Locking plates – use and abuse

AOTrauma Course—Advanced Principles of Fracture Management
April 25–28, 2022 Fredericia, Denmark

Aims

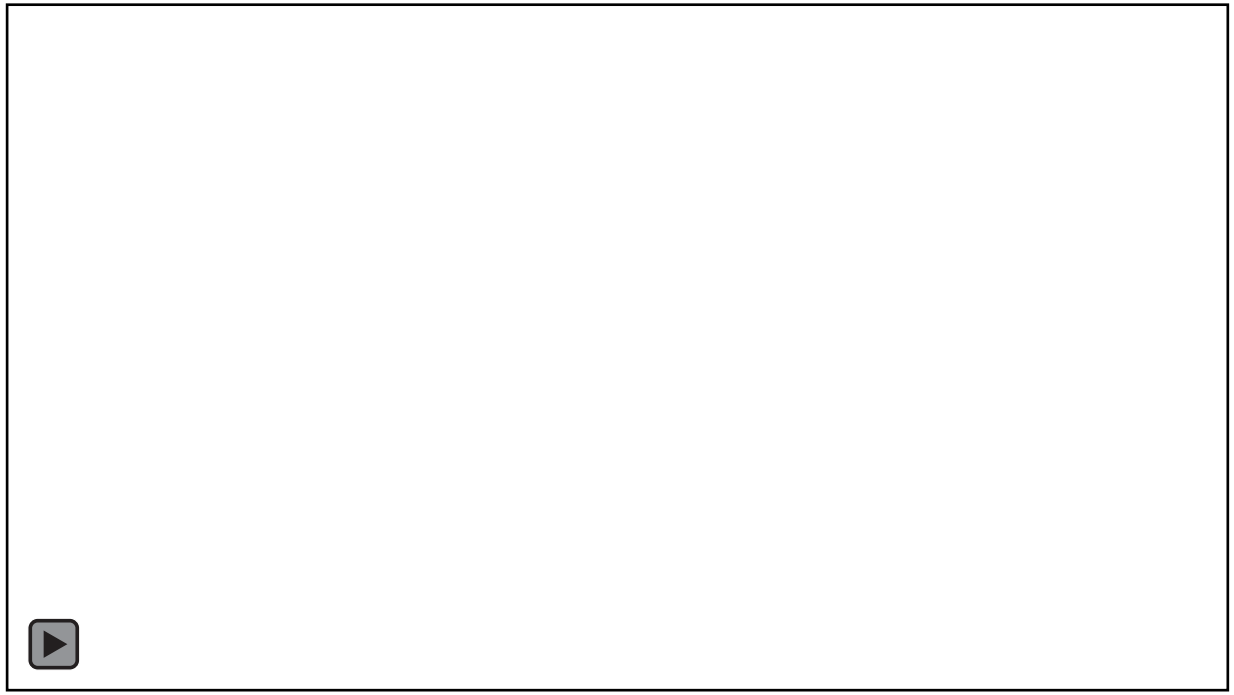
Understanding of:

- How do we use LCPs
  - (1.) compressing
  - (2.) buttressing
  - (3.) bridging
  - (4.) combination in osteoporotic fractures
- Advantages of anatomical preformed LCPs
- Differences between internal and external fixators

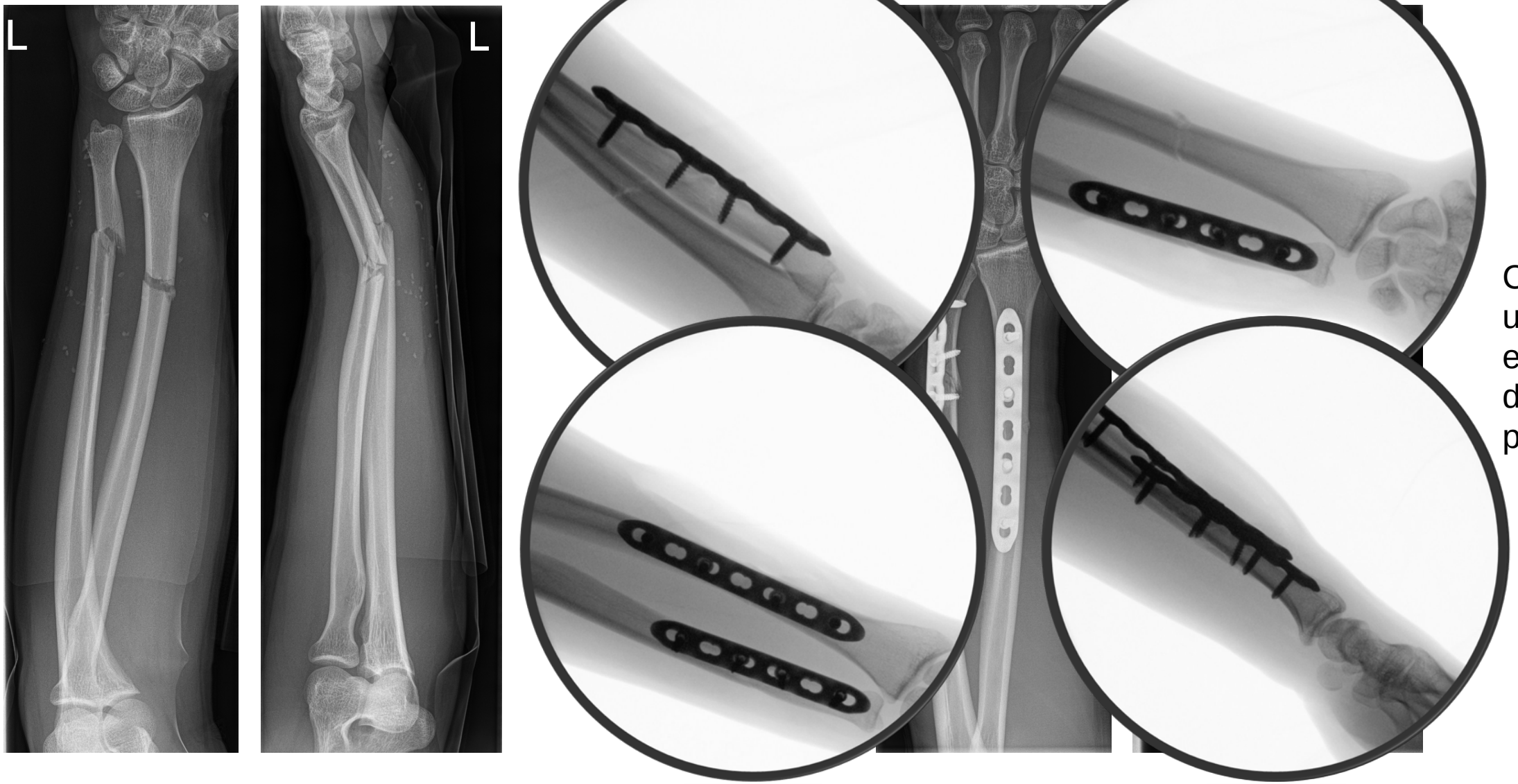
Not all Locking Compression Plates are equal…

Principles:

- (1.) Absolute stability
- (2.) Buttress
- (3.) Internal fixator
- (4.) Anatomically adapted to region of interest
  → opportunity to fix joint surface AND metaphysis



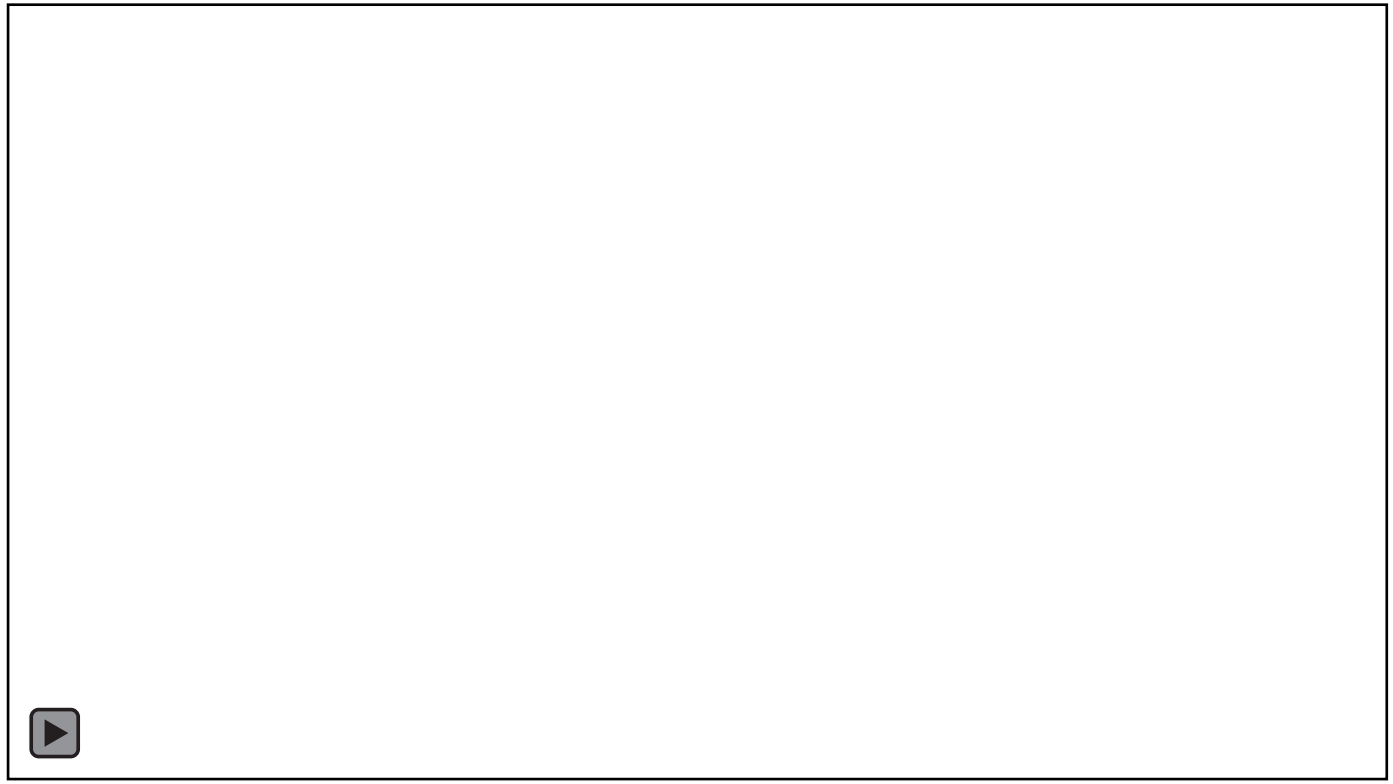
(1.) Absolute stability – and how it‘s done



Compression using eccentric drilling and pre-bending

(2.) Buttress – and how it‘s done

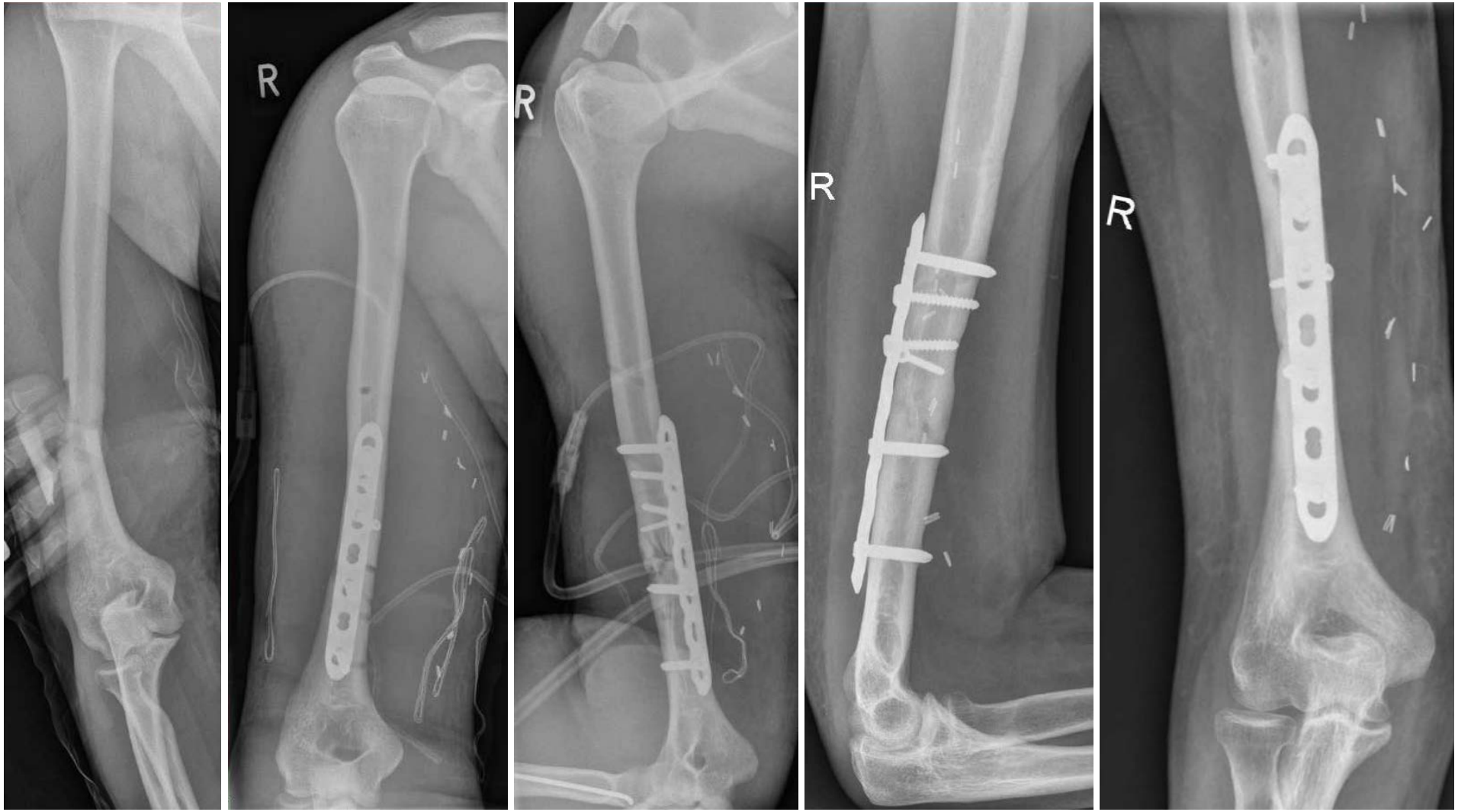
- Protection of an absolute stable construction
- Direct fracture healing



Simple fractures need absolute stability.

Use: Complex fracture of the distal humerus shaft:

Arterial lesion, separate wedge: first simplified, then fixed with dynamic compression

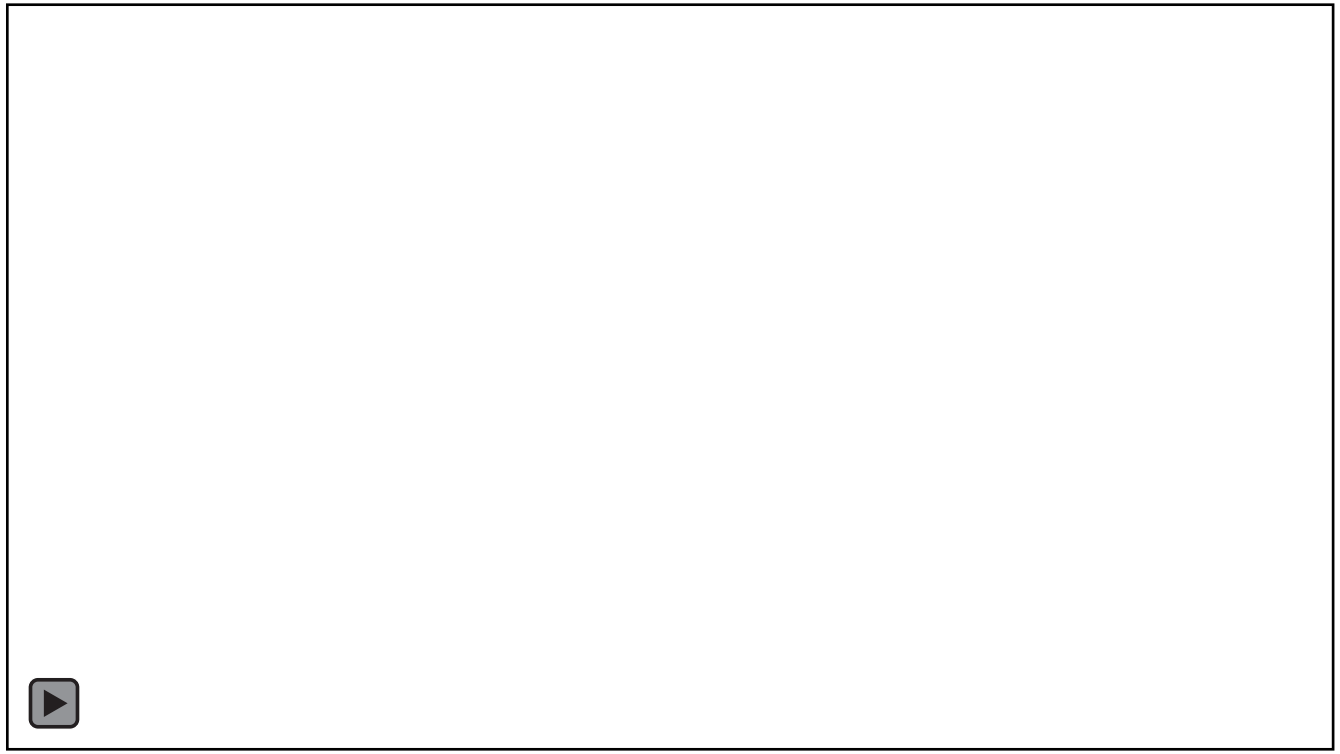


When using universal plates, mind dimensions

- The right dimensions
  - forearm: 3.5 mm
  - humerus: 4.5 mm (narrow)
  - femur: 4.5 mm (broad)
  - tibia: 4.5 mm (narrow)
- If it doesn’t fit, change your plan.

(3.) Internal fixator – and how it‘s done

- Bridging the fracture
- Respect biology
- Indirect fracture healing



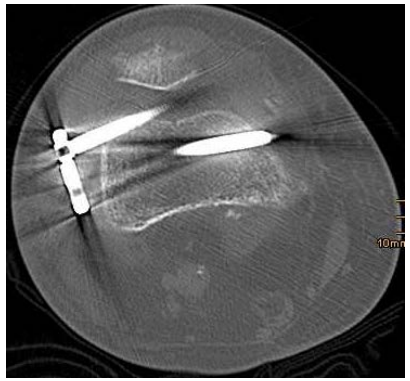
Complex fractures need relative stability.

Use: complex distal femur fracture

Bridging the fracture, small incisions, good healing

Abuse: periprosthetic fracture fixed by Femur-LISS

Use self-drilling screws monocortical, place plate correctly, mind stress shielding



Abuse: nonunion following fixation with Tibia-LISS

Avoid open reduction and large gaps

Accident

2 days after fixation

6 months after fixation

Complex fractures turn into simple nonunions.

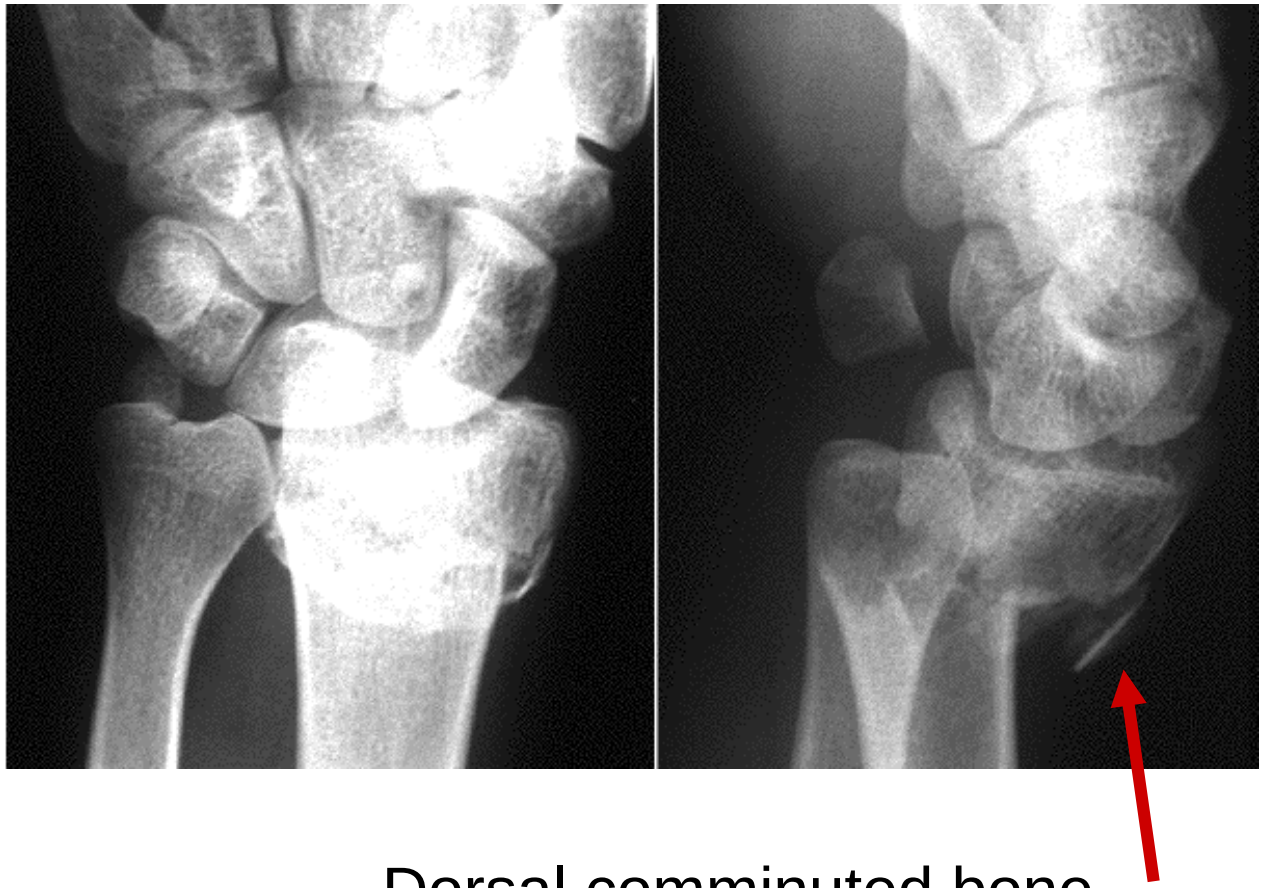
Abuse: failed fixation in proximal humerus fractures

Avoid primary malalignment (varus), provide medial stability

Jaeger M et al. (2011) Unfallchirurg 114: 1068-1074

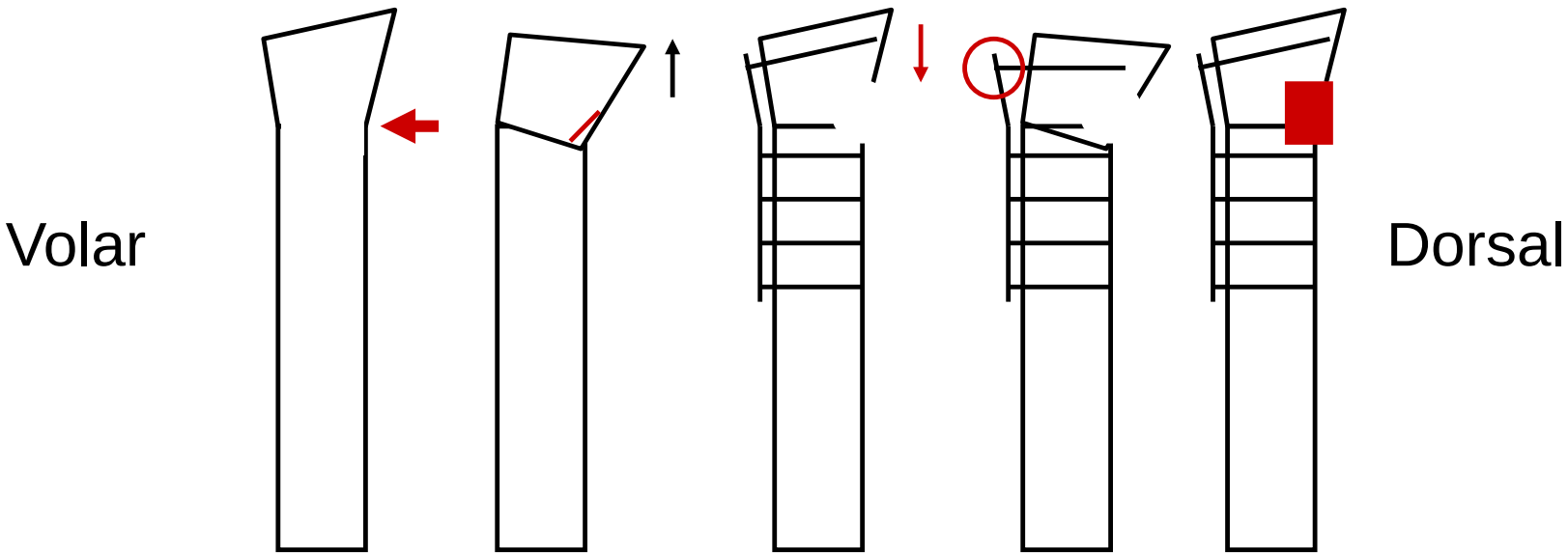
(4.) Anatomically adapted to region of interest

→ opportunity to fix joint surface AND metaphysis

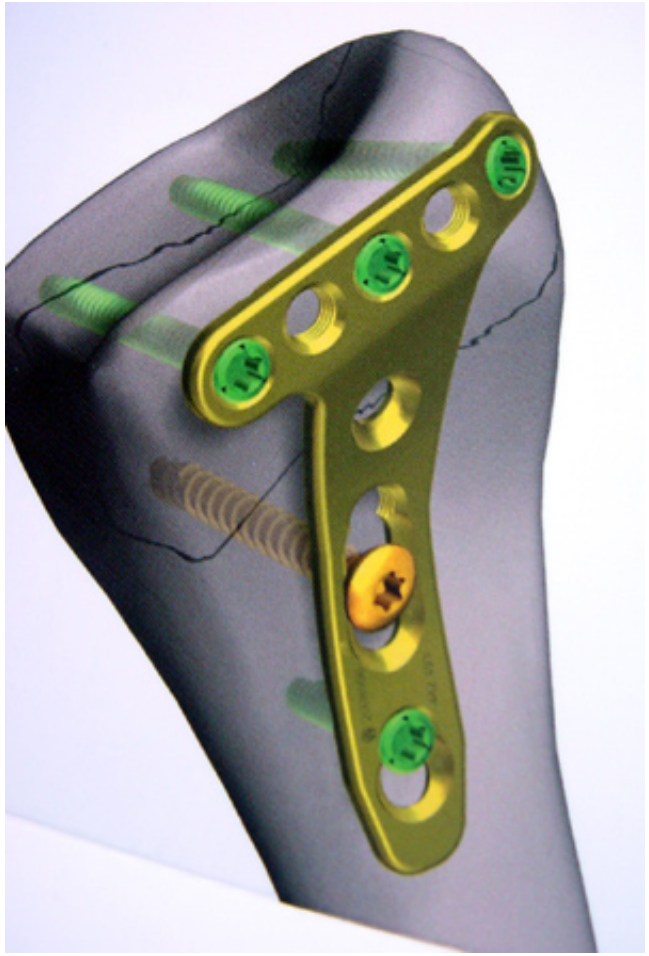


Dorsal comminuted bone

Reduction – and then?



Angular stability helps to retain reduction



2,4 Radius LCP

Locking **C**ompression **P**late

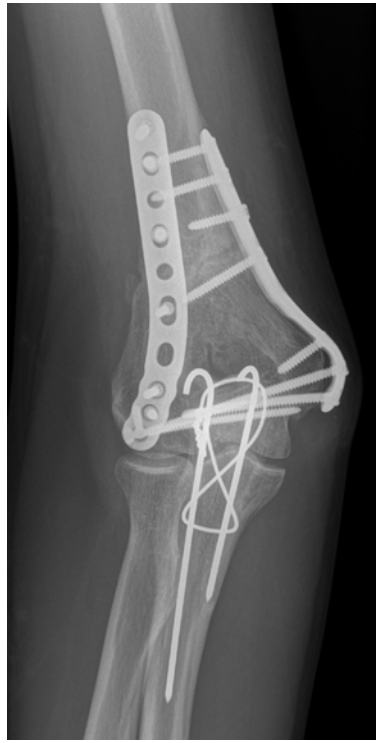
Use: Osteoporotic bones may be fixed without secondary loss of reduction

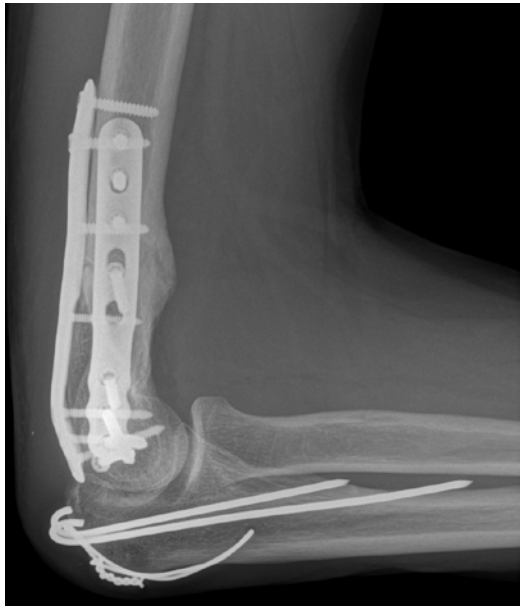
Osteoporotic fractures need angular stability.

Specific plates meeting the needs of different anatomical regions

6 weeks

3 months





Principles of fixation using internal and external fixators might be similar, but

- External:

  - flexible configuration

  - minor stability

  - high risk of infection (most superficial)

- Internal:

  - defined configuration

  - high stability

  - low risk of infection

Flexible Fixation and Fracture Healing: Do Locked Plating 'Internal Fixators' Resemble External Fixators?

Hagen Schmal, MD, Peter C. Strohm, MD, Martin Jaeger, MD, and Norbert P. Südkamp, MD

(*J Orthop Trauma* 2011;25:S15–S20)

Take home

- Use of LCPs follows the following principles
  – (1.) and (2.) absolute stability and buttressing
  Simple fractures need absolute stability.
  – (3.) bridging
  Complex fractures need relative stability.
  – (4.) combination in osteoporotic fractures:
  Osteoporotic fractures need angular stability.
- Principles of fixation using internal and external fixators are similar, but biomechanics and clinical use differs a lot.