Reduction of intra-articular fracture

Markus Parkkinen, MD, PhD

AOT Advanced Principles Course

Basic principles

- Anatomical reduction of joint surface, normal rotation and mechanical axis
- Stable fixation
- Early mobilization
- Meticulous soft tissue handling!

- Articular surface fracture is often accompanied by irreparable damage to the cartilage

- Anatomical reduction of the joint surface is the only possible contribution the surgeon can make to prevent posttraumatic osteoarthritis

- Some joints might be more tolerant for residual displacement

- The goal is still to restore perfect anatomical congruence

Treatment of articular fractures

- Anatomical reduction of fragments:
  - No step-offs
  - No depression
  - No gaps

- Stable internal fixation
  - Can withstand early mobilization

- Early motion of joint
  - Important for hyaline cartilage healing
  - Prevents stiffness

Outcome after articular fractures depends on:

- Trauma energy
- Residual malalignment
- Ligamentary instability
- Step-offs in articular surface

History of treatment of articular fractures

"Perfect anatomical restoration and perfect freedom of joint movement can be obtained simultaneously only by internal fixation."

Sir John Charnley, 1961

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Planning the surgery is essential

- Often determines the success or failure of the operation
- Imaging (X-rays, CT 2D and 3D, MRI)
- Choose your approaches
- Choose the implants
- Timing of surgery

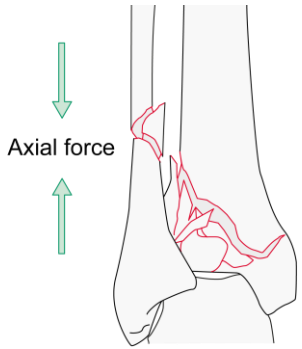
Staged procedure

- High energy trauma – soft tissue damage
- External fixation or splint first
- Wrinkle test
- CT with external fixation!!! (ligamentotaxis)
- Operation planning!!
- Consultation of plastic surgeons? (open fractures)

Articular fractures - distraction

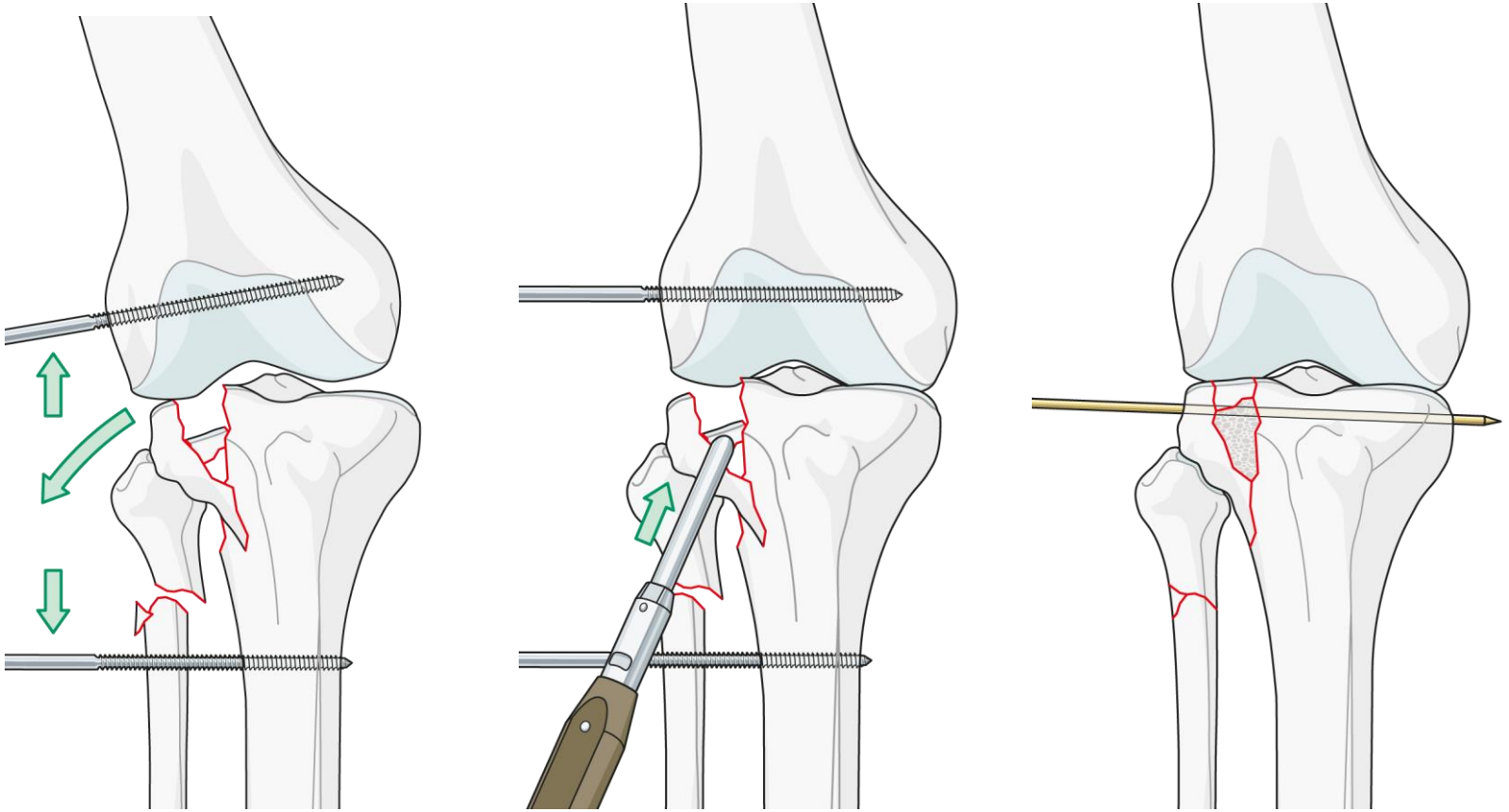
- Distraction is used to realign the metaphyseal area by indirect reduction
  - **Plus** it utilizes residual intact portions of soft tissue attachments to reshape anatomical structures

- Following approach, direct reduction under visual control is required to reconstruct the joint surfaces



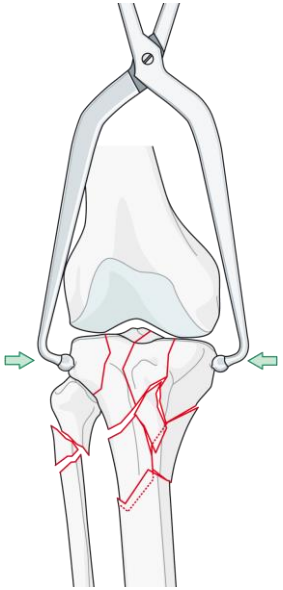
Principles of treatment

- Distraction



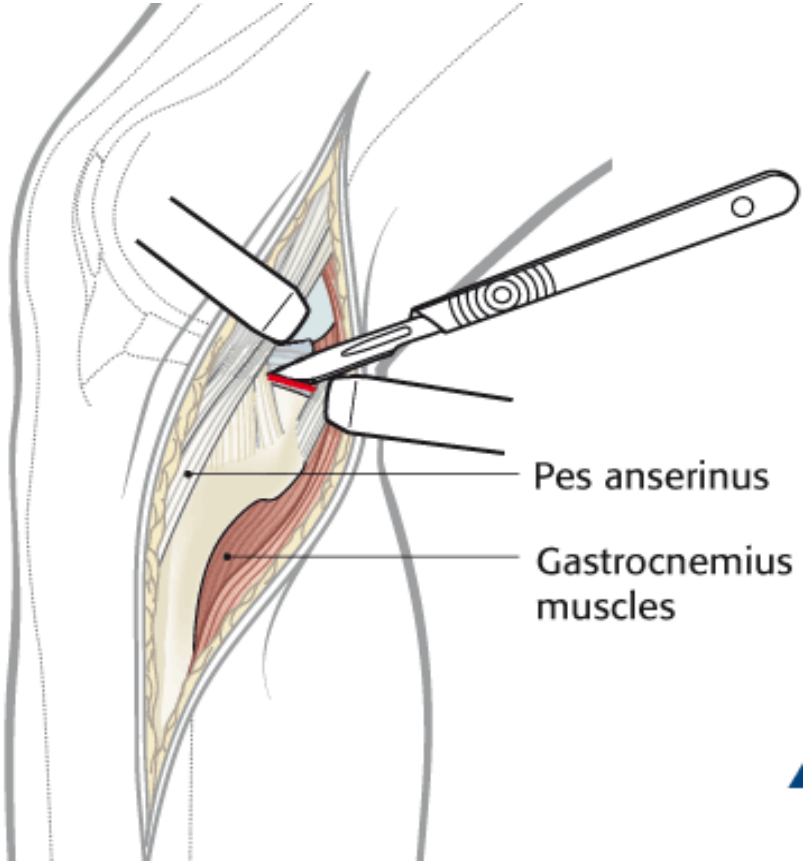
Tools of reduction

- Distractor or ex-fix for indirect reduction
- Screws for indirect and direct reduction
- Reduction forceps for direct reduction
- Schanz screw, K-wire, awl, etc for direct manipulation



All tools when used correctly preserve vascularity

Arthroscopy



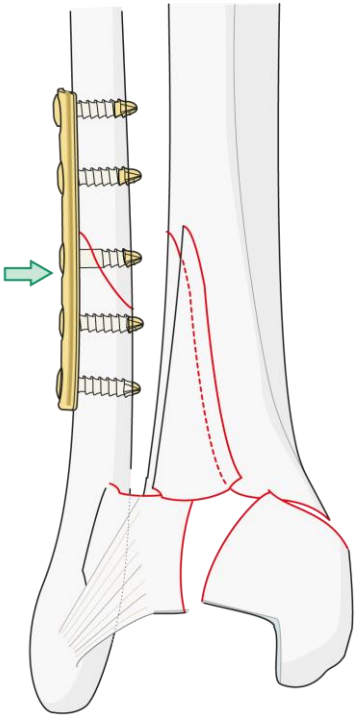
Reduction techniques

- Distract—use the ligamentotaxis of soft tissue
- Correct length and alignment
- Make your approach—visualize the joint
- Treat joint incongruency
- The sequence of steps will vary

Reduction of pilon tibiale fracture

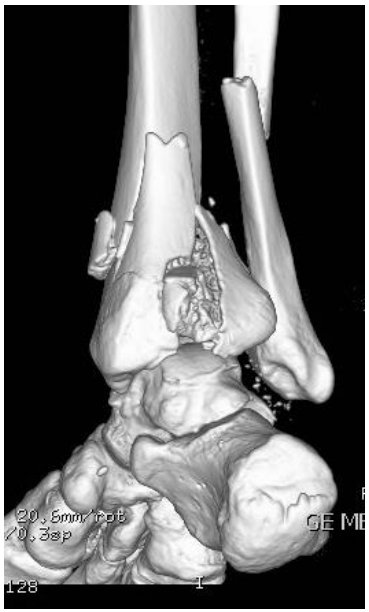
Correct length

- If fibula fx is simple, start with that
- Reduces correct length
- Reduces Chaput + posterolateral fragment indirectly



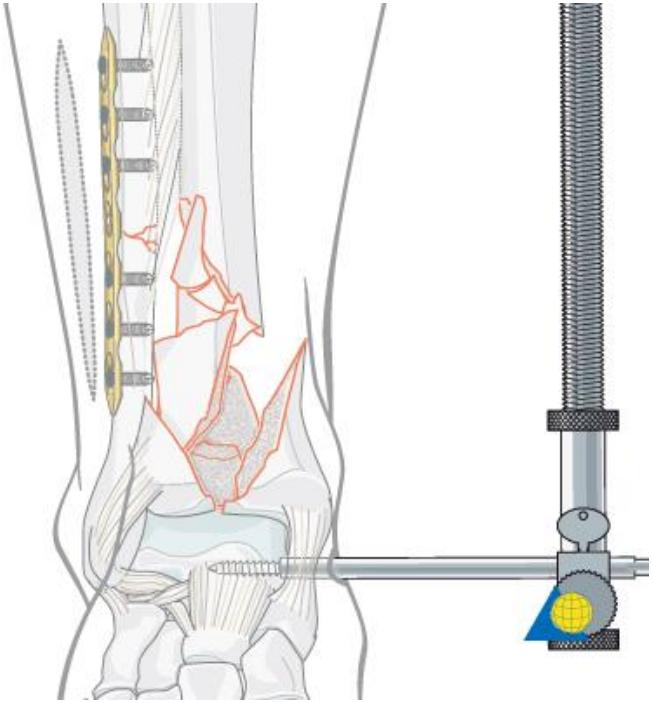
C-type → B-type

Platefixation of the posterolateral fragment

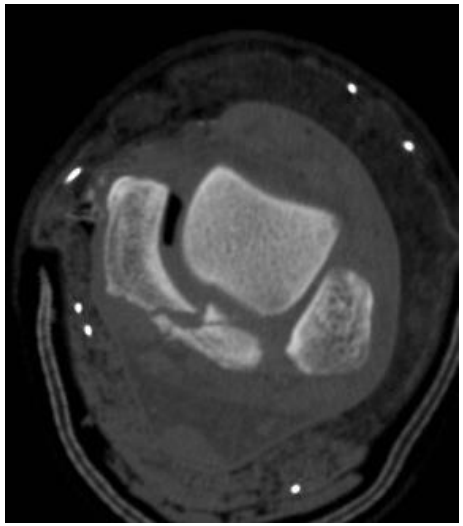


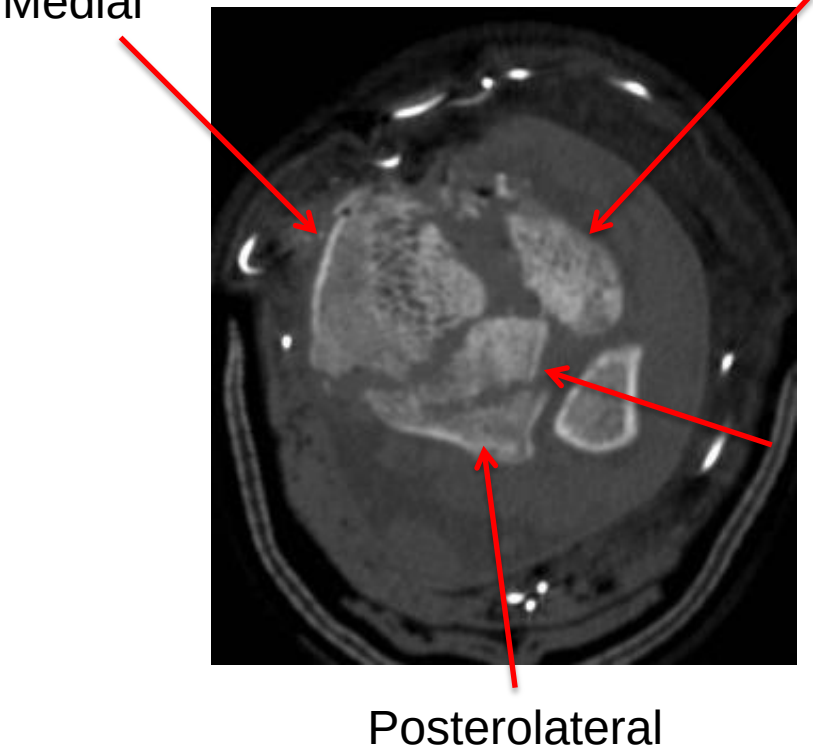
AO Distractor

- Schanz screws to neck of talus and tibia
- Parallel to the joint



Evaluate the fracture





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Steps of pilon fracture reduction

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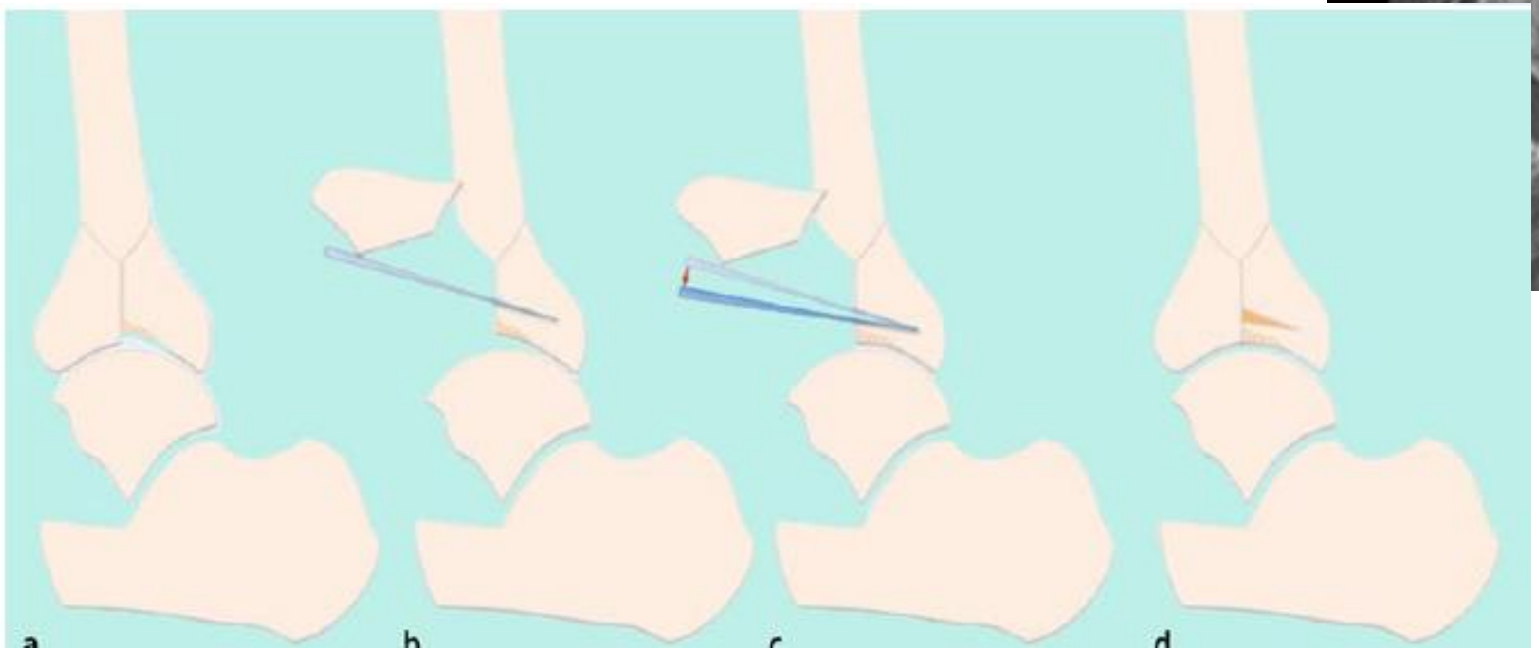
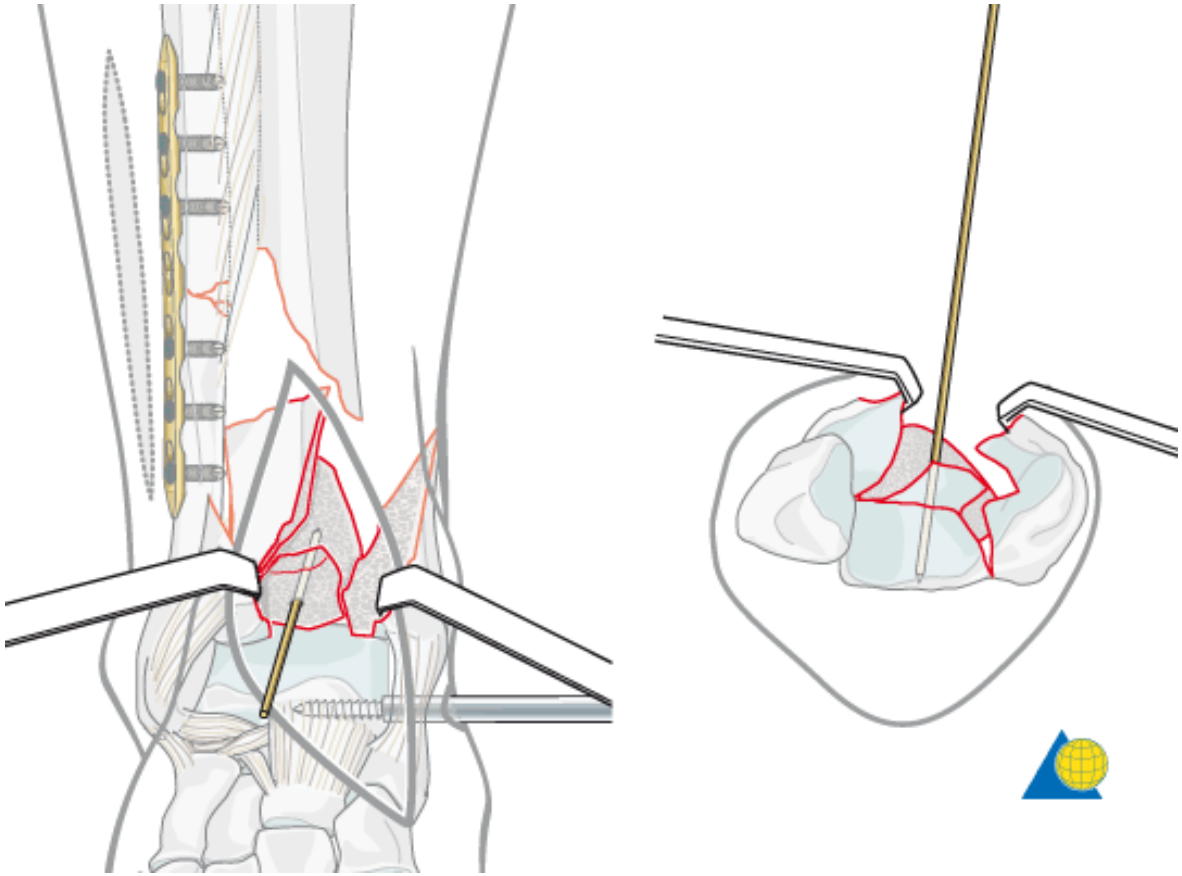
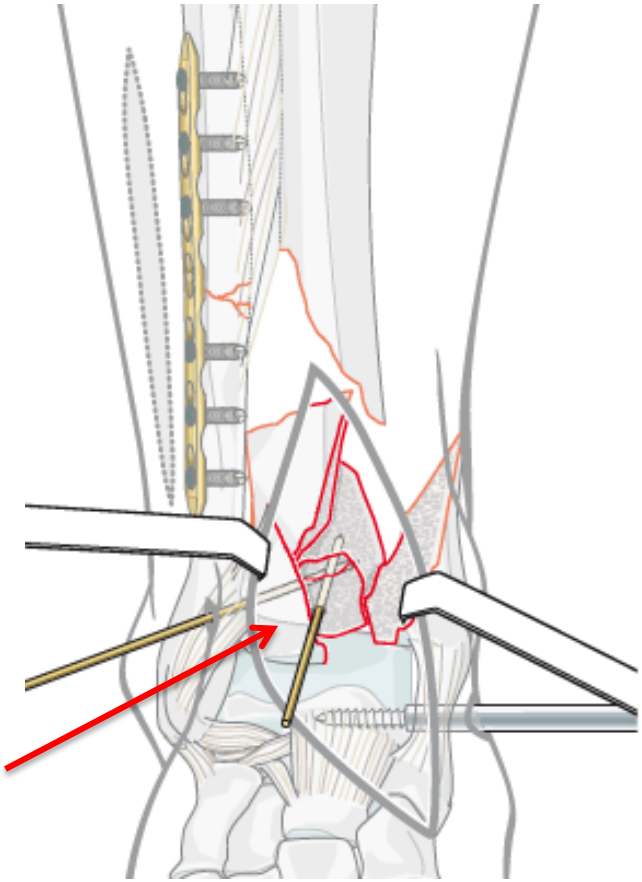
1. Reduction of central impression

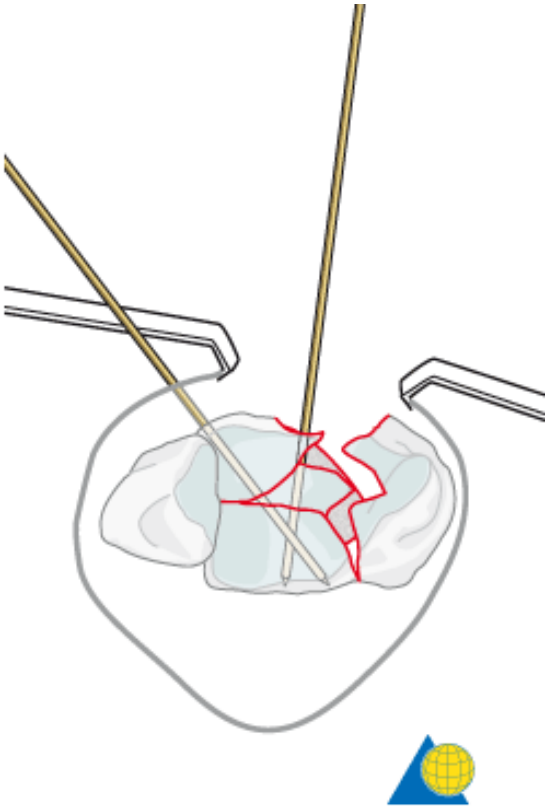


1. Central impression fixation

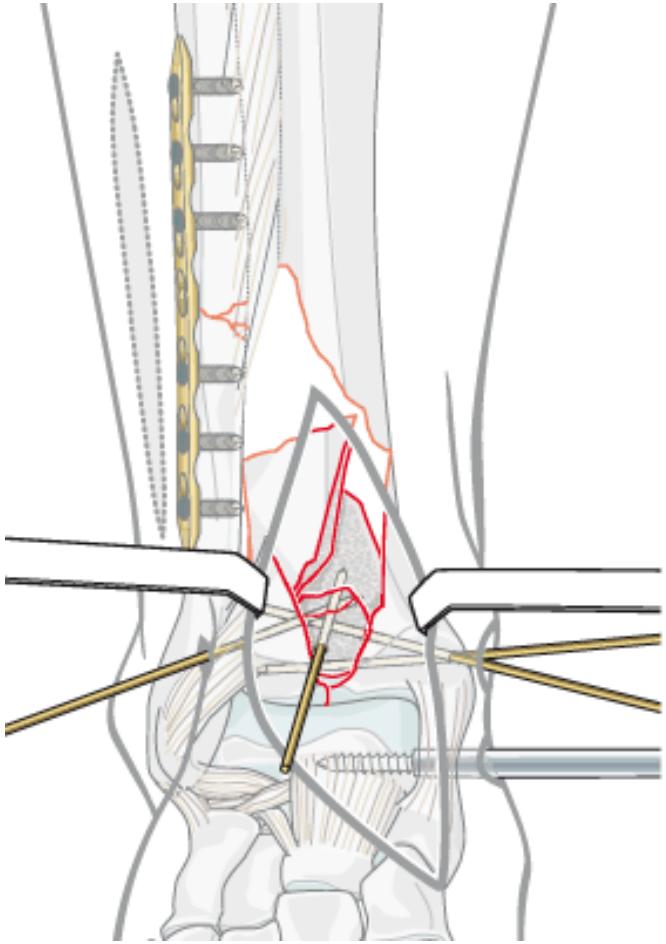


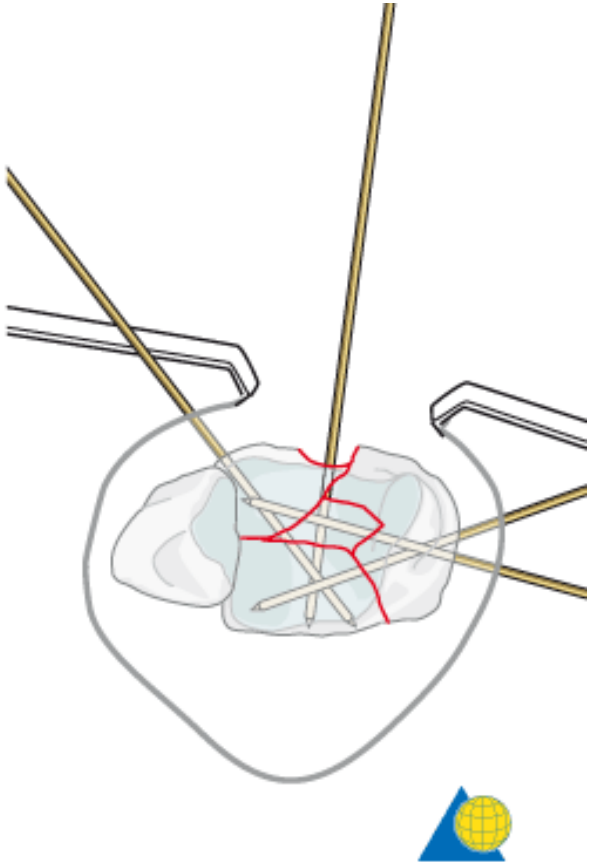
2. Anterolateral fragment



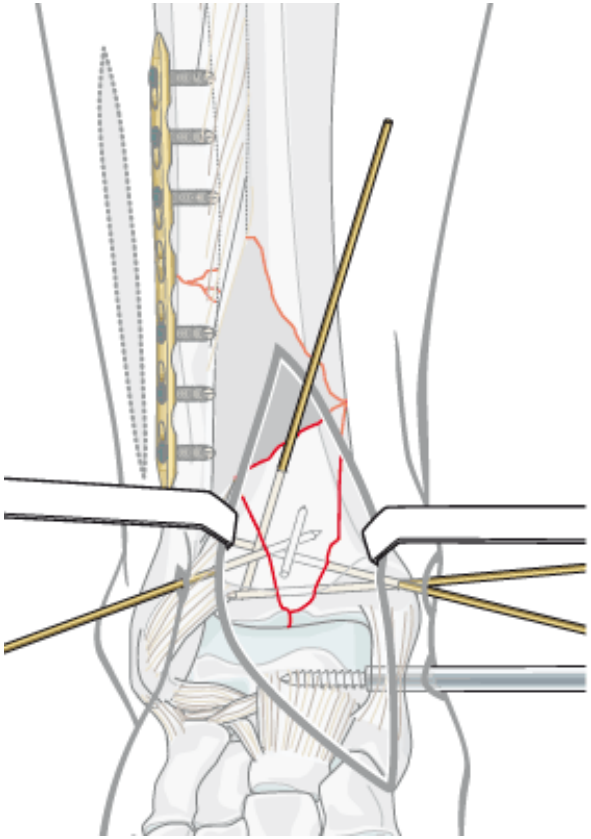


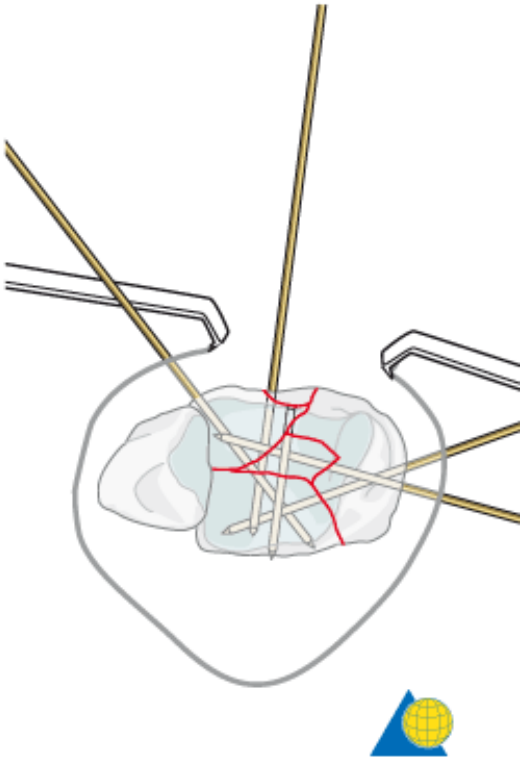
3. Medial fragment



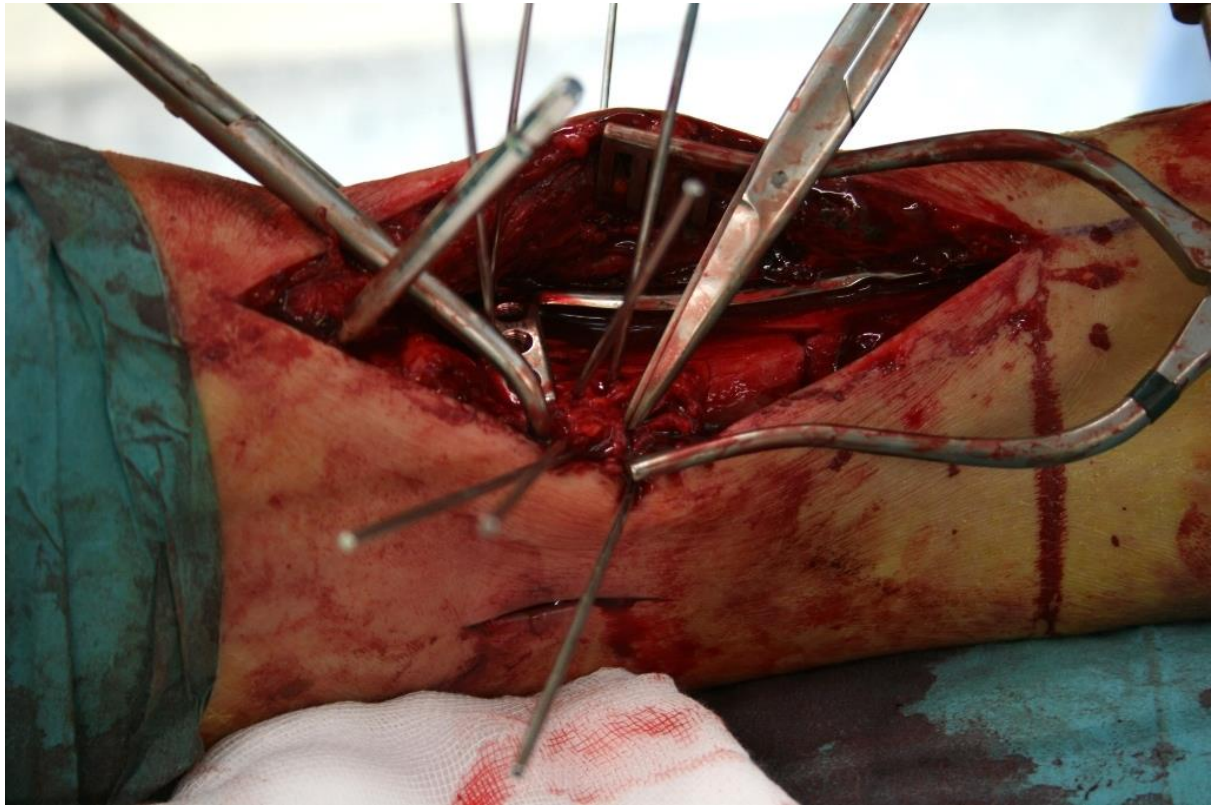


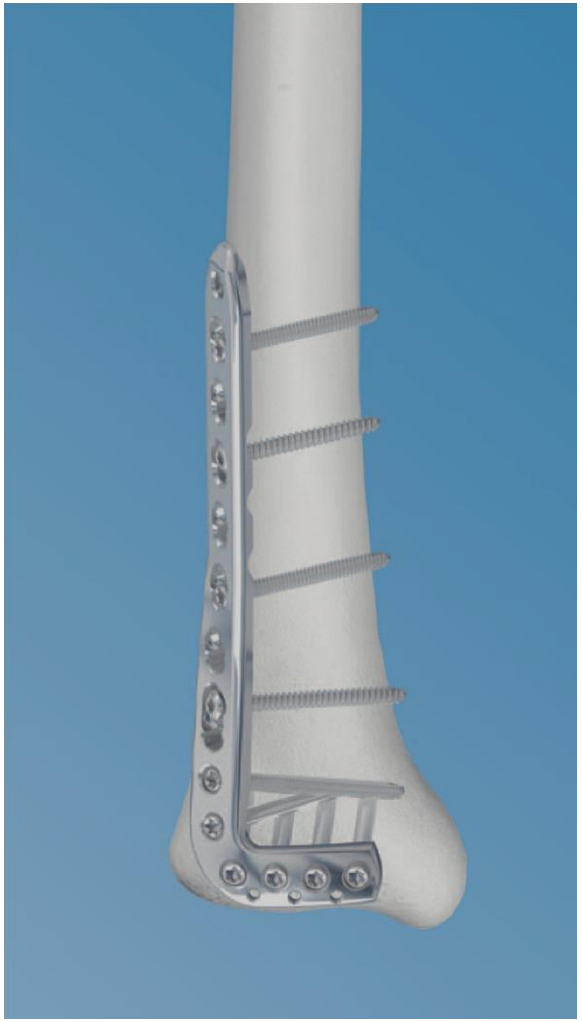
4. Anterior cortex



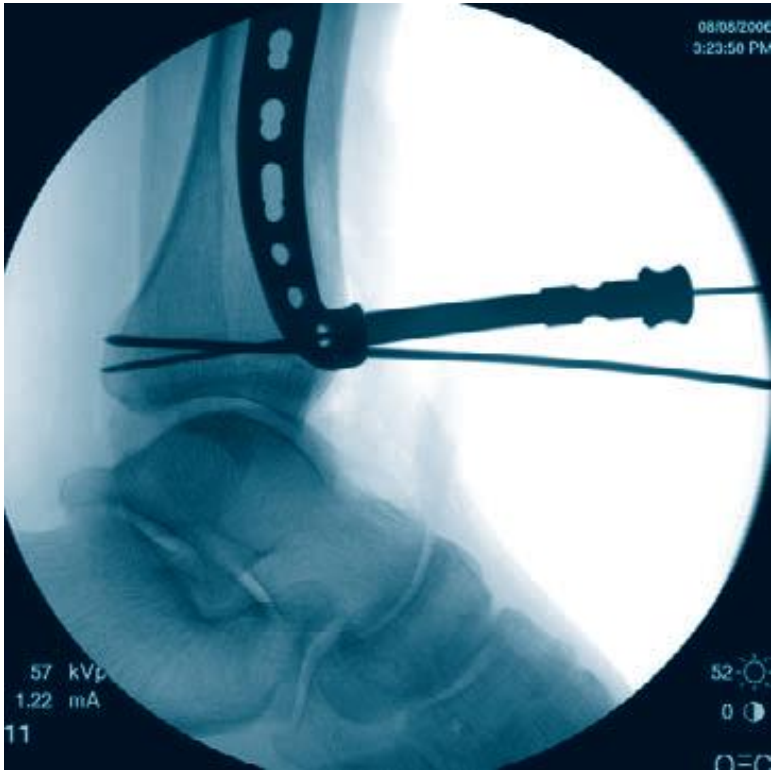


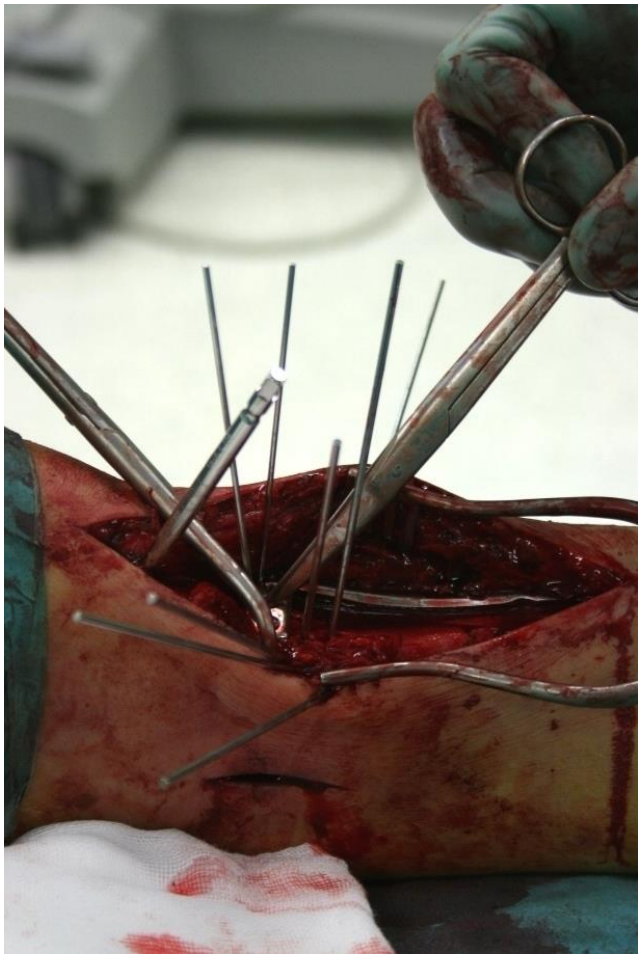
5. Platefixation



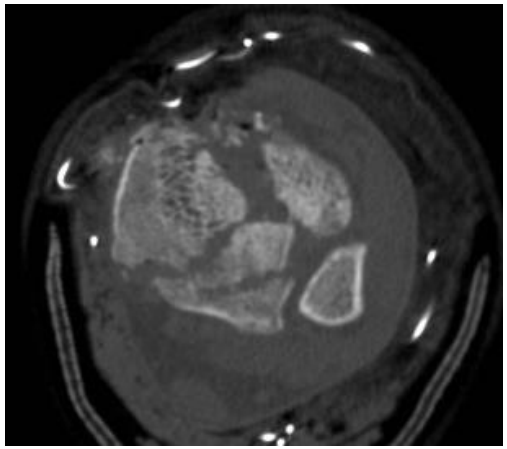


Fluoroscopic control






Proximal screws minimal invasive



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Take home message

- For precise anatomic reduction – usually open reduction with visual confirmation
- Useful tools to enhance visibility: AO distractor, external fixator, arthroscopy
- Use available instruments for direct reduction (pointed reduction forceps, K-wires, biosticks)
- Indirect reduction for length and alignment
- Absolute stability → early mobilization → enhances healing