

# Locking plates- Use and abuse

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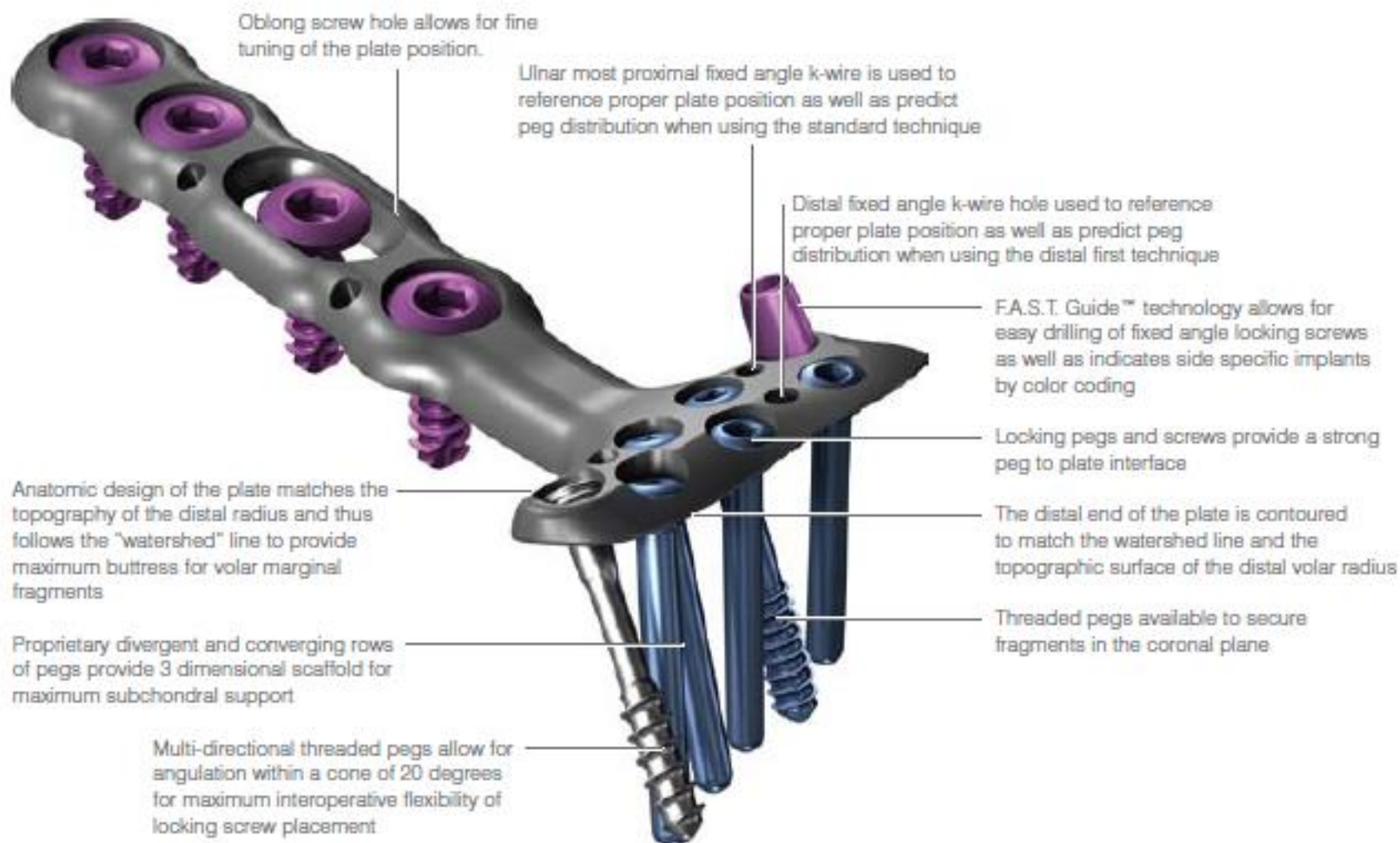
Stockholm

# Learning outcomes

- Indications
- Advantages and disadvantages
- Techniques

# Locking plates

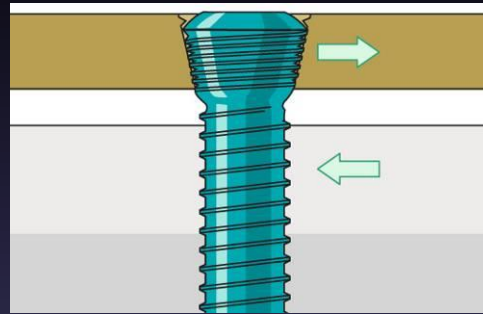
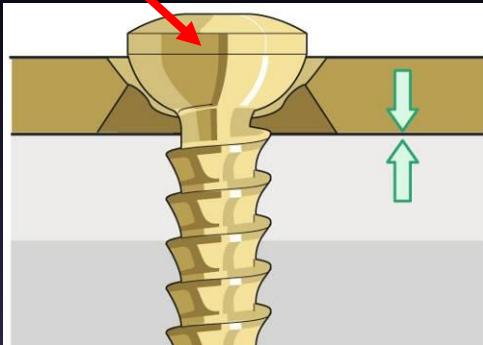
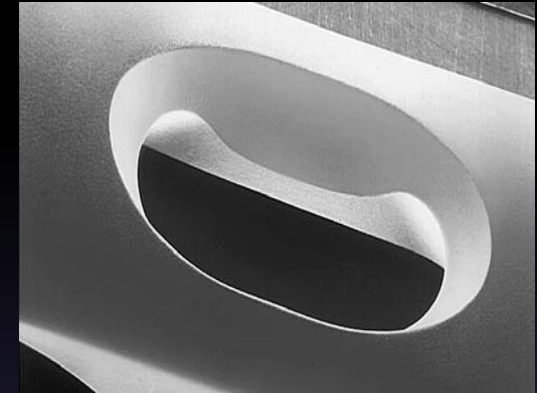
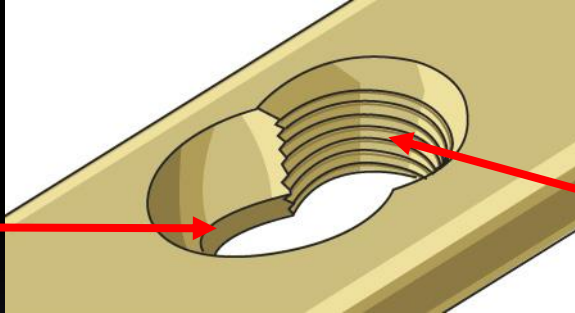
- May be site specific
- Anatomically contoured
- Complex instrumentation
- Mechanically different to conventional plates



# How do they differ?

dynamic  
compression  
unit

conical and  
threaded  
unit



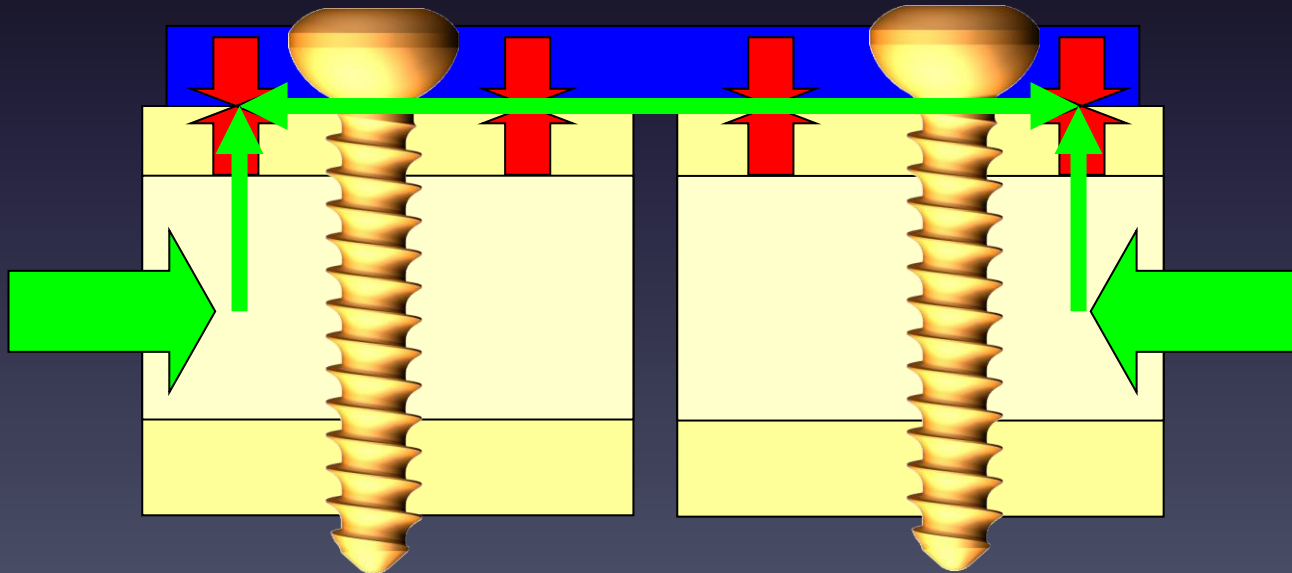
How do plates work?

# Load transmission

- Standard plate
  - Plate to bone compression
- Locking plate
  - Load through fixed plate-screw interface

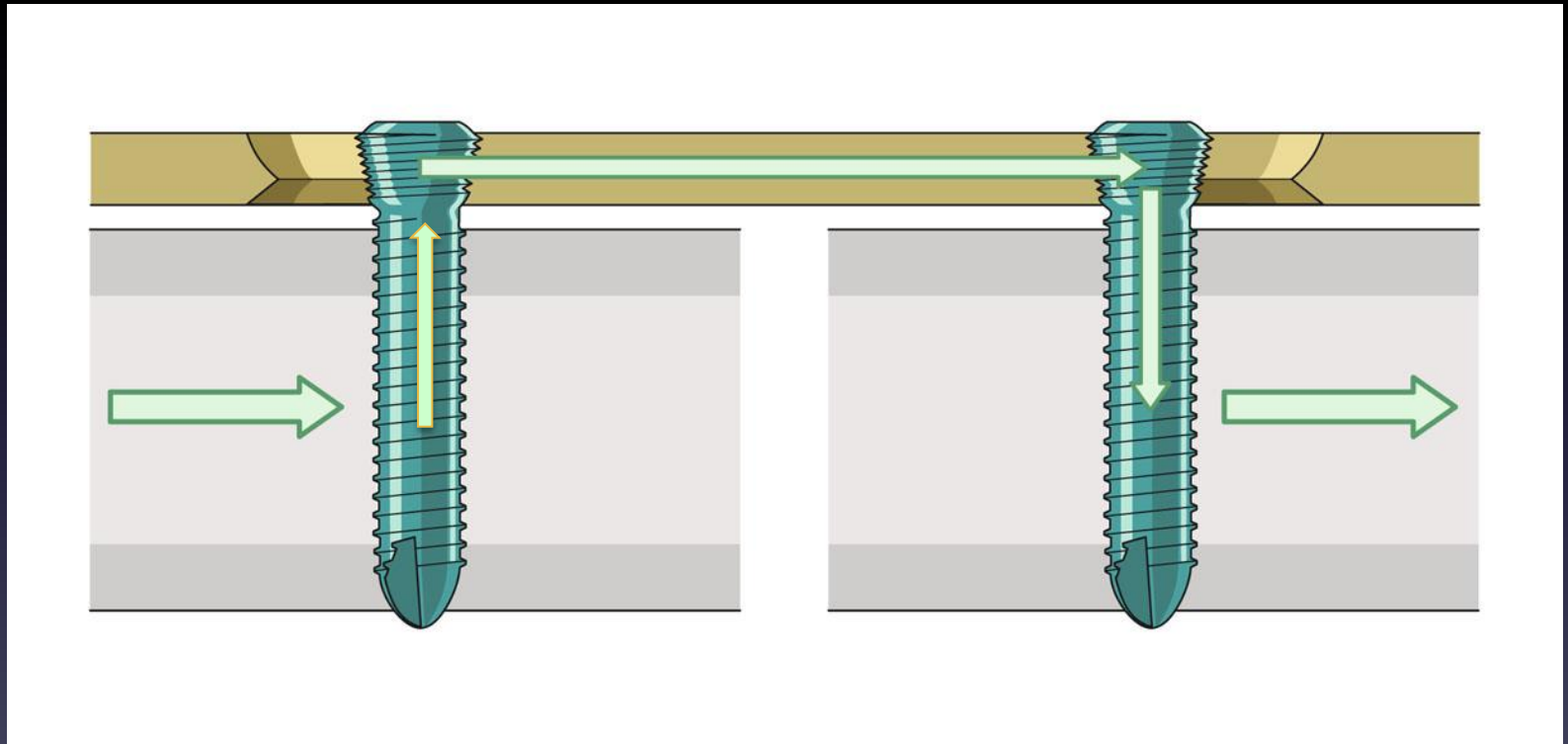
# Standard plate

- Function by:
  - compression of plate to bone
  - Dependent of purchase/bone quality
  - Load shared by plate and bone





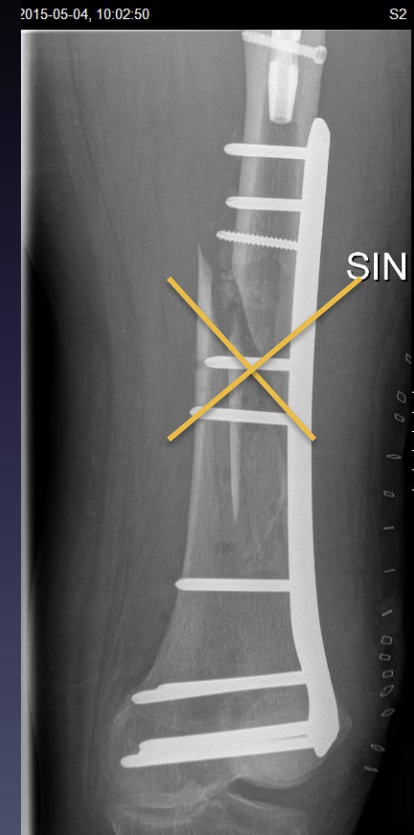
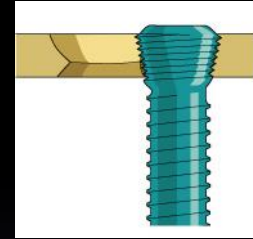
# Locking compression plate(LCP)



Load through the plate

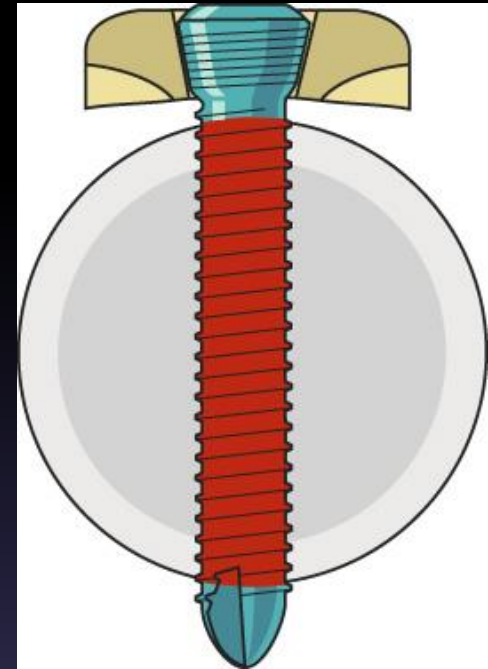
# Functions of locking head screws (LHS)

- Always in combination with a plate
- Never as lag screw
- Never cross an unreduced fracture with a LHS



# Unicortical or bicortical?

- Osteoporotic bone
  - Bicortical
- Normal bone
  - Probably bicortical



# Features and advantages of LCP

- Axial and angular stability
- Cannot be over-tightened
- No primary loss of reduction
- No or less screw loosening, no or less secondary loss of reduction

# Drawbacks of LCP

- Screw insertion is only possible in certain angles
- Loss of the feel for the quality of bone during screw insertion and tightening
- Screw jamming and difficult implant removal

# Loss of feel



# Modes of failure







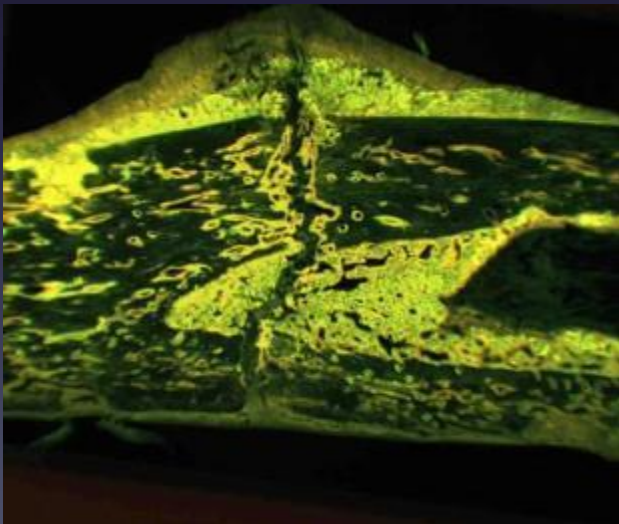
How do I use the plates?

- Mechanical stability

# Respect principles of absolute and relative stability – regardless of implant

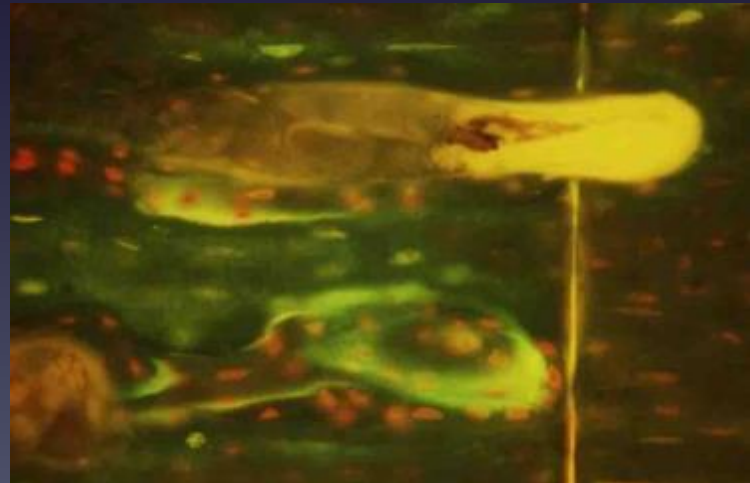
- **Relative stability**

- Callus



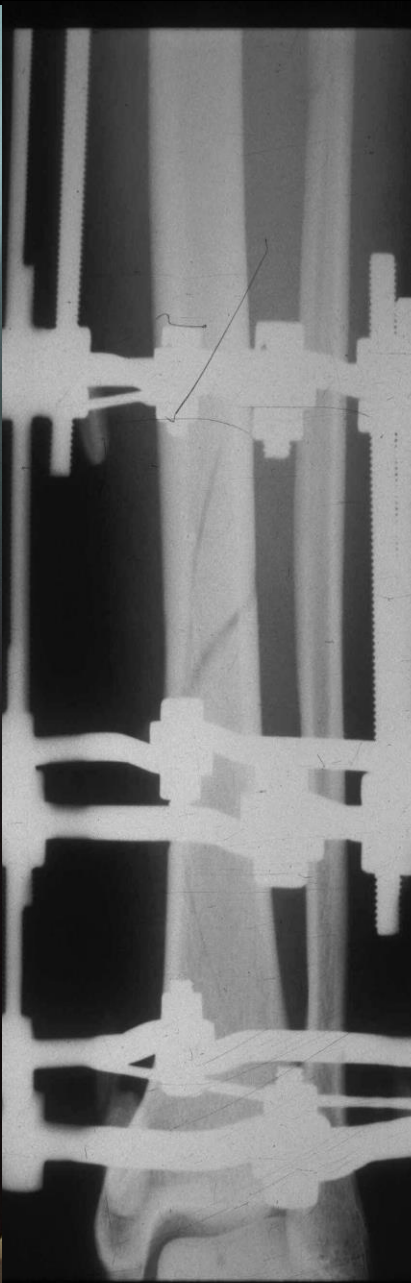
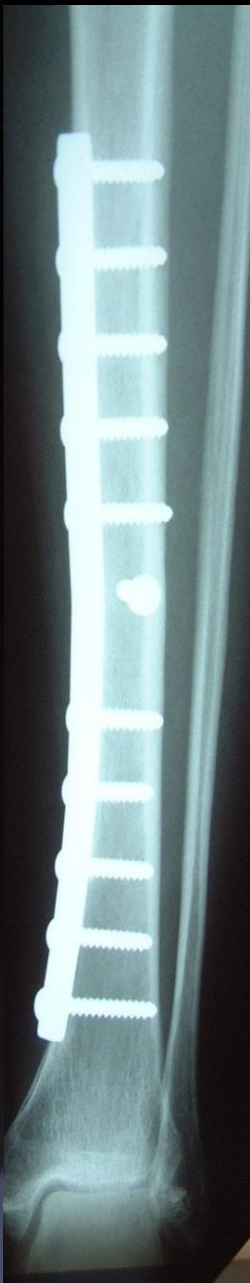
- **Absolute stability**

- Compression
- Direct bone healing









# Planning and decision making

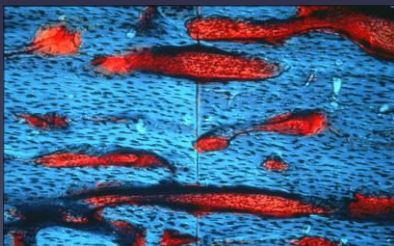
- The stability of the fracture fixation determines bone healing
- How much stability is necessary?

Absolute or relative stability

- What kind of bone healing is best for the type of fracture?

Direct or indirect bone healing

- Which are the technical limitations?  
(eg, iatrogenic trauma)



direct bone healing



indirect bone healing

# Locking plates

- Mechanically stiffer than non locked plate
- Best used in bridging mode
- Aiming to work with relative stability
- Too stiff for simple fracture patterns?

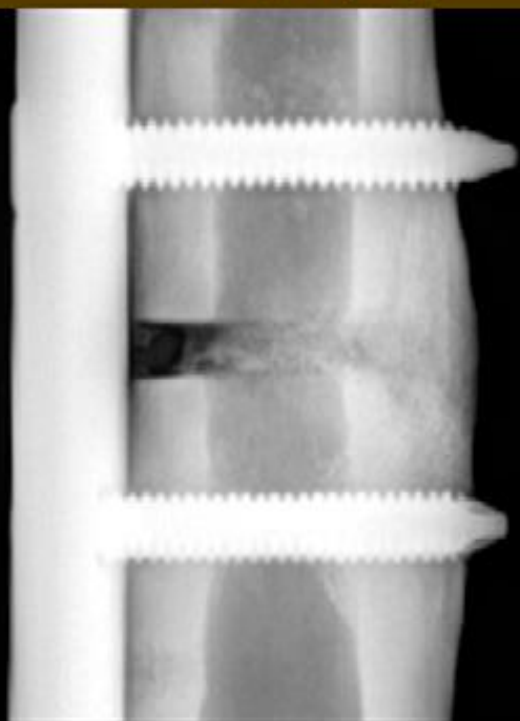
# Fracture healing – locking plates

- Higher rate of delayed union
- Asymmetric callus

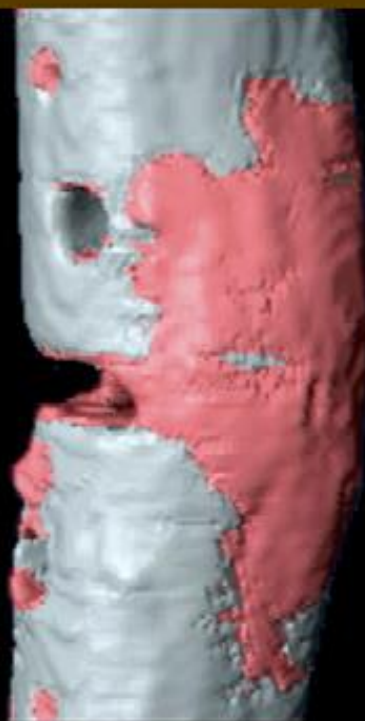


LP

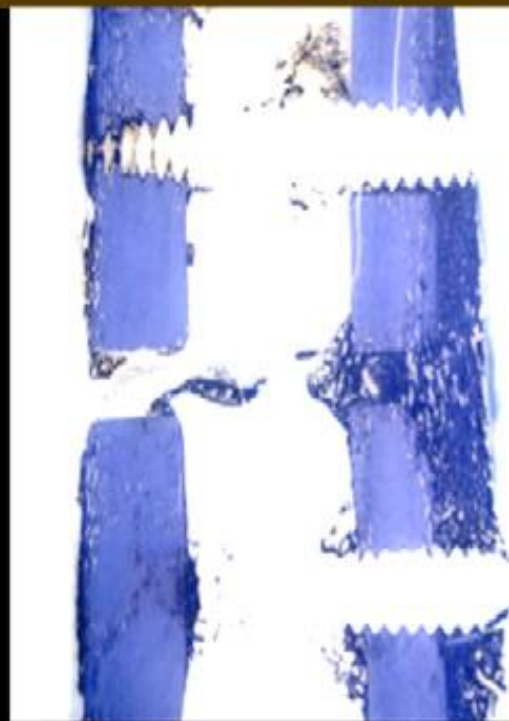
Radiography



CT



Histology



# Non-union machine



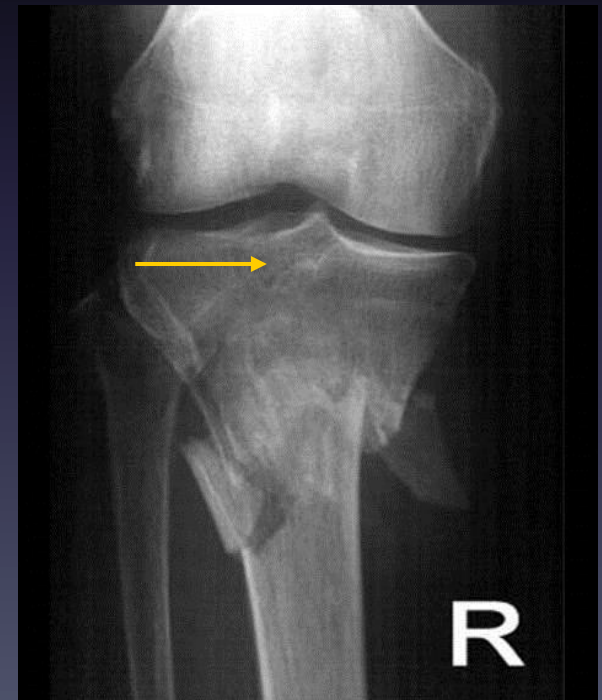
# Hybrid fixation

# Combination of compression and bridging with one plate

- A combination of both methods is possible when two different fractures occur in the same bone.

As in;

- Articular fracture with additional metaphyseal/diaphyseal fracture



# Hybrid bridging w locked plates

- Indirect, closed, reduction
- Long plate- Working length
- Fixation with LHS/CS only on main fragments
- Elastic fixation to achieve relative stability



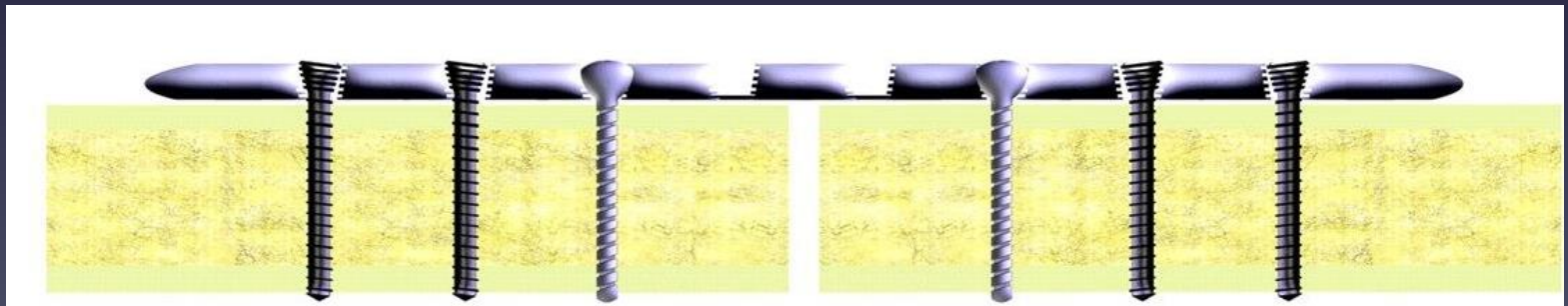
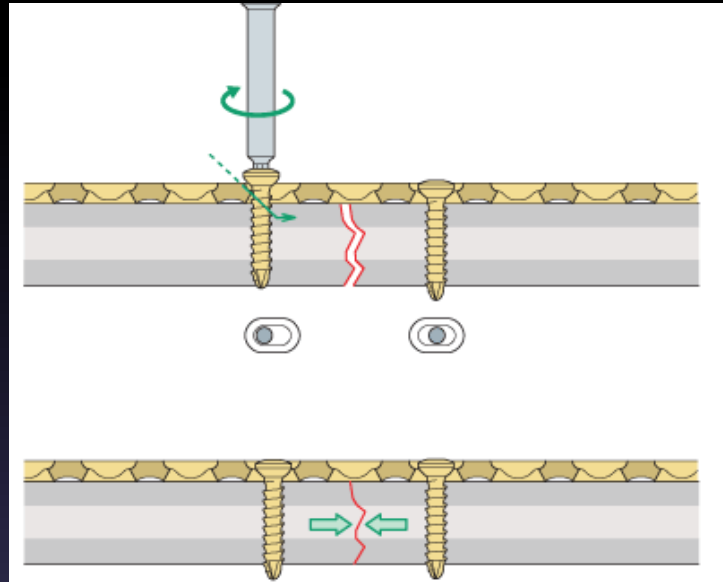
300/MG

R

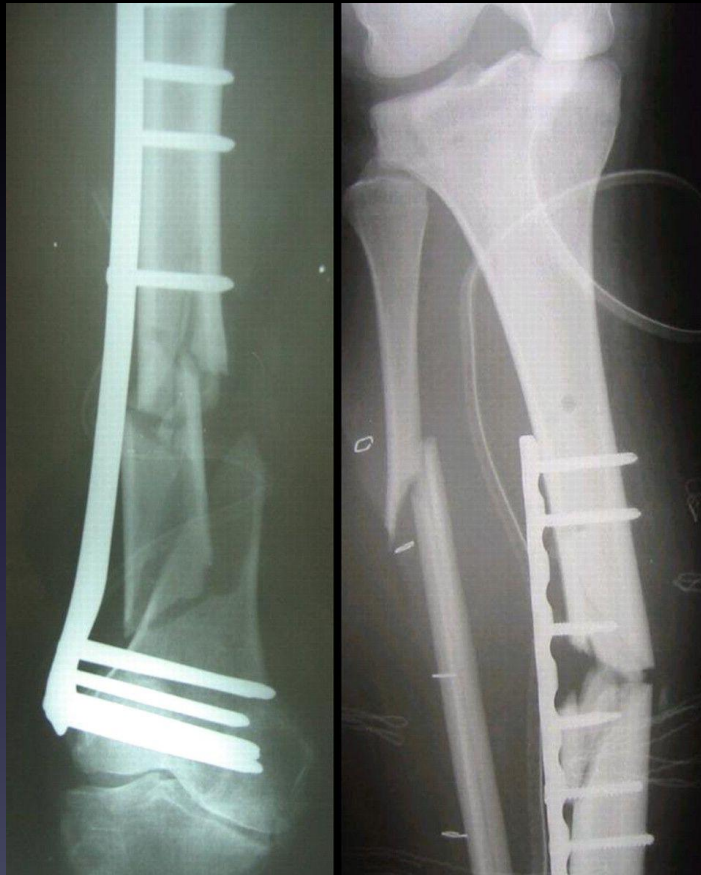


# Fracture surgery first

## ”Compress (lag) before lock”



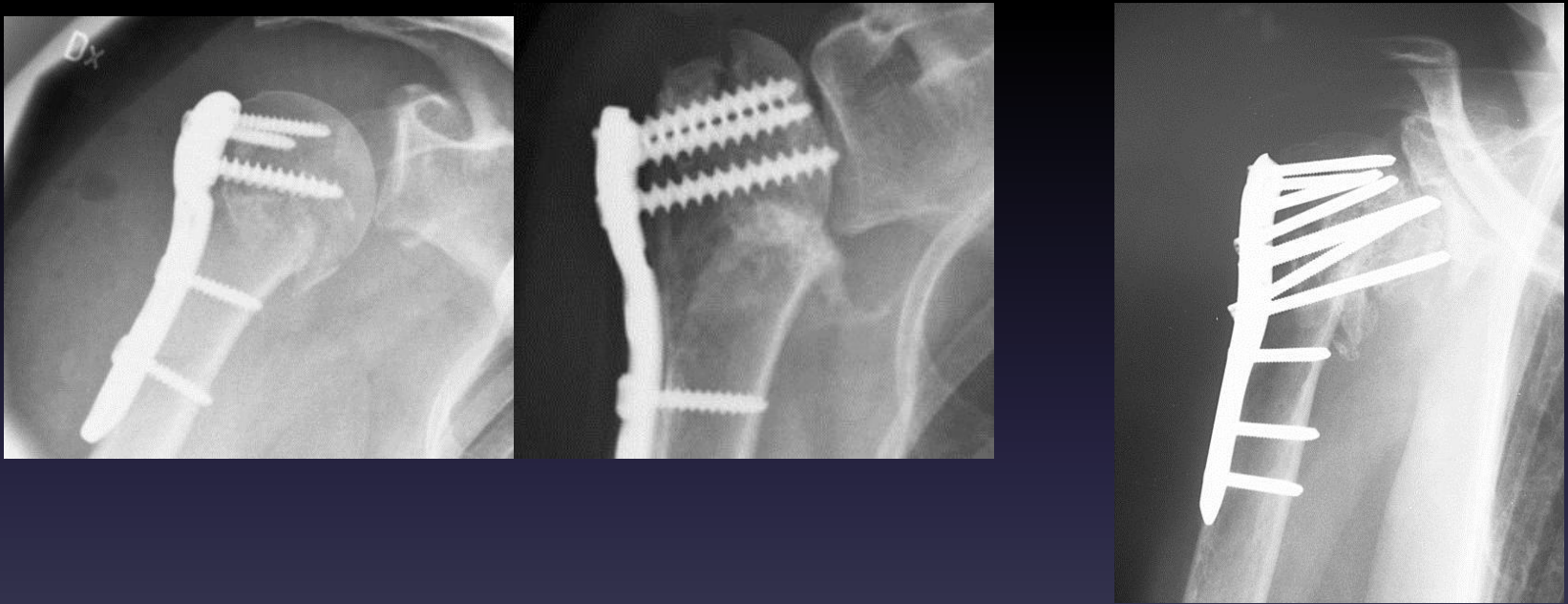
# LCP cannot compensate for bad surgical technique



OID=Open Internal Decoration



# Or for bad biology



- 20-30% complications in the elderly



Principle failure— 41% ”major treatment failure”

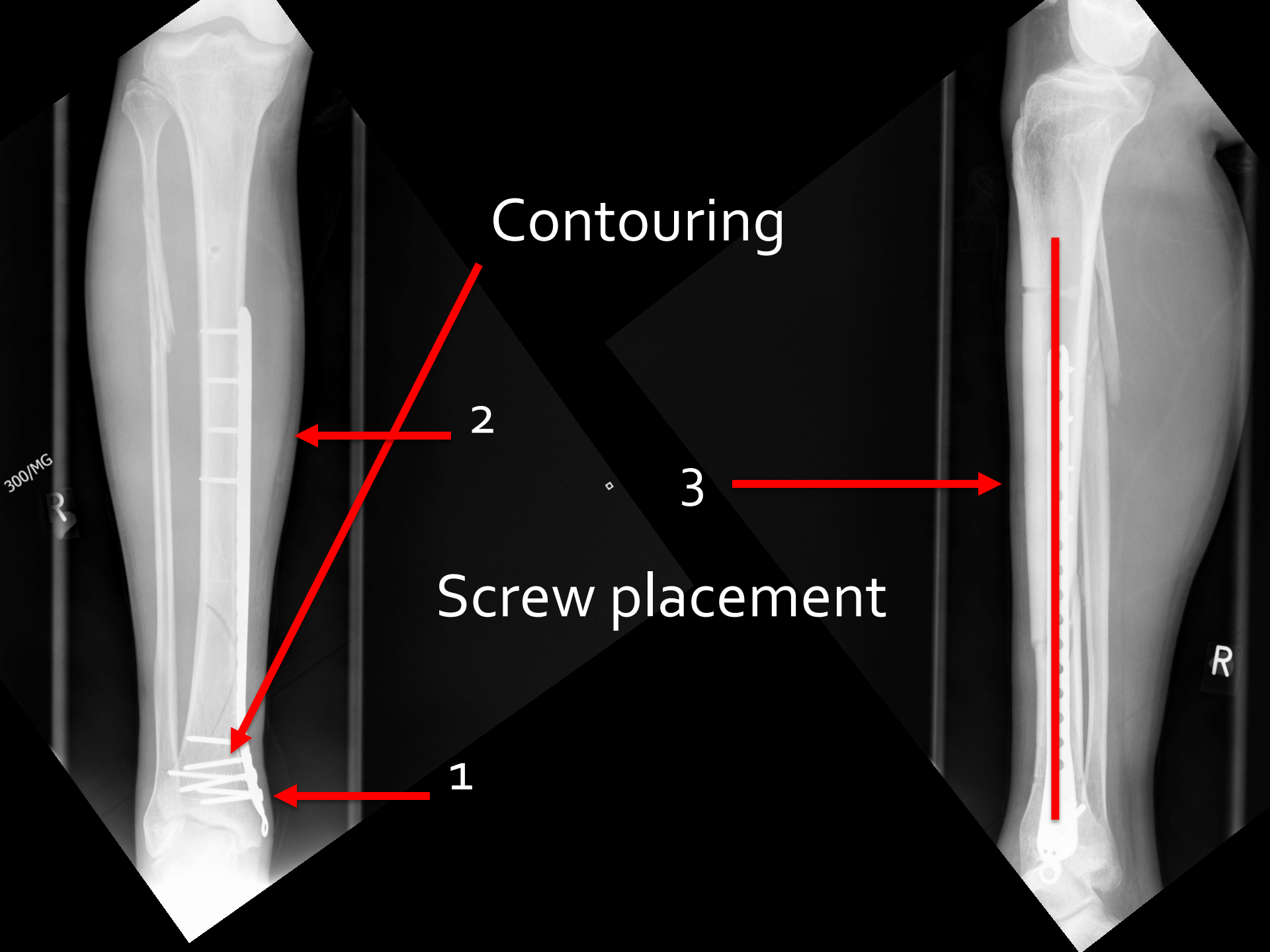


# Indications for locked plating

- Peri-articular fractures
- Osteoporotic fractures
- Osteotomy with opening wedge
- Multifragmentary fractures
- Periprosthetic fractures

# Pre-operative planning

- Plan according to principles
- Plan reduction technique/s
- Selection of implants
- Sequence of screw insertion
  - Standard then locking
- Function of screw used



Contouring

2

3

Screw placement

1

# Locking plates - advantages

- Minimally invasive insertion
- More reliable fixation in osteopenic bone

# Locking plates - disadvantages

- Delayed union
- Asymmetric callus

# Summary

- Locking plates offer enhanced stability
- Anatomically shaped
- Secure fixation in osteopenic bone
- Careful selection and insertion of implants