

Orthopedic Hardware

The nuts and bolts!

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Medical School

- No financial disclosures

WHO IS THIS LECTURE DESIGNED FOR?

- If your entire report reads :
 - *“orthopedic hardware present in satisfactory alignment”*
 - *“post operative appearances as expected”*
- If you tend to hit the “next study” button , when you see imaging of hardware
- If your plate & screw interpretations **only** include –
“Dynamic compression & lag screws”

..... Then it will be useful!

OBJECTIVES

- Identification of hardware
 - Screws / plates & “modern & improved” hardware
 - Basics of joint replacement
 - Functionality of orthopedic hardware
 - Complications of orthopedic hardware
-

OUTLINE

- Screws
 - Plates
 - Traditional
 - New and improved plates
 - “Invisible” hardware
 - Joint replacement
 - Complications
 - Spine hardware
 - Principles / Imaging / complications
 - Summary
-

SCREWS

SCREWS

- Cortical

- Fully threaded



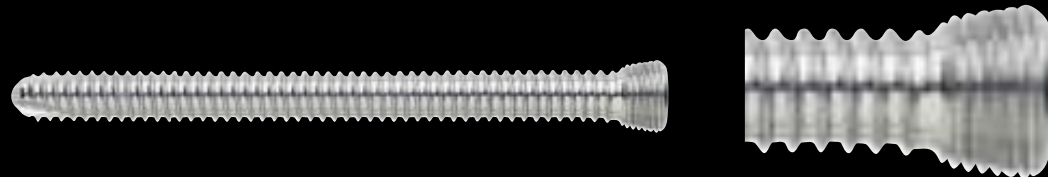
- Fully threaded self tapping



- Partially threaded shaft screw



- Threaded head screw



SCREWS

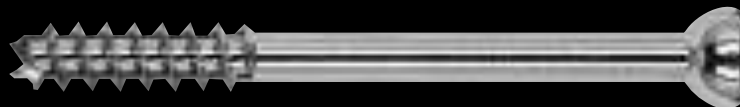
- Cancellous



- Partial threaded cancellous



- Cannulated



SCREWS

- Headless



- Bioabsorbable

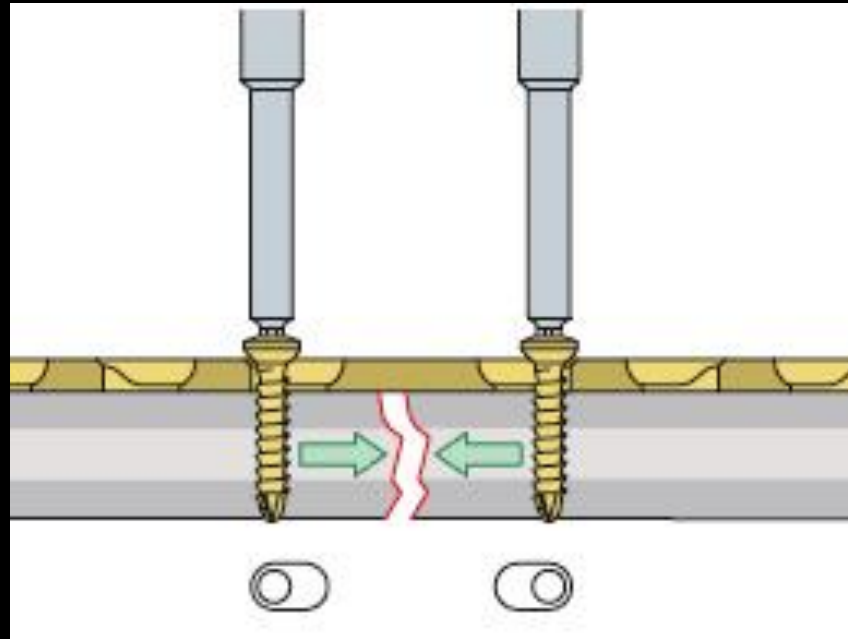


PLATES

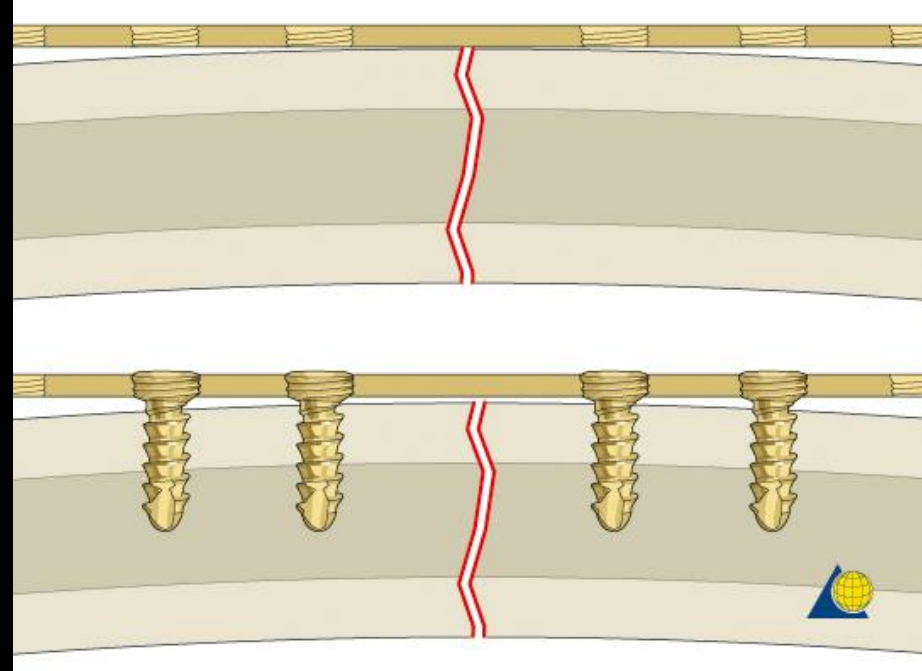
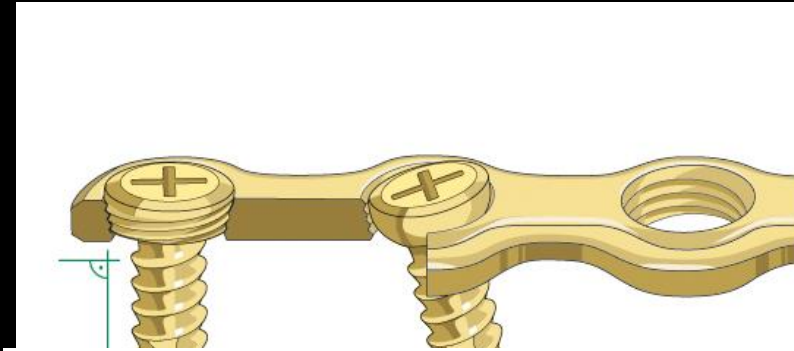
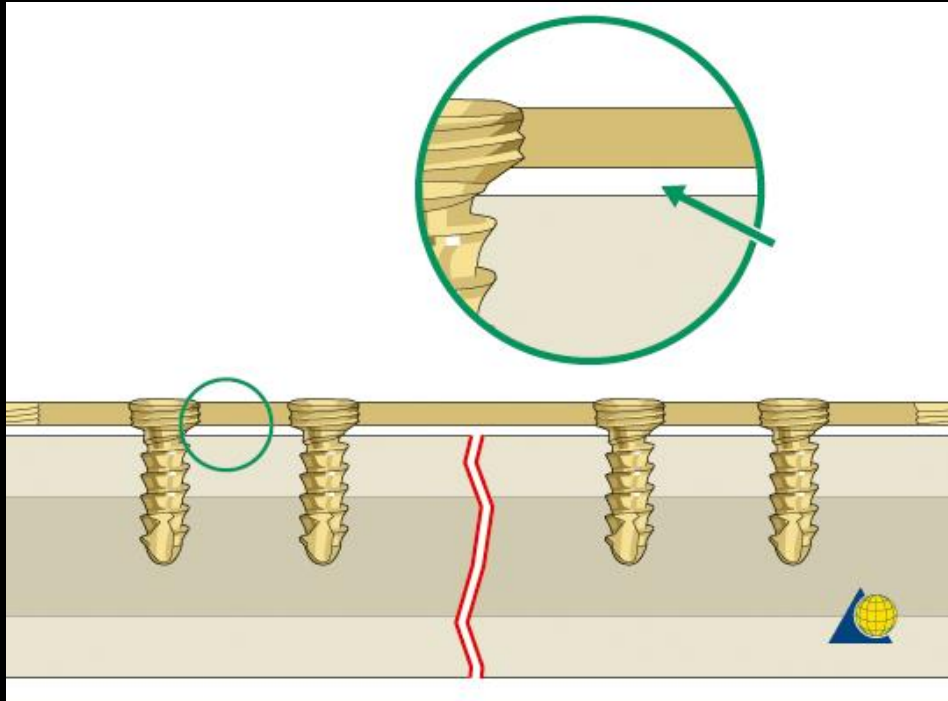
PLATES – DYNAMIC COMPRESSION



- Oval beveled holes
- Flush fit on periosteum



LOCKING PLATES – PRINCIPLES



Diagrams courtesy AO foundation

COMBI LOCKING PLATES



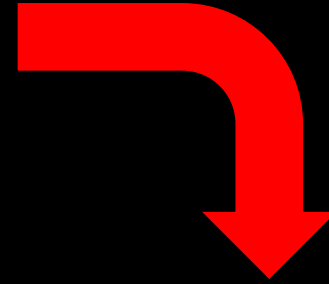
- LCP – Locking Compression Plate
- Has both “oval” and “locking” holes
- Advantage of using both traditional screws and locking screws
- Juxta-articular placement
- Osteoporotic bone
- Percutaneous techniques

TIMELINE

1970's
DCP
plates -
AO



1990's
Locking plates



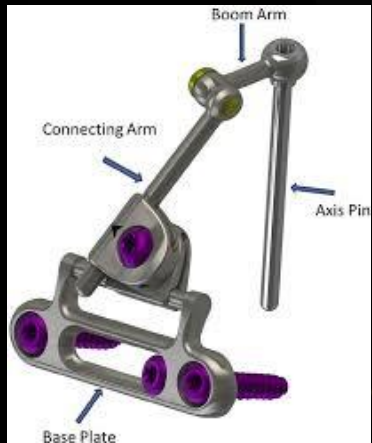
2020's

Contoured / Reconstruction plates
Steerable fixation

3D printed plates

2010's
Variable
angle locking
plates

INTERNAL FIXATOR ELBOW



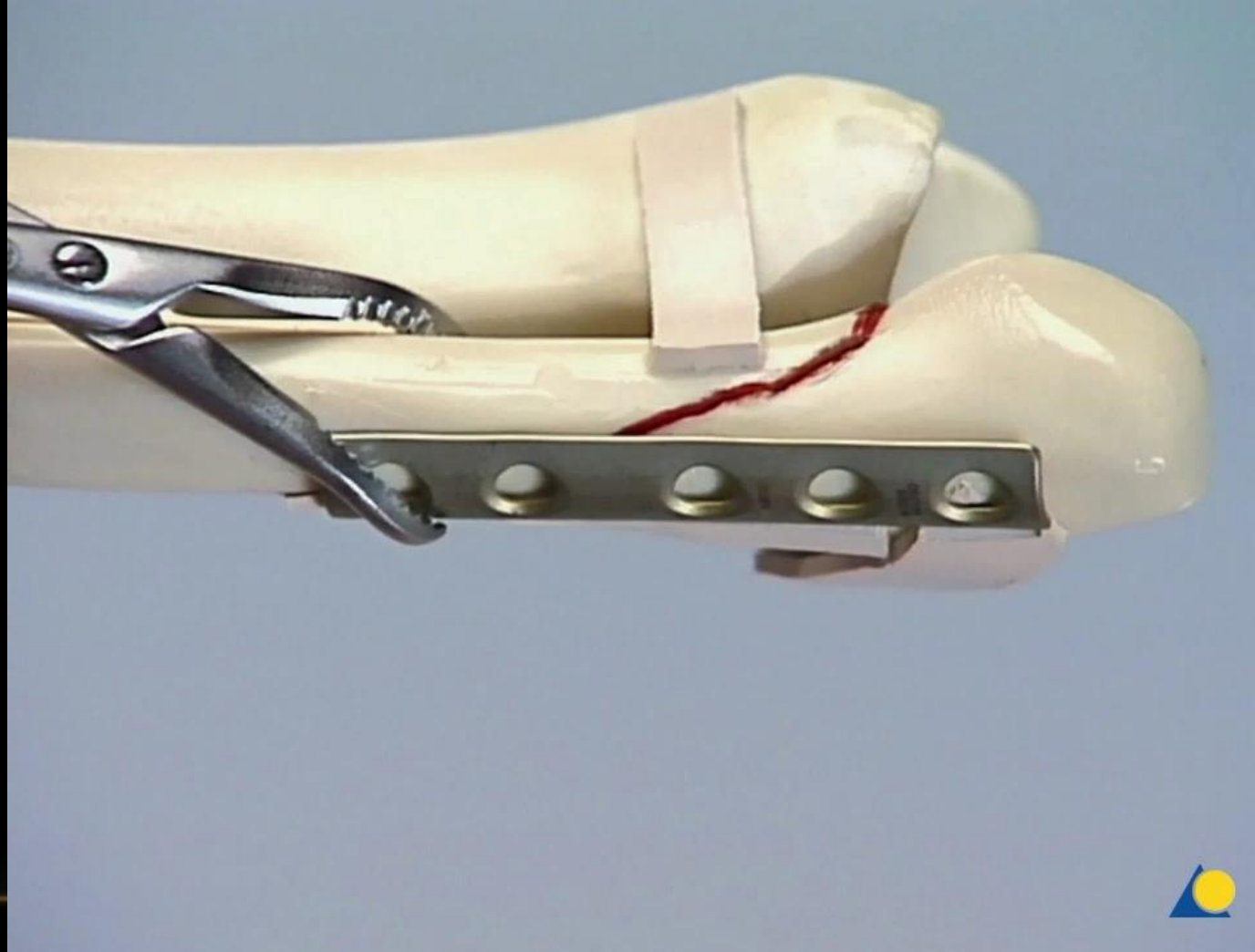
VARIABLE ANGLE LOCKING PLATES



- Star shaped
- Combine variable angle with locking
- Creates fixed angle fixation



LET'S PUT IT TOGETHER....



LETS LOOK AT SOME RADIOGRAPHS !

TYPICAL INTRAOPERATIVE ACTION



K wires



Tubular plate

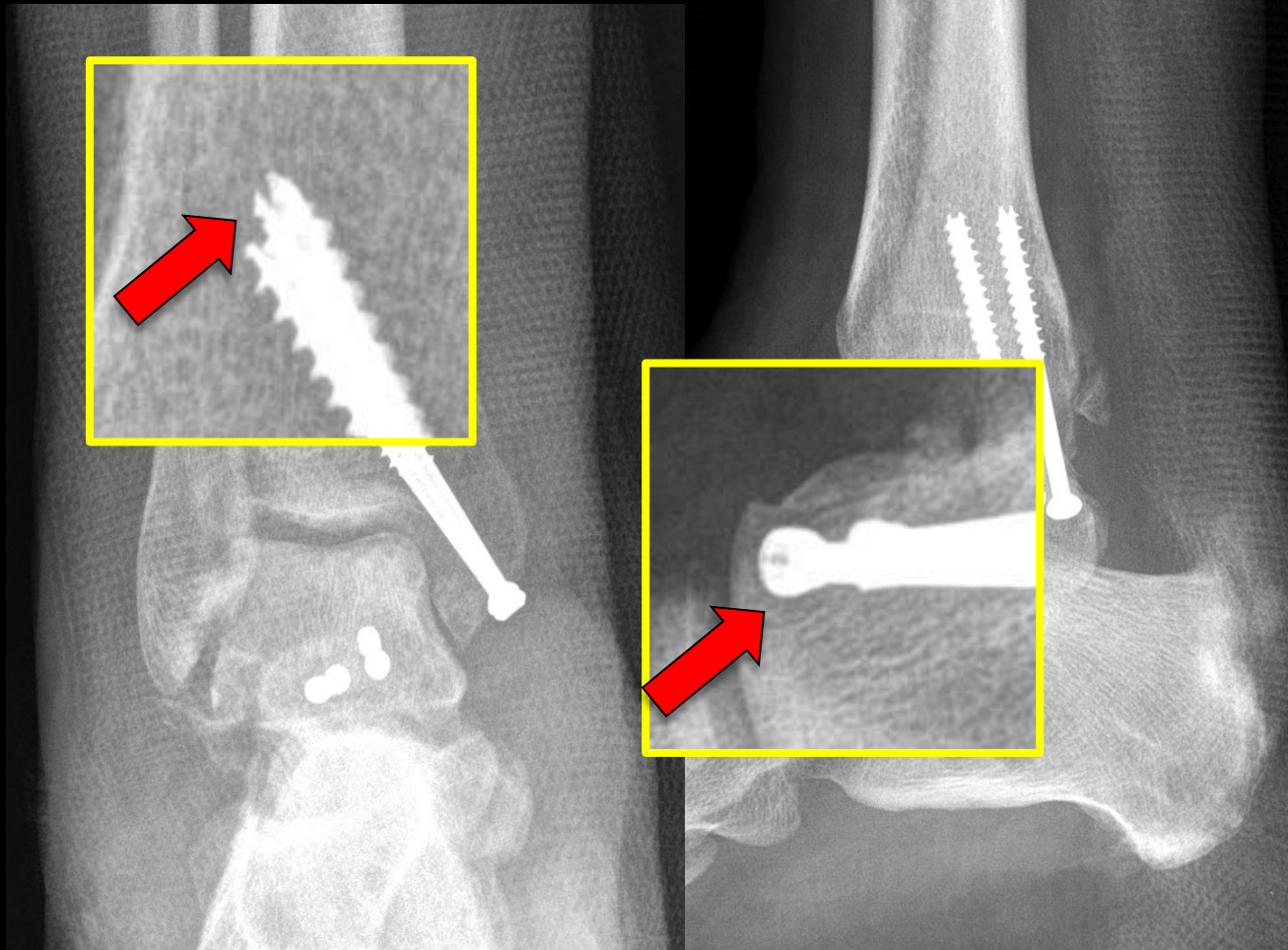


TYPICAL INTRAOPERATIVE ACTION

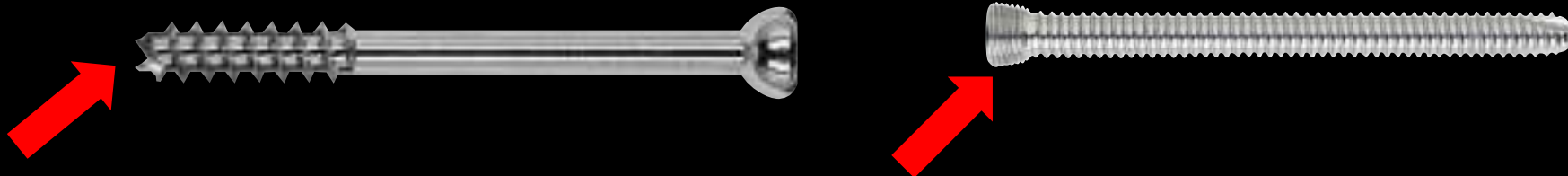


Cannulated screw

INTER-FRAGMENTARY SCREW FIXATION

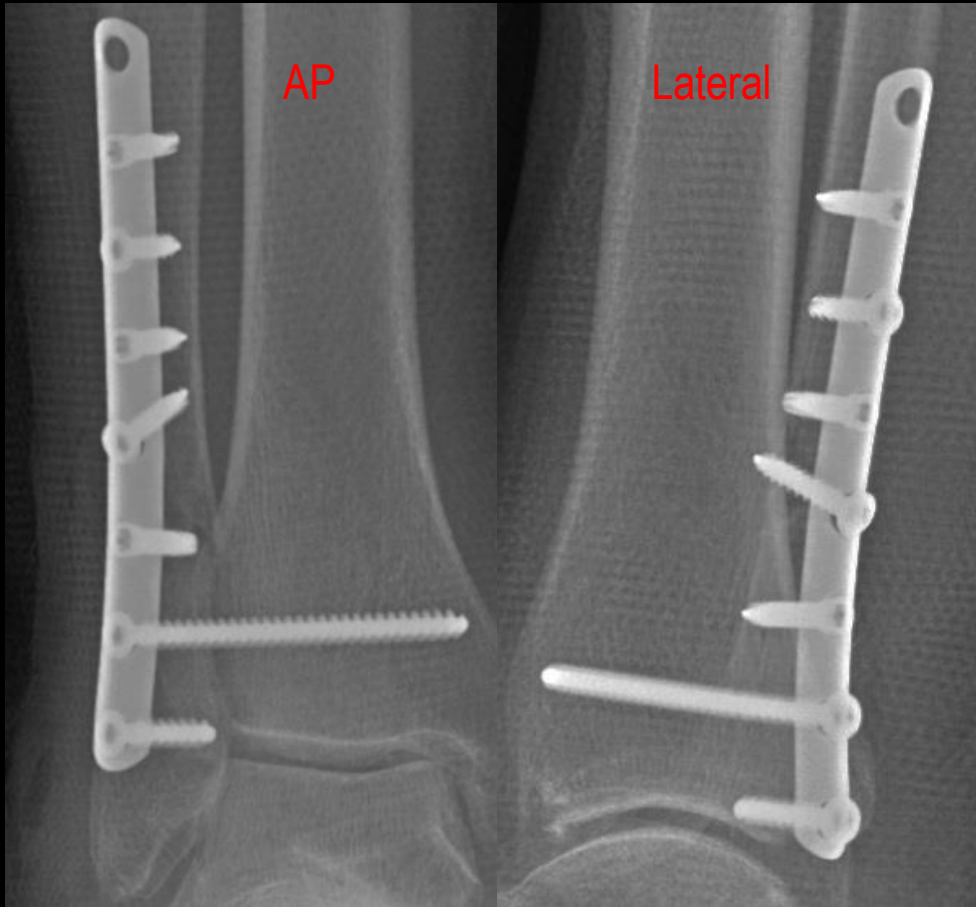


- Look for “notch” on cannulated screw
- Threads on head for “threaded head” screws



PLATES

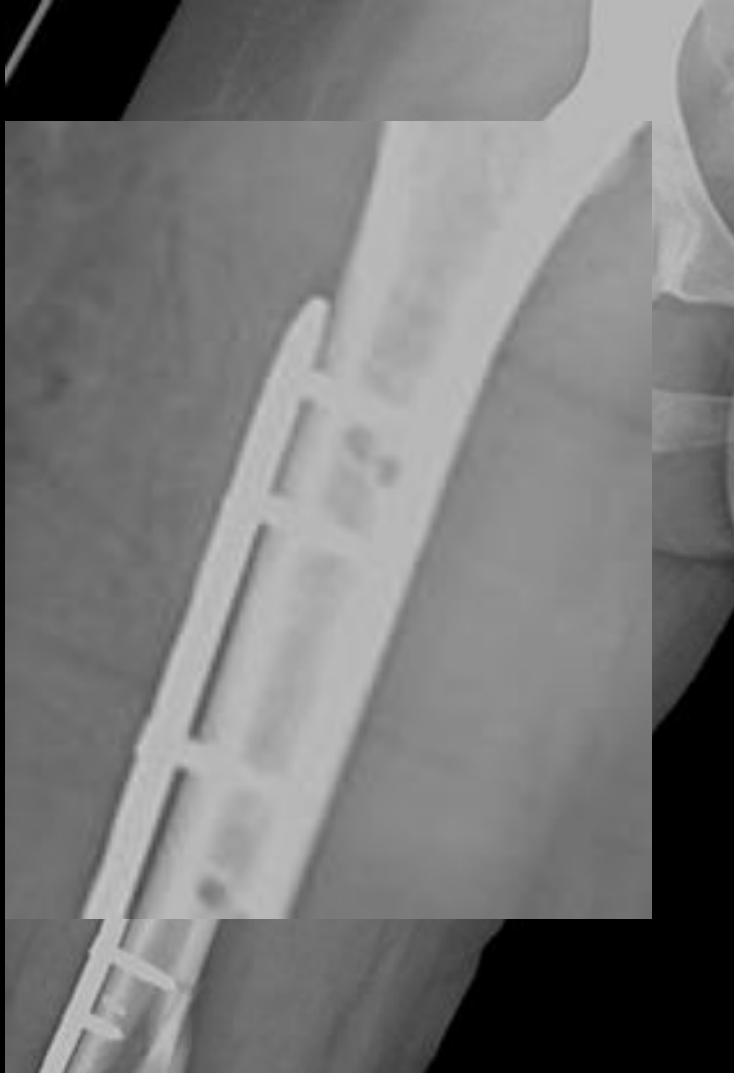
SIMPLE TUBULAR PLATE



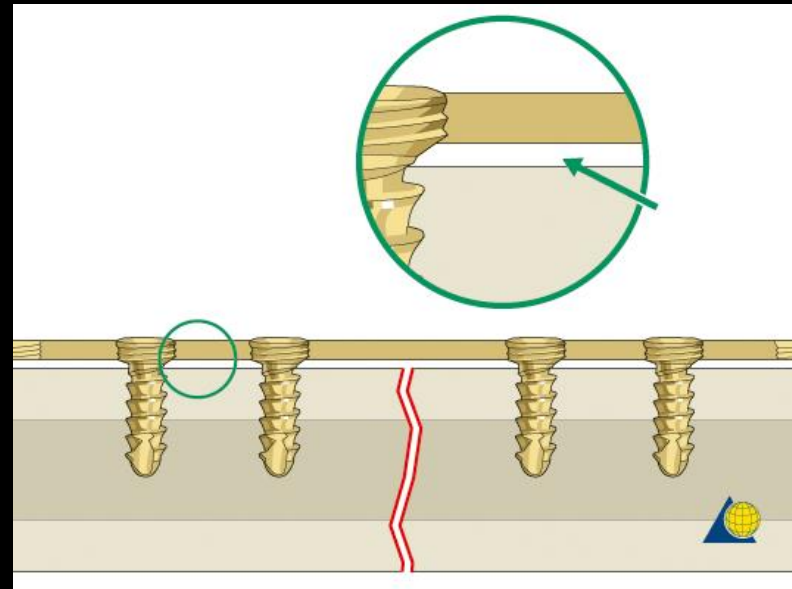
- 1/3 Tubular plate
- Bridge a fracture where there is no significant need for compression



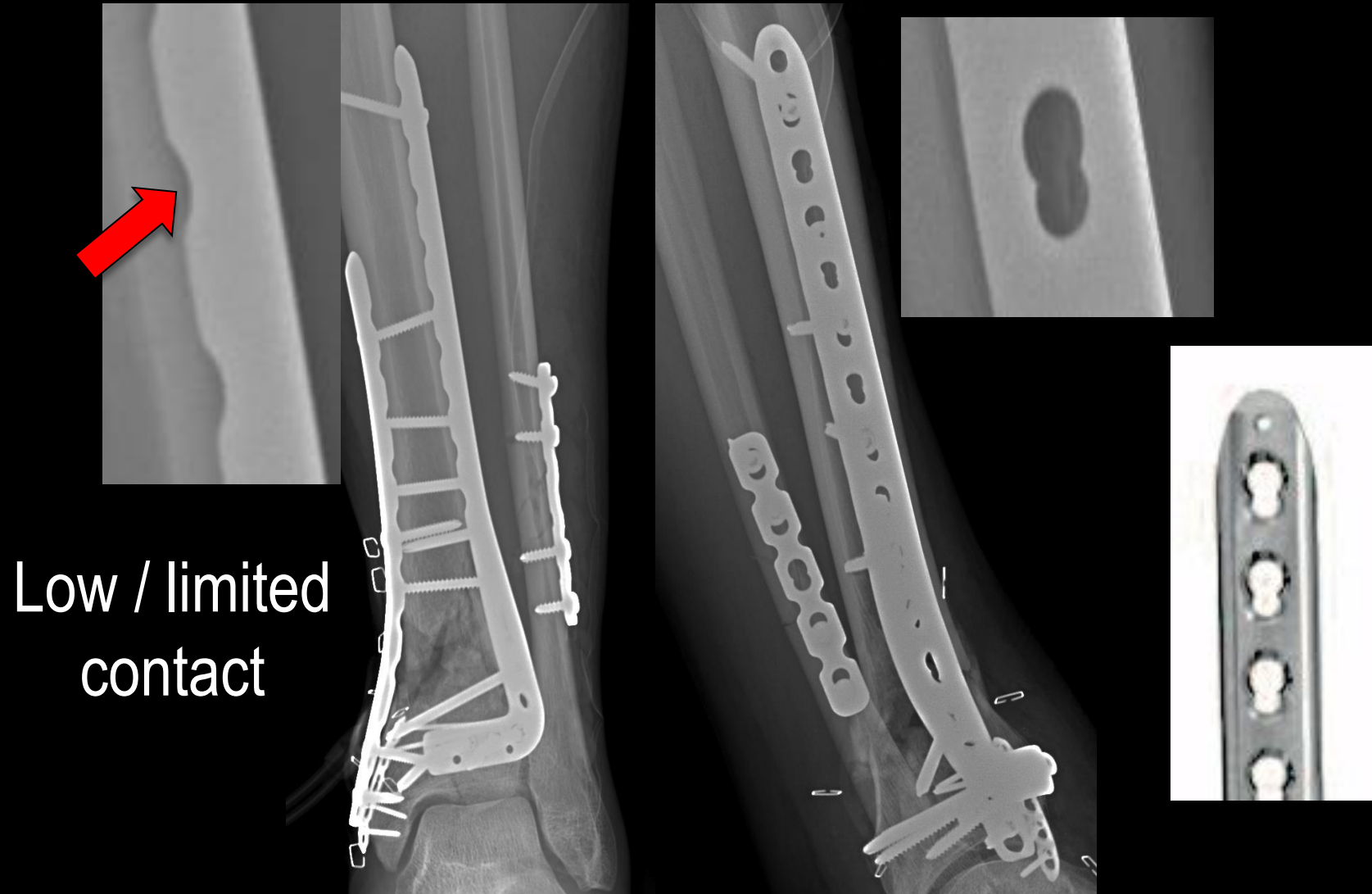
LOCKING PLATE



- Lateral femoral condylar locking plate
- Note plate stand-off the cortex



COMBINATION LOCKING PLATE



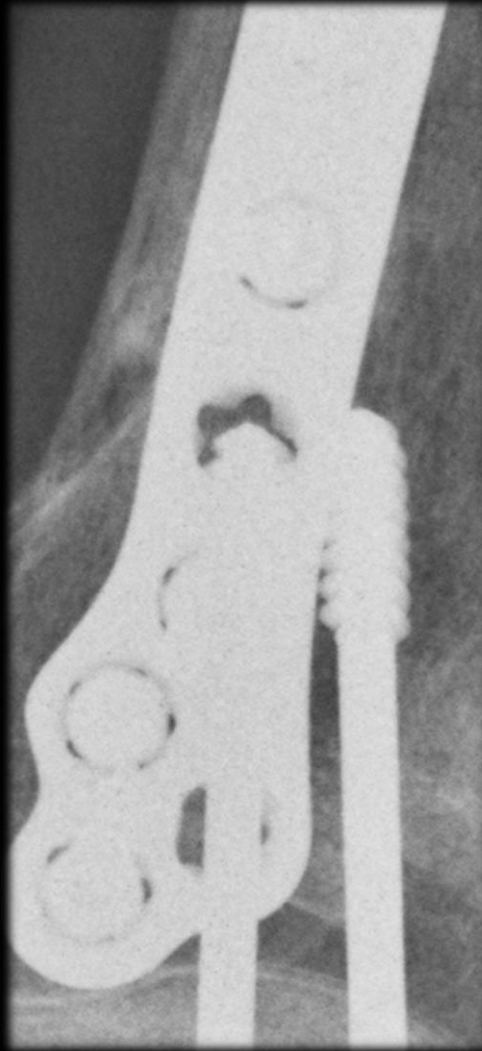
HOW TO RECOGNIZE THE LOCKING SCREW?



Non
Locking
screw

Locking
screw –
Low profile

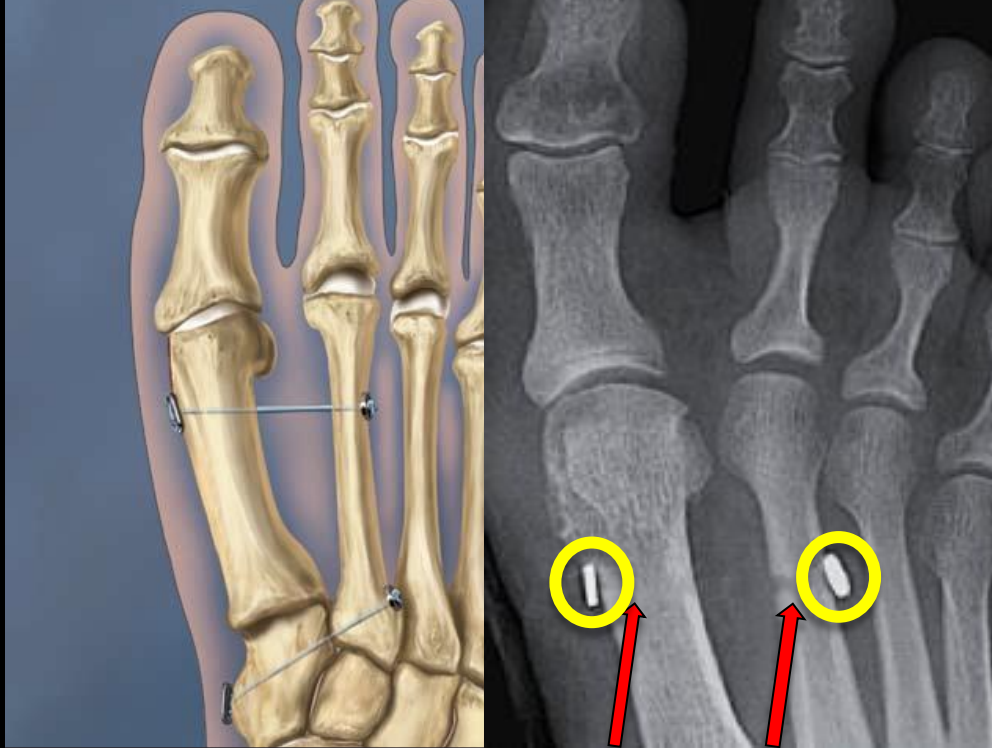
VARIABLE ANGLE LOCKING PLATES



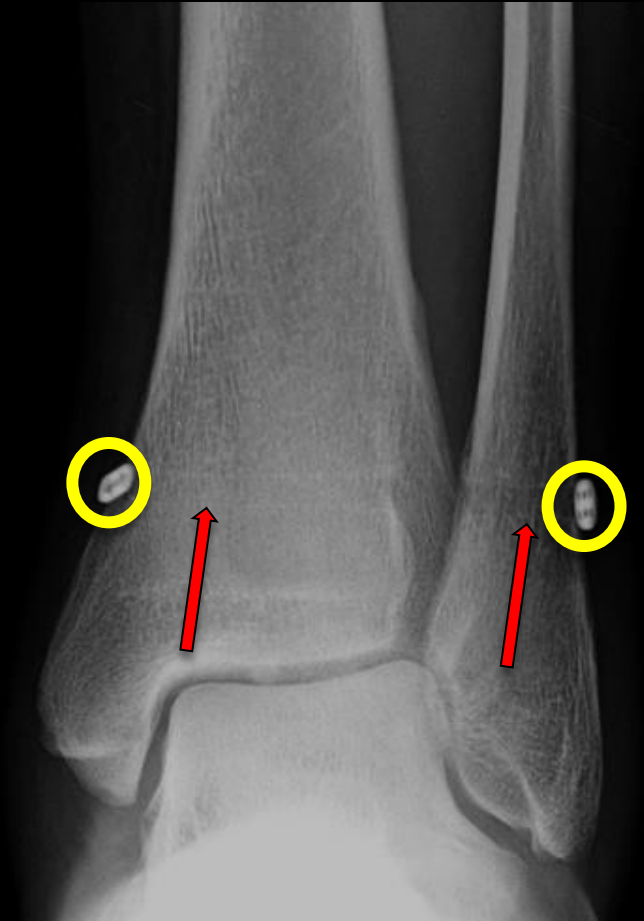
“INVISIBLE” HARDWARE

RADIOLOGISTS' NIGHTMARES!

- Things we can't see
- “Tightropes”

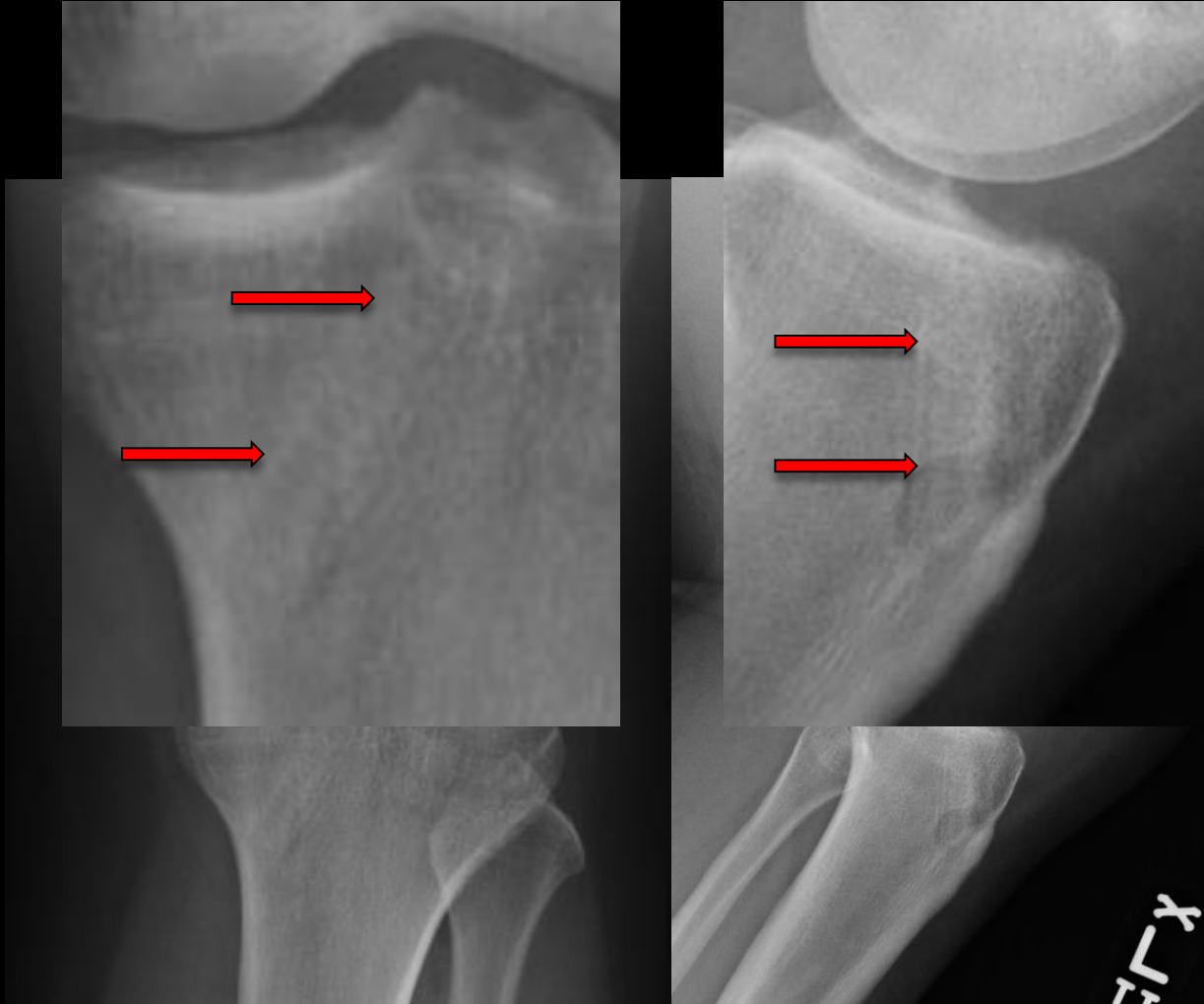


Endo-buttons



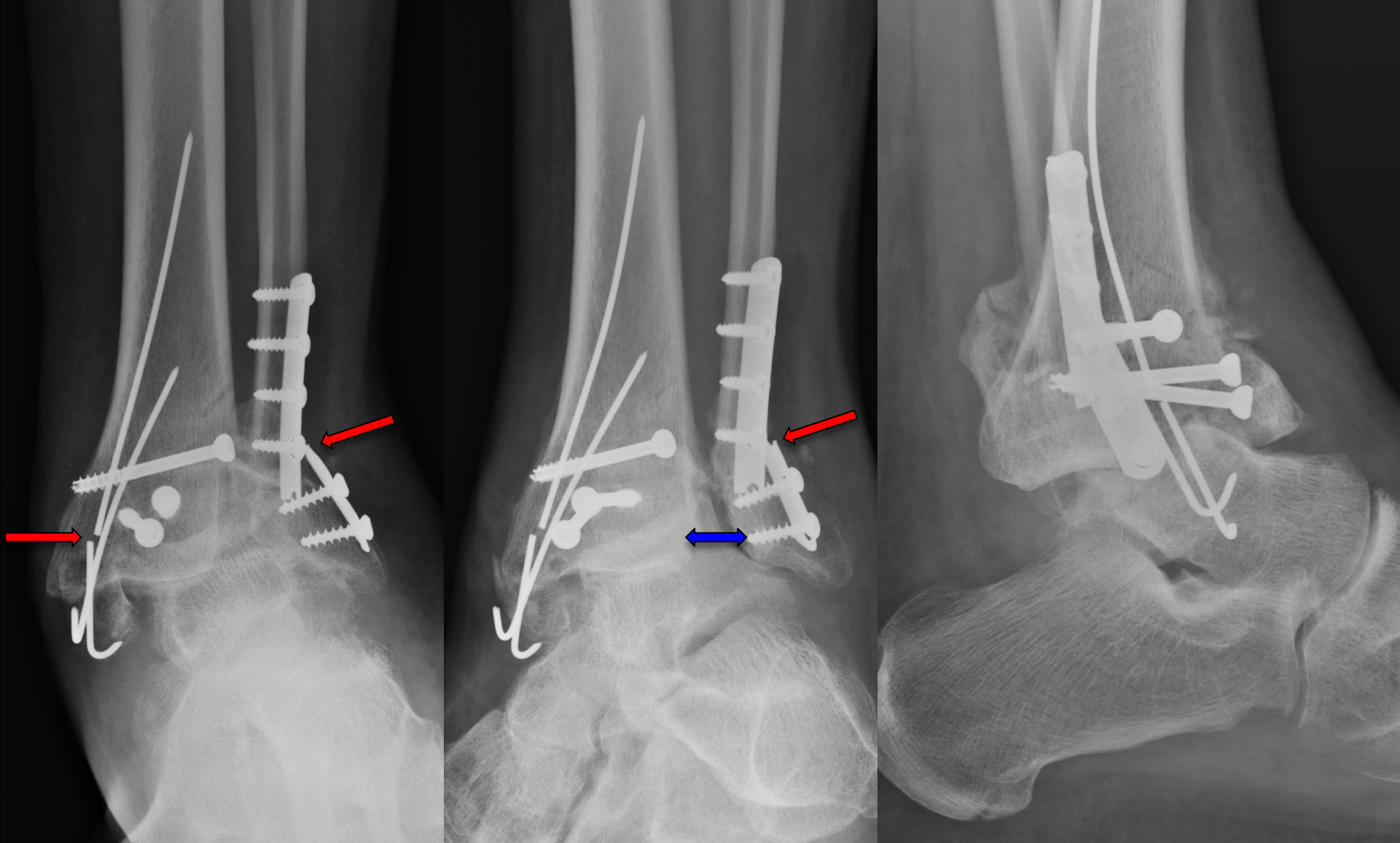
INVISIBLE NIGHTMARES!

- Things we can't see
- Bio-absorbable hardware

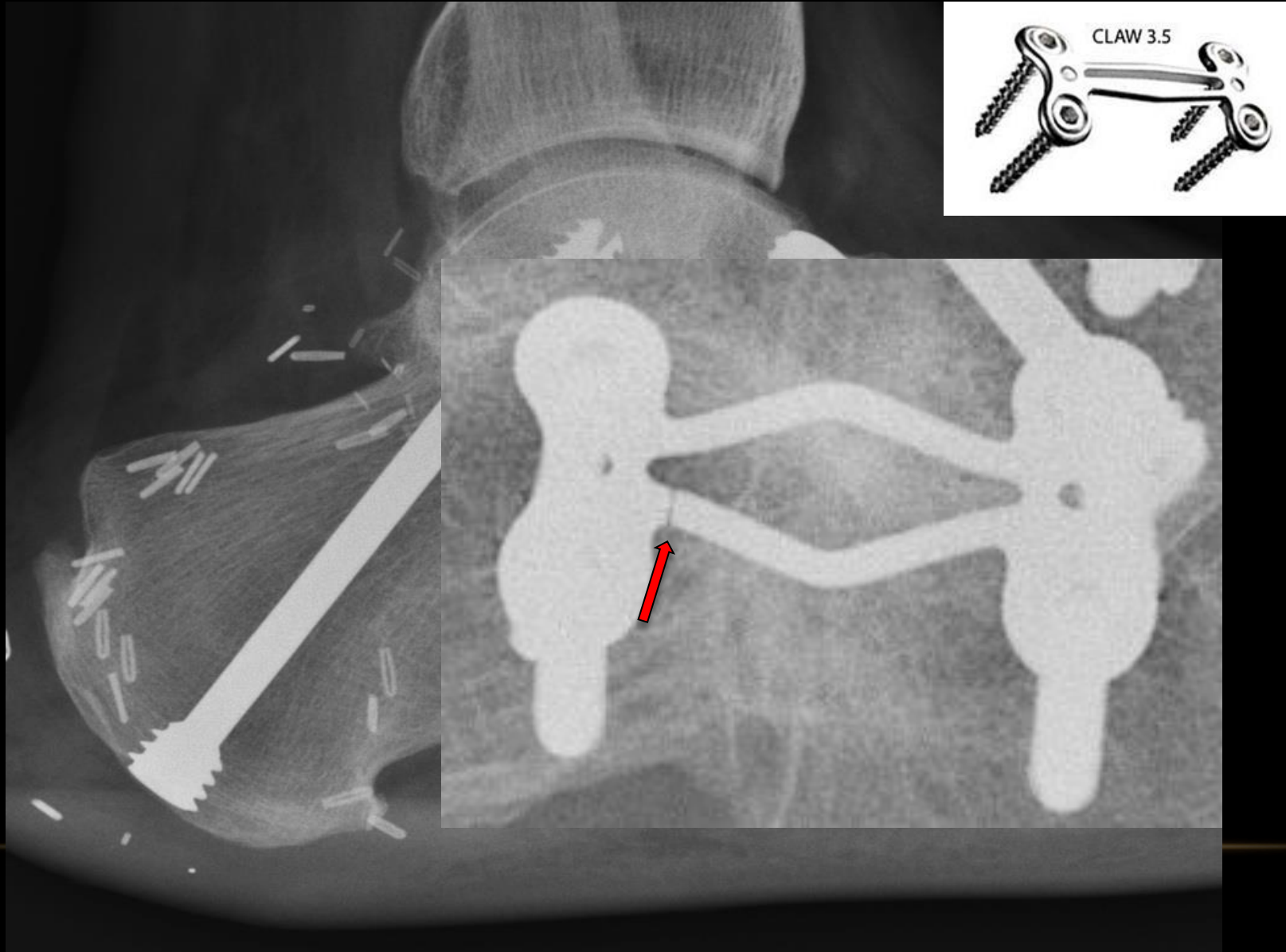


COMPLICATIONS

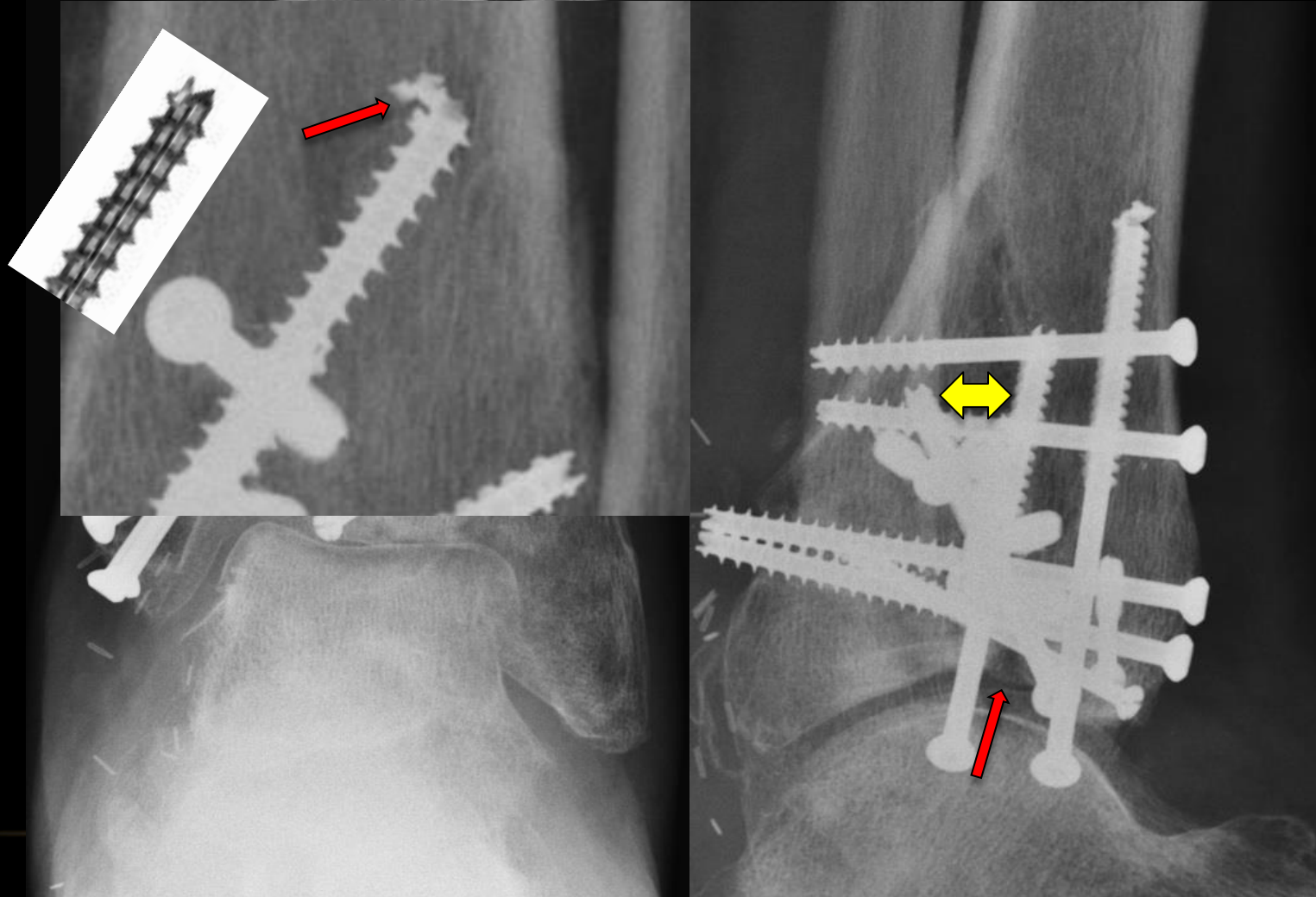
STARTED WEIGHT BEARING EARLY!



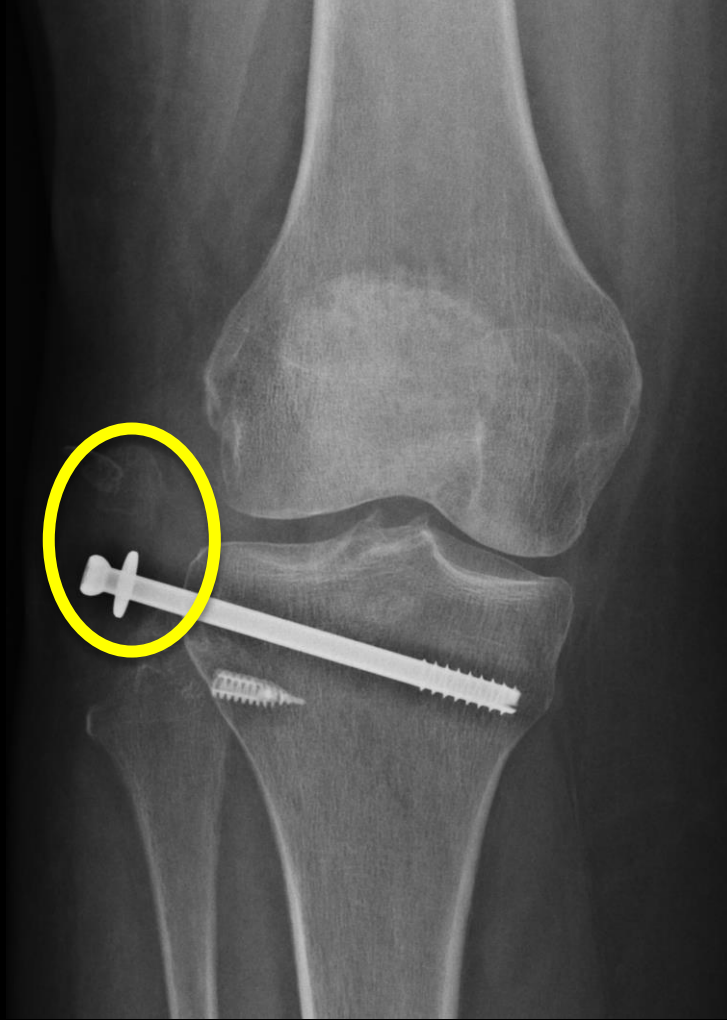
POST ARTHRODESIS PAIN



MESMERIZING IMAGES - WOW!



WHAT ELSE IS THE HARDWARE HOLDING ?

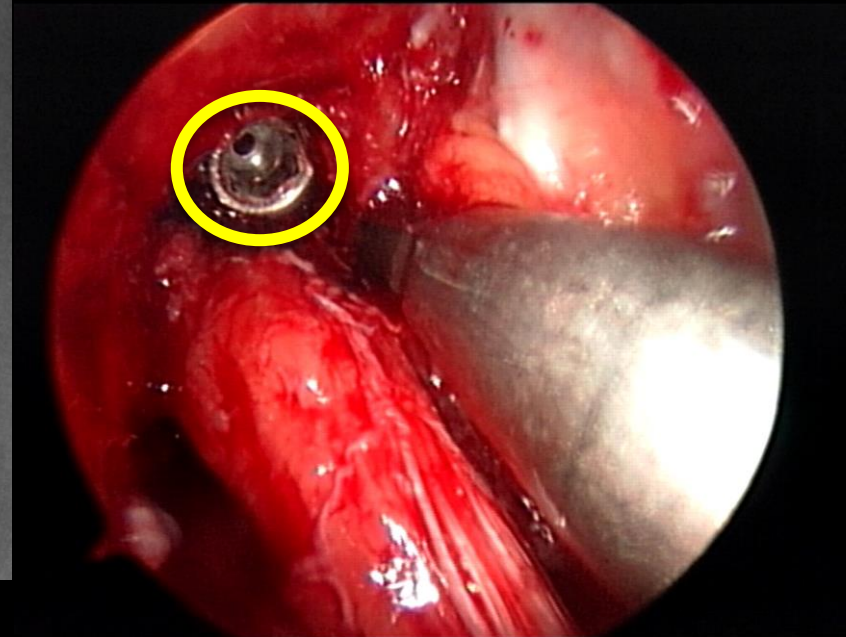


- Remember the hardware is holding more than the bone fragments
- Loss of integrity of the lateral compartment – unstable knee

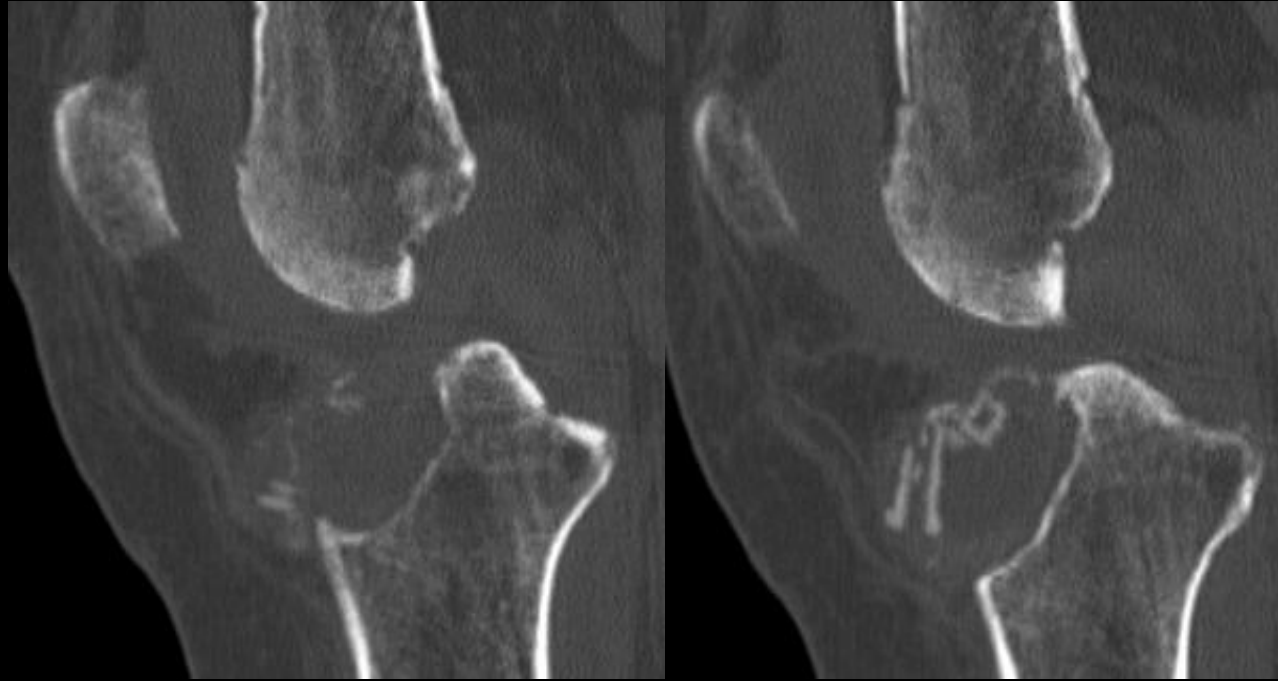
UNSTABLE KNEE – POST ACL RECON



- “Interference” screw interferes between the native bone and graft

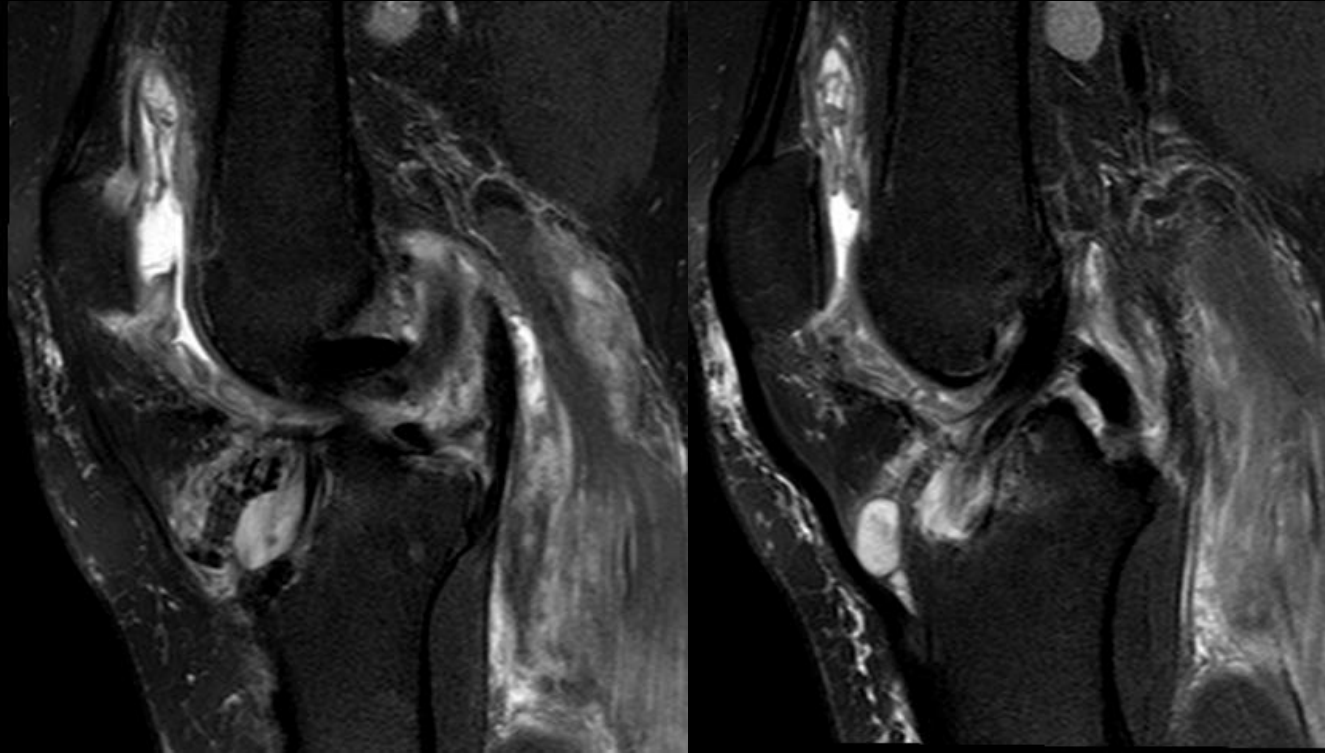


UNSTABLE KNEE – POST ACL RECON



- Fragmented screw
- Large widening of tunnels
- Granulomatous reaction

UNSTABLE KNEE – POST ACL RECON



- Graft still intact ! But no longer functional.
 - Severe synovitis
 - Reactive muscle edema

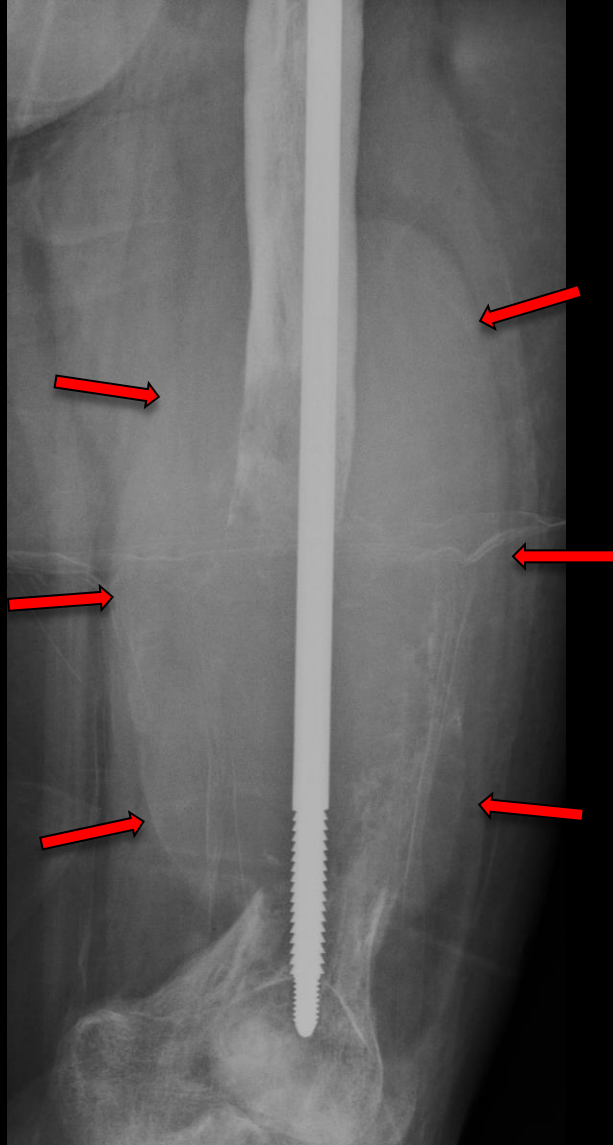
ATV INJURY – COMMINUTED LAT CONDYLE



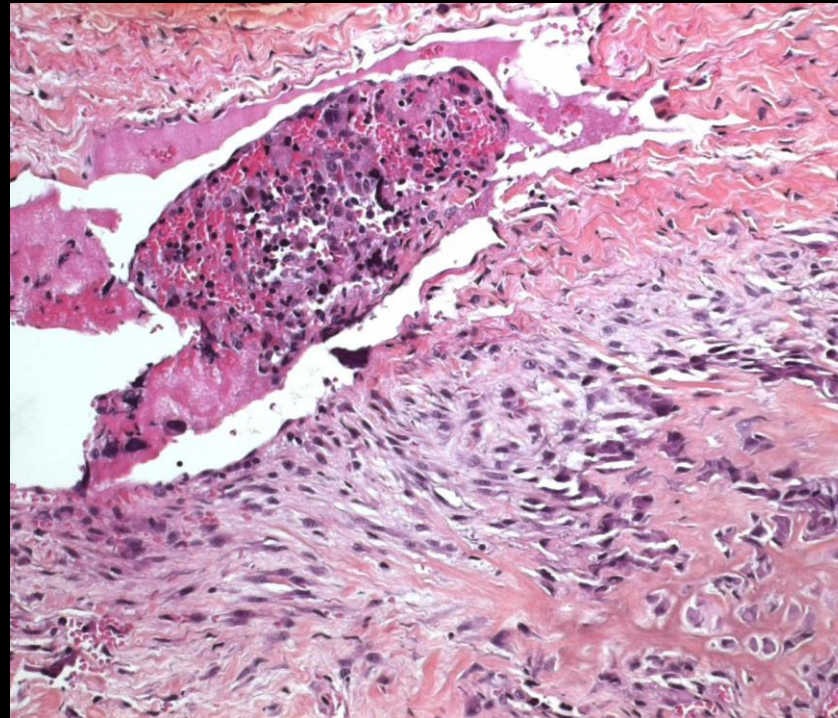
Protruding Headless screw



DIFFICULTY WEIGHT BEARING



Secondary osteosarcoma



References

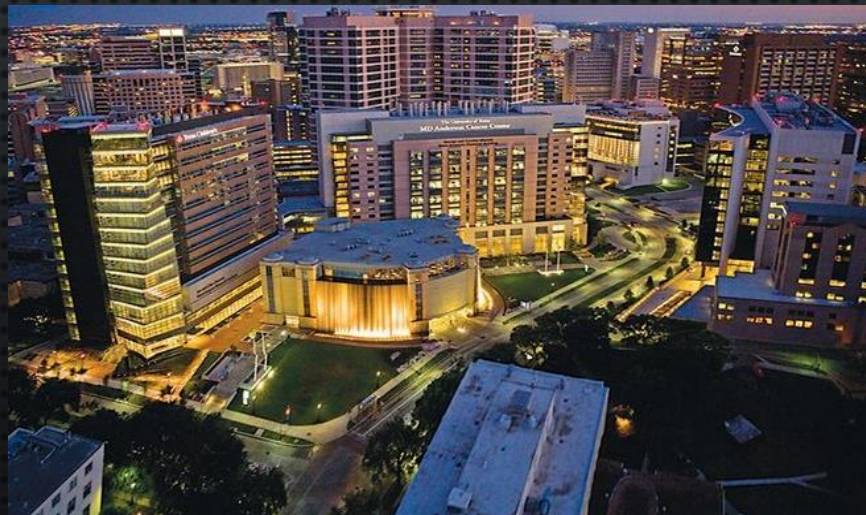
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Thank you for your attention!



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