AO TRAUMA

Femoral shaft fractures

Arvind von Keudell, MD MPH
Associate Professor

AO Advanced
Odense, KD

BRIGHAM HEALTH
BWH
BRIGHAM AND
WOMEN'S HOSPITAL
Arvind von Keudell, MD, MPH
Overlæge
Associate Professor of Orthopaedic Surgery
Bispebjerg Hospital/University of Copenhagen
Associate Professor of Orthopaedic Surgery
Brigham and Women's Hospital/ Harvard Medical School
REGION H
Bispebjerg Hospital
UNIVERSITY OF COPENHAGEN
HARVARD MEDICAL SCHOOL
TEACHING HOSPITAL
Mass General Brigham

Learning objectives

- Determine factors that influence decision making
- Outline surgical reduction techniques utilizing tools of distraction to achieve length and alignment
- Outline surgical fixation techniques (plating, external fixation, intramedullary nailing)

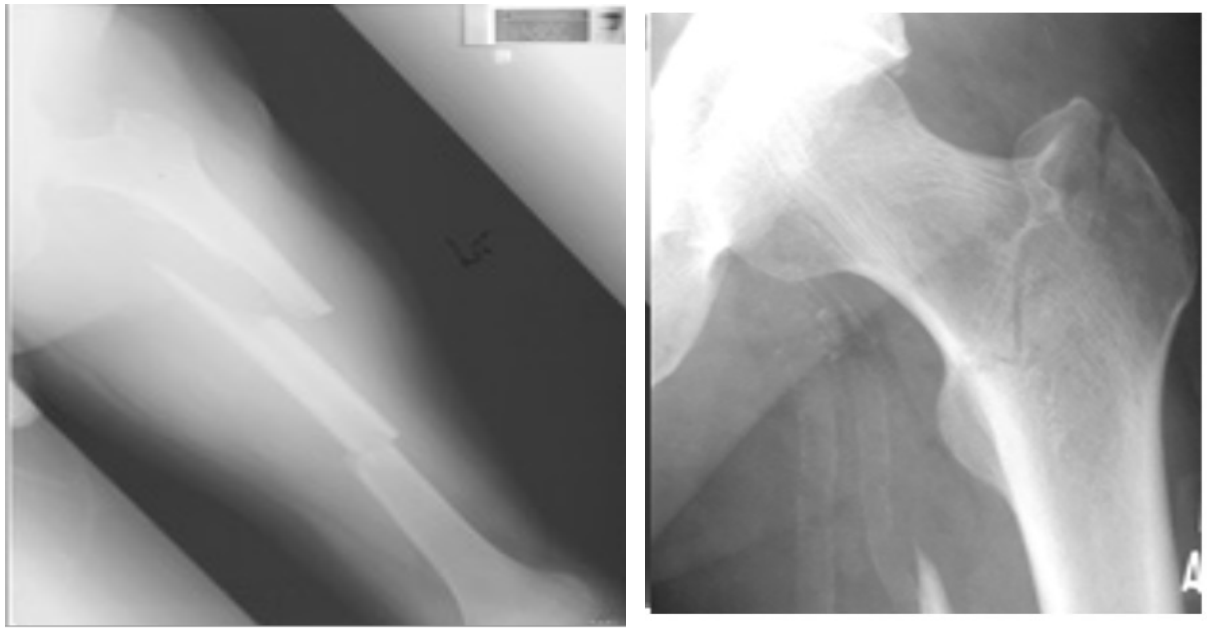
Epidemiology

- Who gets this injury
  - Age: 25–65 years
  - 1:10,000
- High-energy injury
  - Risk of associated injuries of the head, chest, or abdomen
  - Blood loss of 1–1.5 liters (20% total blood volume)
  - Risk of shock, fat and pulmonary embolism
  - Open/closed injury
- Low-energy falls in the elderly

Early treatment

- Assessment
  - Airway, breathing, and circulation (ABC)
  - Life threatening injuries
- Analgesia
- Splintage
- Resuscitation

Early treatment



- Good quality, full length x-rays including hip and knee joints
  - Location of fracture, degree of comminution
- When severely comminuted, take x-rays of uninjured leg
- Must rule out extension into hip/knee
- Easy to treat if you know it beforehand
- Displace during nailing—difficult to treat

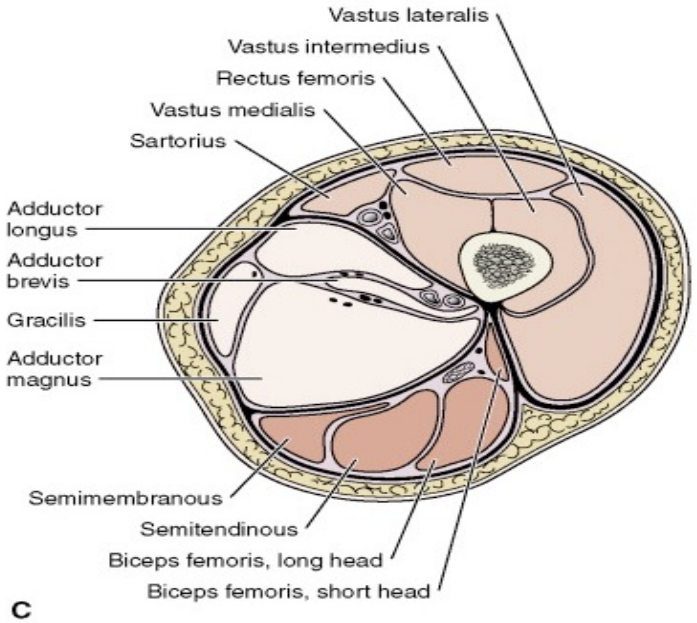
Treatment options

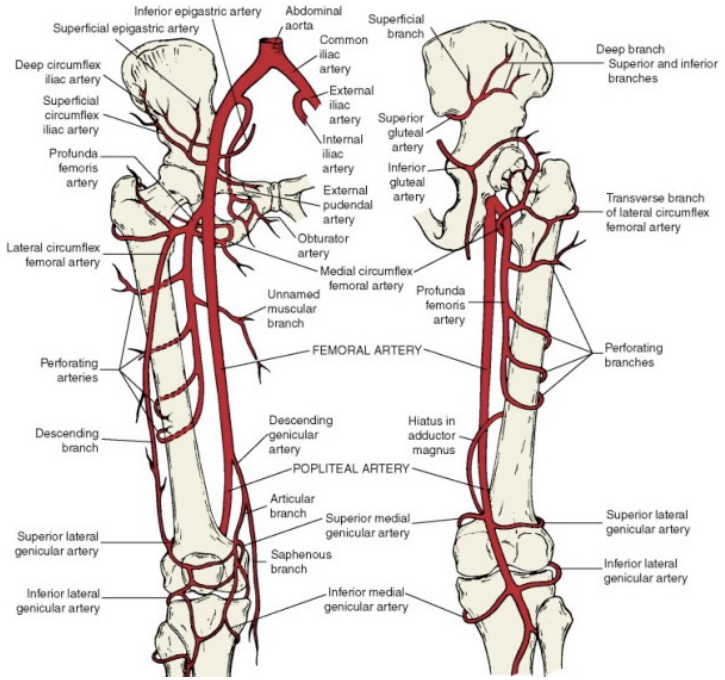
- Nonoperative
  - Pediatric patients
  - Medically unfit
  - Operative treatment not possible (lack of trained personal and/or resources)
- Skeletal traction
  - “Simple”, low risk, cheaper
  - High nursing demand
  - Long stay
  - Malunion, joint stiffness, wasting

Operative treatment

- Plating
- External fixation
- Intramedullary (IM) nailing

- Pros and cons:
  - Accurate reduction
  - Early mobilization, short stay
  - Infection





Factors influencing decision making

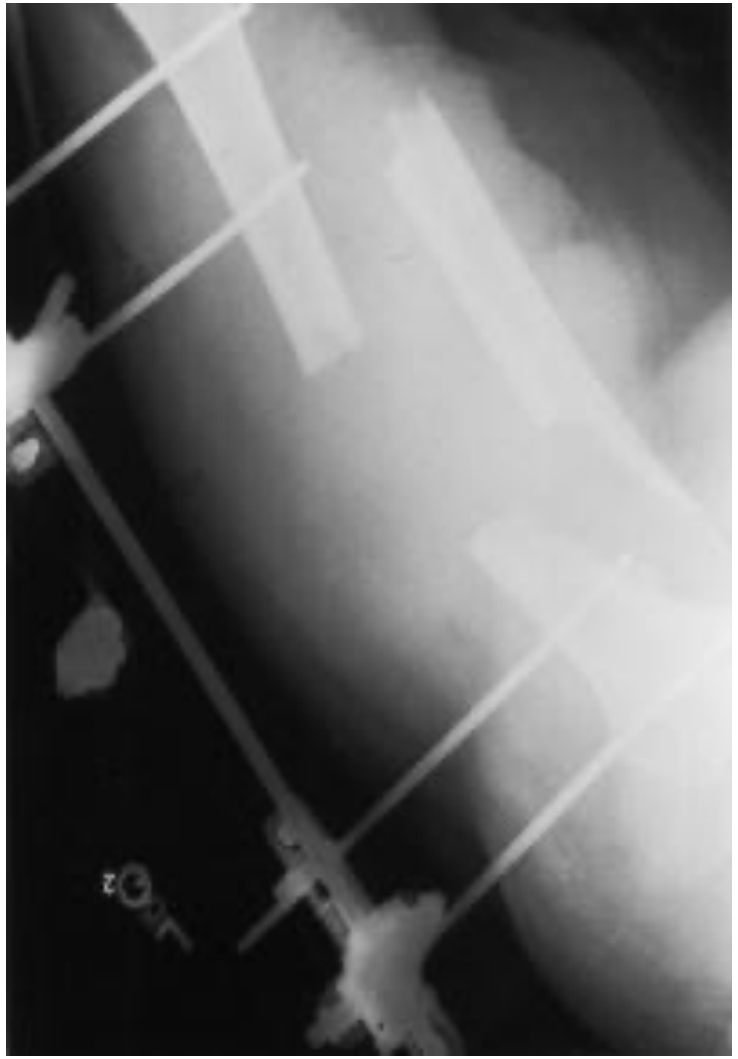
- Age
- Closed versus open injury
- Extension into proximal and distal joint
- Other injuries: chest and head injury
- Presence of previous implants (ie, hip and knee prosthesis)

Plating—indications

- Metadiaphyseal fractures
- Narrow canal
- Endoprosthesis—canal not available
- Preexisting deformity
- Pediatric patients

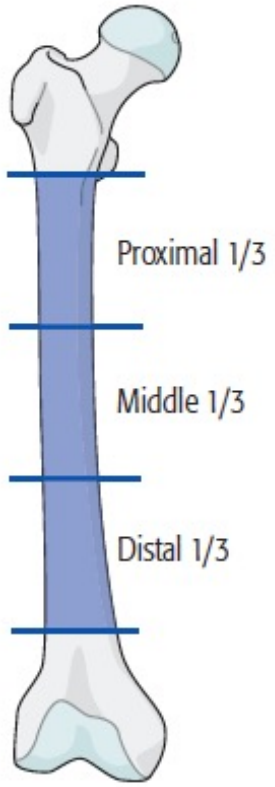
External fixation—indications

- Gross contamination
- Provisional stabilization and damage control
- Fracture with bone loss

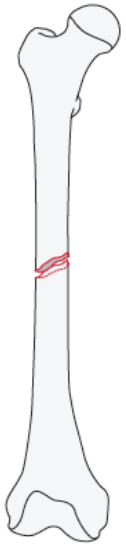


IM nailing

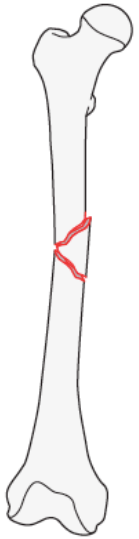
- Treatment of choice for virtually all femoral shaft fractures
- From lesser trochanter to within 7 cm of knee joint



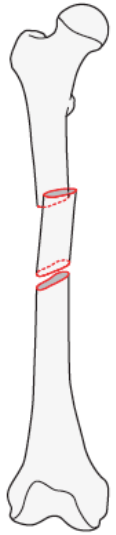
Types:
Femur, diaphyseal segment,
simple fracture
32A



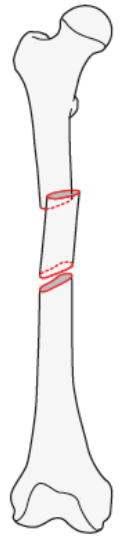
Femur, diaphyseal segment,
wedge fracture
32B



Femur, diaphyseal segment,
multifragmentary fracture
32C

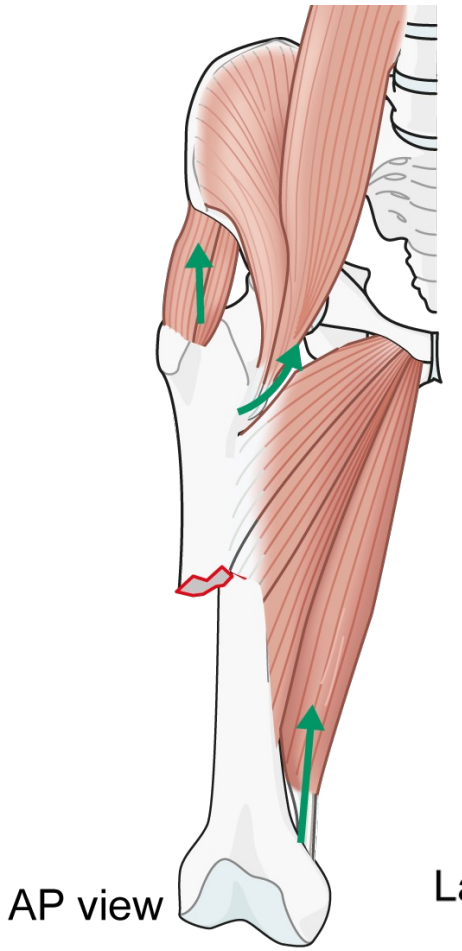


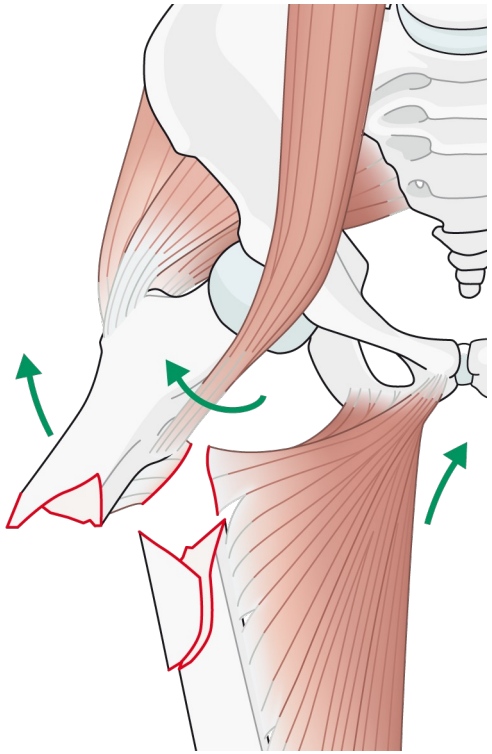
Femur, diaphyseal segment, multifragmentary,
intact segmental fracture
32C2*



Deforming forces

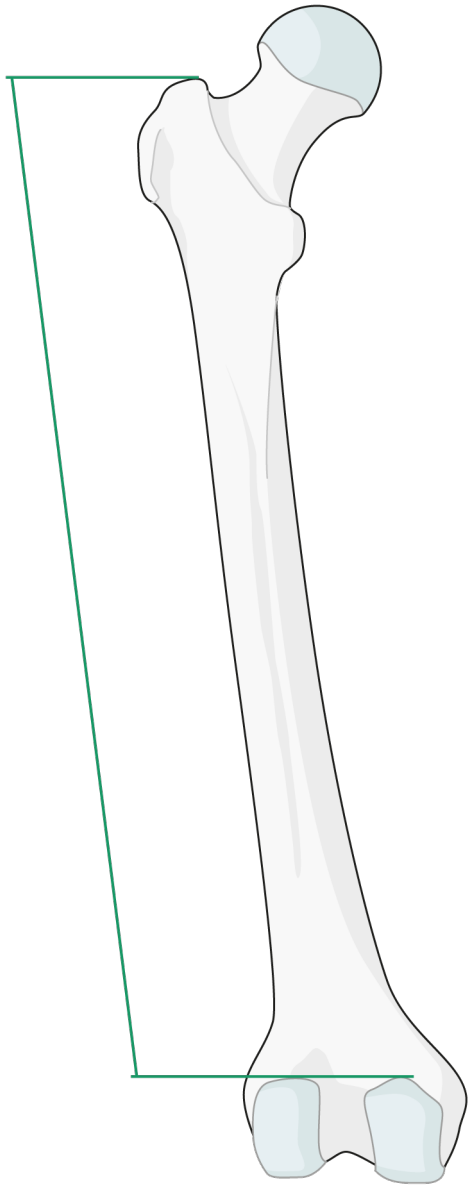
- Proximal fragment flexion adduction
  - Psoas
- Adductors cause varus
- Quadriceps cause shortening
- Gastrocnemius cause hyperextension





Preoperative planning

- Measure diameter
- Measure length
  - Opposite side
- Nail length
  - Tip of the greater trochanter to adductor tubercle



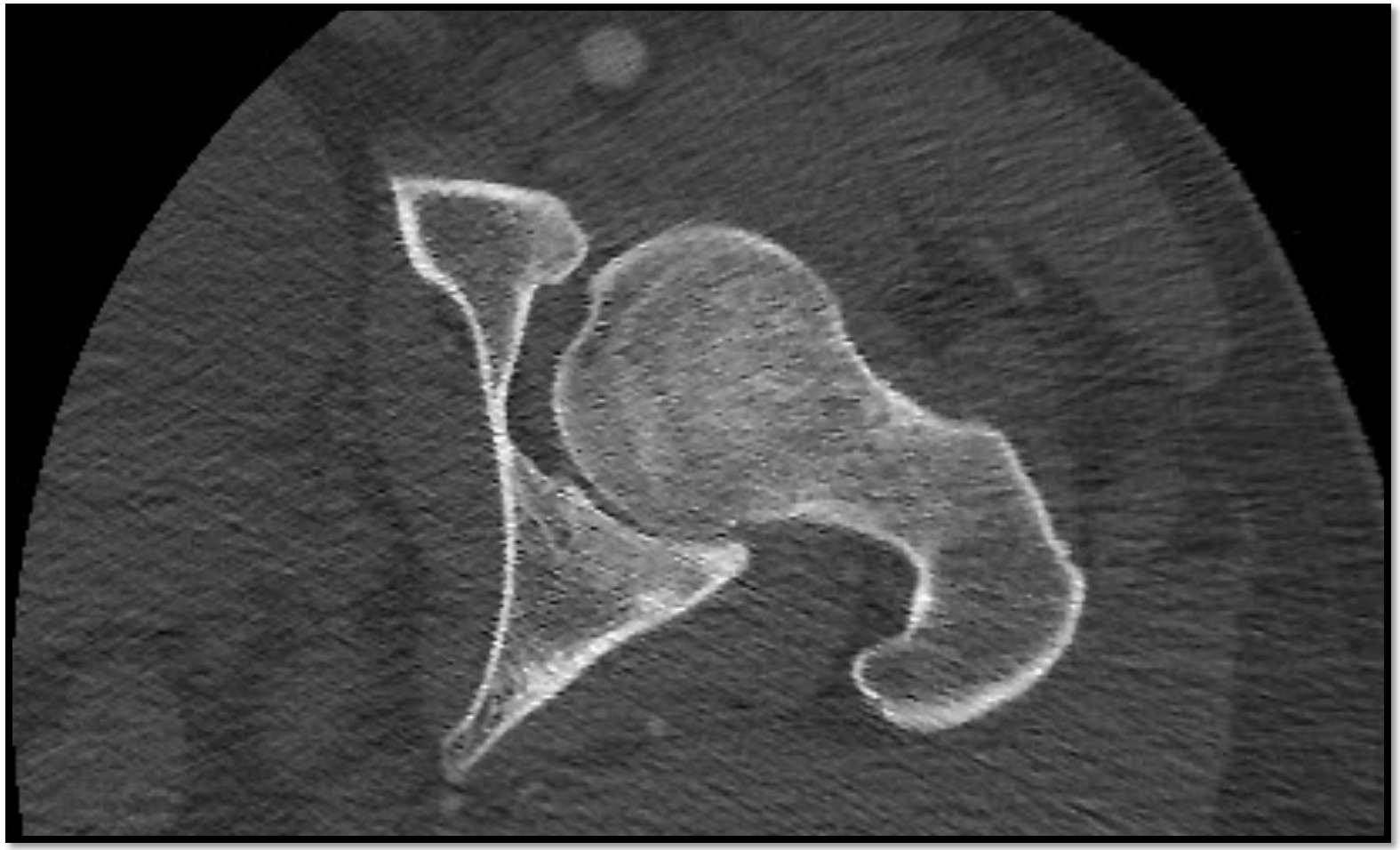
25 YO Male
MCC
Ripped half his left foot off
Left Femur Fracture
No Other Injuries

Cross Table

L
JPK
Cross T

L

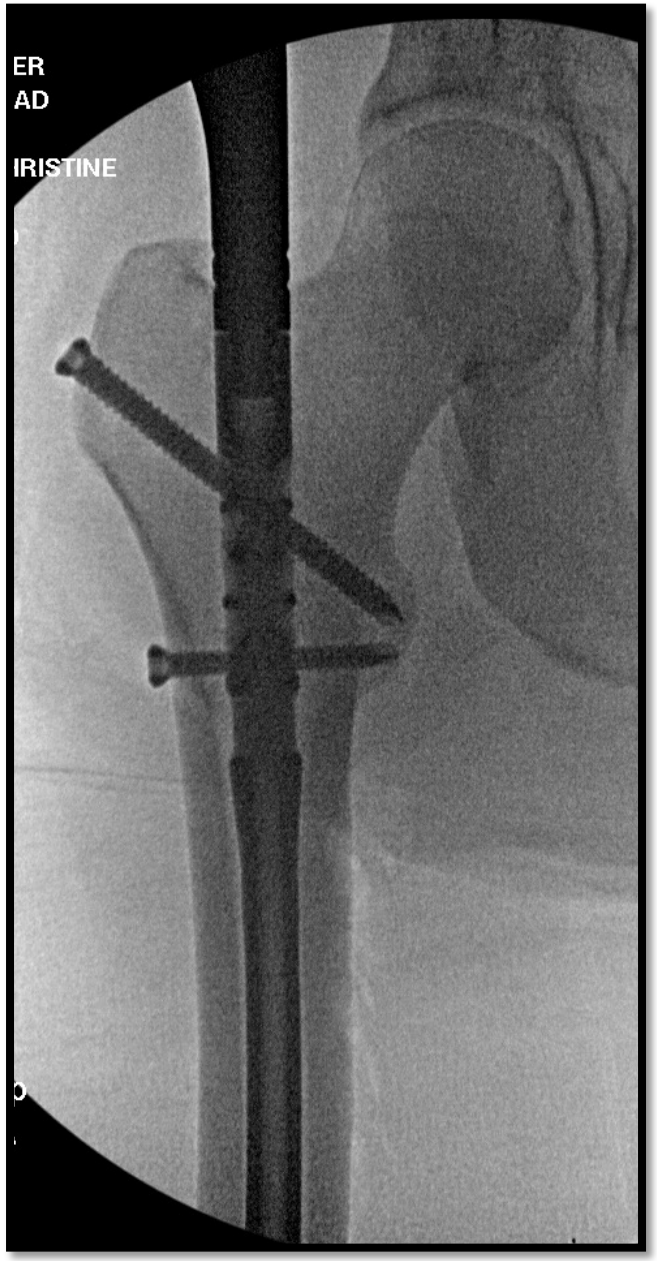
No Femoral Neck Fx



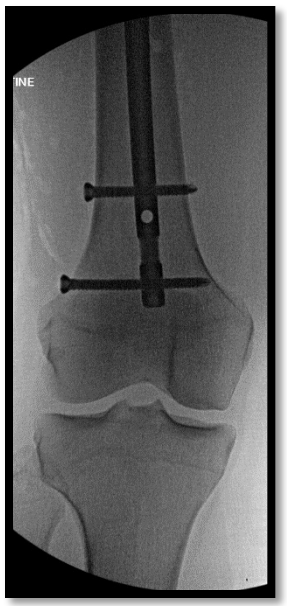
OEC

OEC

OEC

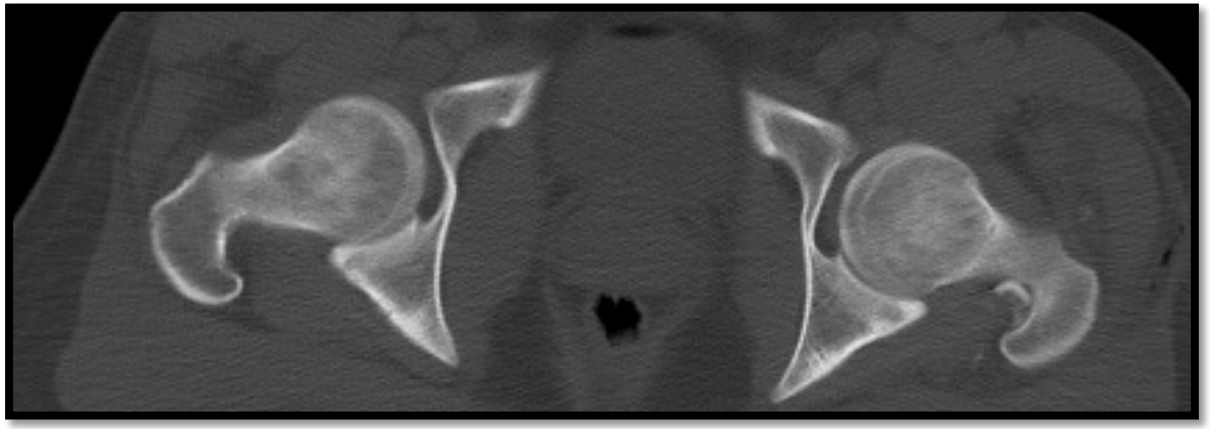

ER
AD
IRISTINE

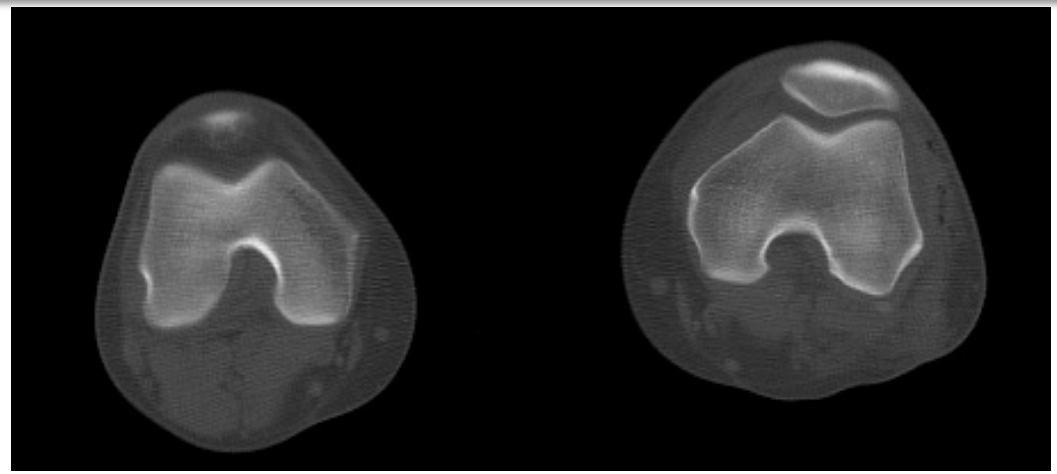
UC DA
NE
OEC

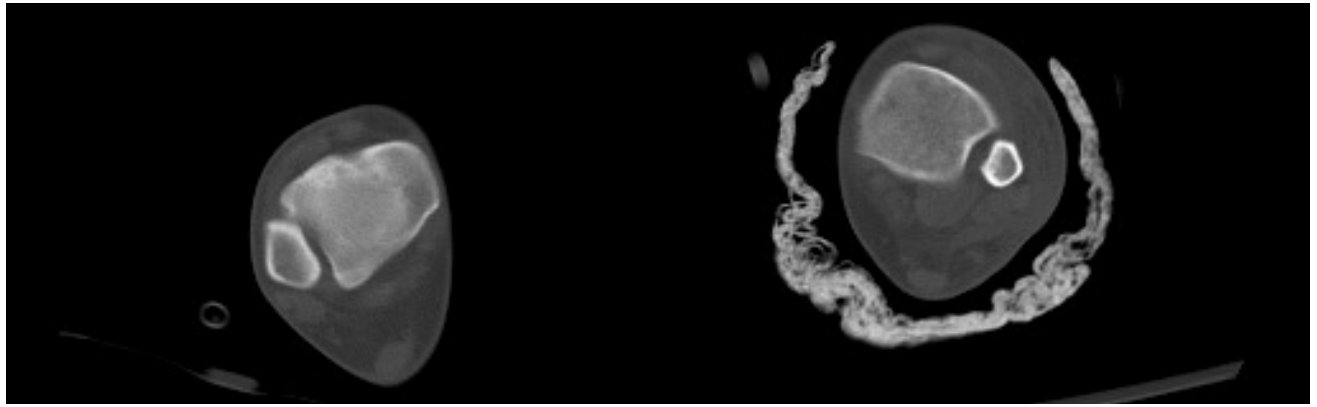

INE

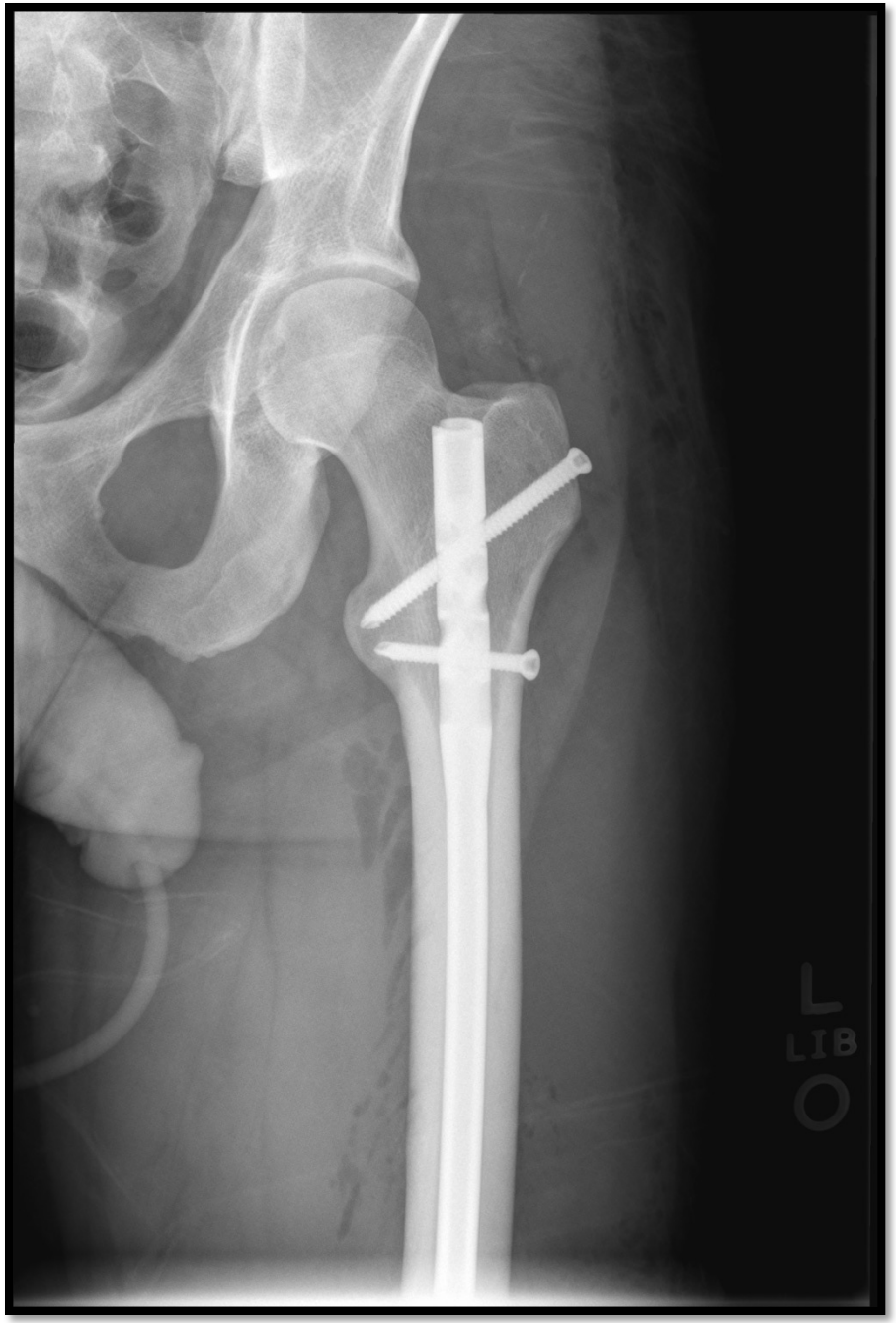
HER
RAD
CHRISTINE
10

OEC







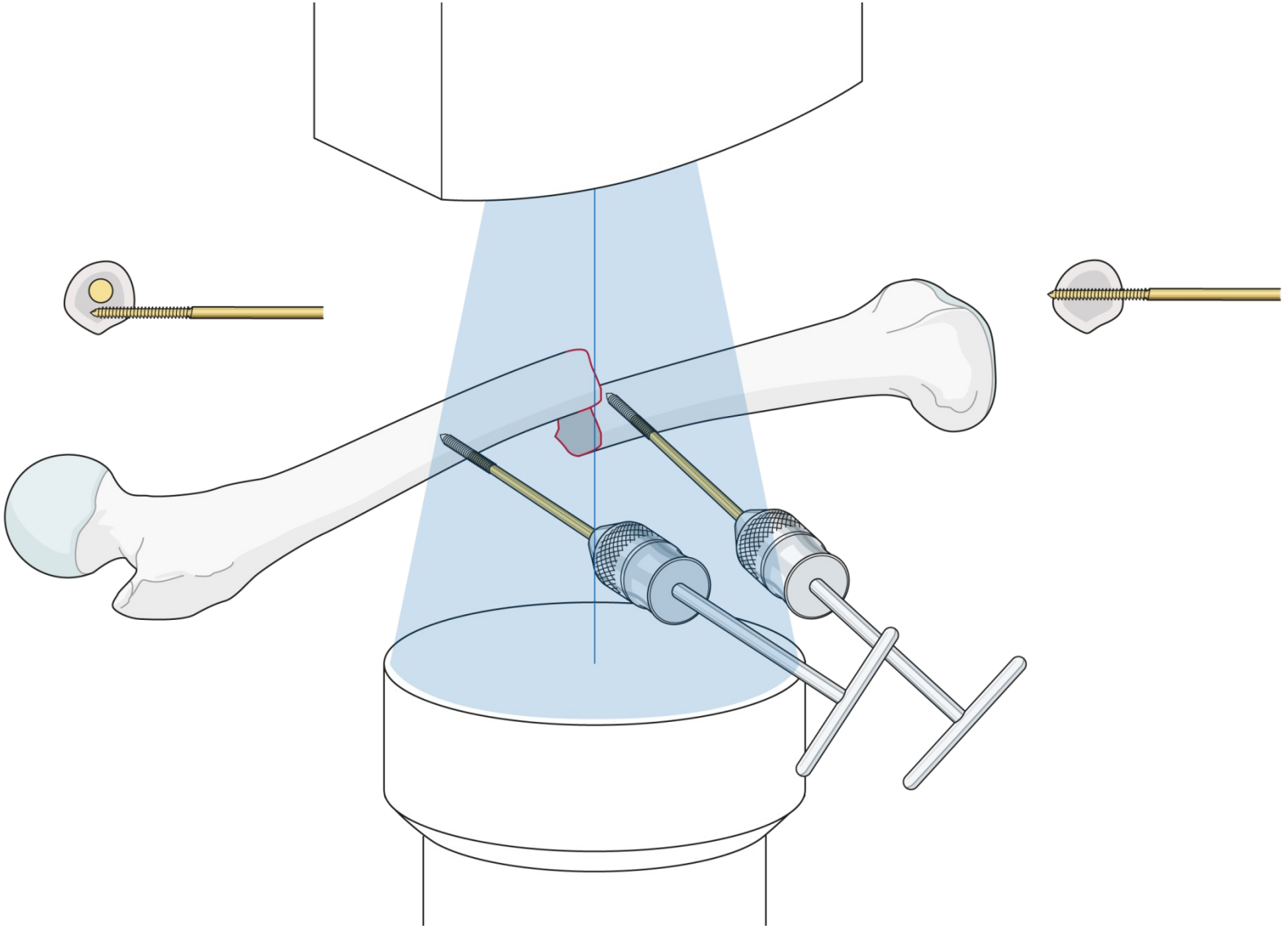

L
LIB

L
LIB

Cross Table
L
LIB

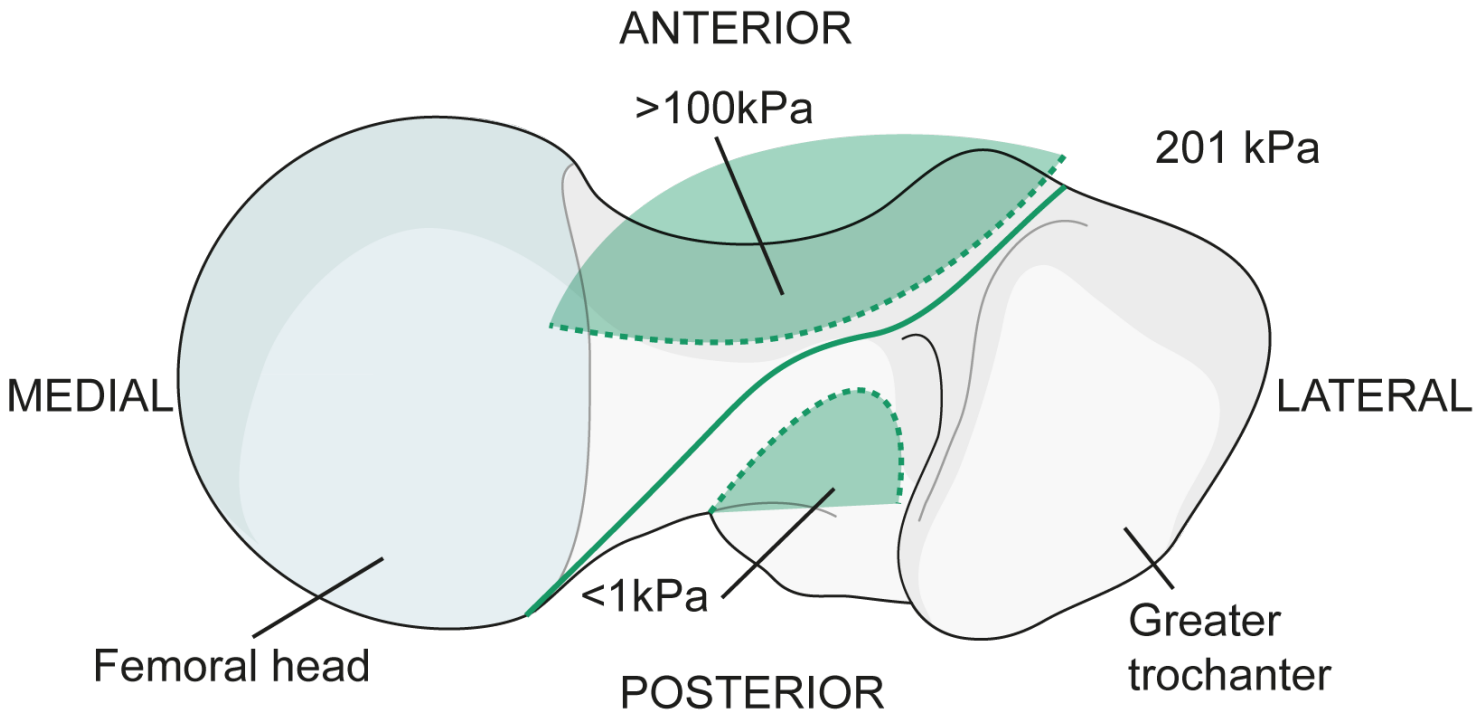
Cross Table

Tips and tricks—two Schanz screws



Entry point

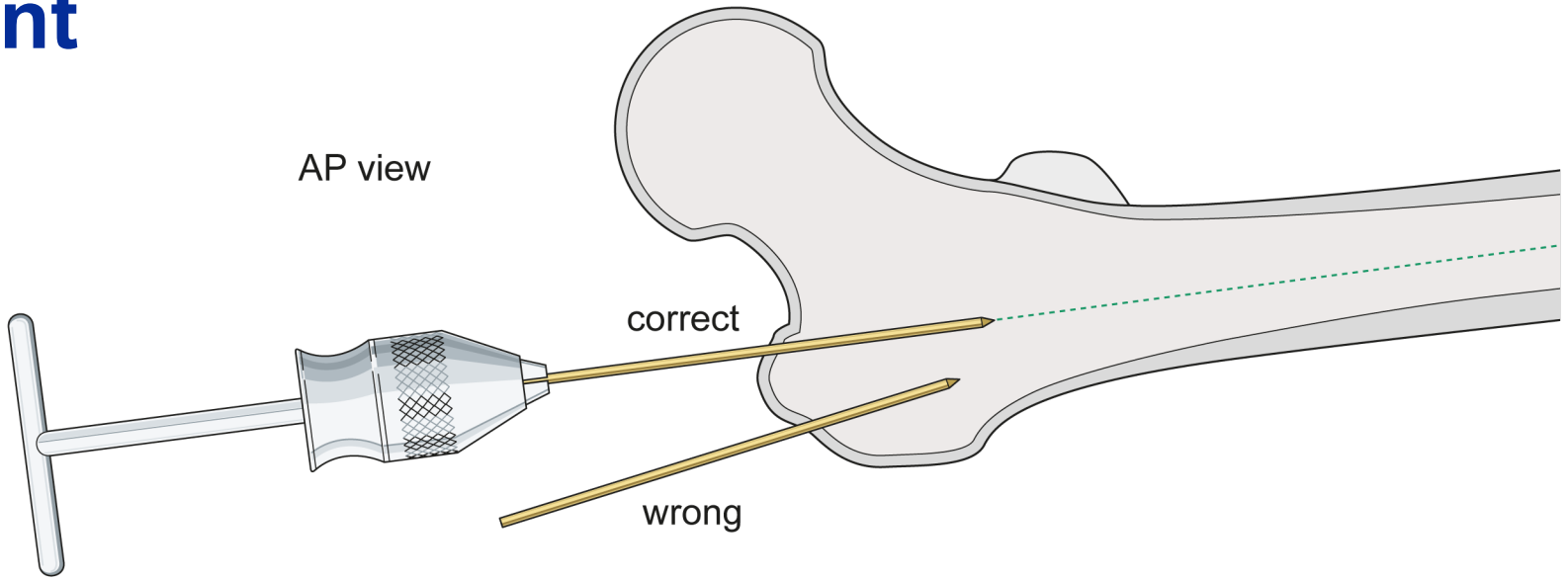
- Hoop stresses—exact entry is essential
- Poor placement leads to a fracture

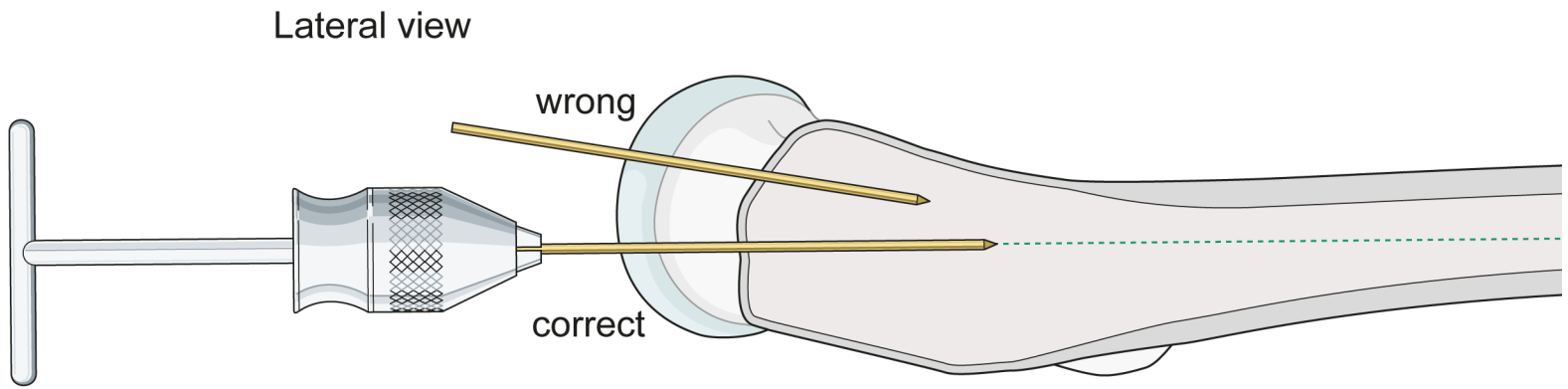


Entry point

- Femoral nailing with excessively medial starting point
  - Compromises vascularity of head
  - Produces a stress riser in the neck of the femur
- A lateral portal directs nail toward medial cortex
  - Varus angulation

Entry point





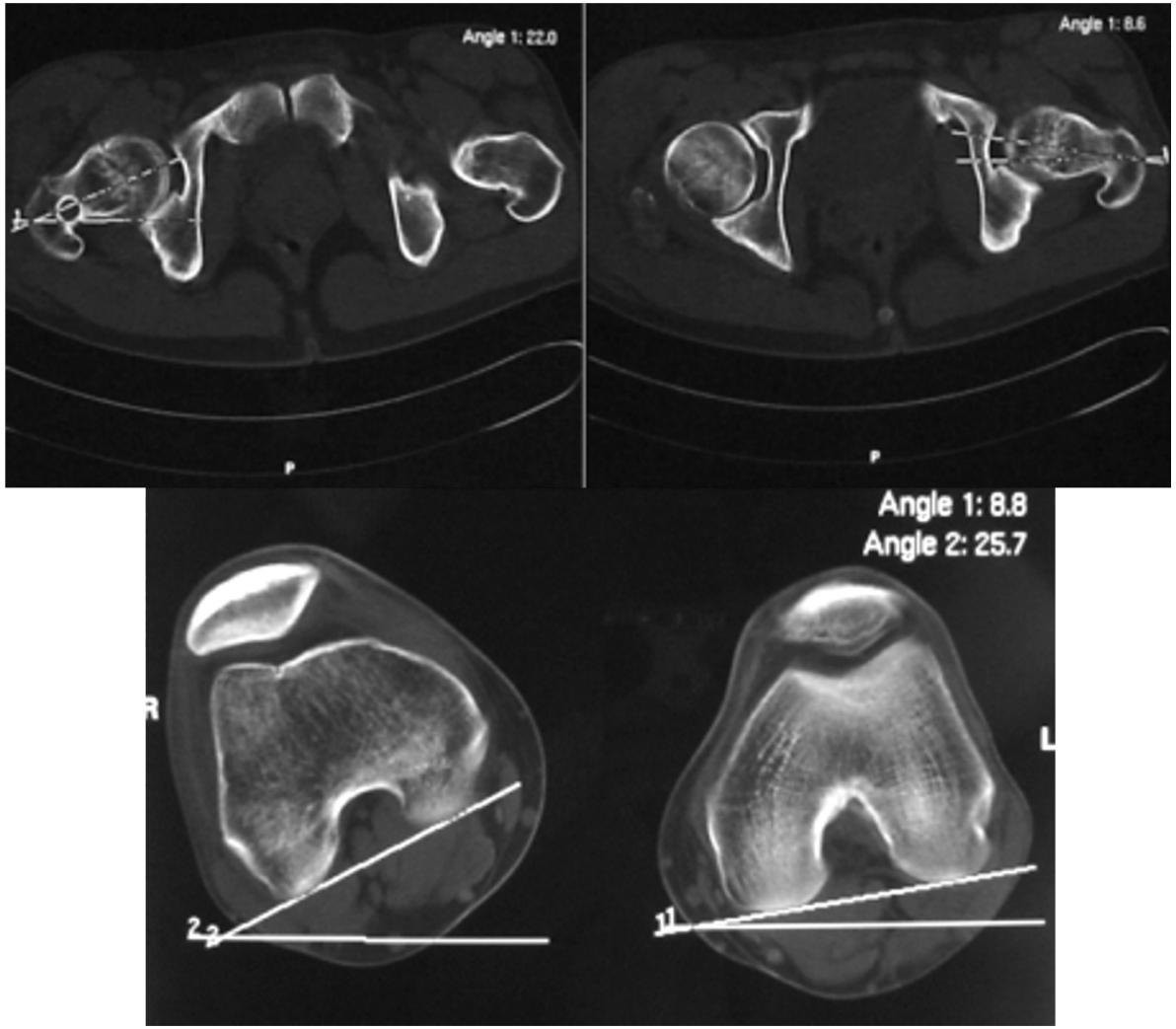
Entry point

- Wrong entry point

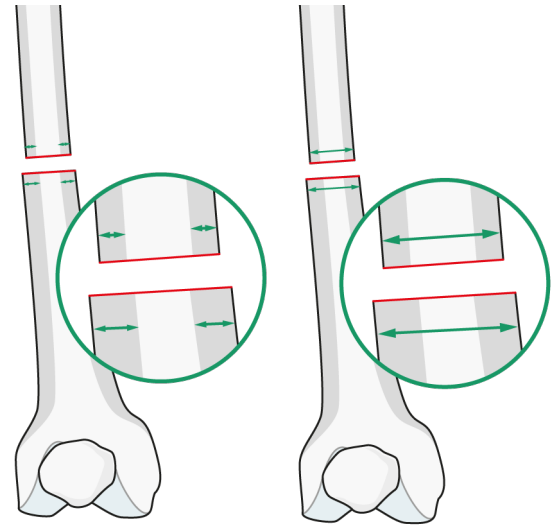
Complications of femoral nailing

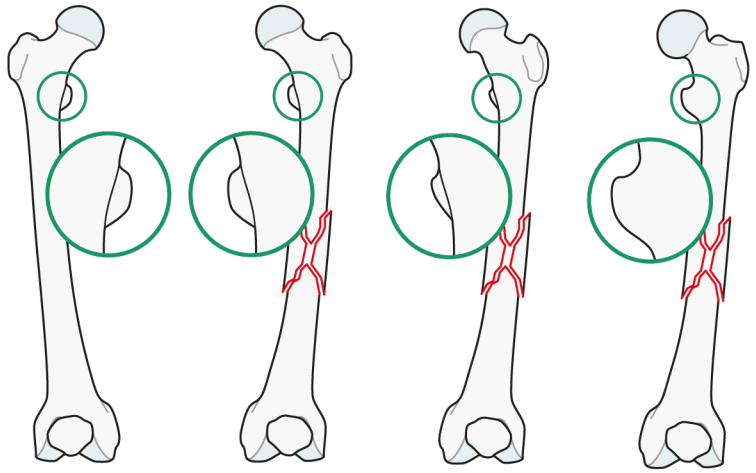
- Fat embolism
- Infection
- Malunion: rotation more than 15° and length
- Nonunion
- Heterotropic ossification

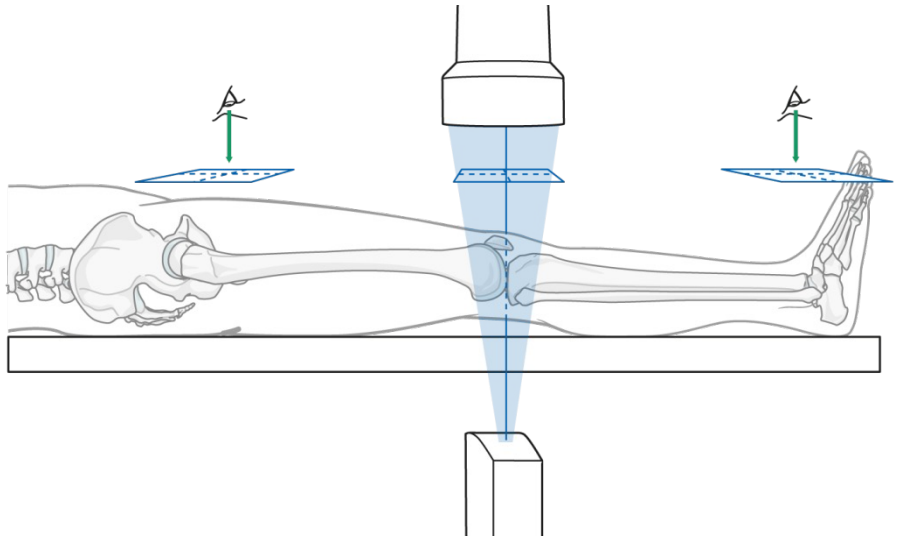
Rotational malalignment

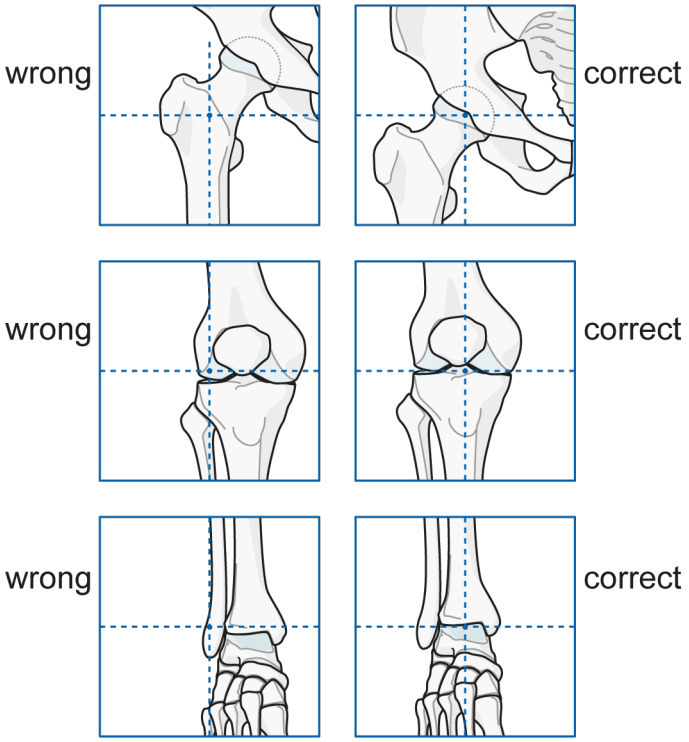


Rotation, alignment









Take-home messages

- Reamed, locked IM nailing is gold standard
- Plating has a role when the medullary canal is not available
- Severe open fractures—external fixation is a viable option
- Check length, rotation and alignment
- Check for femoral neck fractures