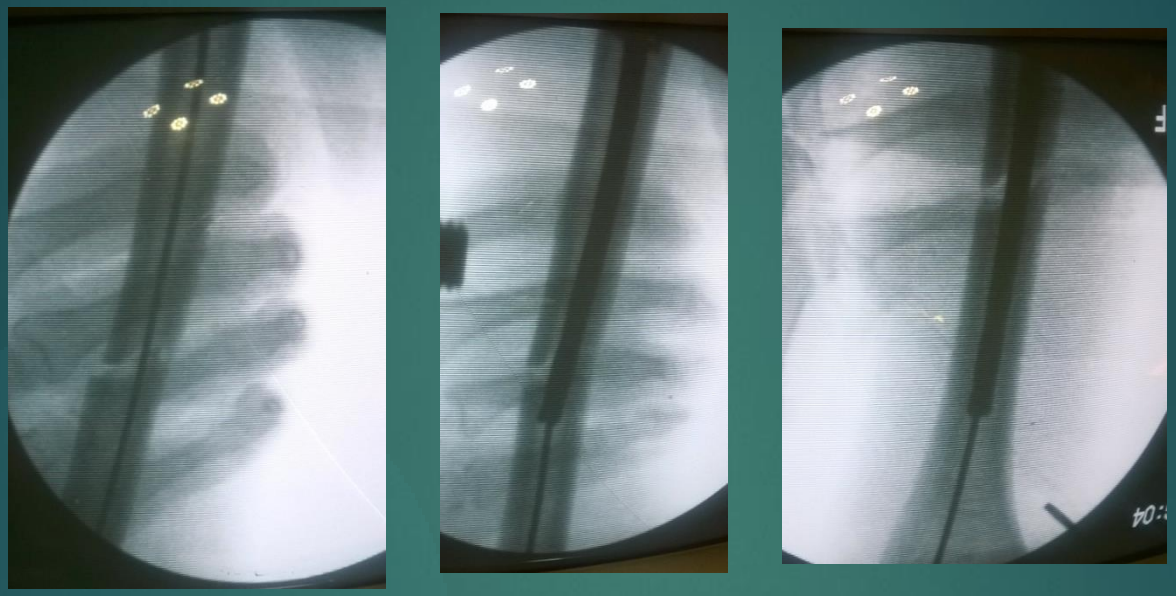
A guide was advanced under c-arm image in to medullary canal.

Over guide wire

Canal enlarged…



Preparation of Proximal canal



- Fracture reduction with guide wire insertion.
- Determine nail size under image intensifier.
- Prepare distal canal up to the cranial end of olecranon fossa..

Reaming principles

- Reaming is done to be able to fit a thicker, stronger nail
- Better done with flexible powered reamer

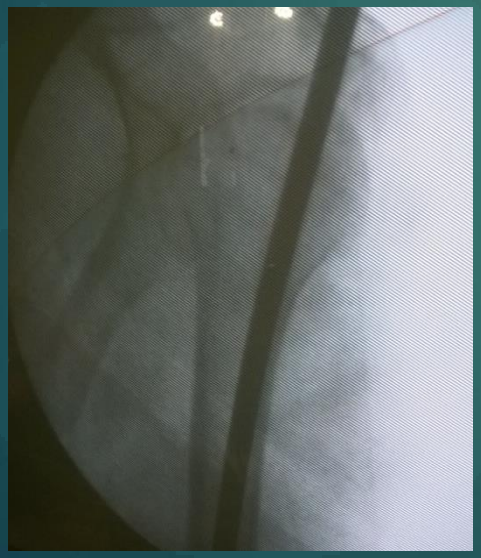
- 1. Always start with the smallest reamer as per the size of the medullary canal
- 2. Always ream over a guide wire
- 3. Run the reamer only when there is resistance; otherwise it should just be pushed
- 4. Do not ream across the fracture site. !!!!!

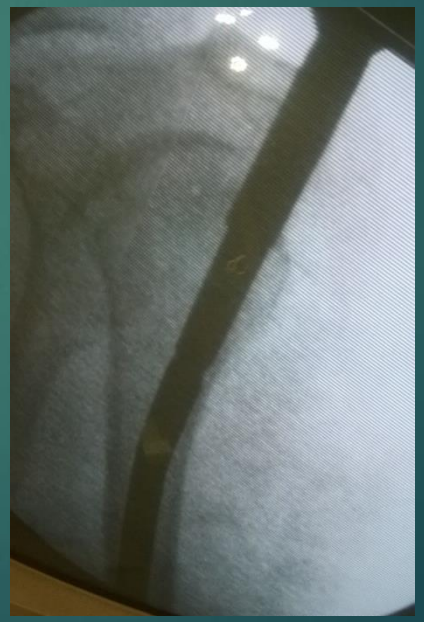
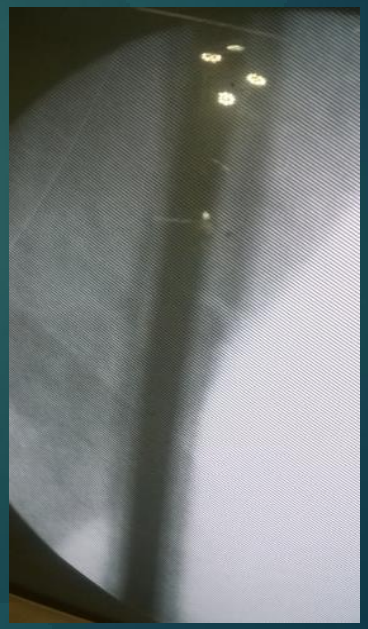
When using detachable reamer bits, ream over a beaded guide wire.

5. **Reamer Control should be with Surgeon**

Introduction of nail.

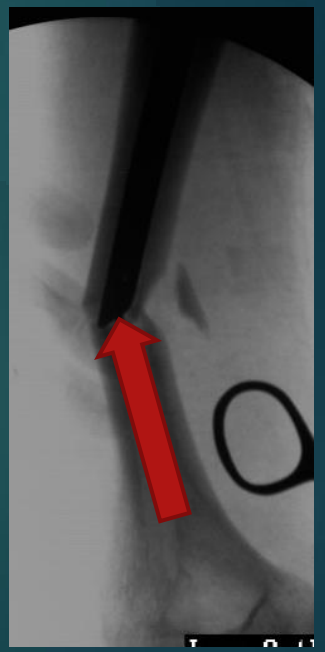
Reduce fracture using traction, varus/vagus, and rotational force applied manually and gentle introduction of nail, Avoid hammer



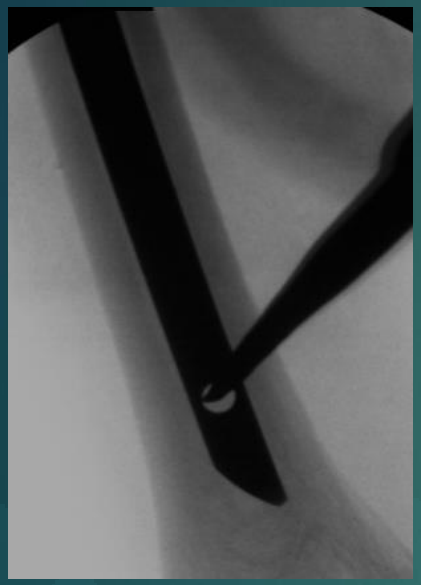



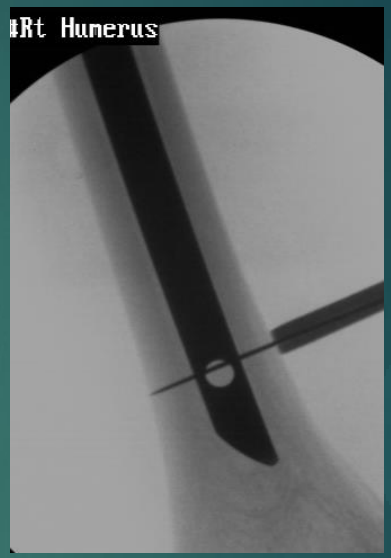
Nail as reduction tool.

- Reduction
- Use the nail tip as a reduction aid.
- After passing the fracture site, adjust humeral shaft alignment, rotation, and length.
- Control under image intensification in two different planes.



DISTAL LOCKING





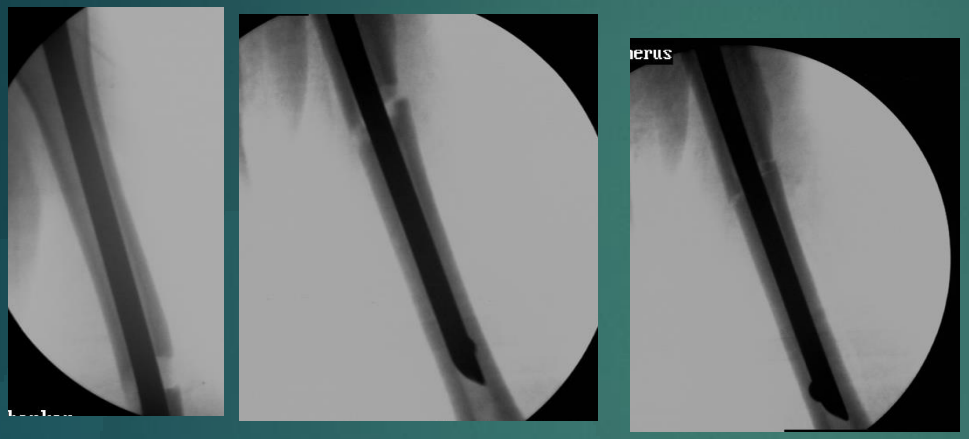
- Free hand or aiming device.
- Avoid injury to neurovascular structures
- Vertical incision lateral edge of biceps.
- Splitting of brachialis muscle.

Drill the posterior cortex with K wire and then enlarge with drill and pass the screw. Use one or two screws

No gap at fracture site is acceptable.

Pearl to Avoid Fracture Gap

Constant Watch at # Site



Fracture Compaction
Back slapping

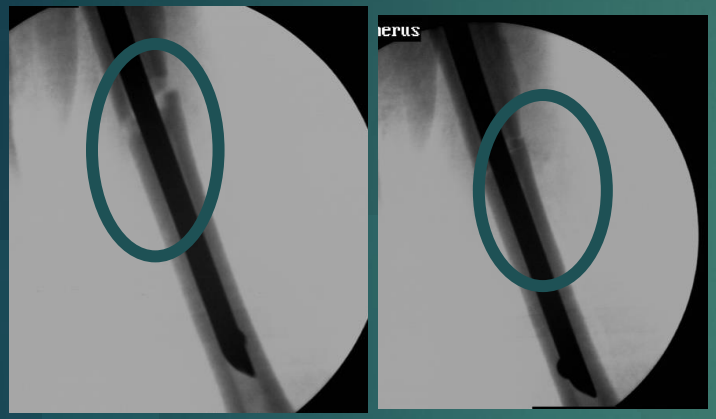
Before # Compaction

After # Compaction

Or compression of the # by inbuilt mechanism in nail.

Pearl to Avoid Fracture Gap

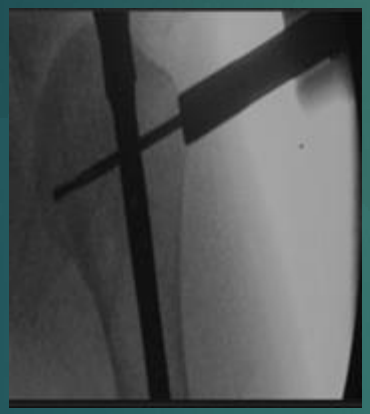
Constant Watch at # Site



Extraction blows after distal locking - Compacting #.

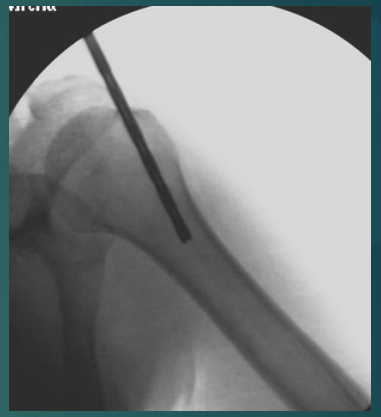
IF GAP PERSIST CHANGE TO THINNER NAIL.

Final assessment before Proximal locking and wound closure.



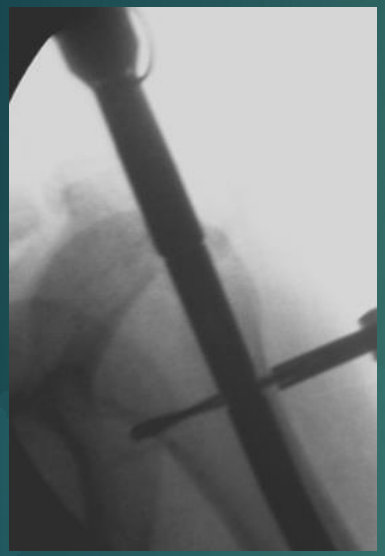
Particular notice is taken of the position of the proximal end of the nail and the location and length of all interlocking screws.

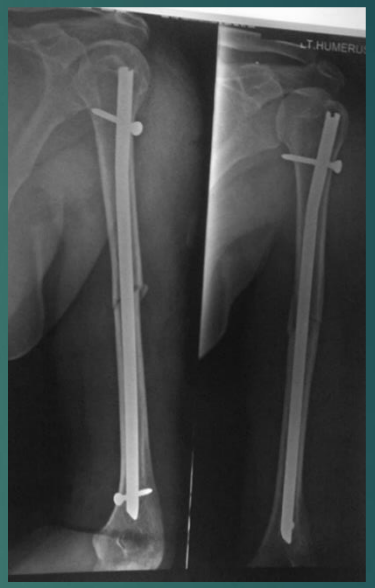
Pearl to Avoid Shoulder Adhesion



- **Incision in line with fibers of supraspinatus**
- Early full ROM of shoulder

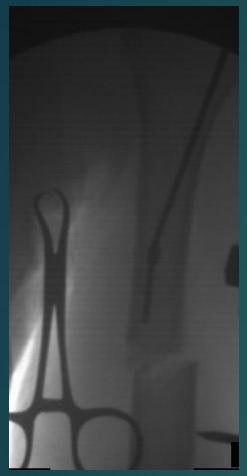
Pearl to Avoid Shoulder Impingement

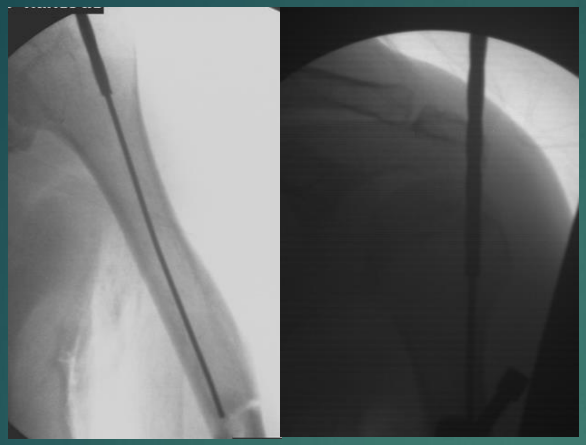




Proximal end inserted at least 2-3 mm under head surface to avoid impingement.

Pearl to Avoid Fracture Comminution

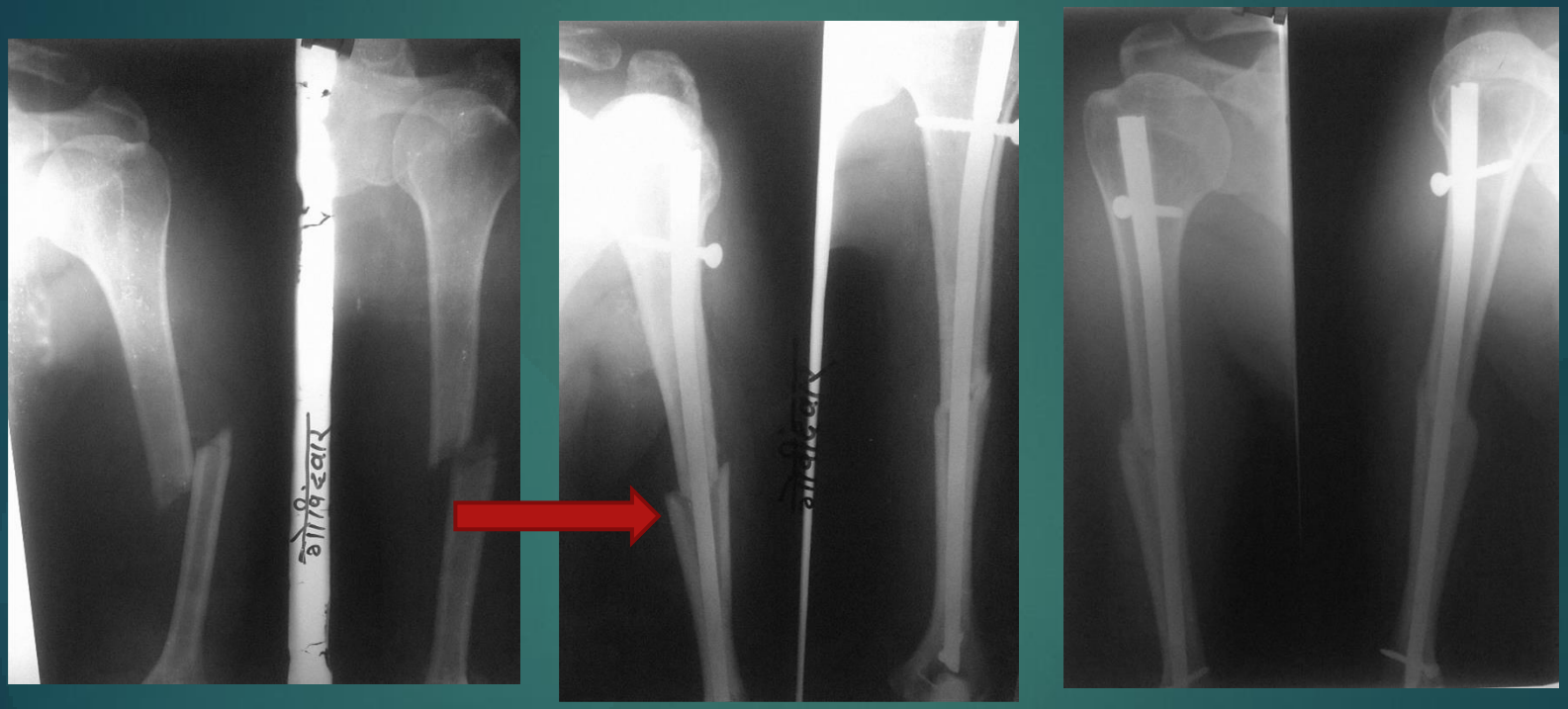




Proper Entry From The Top and Reaming of canal .

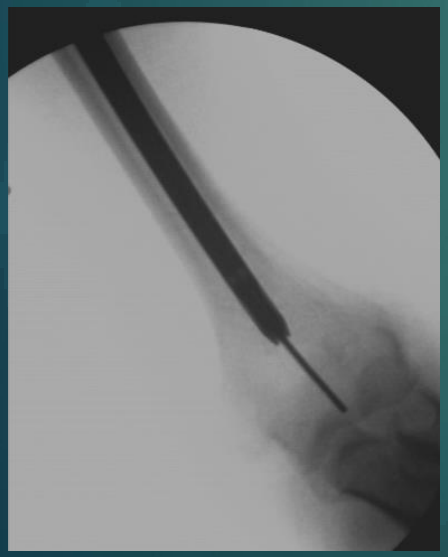
No forceful hammering of nail.

Case of Iatrogenic Fracture Comminution



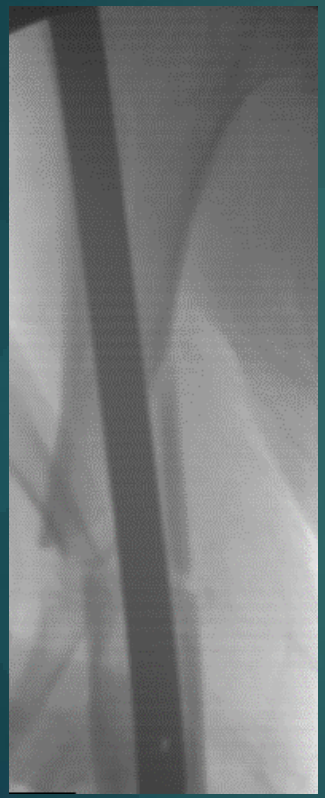
Pearl to Avoid rotational instability

Reaming to Fit Thicker Nail
Increases contact and also stronger biomechanically.
Locking at both the ends.



Metaphyseal fracture.

Pearl to Avoid unstable construct.



At least two proximal /distal screw

Poller screw

Use of poller screw .

Poller screw increases the stability of construct by narrowing the canal.

Augmentation by additional nail

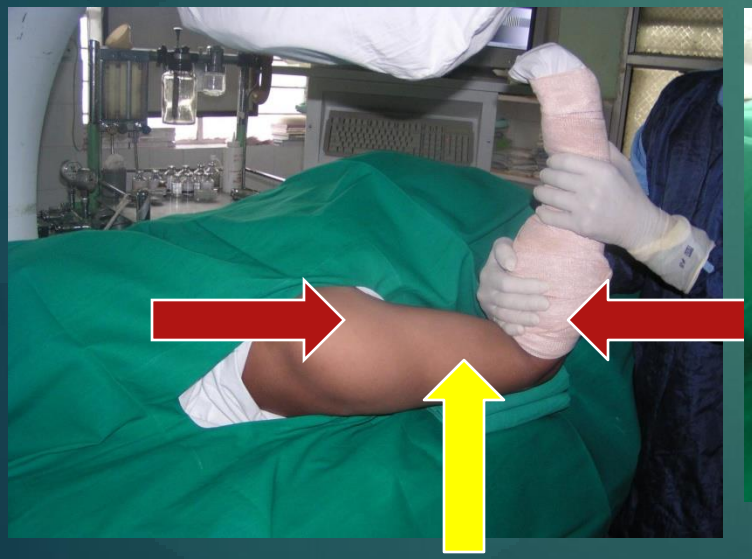
Because of the funnel shape of the humeral shaft, a true interference fit is difficult to obtain;

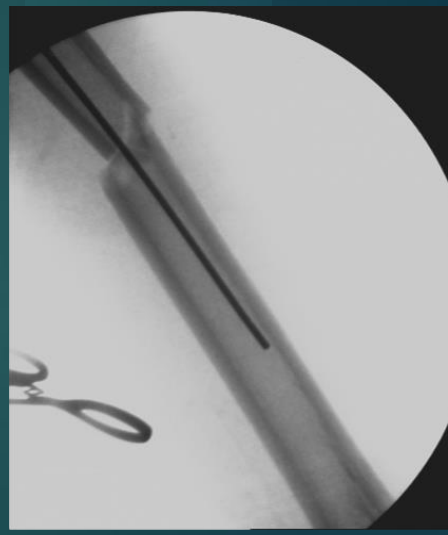
Trumpet shape of the proximal two thirds of the humeral canal which gradually becomes cylindrical distally.

Wide canal fill the gap with augmentation

Pearl to Avoid Radial Nerve Palsy.

Firm support at the fracture site while reduction and reaming.



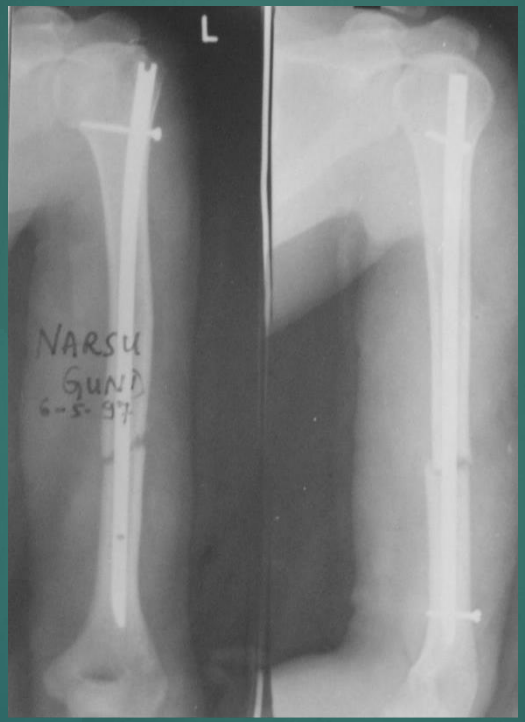


ASSOCIATED RADIAL NERVE INJURY.

- Anatomical reduction
- Close nailing and observe
- Over 95% of the nerve injuries will recover spontaneously.“

- Non-anatomical reduction
  - Open reduction & nerve exploration.
  - the nerve is identified and a neurolysis can be done and continuity of the nerve documented .
  - This does NOT in any way hasten the nerve recovery.

FRACTURE RESORPTION GAP



Transverse Fractures Persistent Gap

Non Weight Bearing bone, Takes unusually long time.

Fracture Resorption Gap

Wait if no problem

Allow all activities

Unites usually by one year

Keep patient informed to avoid apprehension and surgery

Gap at fracture site – in comminuted fracture How Long to Wait ?

Weight for 10-12 weeks .

If no signs of healing revision surgery

Conclusion.

- MINIMALLY INVASIVE METHOD .
- RELATIVE STABILITY OF NAIL PRODUCESS HEALING BY SECONDARY CALLUS FORMATION.
- STIFFNESS OF SHOULDER IS PREVENTABLE COMPLICATION.