

**TRAUMATISMES  
DU SQUELETTE APPENDICULAIRE**

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# Plan

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Sémiologie de base

Diagnostic positif en radiologie conventionnelle

- Signes directs
- Signes indirects (tuméfaction parties molles, tuméfaction synoviale pour trauma articulaire)

Description des fractures

Diagnostics différentiels/pièges

Que faire en cas de doute? / Bilan complémentaire

question à se poser une fois le diagnostic fait:

- Y a-t-il une autre lésion ?

# Objectifs

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Concepts généraux

# Ce que nous ne ferons

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pas...

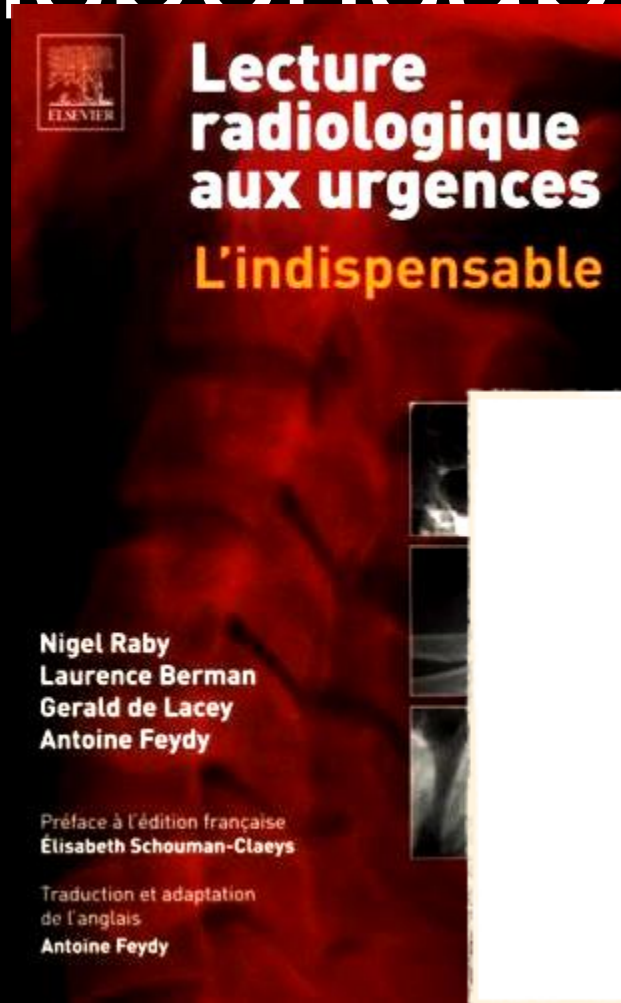
Liste des lésions articulation par articulation

Classifications

Traumatologie autre que la traumatologie osseuse (pas muscles, tendons, ligaments)

Pathologie pédiatrique

# Le quasi indispensable...

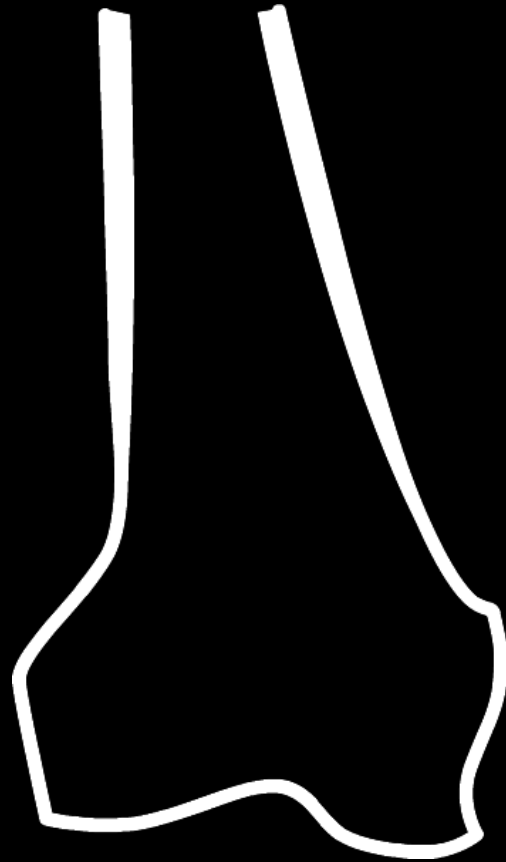


# ANATOMIE

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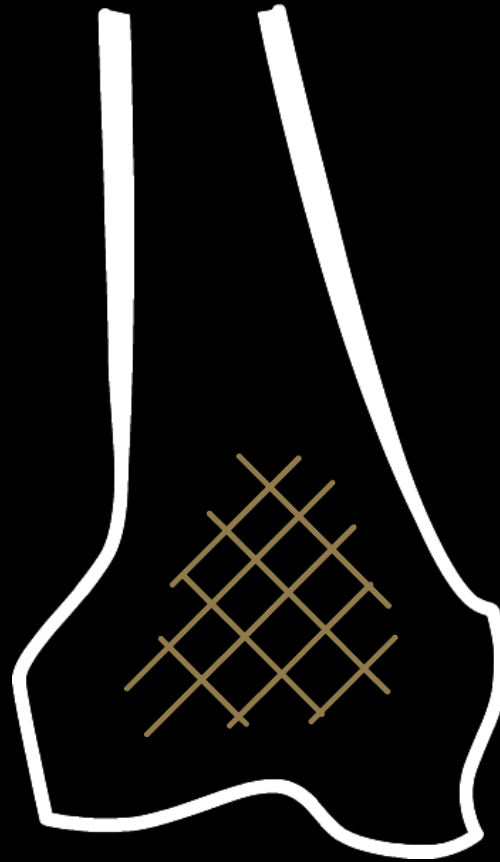
# Os cortical

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# Os trabéculaire

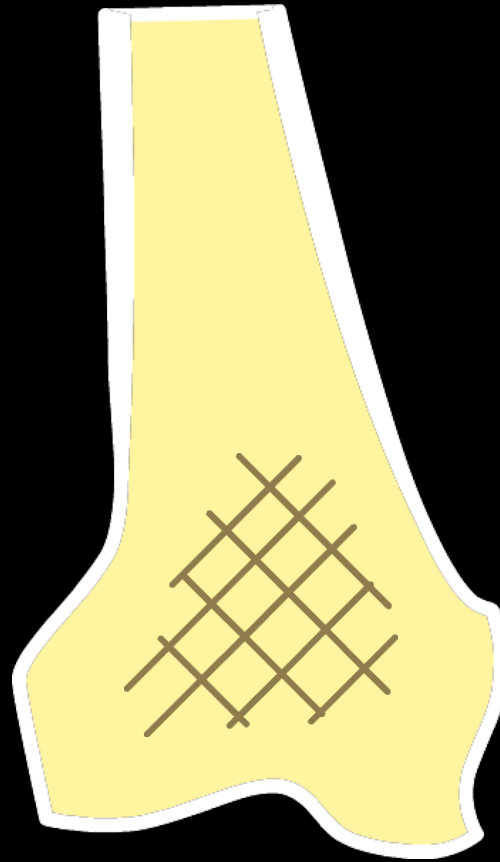
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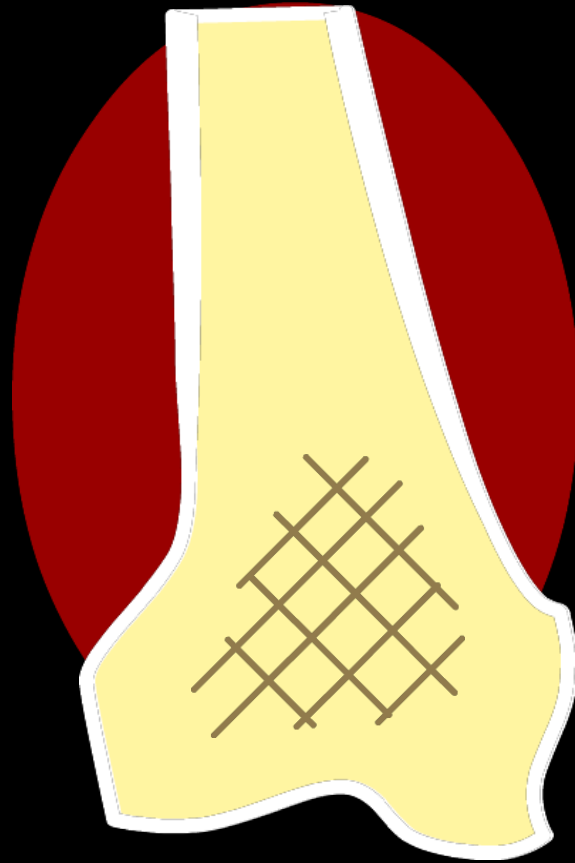
# Médullaire

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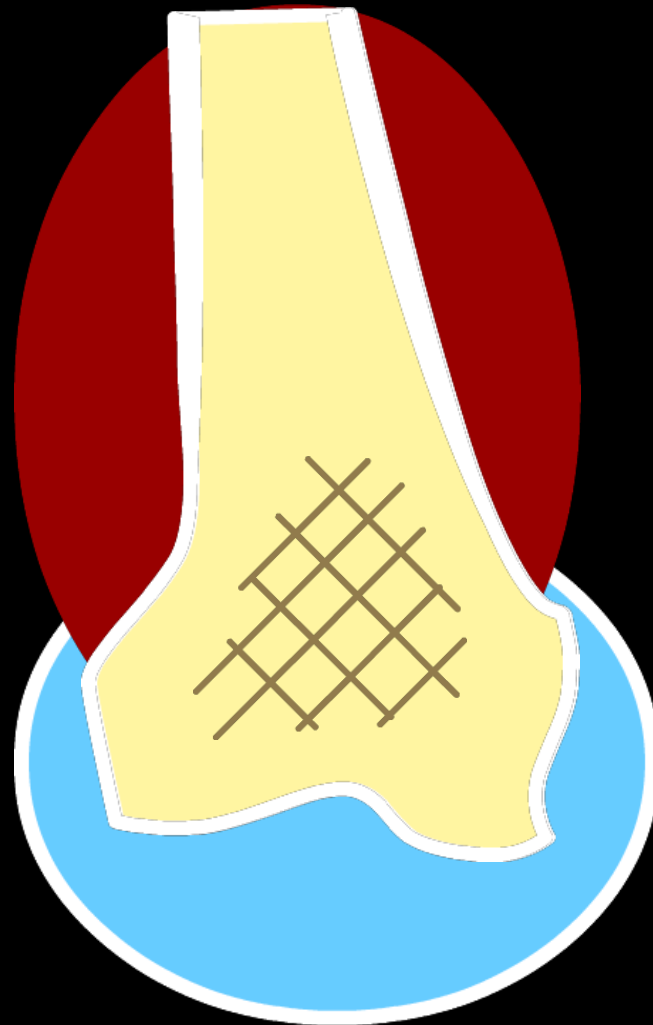
# Parties molles

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# Articulation

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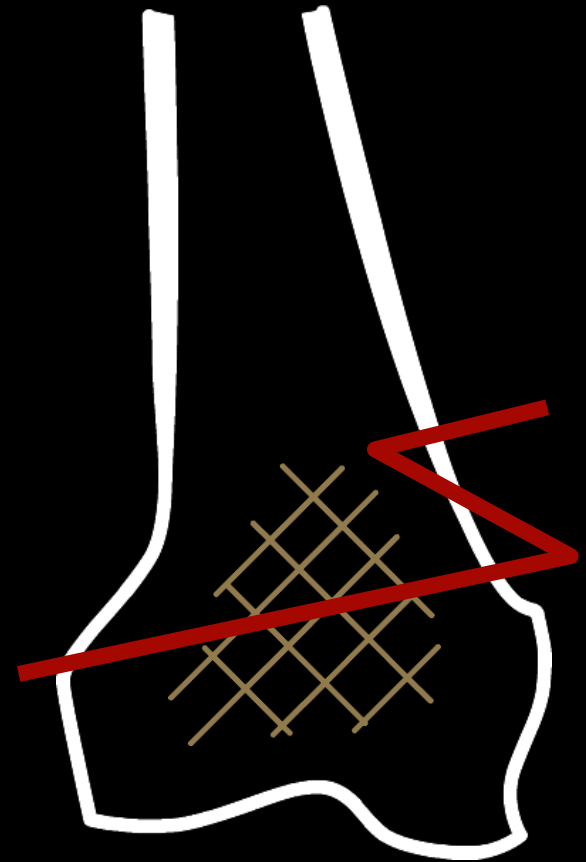


# Fracture

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= solution de continuité de  
l'os  
(cortical/trabéculaire)

S'accompagne de  
modifications de la  
médullaire / parties  
molles

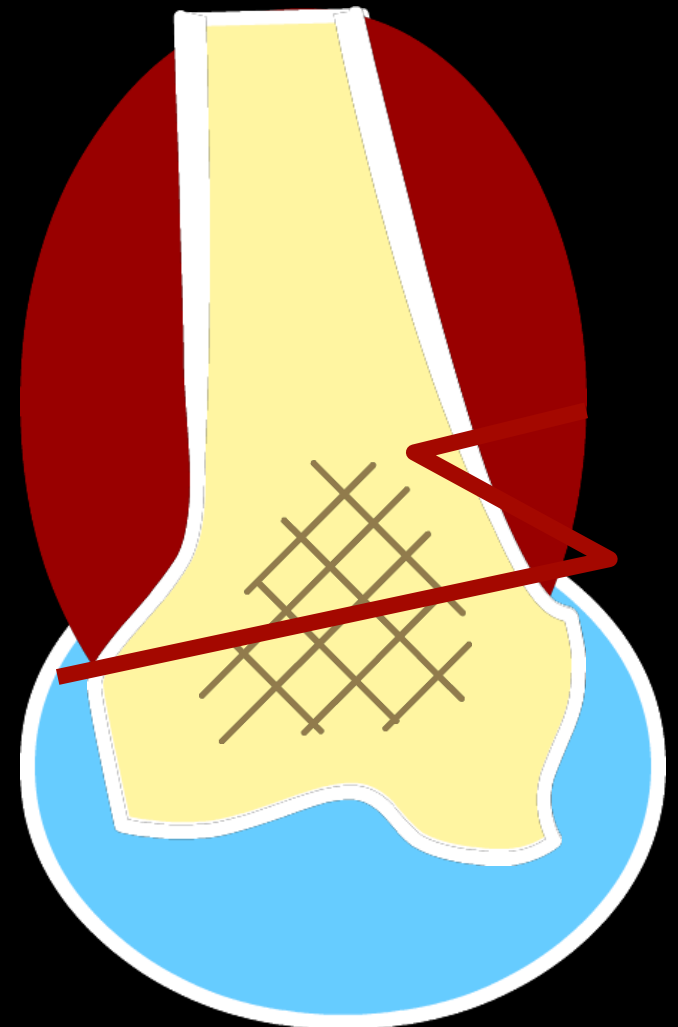


# Fracture

---

= solution de continuité  
de l'os  
(cortical/trabéculaire)

S'accompagne de  
modifications de la  
médullaire / parties  
molles



# Réparation

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Activation des **ostéoclastes**

- Résorption

Activation des **ostéoblastes**

- Réaction périostée et formation cal

# Signes à l'imagerie

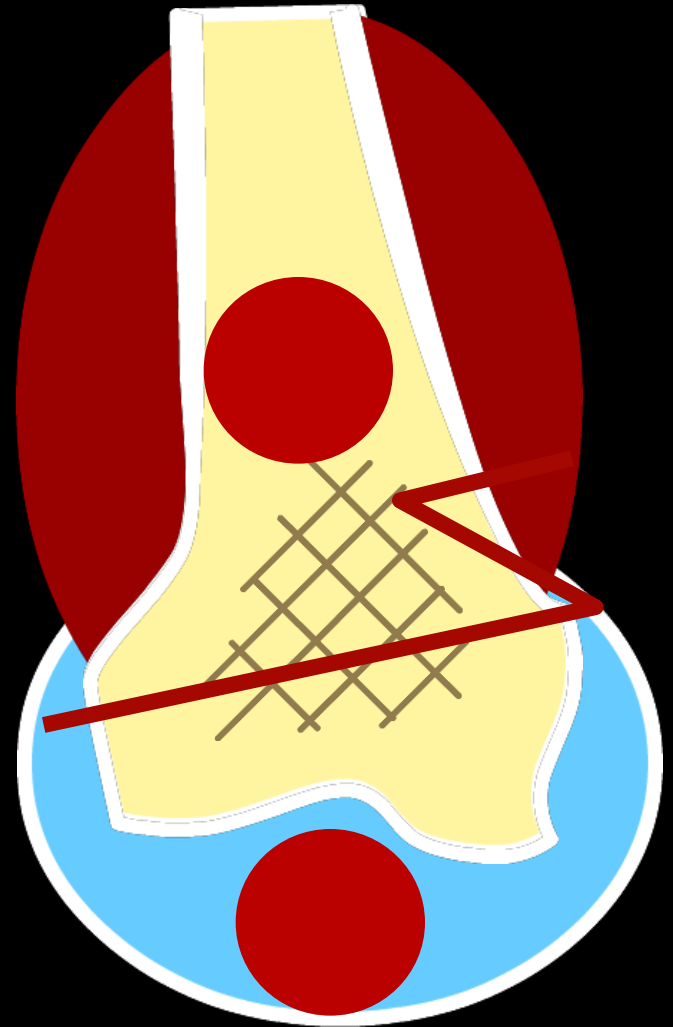
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Rupture de l'os cortical

Rupture de l'os trabéculaire

Infiltration médullaire

Parties molles / articulation



# Rupture corticale

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# Analysis of radiographs



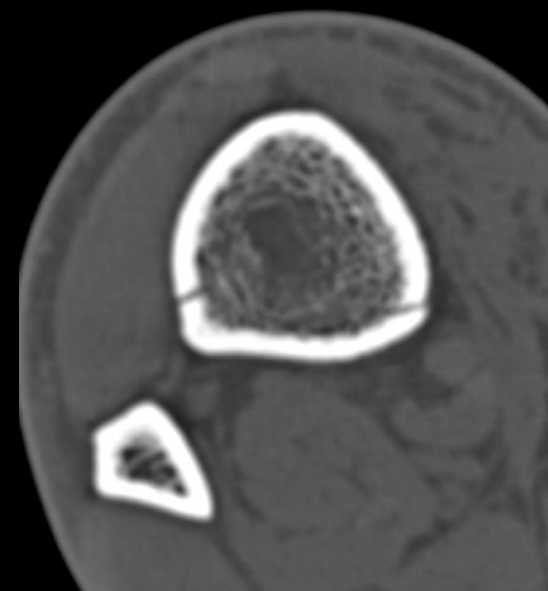
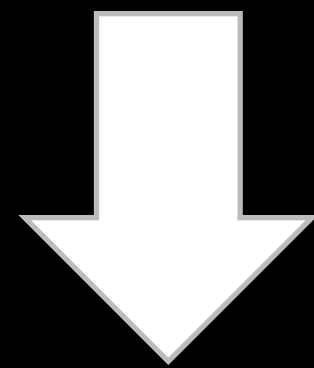
# Analysis of radiographs



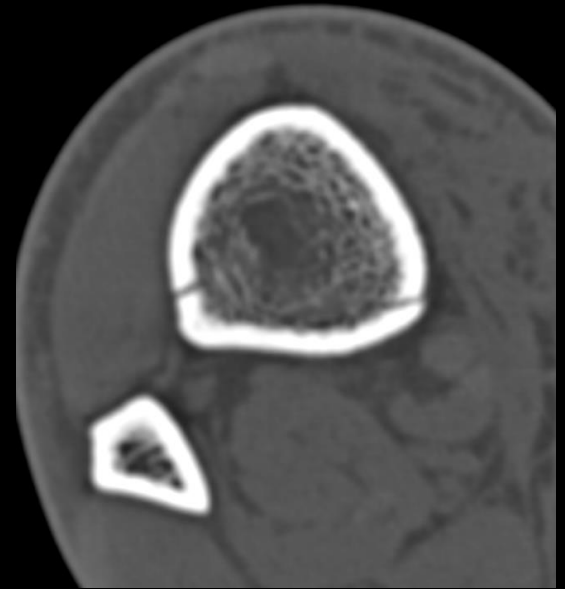
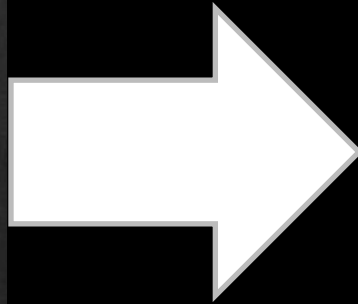
# Analysis of radiographs



No fracture line



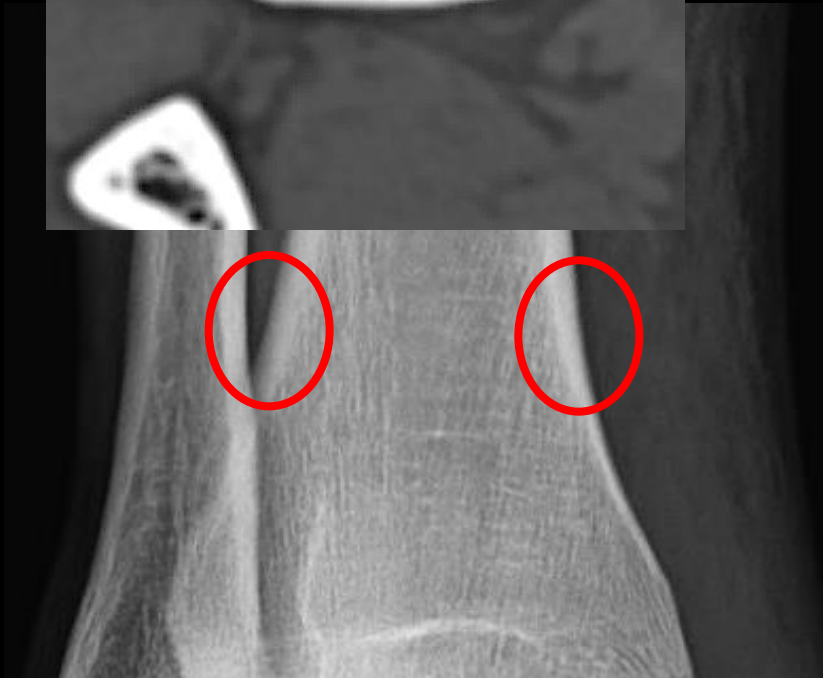
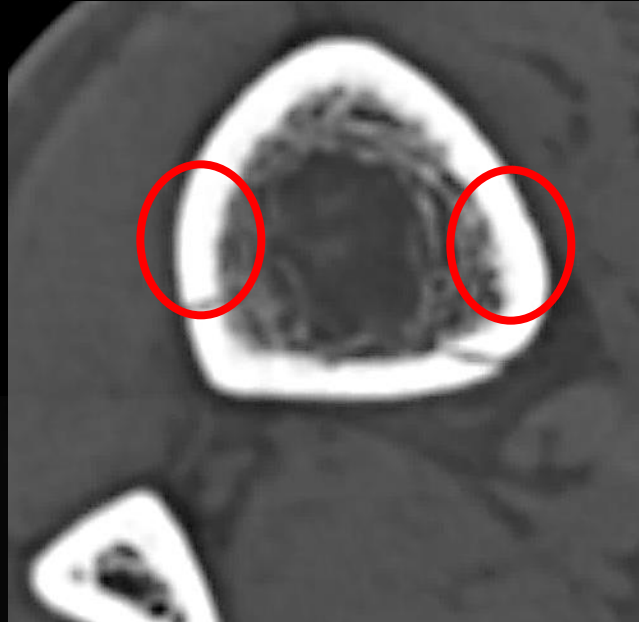
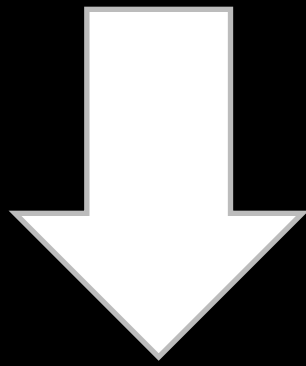
Fracture line



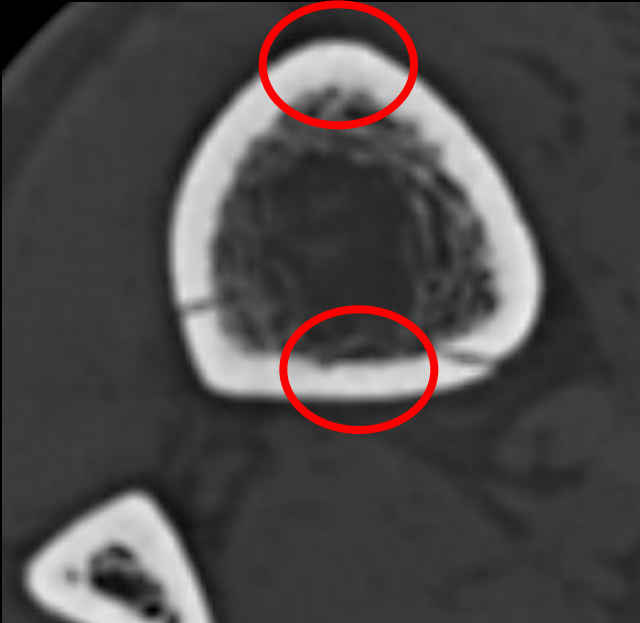
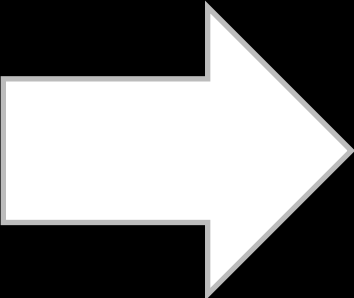
## Rule 1

Radiographs only demonstrate change in cortical bone to which the X-ray beam is tangent.

AP radiograph



# Lateral radiograph

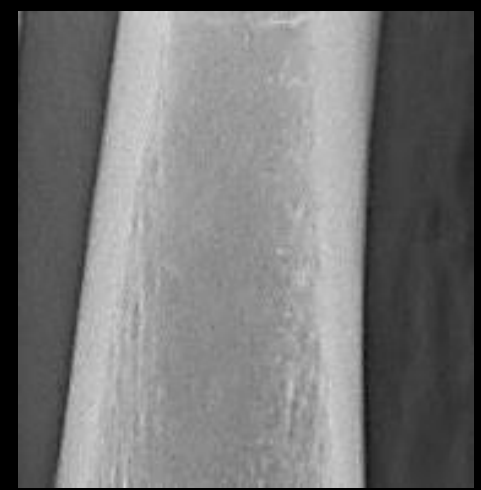
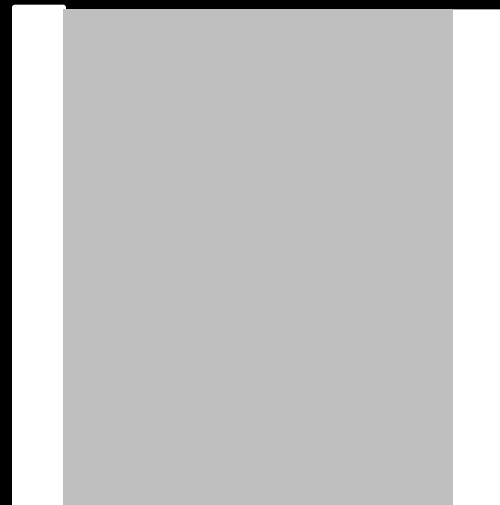
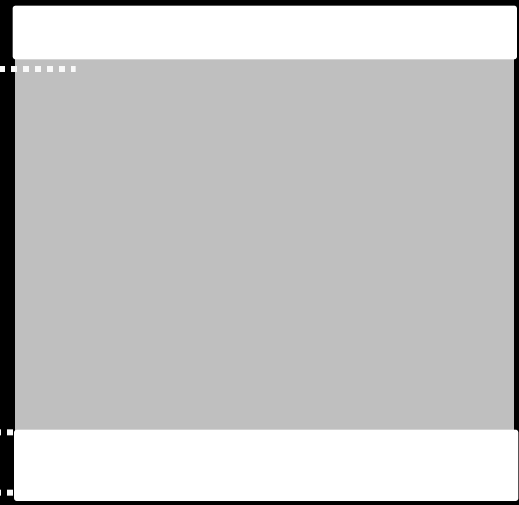
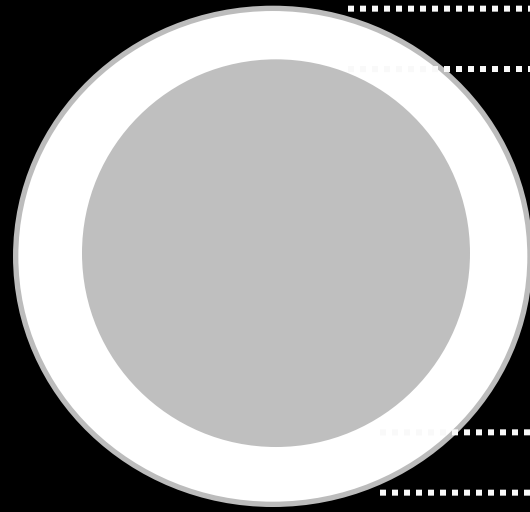
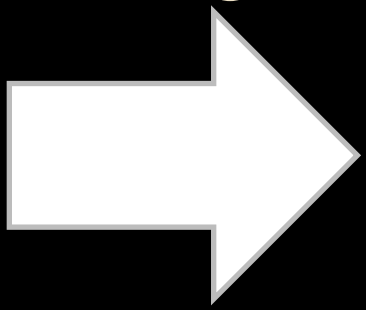




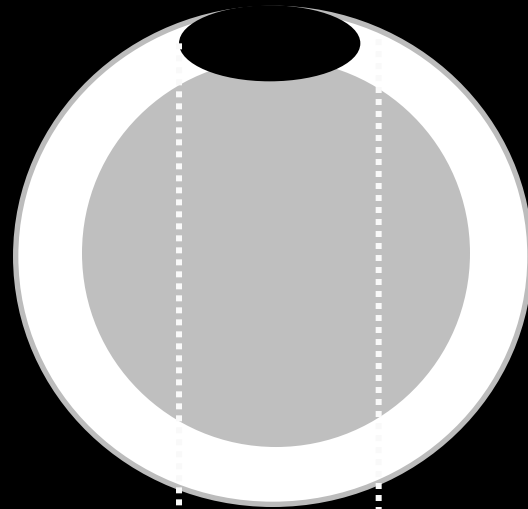
AP radiograph



Lateral radiograph

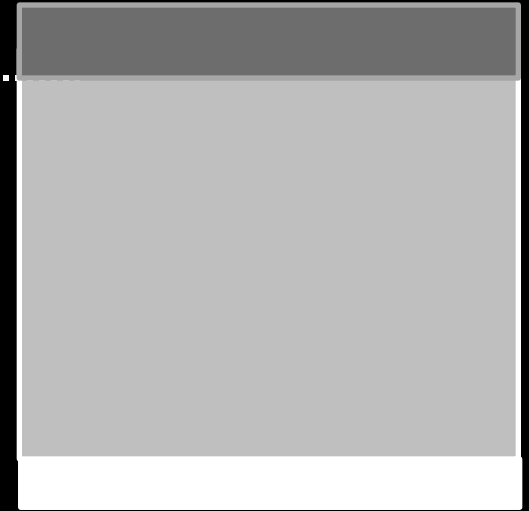
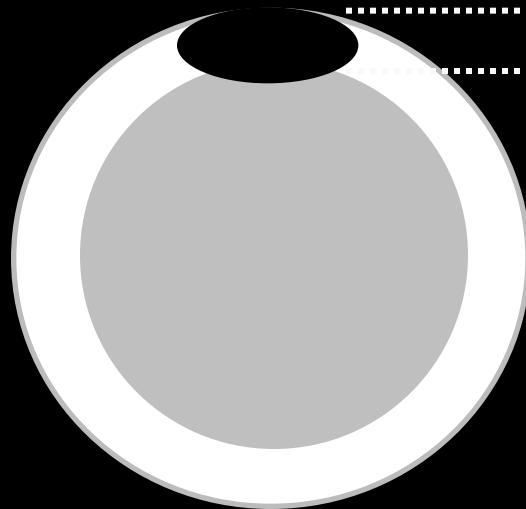
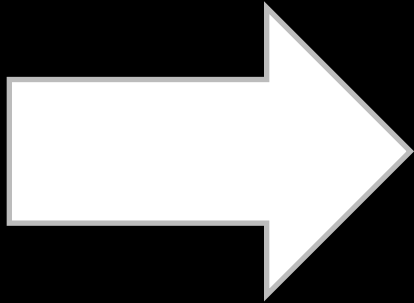


AP radiograph



A bone lesion is barely visible when the x-ray beam is not tangent to it

Lateral  
radiograph



A bone lesion is visible  
when the x-ray beam is tangent to it.

## Rule 1

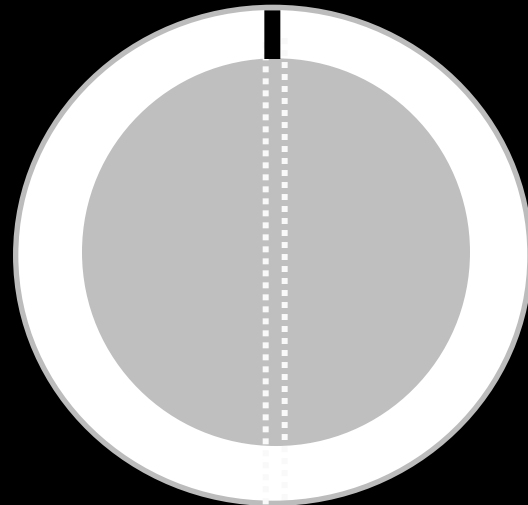
Radiographs demonstrate a bone lesion when it is located in a cortical area to which the x-ray beam is tangent.

## Rule 1

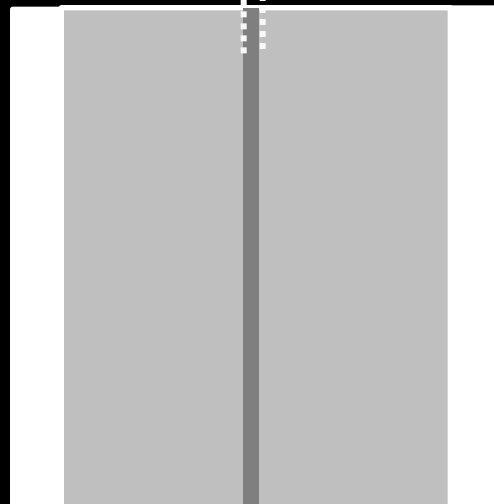
Radiographs demonstrate a bone lesion when it is located in a cortical area to which the x-ray beam is tangent.

Fracture line ?

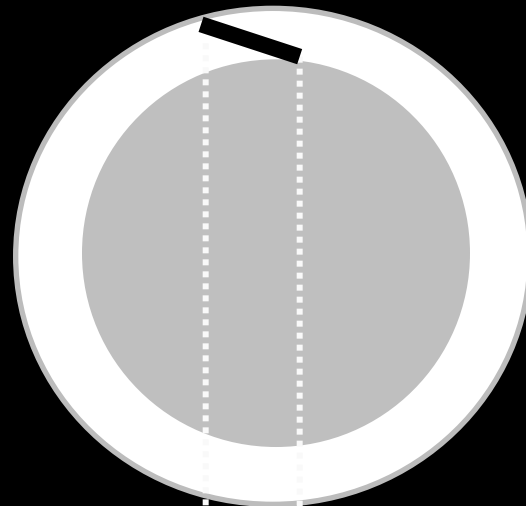
AP radiograph



A cortical line is visible when the x-ray beam is tangent to its edges.



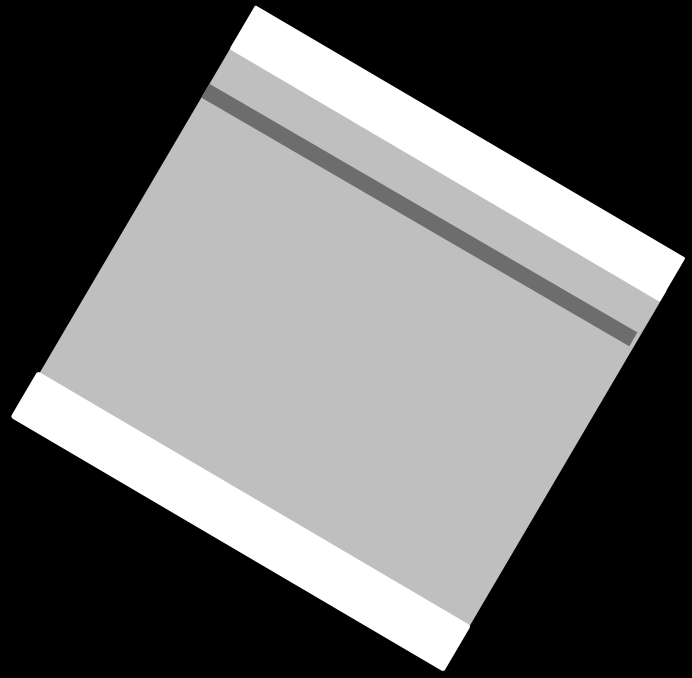
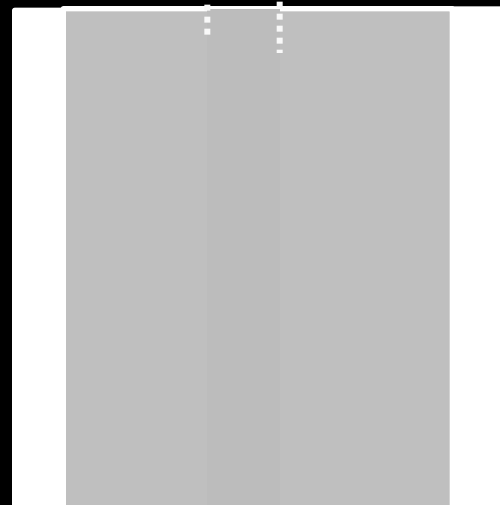
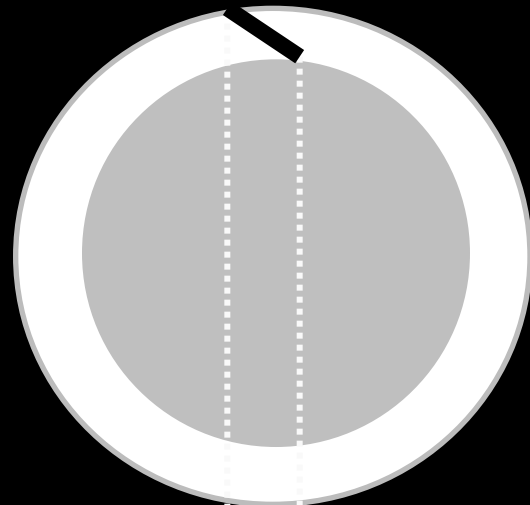
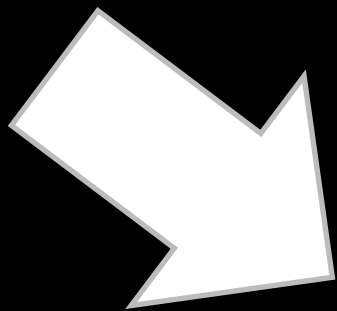
AP radiograph



A cortical line is barely visible when the x-ray beam is not tangent to its edges.

# AP radiograph

A bone lesion is barely visible when the x-ray beam is not tangent to it





## Rule 2

Radiographs demonstrate a cortical line when it is tangent to its edges.



# Analysis of radiographs



Lack of tangency

Superimposition of other bones

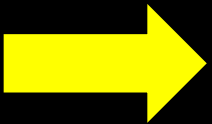


## Visibility of fracture on radiographs

- X-ray beam tangent to the fracture edges
- No superimposition

# Objectives

- Introduction
- Principles of analysis of radiographs
- Healing of cortical fractures
- Scoring of fracture healing with mRUS
- Validation of mRUS
- mRUS during healing



# Fracture healing



Initial radiograph

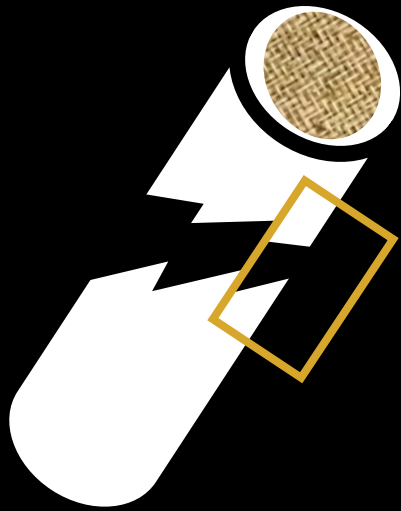


+ 2 months

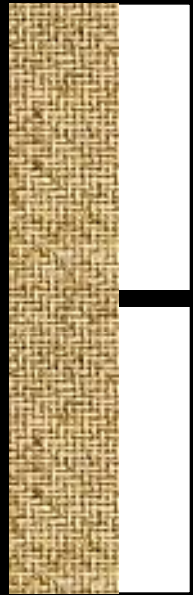


+ 5 mon

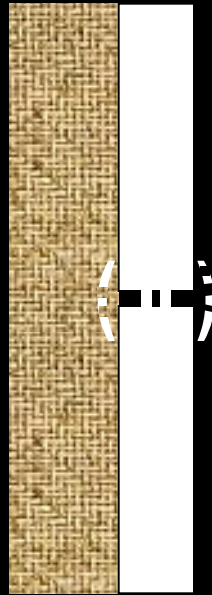
# Fracture healing



CALLUS

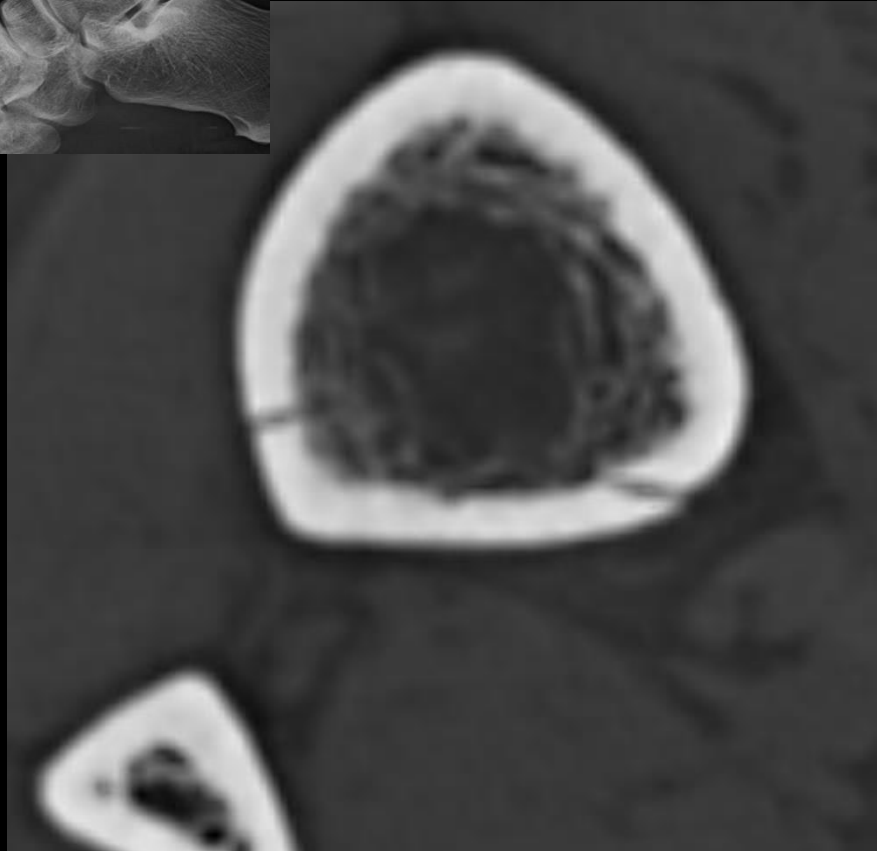


No

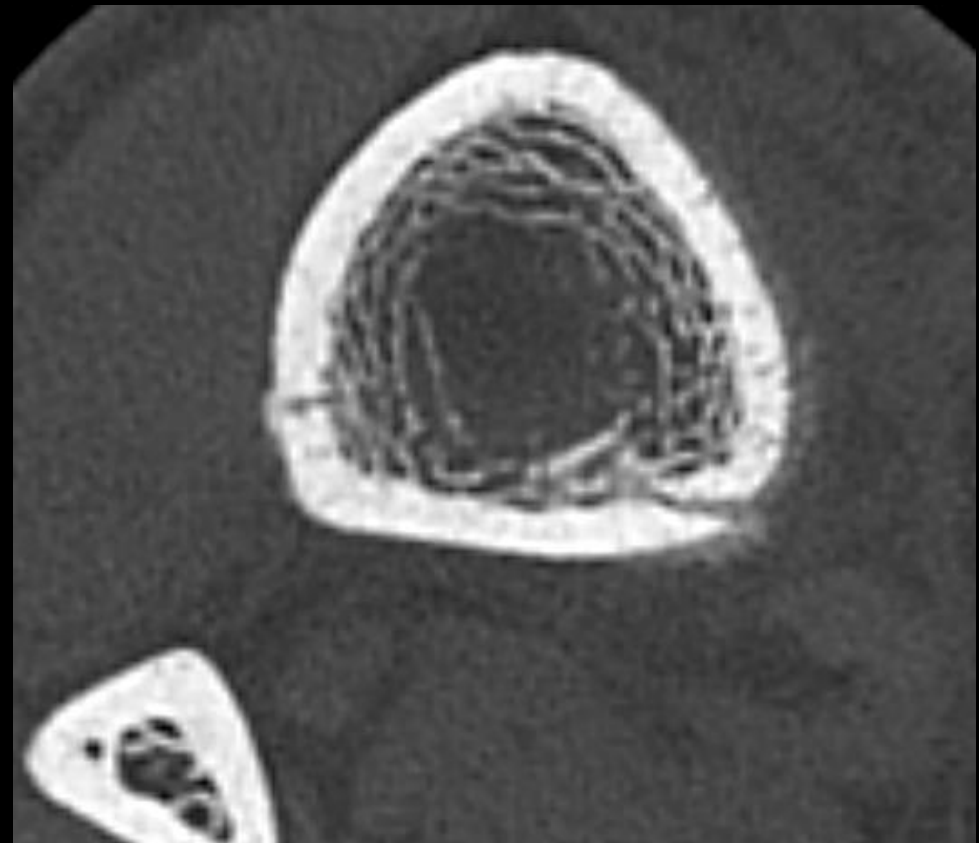


discontinuous

# Fracture healing



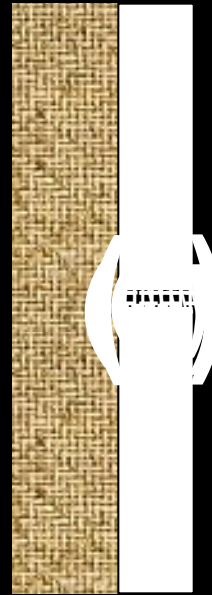
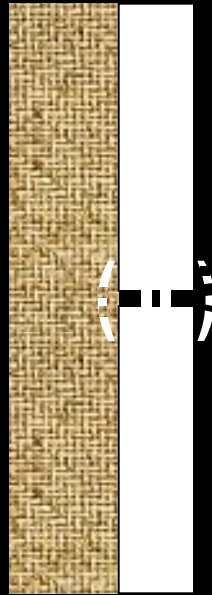
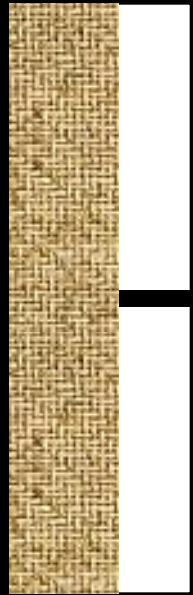
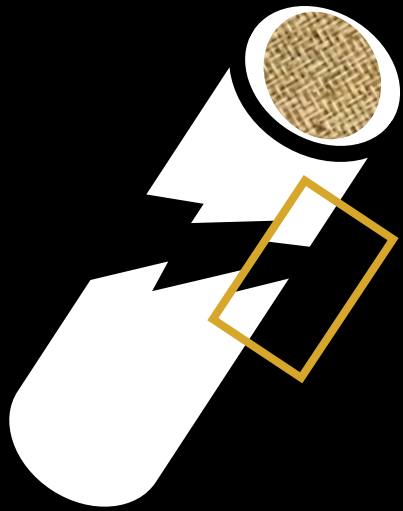
Initial CT



+ 3,5 months



# Fracture healing



CALLUS

No

discontinuous

Continuous

Mature

# Rupture corticale

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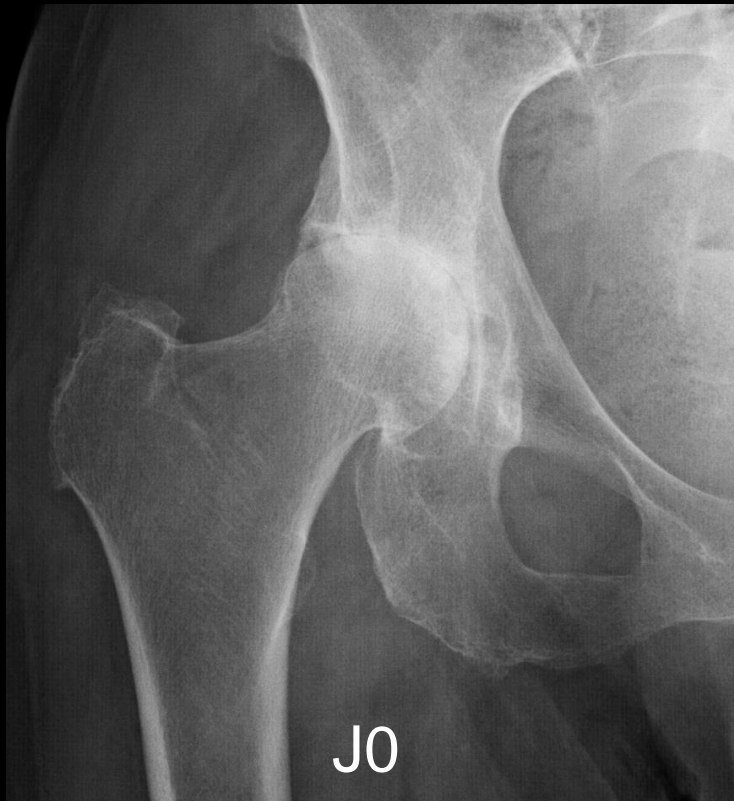


Rx: Si on est dans l'axe

Intérêt des incidences complémentaires

# Rupture corticale

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Déformation



# Rupture corticale

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# Rupture corticale

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# Rupture trabéculaire / infiltration médullaire

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# Rupture trabéculaire

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# Rupture trabéculaire / infiltration médullaire



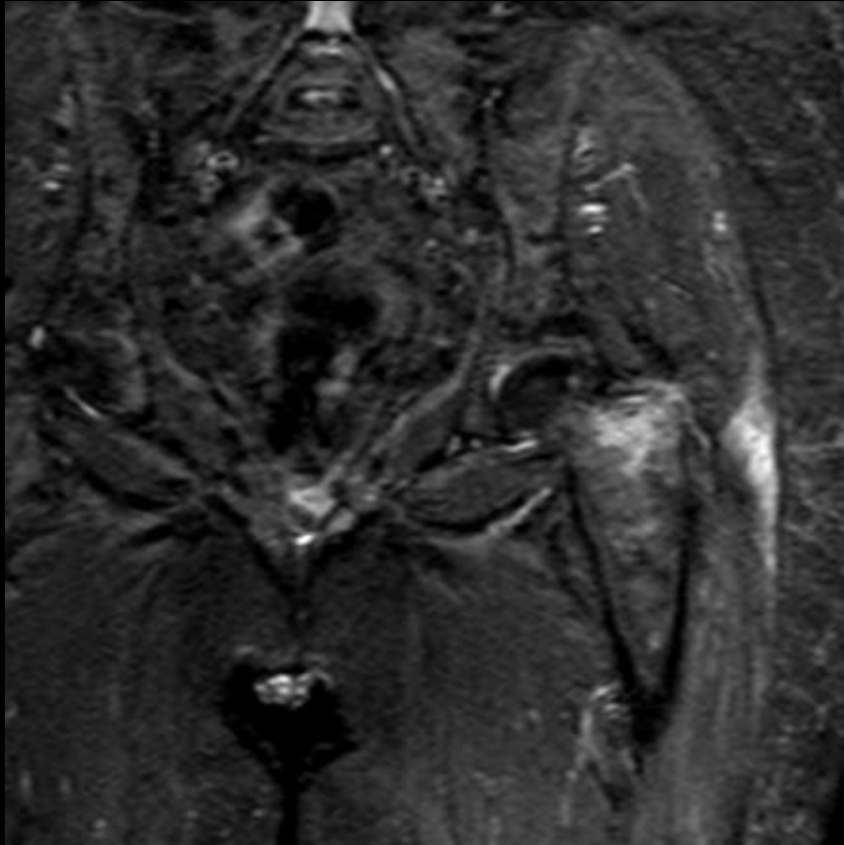
Femme de 83 ans

09/06/09





22/06/09



30/06/09

# Infiltration médullaire

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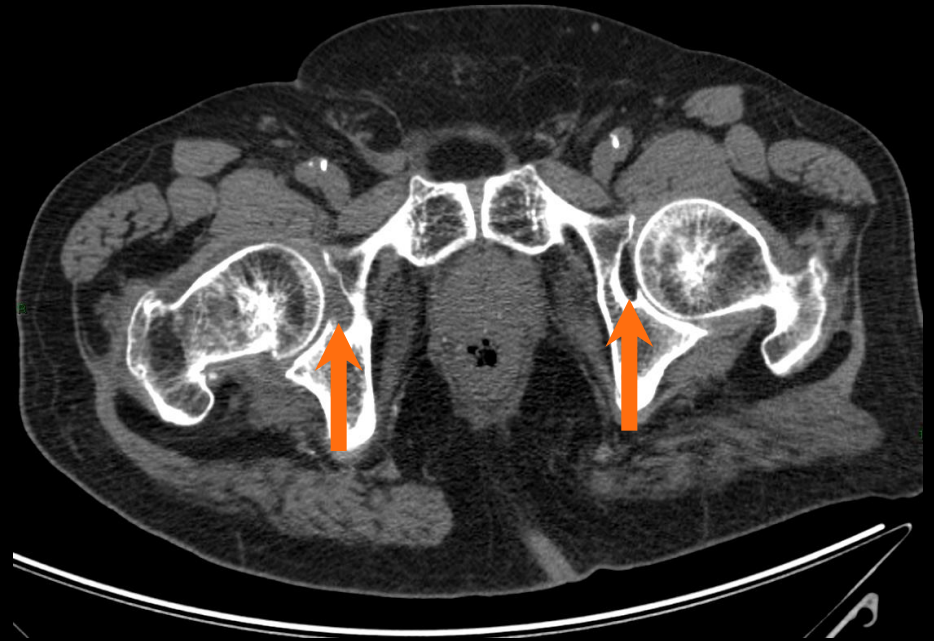
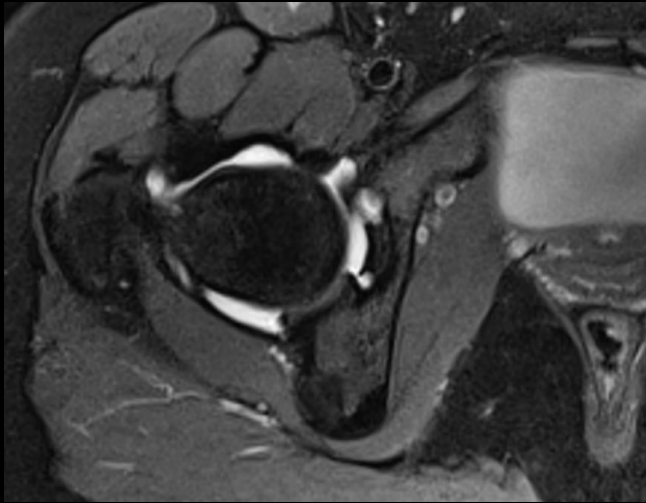


# Tuméfaction synoviale

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# Tuméfaction synoviale

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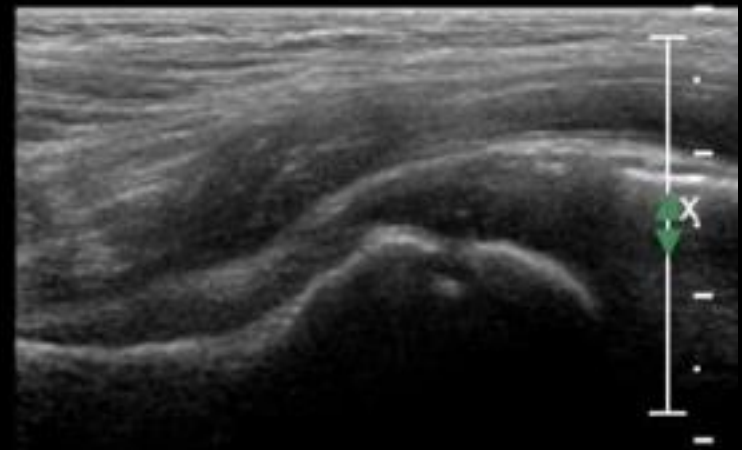
# Tuméfaction synoviale

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RT



LT



# Tuméfaction synoviale

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Coude  
Genou  
Cheville  
Interphalangiennes

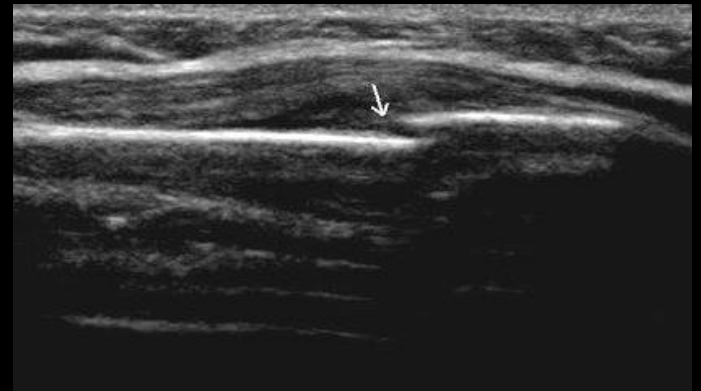
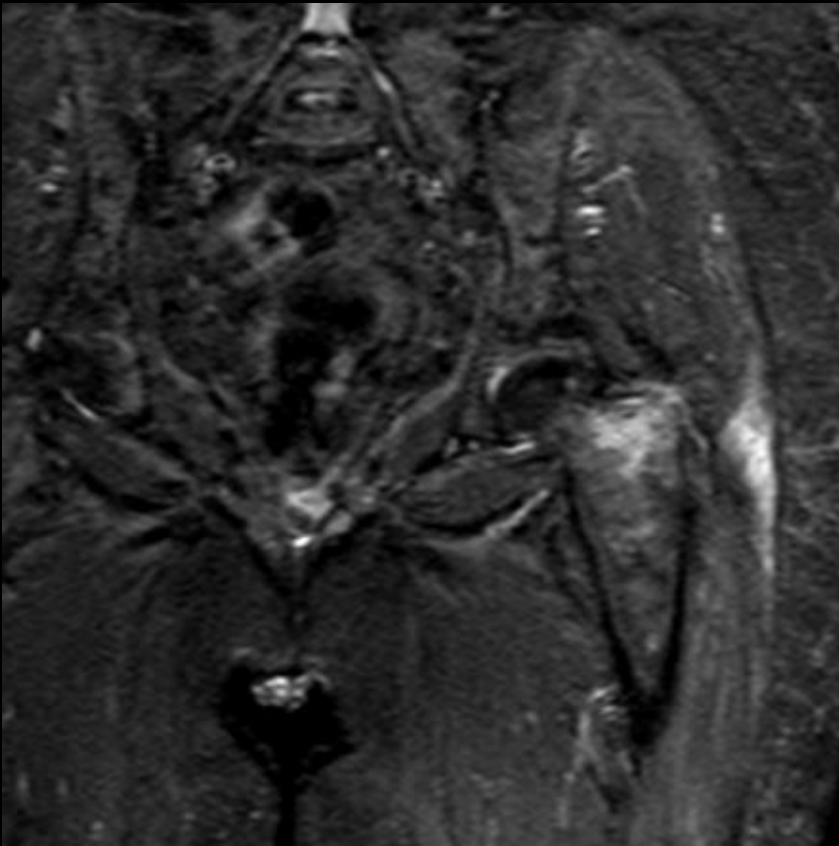


1. Articulations superficielles

2. Contraste graisseux

# Tuméfaction parties molles

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# Techniques d'imagerie morphologique

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	Rx	CT	IRM	US
Os cortical	++	+++	-	++
Os trabéculaire	+-	++	-	-
Médullaire	-	+	+++	-
Parties molles	+-	++	+++	++

# LECTURE

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Etre systématique dans l'analyse des clichés.

- Avoir un plan.
- Toujours appliquer le même.

# Analyse systématique des Rx du poignet

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# Analyse systématique des Rx du poignet

Critères de qualité de face:

- Alignement axe radius, capitatum, M3
- Bonne visibilité interlignes SL, LT, STT
- Continuité de la corticale médiale de l'ulna et du processus styloïde ulnaire



# Analyse systématique des Rx du poignet

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Critères de qualité de face:

- Alignement axe radius, capitulum, M3
- Bonne visibilité interlignes SL, LT, STT
- Continuité de la corticale médiale de l'ulna et du processus styloïde ulnaire

Analyse morphologie, contour, densité des os du carpe

- Scaphoïde/lunatum/hamatum

Parties molles

- Liseré graisseux pararadila et parascaph: VPN

Gil

Inte

Ind



# Analyse systématique des Rx du poignet

Critères de qualité de face:

- Alignement axe radius, capitatum, M3
- Bonne visibilité interlignes SL, LT, STT
- Continuité de la corticale médiale de l'ulna et du processus styloïde ulnaire

Analyse morphologie, contour, densité des os du carpe

- Scaphoïde/lunatum/hamatum

Parties molles

- Liseré graisseux paradila et parascaph: VPN

Gilula

Interlignes ST et LT

Index: radio-ulnaire inférieur (très légèrement négatif),  
inclinaison radiale (16-28°), hauteur radiale (8-10)



# Diagnostic positif en Rx: signes directs

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Pour qu'elle soit vue en Rx: solution de continuité corticale  
+ incidence

Fractures occultes: os trabéculaire, pas os cortical ou  
fracture non déplacée → CT/IRM/Rx répétées

# Diagnostic positif en Rx: signes indirects

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tuméfaction parties molles

tuméfaction synoviale (pour fractures articulaires)



# Niveau Liquide/Liquide

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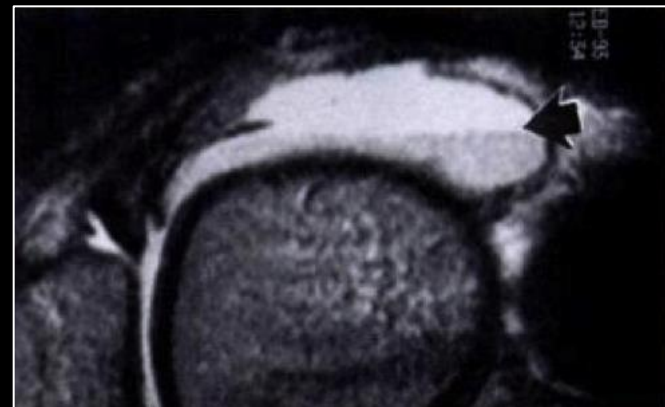
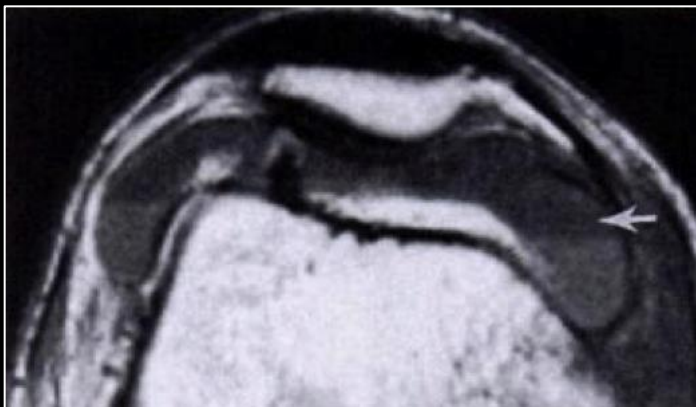
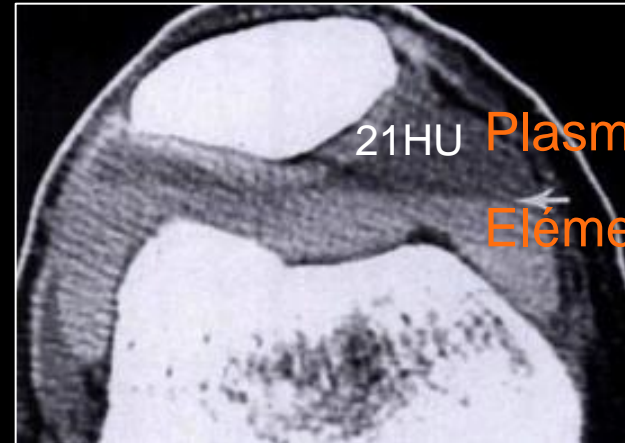
Vue tangentielle



Lugo-Olivieri CH. Radiology. 1996.  
Lee JH. Radiology. 1989.

# Niveau Liquide/Liquide

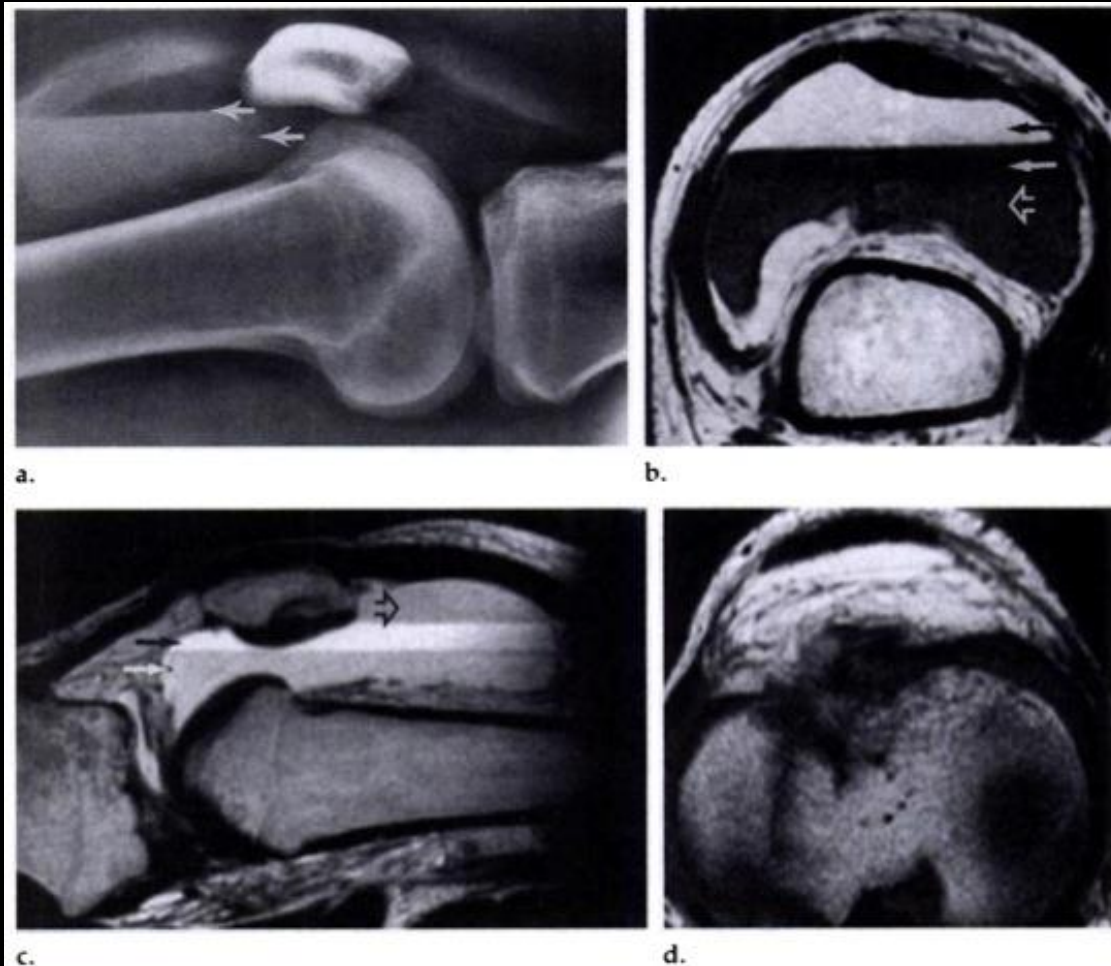
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Lugo-Olivieri CH. Radiology. 1996.

# Niveau Liquide/Liquide

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Double niveau liquide/liquide: LIPOHEMARTHROSE

# DESCRIPTION

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OU?

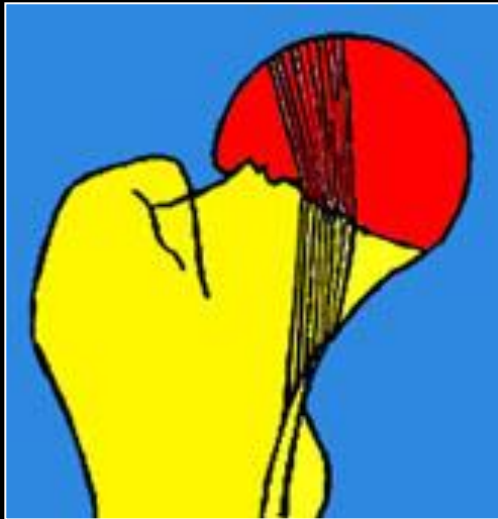
- os long: tiers

# DESCRIPTION

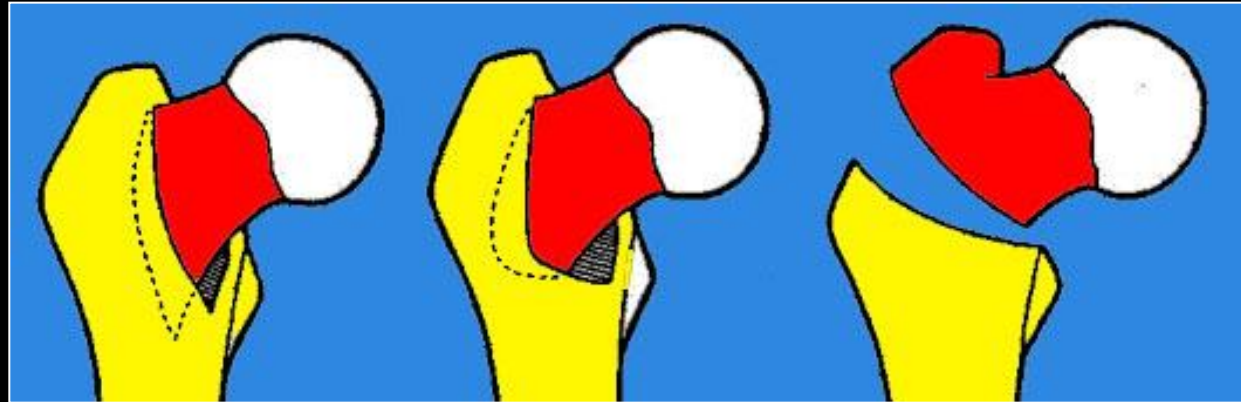
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OU?

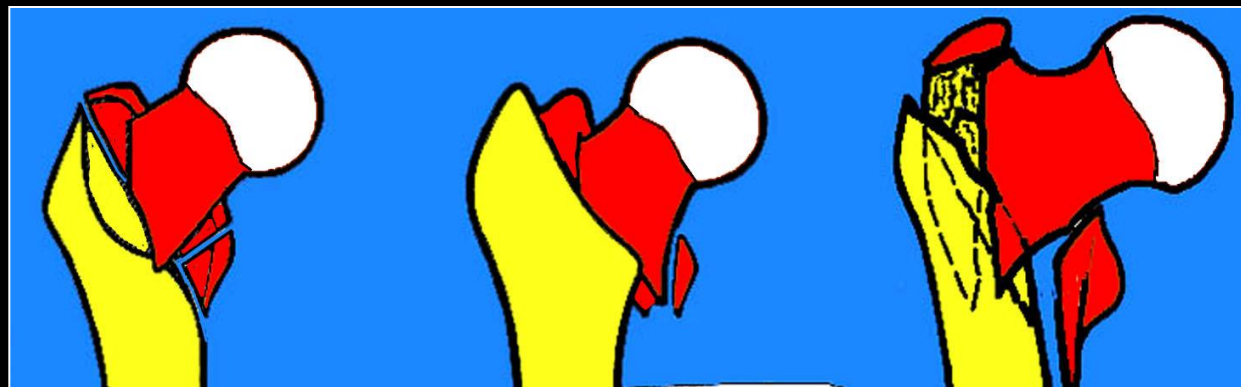
- Terminologie spécifique



## Fractures cervicales



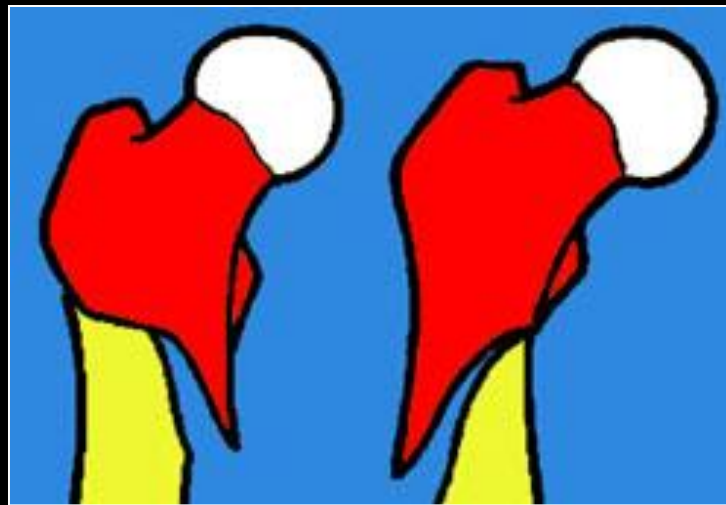
Fractures cervico-trochantérienne



Fractures per trochantériennes



Fractures trochantéro-diaphysaires



Fractures sous trochantériennes



# DESCRIPTION

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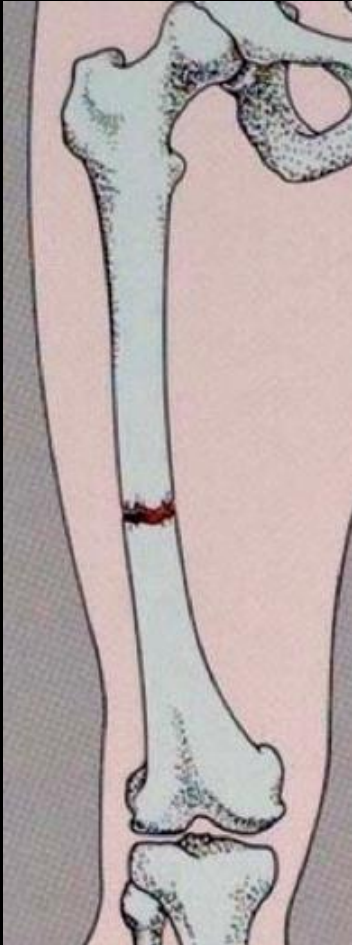
OU?

- Site (tiers)

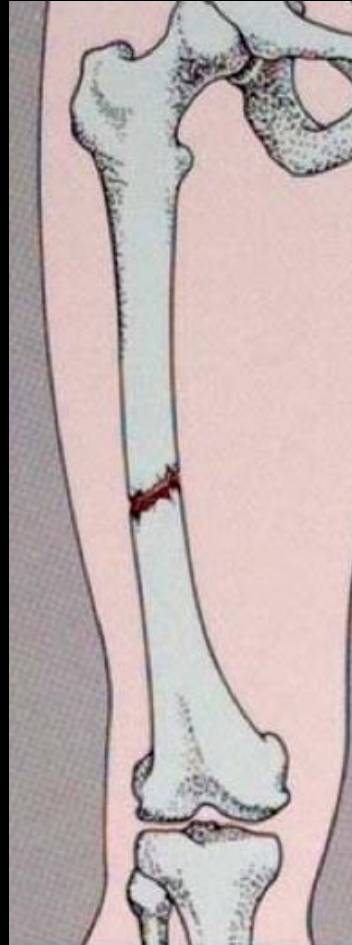
COMMENT?

# COMMENT?

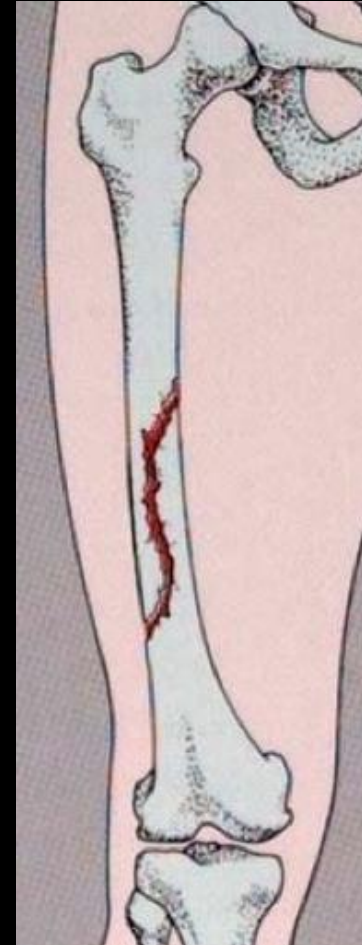
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transverse



oblique



spiroïde

# Description

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OU?

- Site (tiers)

COMMENT?

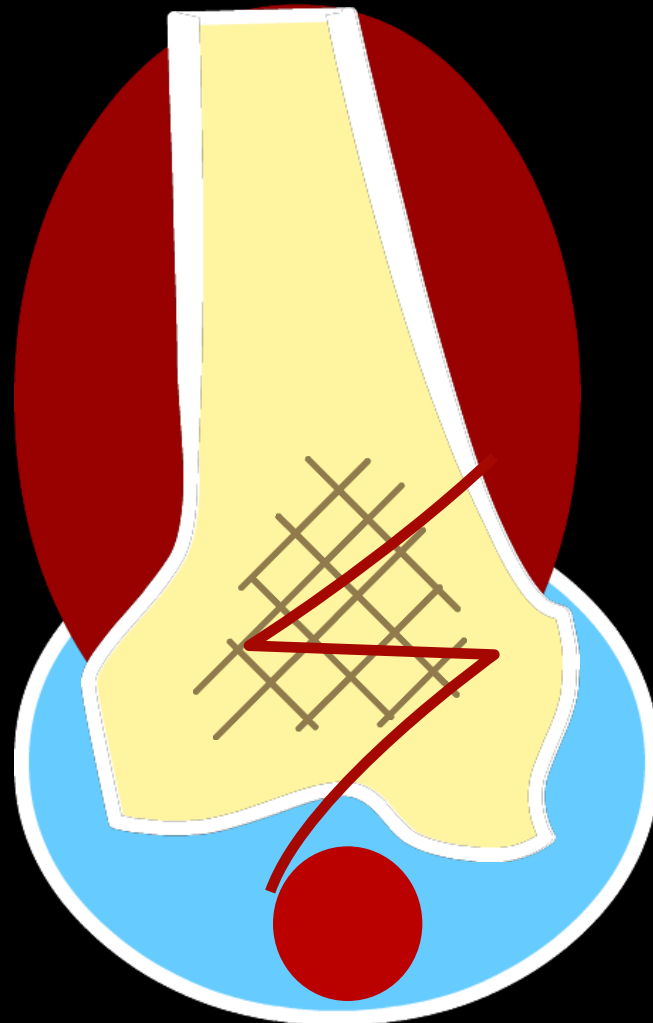
- Fracture transverse/oblique/spiroïde

FACTEURS DE GRAVITE

- **Trait / Fragment articulaire?**

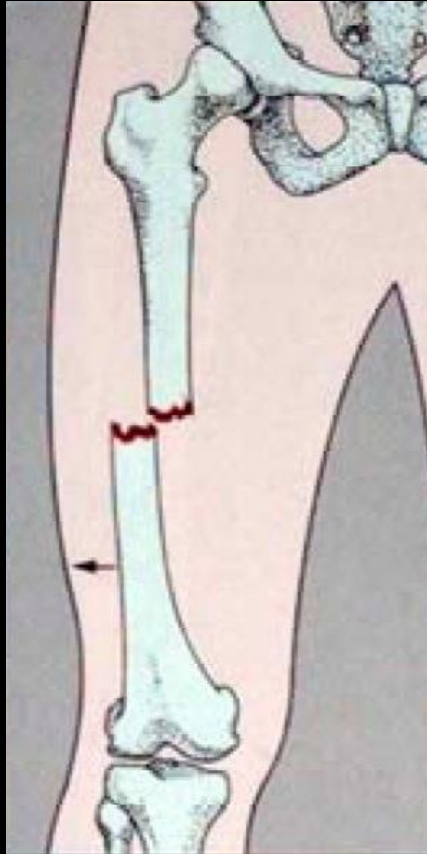
# Fracture articulaire

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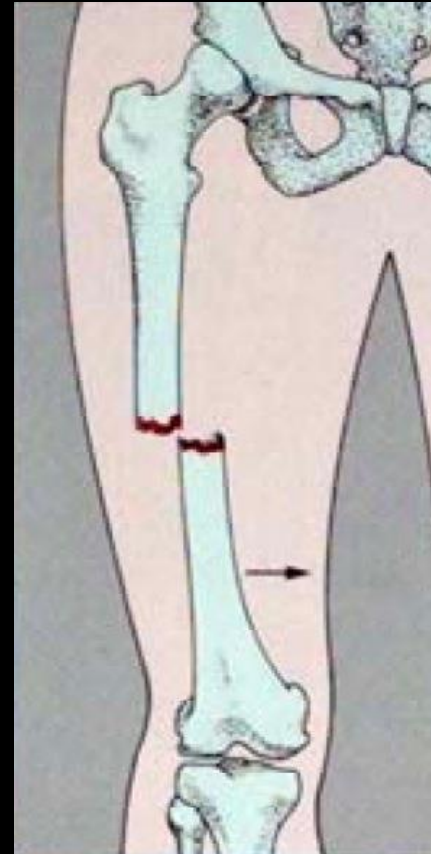


# Déplacement

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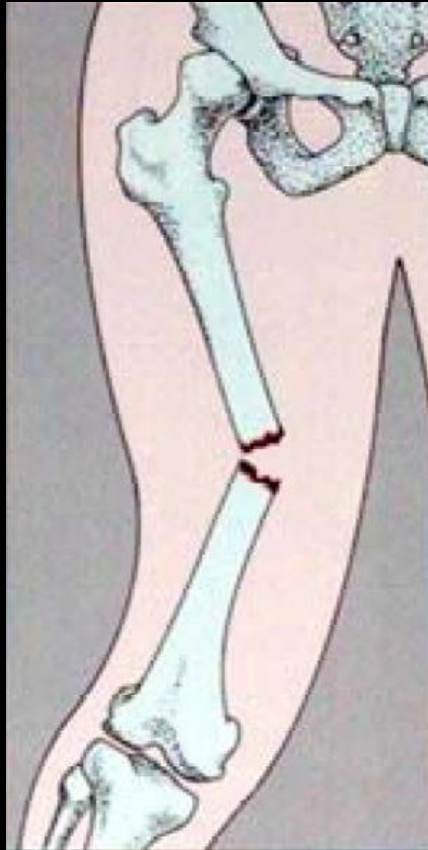
Déplacement latéral



Déplacement médial

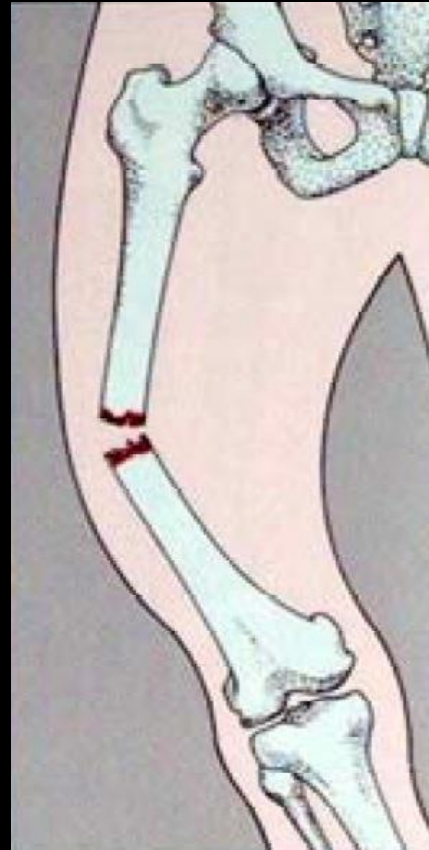
# Angulation

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Angulation latérale de l'extrémité distale

Angulation médiale  
Déformation en Valgus

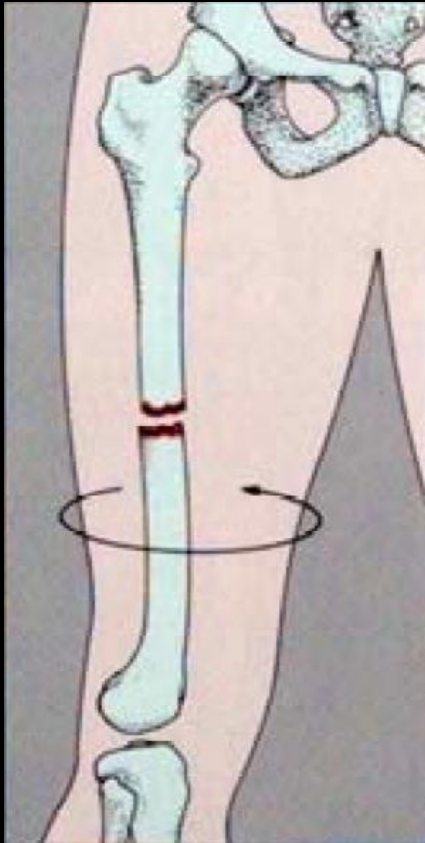


Angulation médiale de l'extrémité distale

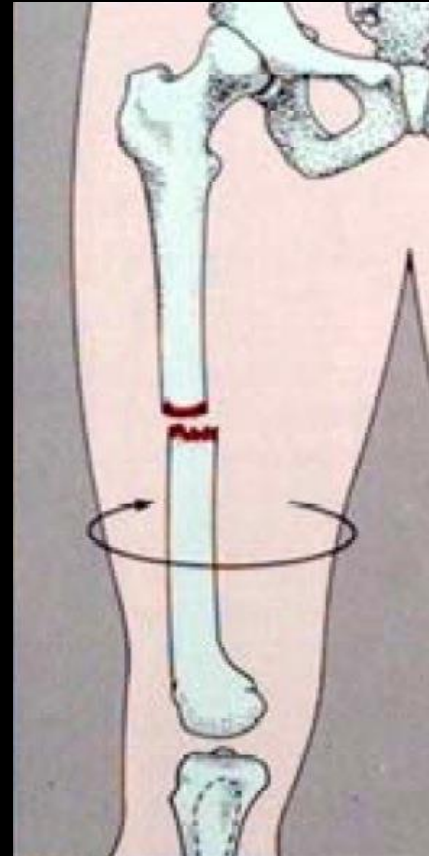
Angulation latérale  
Déformation en Varus

# Rotation

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Rotation interne



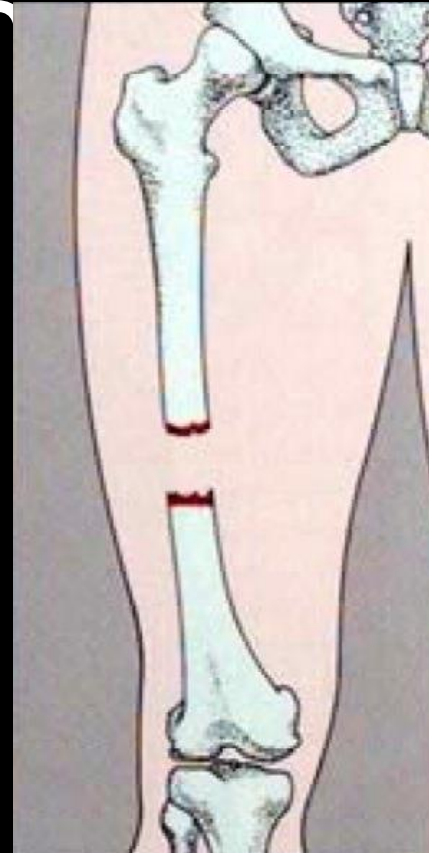
Rotation externe

# Chevauchement/Distrac

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Chevauchement



Distraction



# Diagnostics

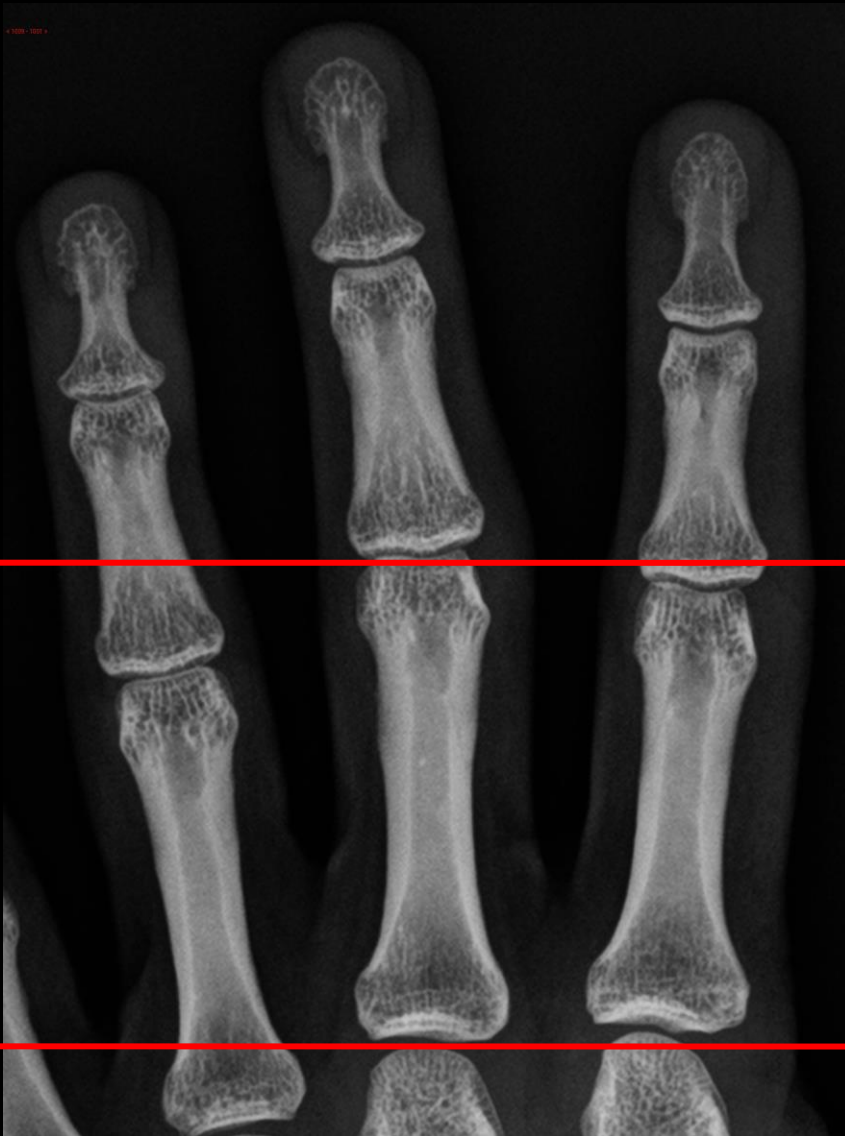
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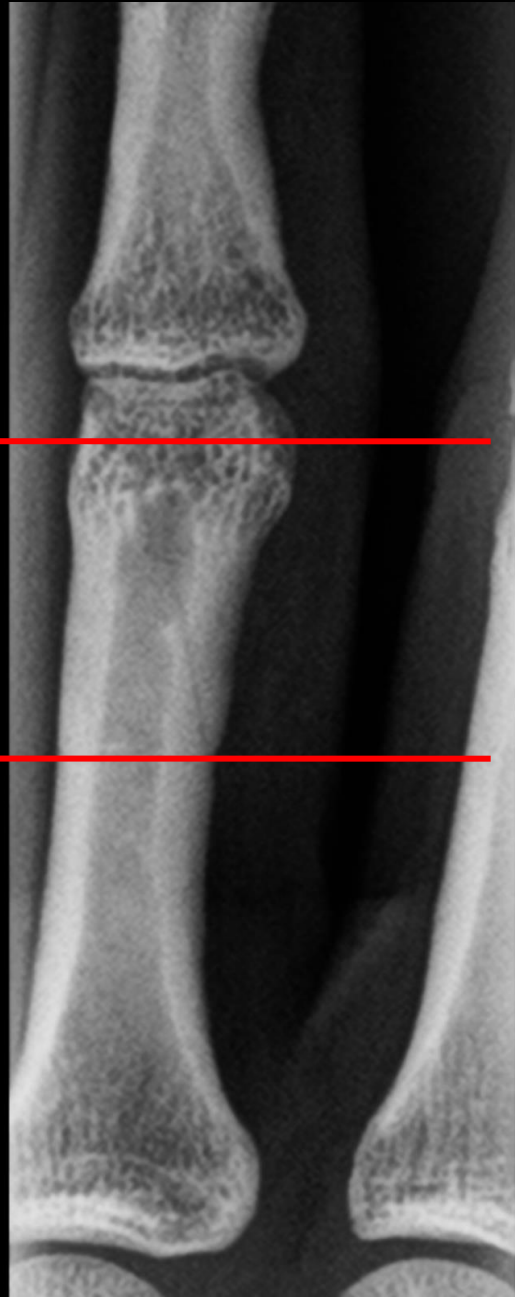
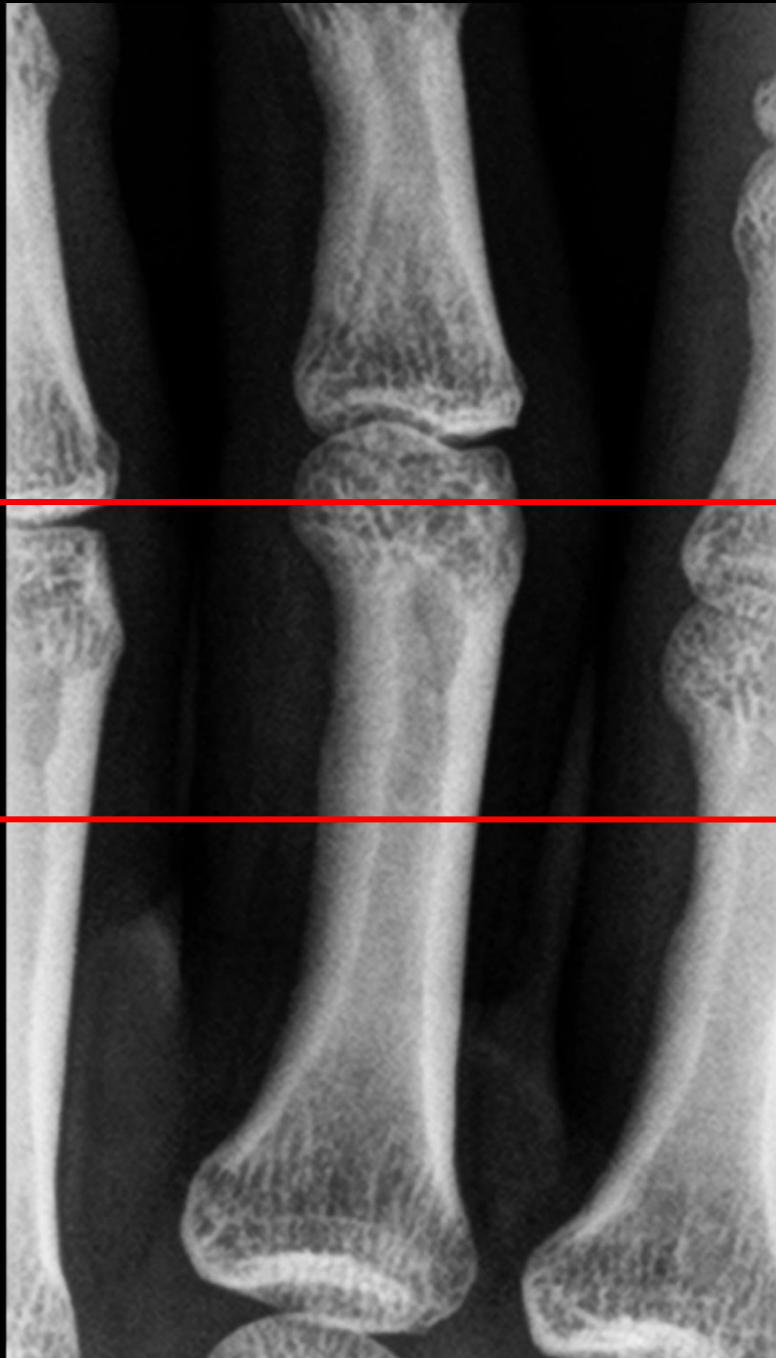
# différentiels/pièges

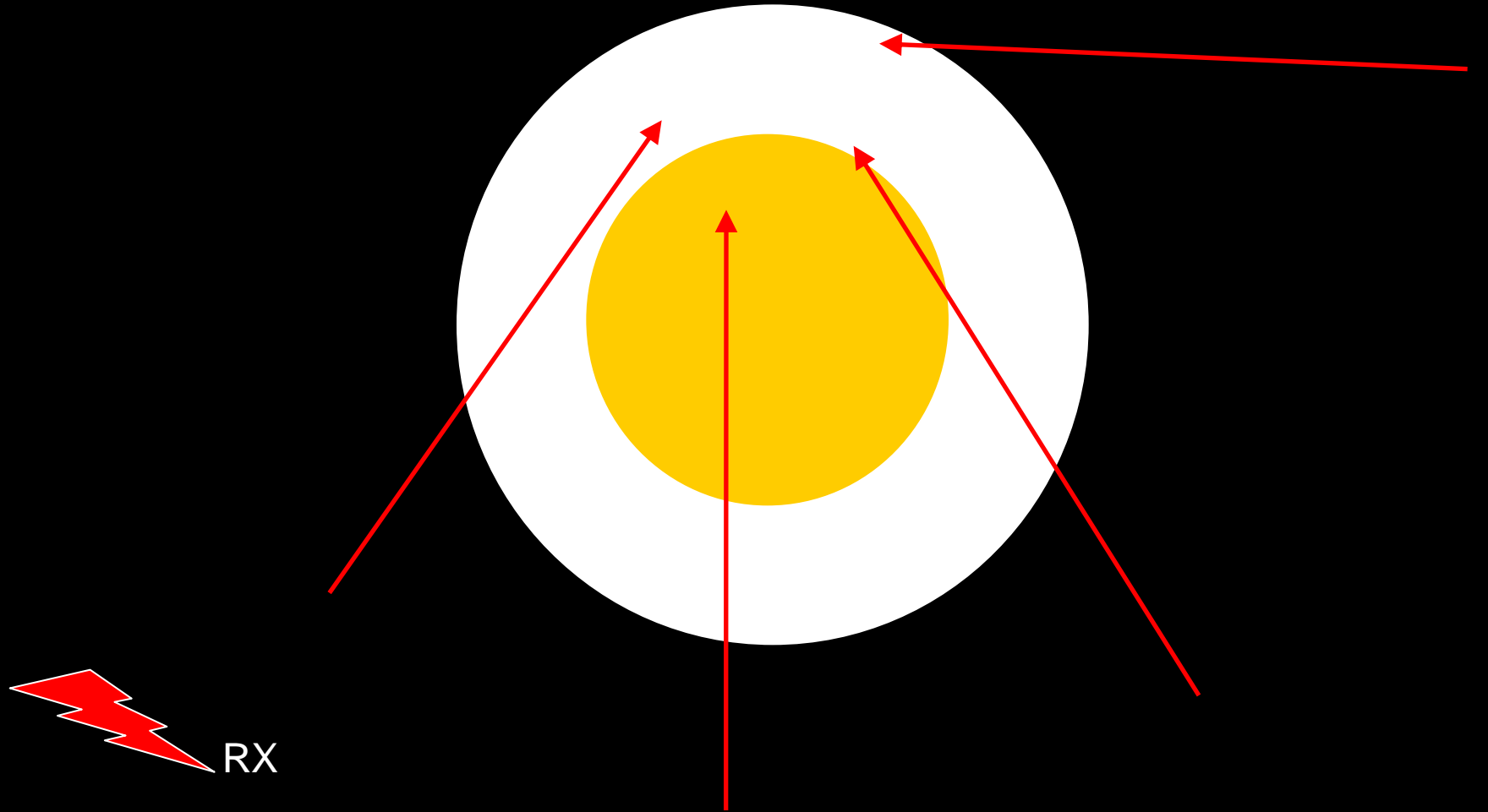
Canal vasculaire

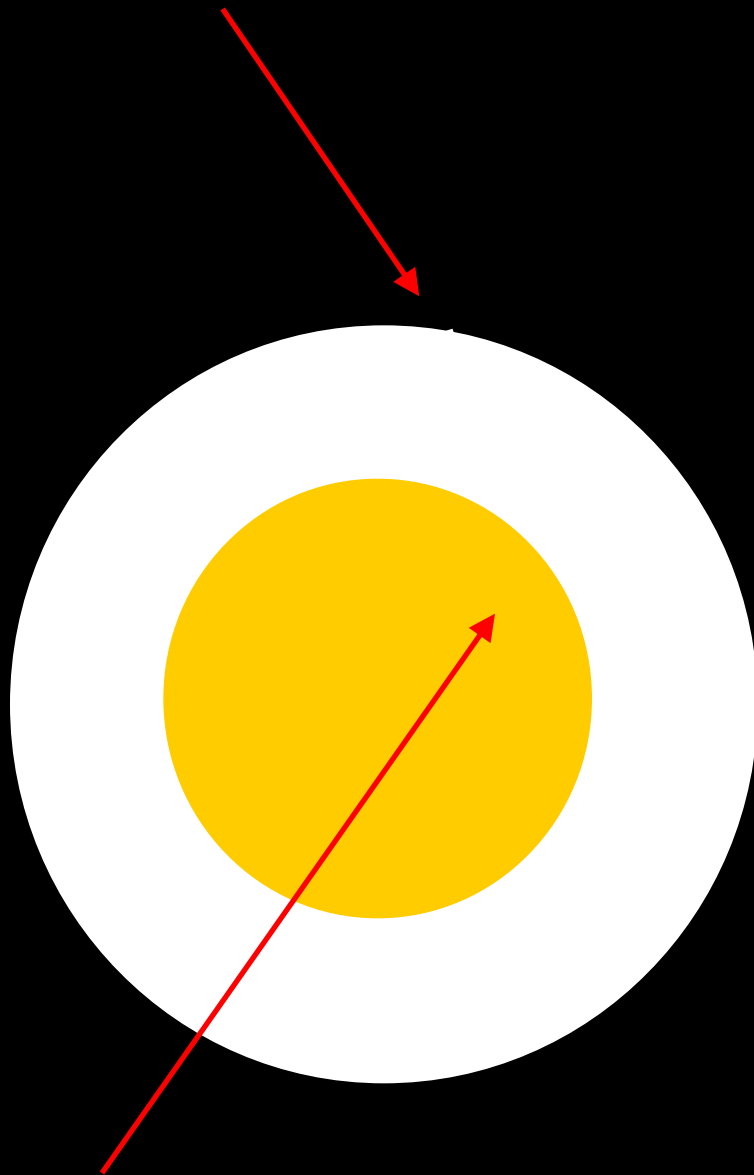


D

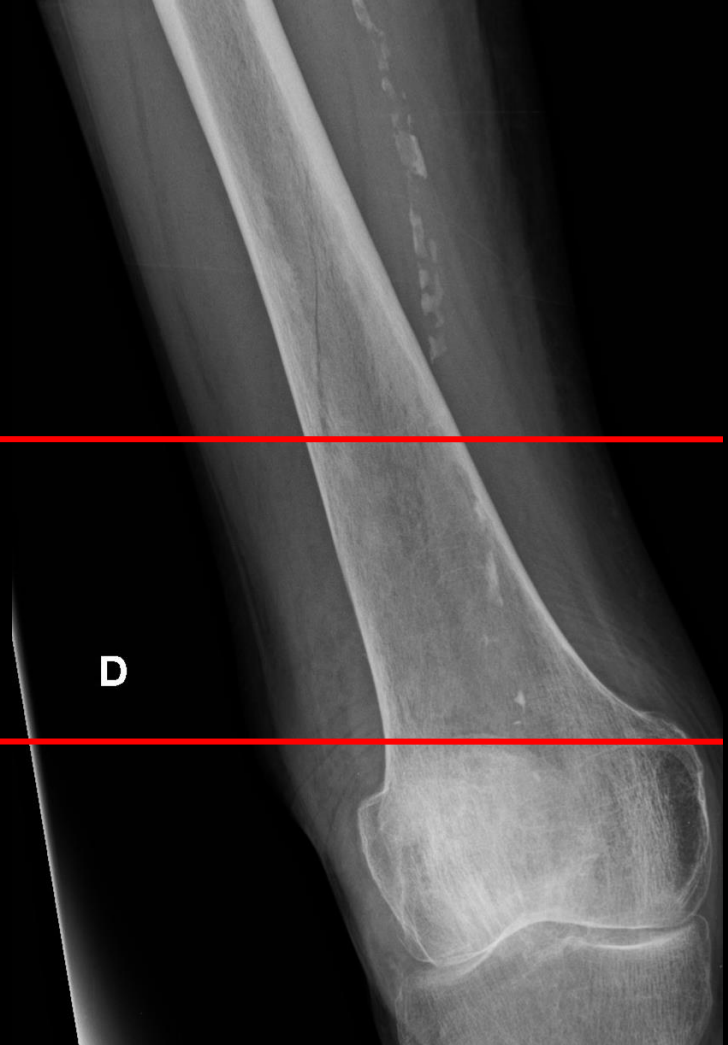






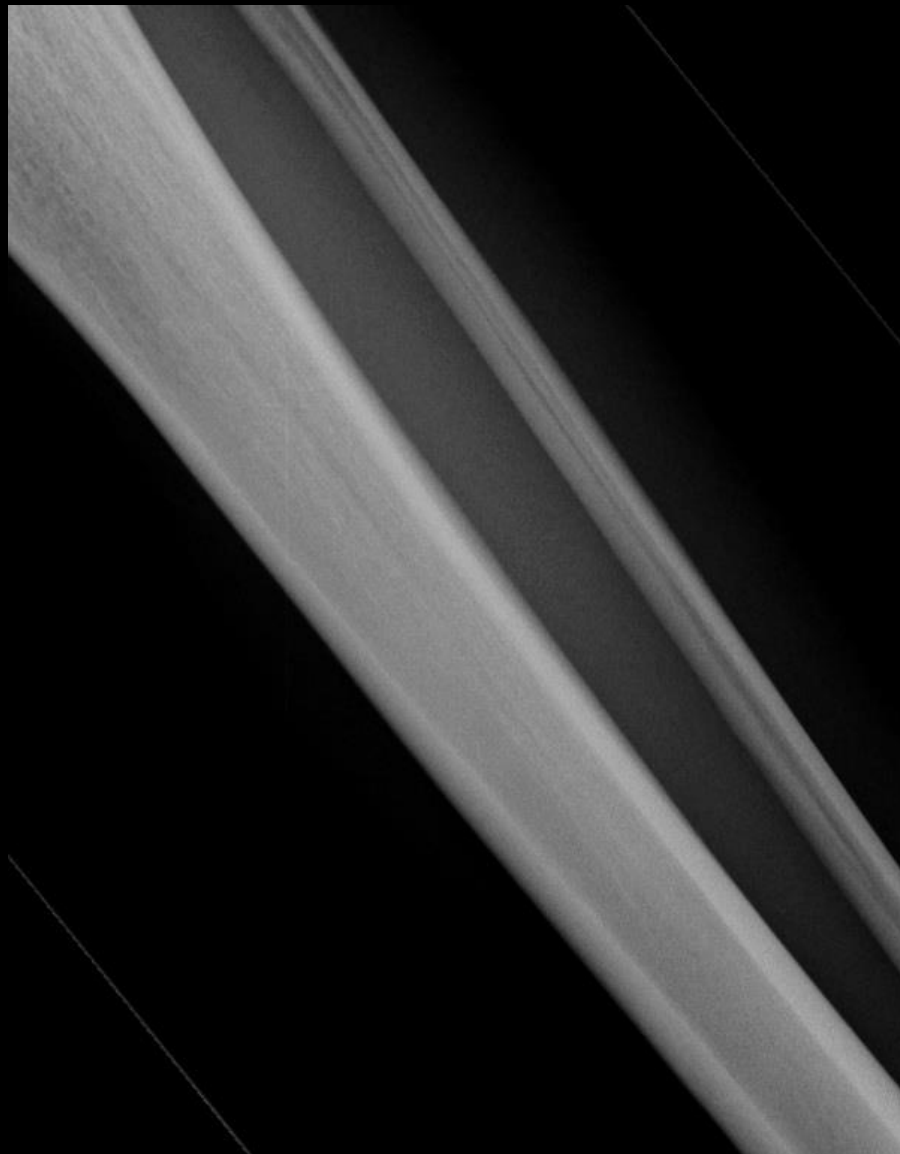


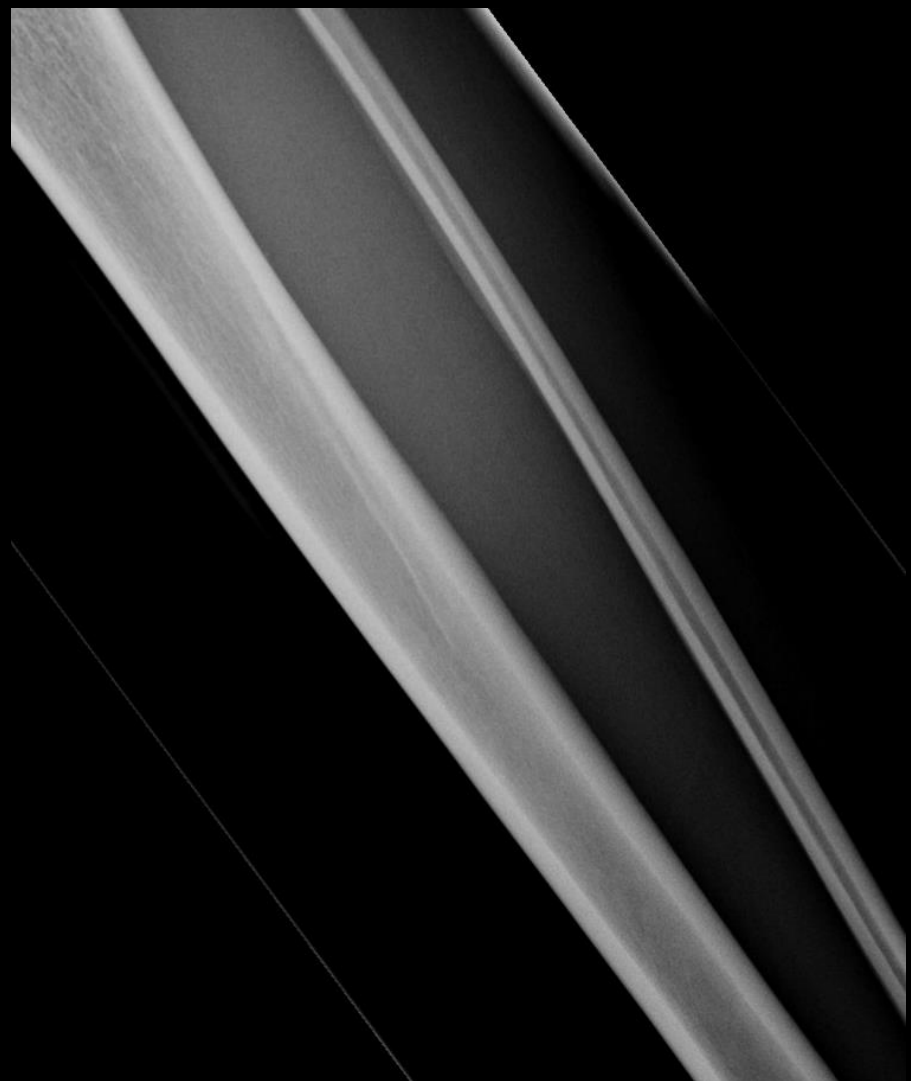
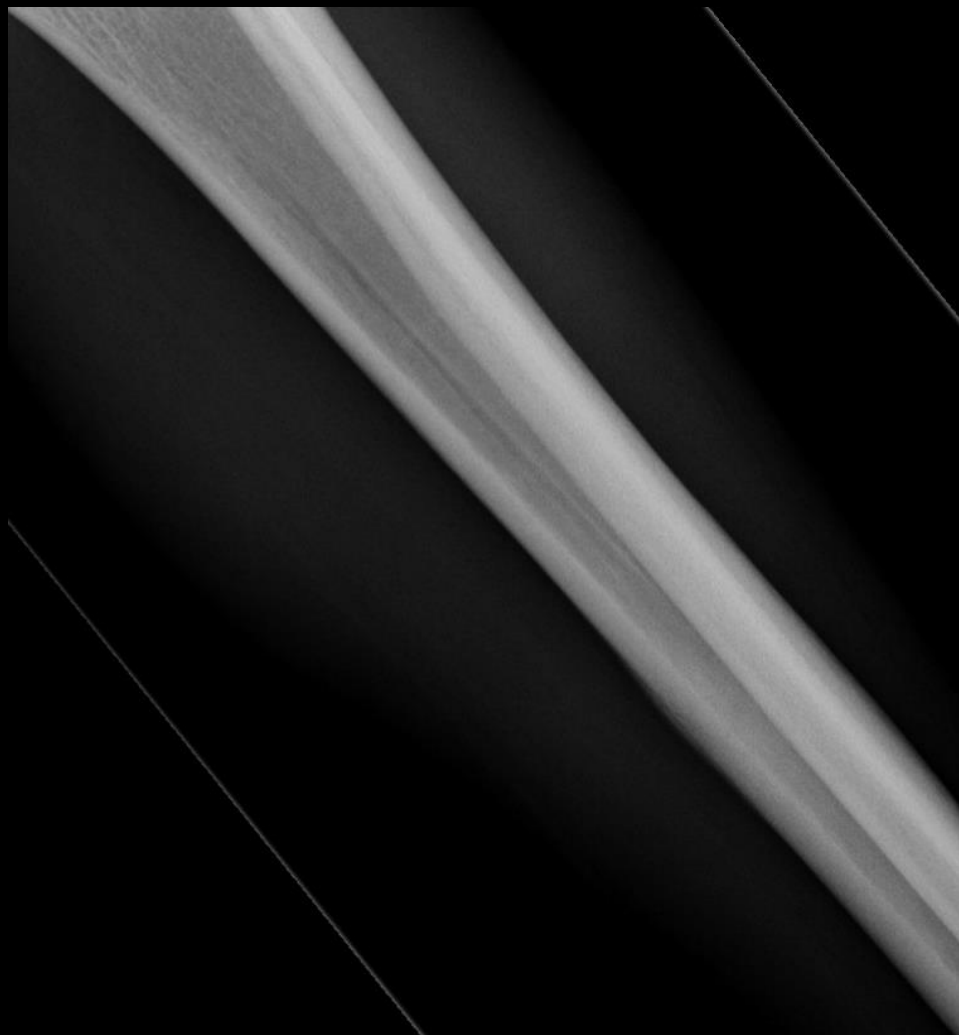






























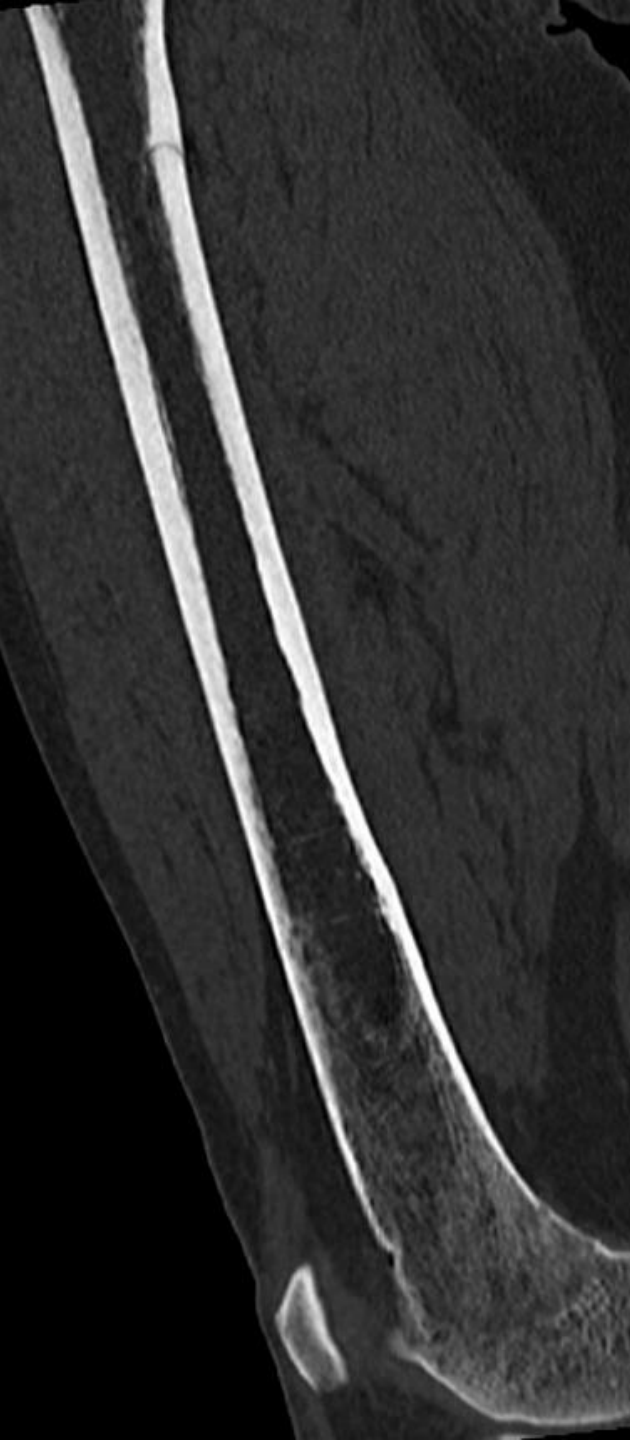


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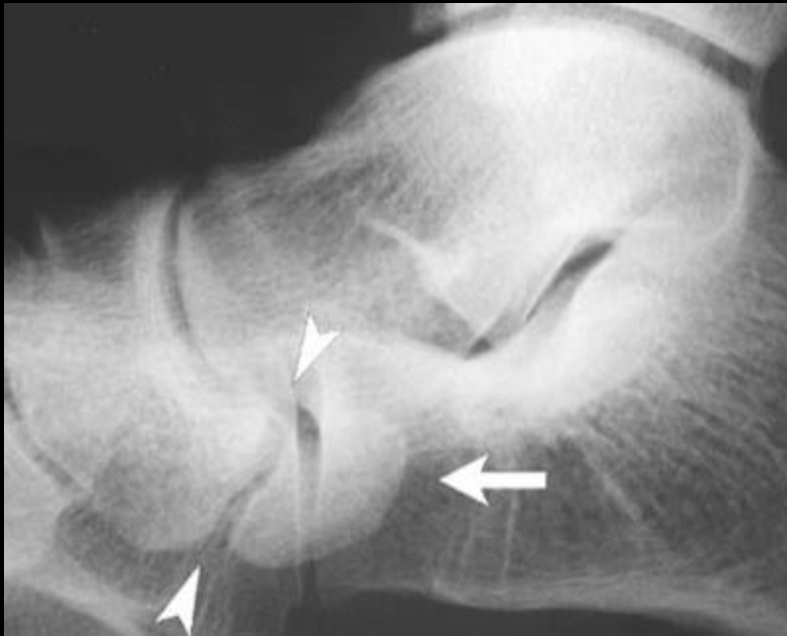
R

L





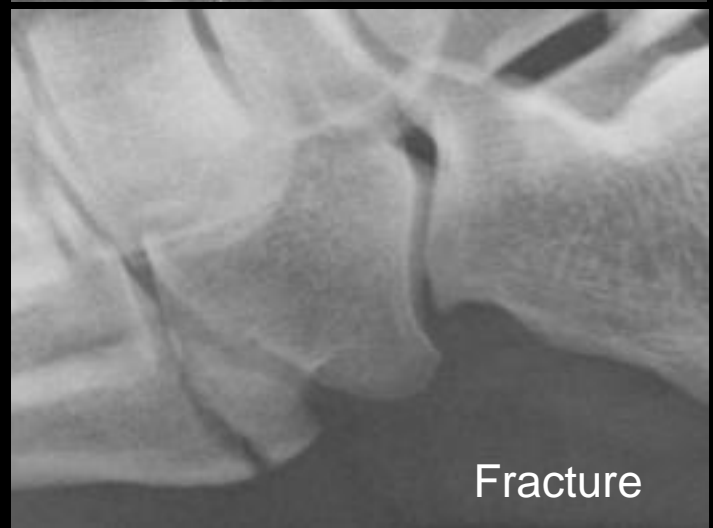
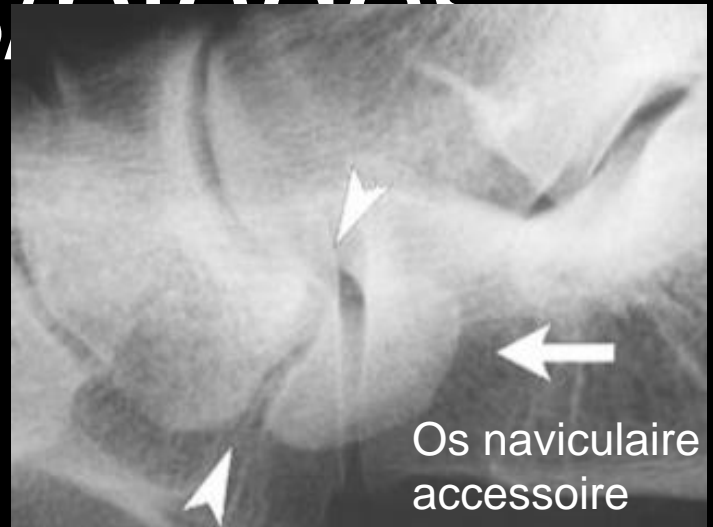
# Diagnostics différentiels/pièges



Mellado JM. Eur Radiol. 2003.  
Ossicules accessoires



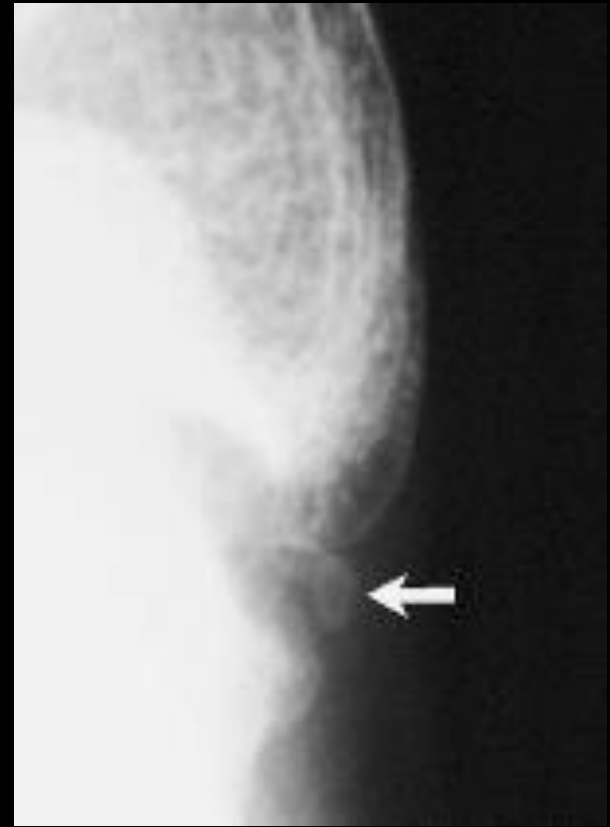
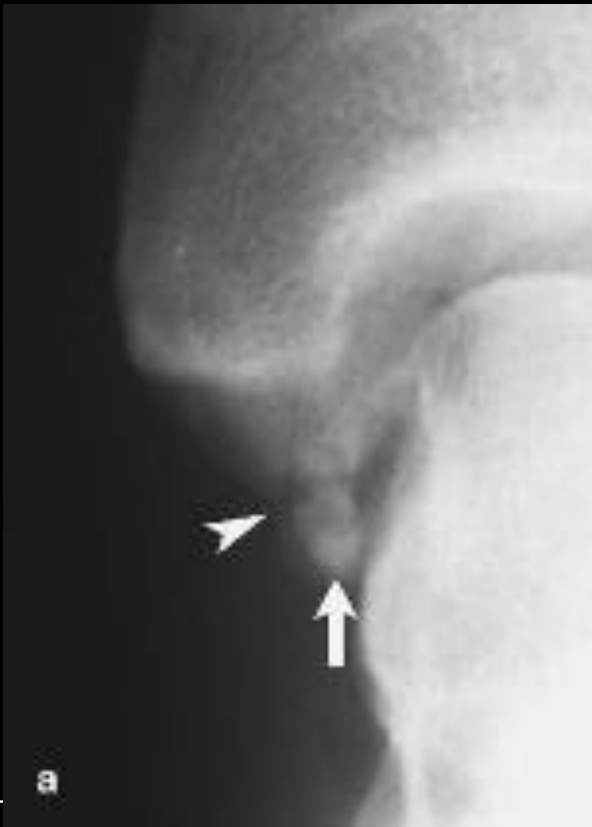
# Diagnostics différentiels/rièges





# Diagnostics différentiels/pièges

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Os subt  
Mellado JM. Eur Radiol. 2003.

# Diagnostics

## • Os acetabulaire différentiels/pièges



# Diagnostics

## différentiels/pièges

- Osteophytes des berges



Dupuis MG. J Radiol. 2007

# Diagnostics

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# différentiels/pièges





**D**



# Diagnostics

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# différentiels/pièges

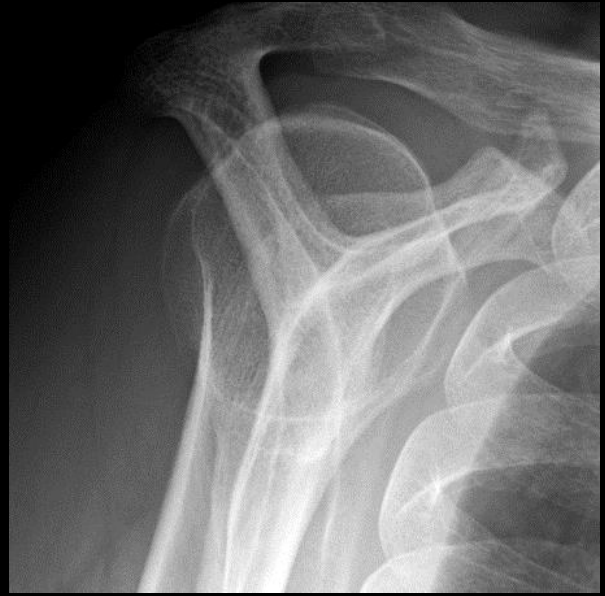
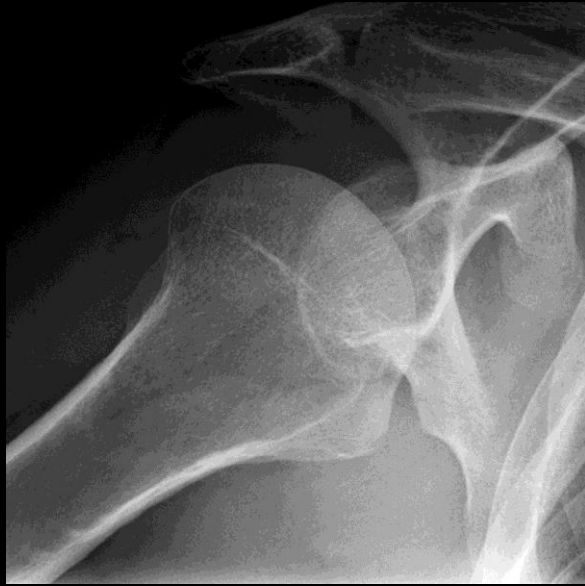


# Diagnostic positif en Rx

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Que faire en cas de doute?

- Aller voir le patient+++
- Faire des incidences complémentaires





# Diagnostic positif en Rx

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Que faire en cas de doute?

- Aller voir le patient+++
- Faire des incidences complémentaires
- Comparatifs pour éliminer les diagnostics différentiels

# CT: quand?

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# Indications CT dans les 24h

## Guide du bon usage des examens d'imagerie médicale

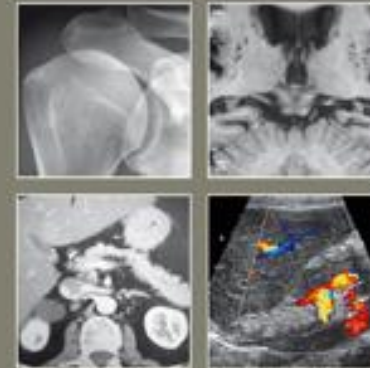
2005

Le **Guide du bon usage des examens d'imagerie médicale** est le fruit d'un travail conjoint de la Société Française de Radiologie (SFR) et de la Société Française de Biophysique et de Médecine Nucléaire (SFBMN), en collaboration avec de nombreux partenaires représentant des sociétés savantes et professionnelles et des Collèges nationaux des enseignants listés dans ce guide.

Ce guide a été rédigé en concertation et avec le soutien de la Direction Générale de la Sécurité Nucléaire et de la Radioprotection (DGSNR) et de l'Agence Nationale d'Accréditation et d'Évaluation en Santé (ANAES).

Ce guide de recommandations est destiné à tous les professionnels de santé.

Société Française de Radiologie



Guide pratique

à l'usage des **MÉDECINS RADIOLOGUES**

POUR L'ÉVALUATION DE LEURS PRATIQUES PROFESSIONNELLES



# Indications CT dans les 24h

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**Epaule**, coude, extrémité distale avant-bras (Pouteau-Colles): difficulté d'interprétation ou incidence sur le choix thérapeutique. difficulté d'interprétation ou incidence sur le choix thérapeutique.

Carpe: si suspicion atteinte scaphoïde et bilan Rx négatif, sinon, Rx à J10

**Bassin**: scanner "facile" dans les 4h au moindre doute.

**Col du fémur**: si discordance radio-clinique

Genou: discordance radio-clinique ou incidence sur le choix thérapeutique

Cheville: si incidence sur le choix thérapeutique

# CT: quand?

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Forte **suspicion clinique** mais **radiographies négatives**

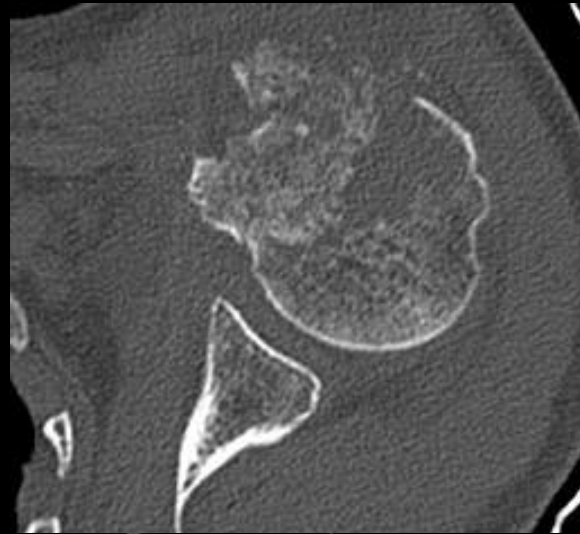
Radiographies positives mais **anatomie complexe**: bilan pré-thérapeutique  
(épaule, bassin, cheville, pied)

**Structures fonctionnellement importantes**

Préciser:

# CT

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15/09/2008



16/09/2008



# IRM: quand?

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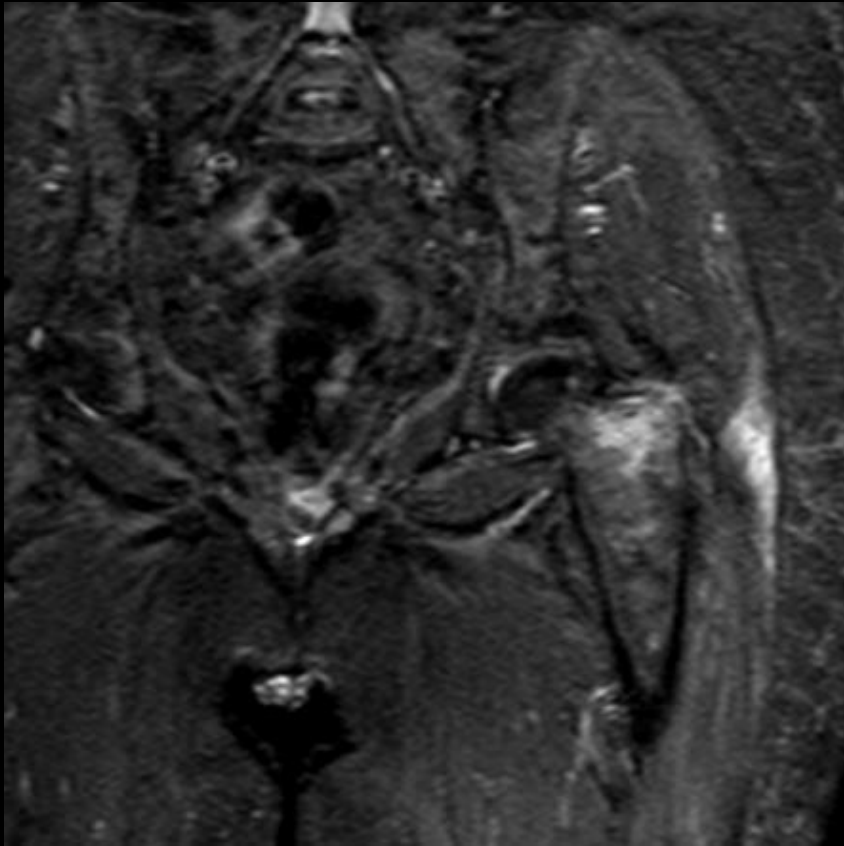
	Rx	CT	IRM	US
Os cortical	++	+++	-	++
Os trabéculaire	+	++	-	-
Médullaire	+-	+	+++	-
Parties molles	+	++	+++	++

À la place du CT à chaque fois que disponible.

La technique la plus sensible.

# IRM: quand?

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## 2 questions à se poser une fois le diagnostic fait

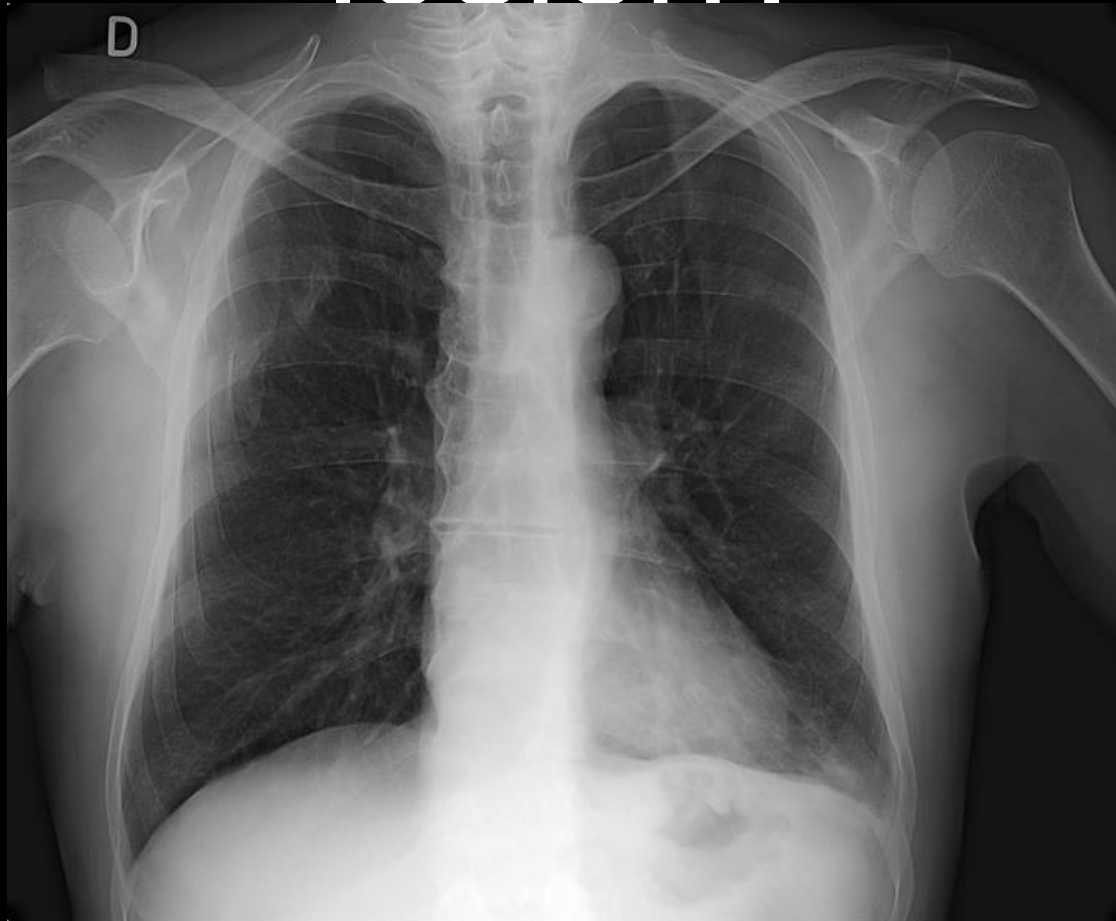
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1. Y a-t-il une autre fracture?

2. Pourquoi est-ce que cela a cessé

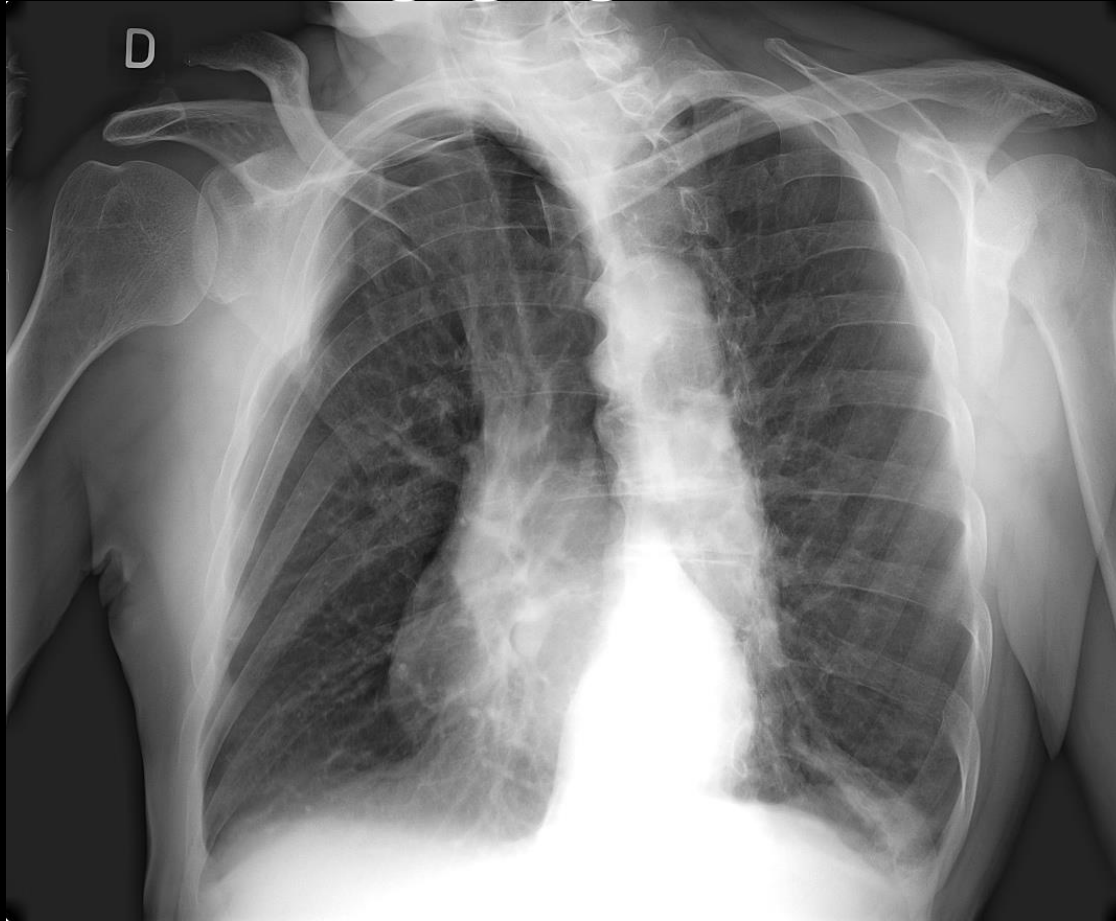
# Y a-t-il une autre lésion?

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# Y a-t-il une autre lésion?

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# Y a-t-il une autre lésion?

---



Non visible sur la Rx





D



Pourquoi est-ce que  

---

cela a cassé?



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D



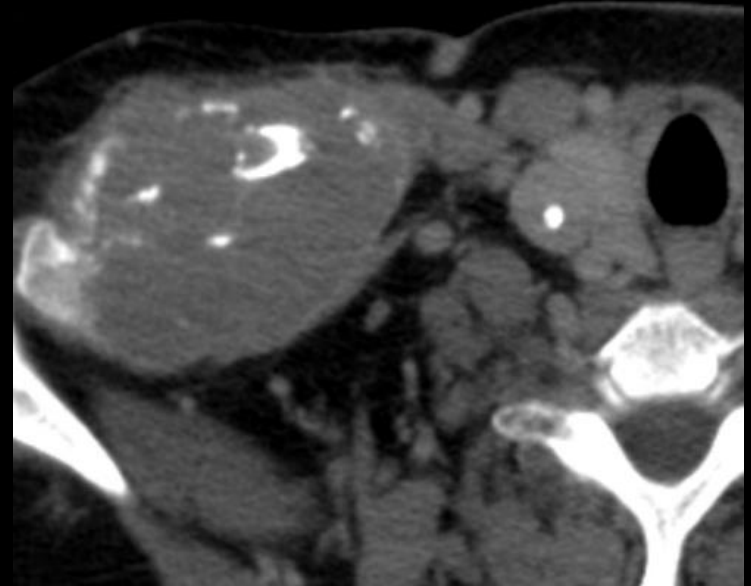
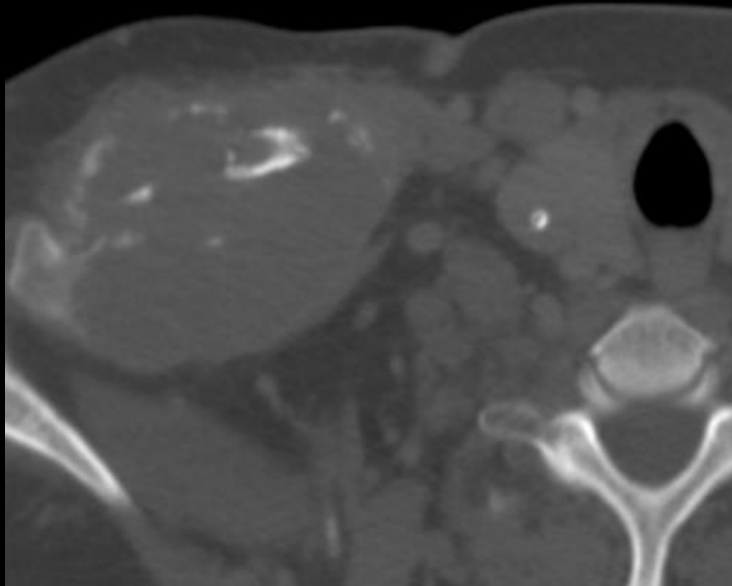
24/05/2010



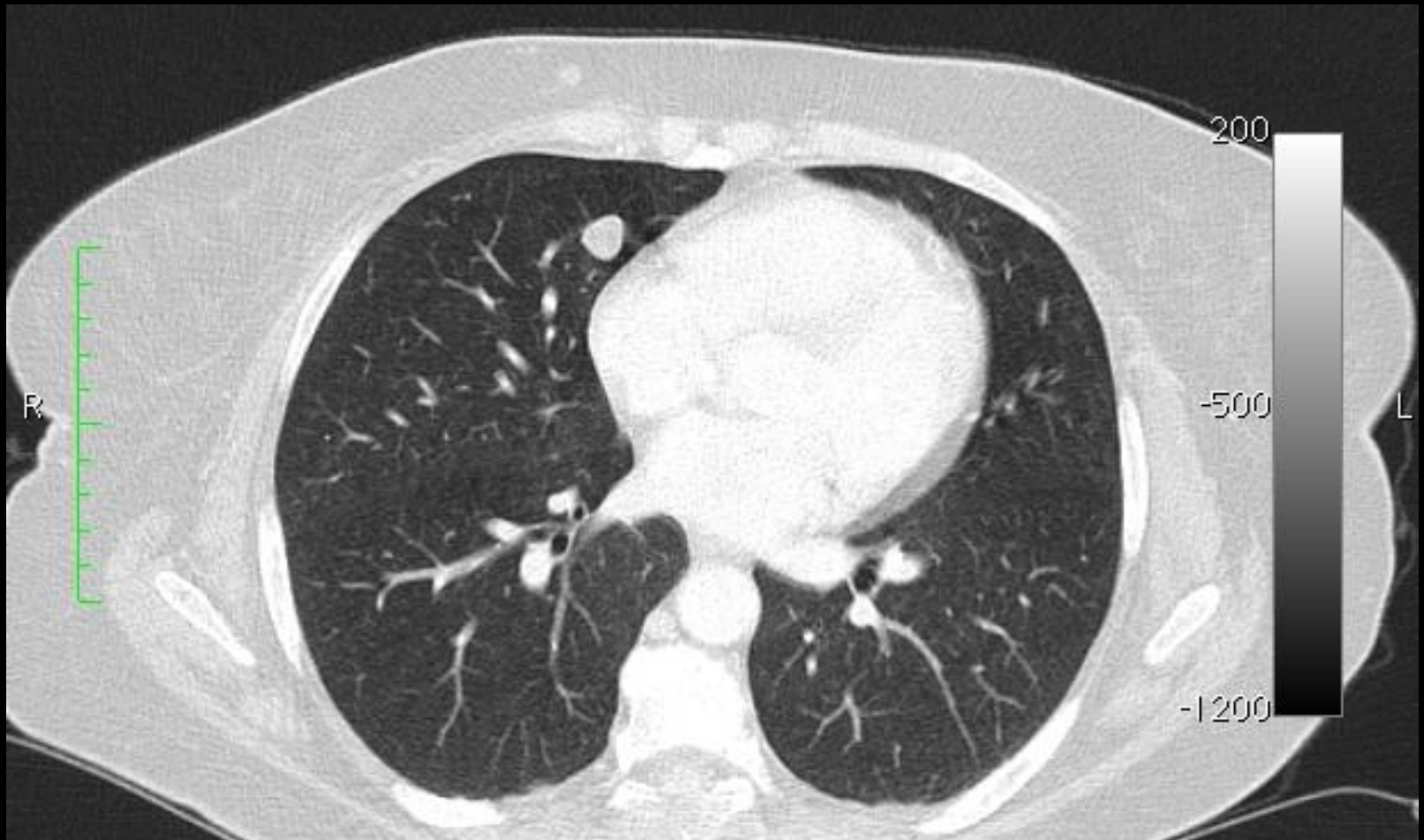
17/06/2010



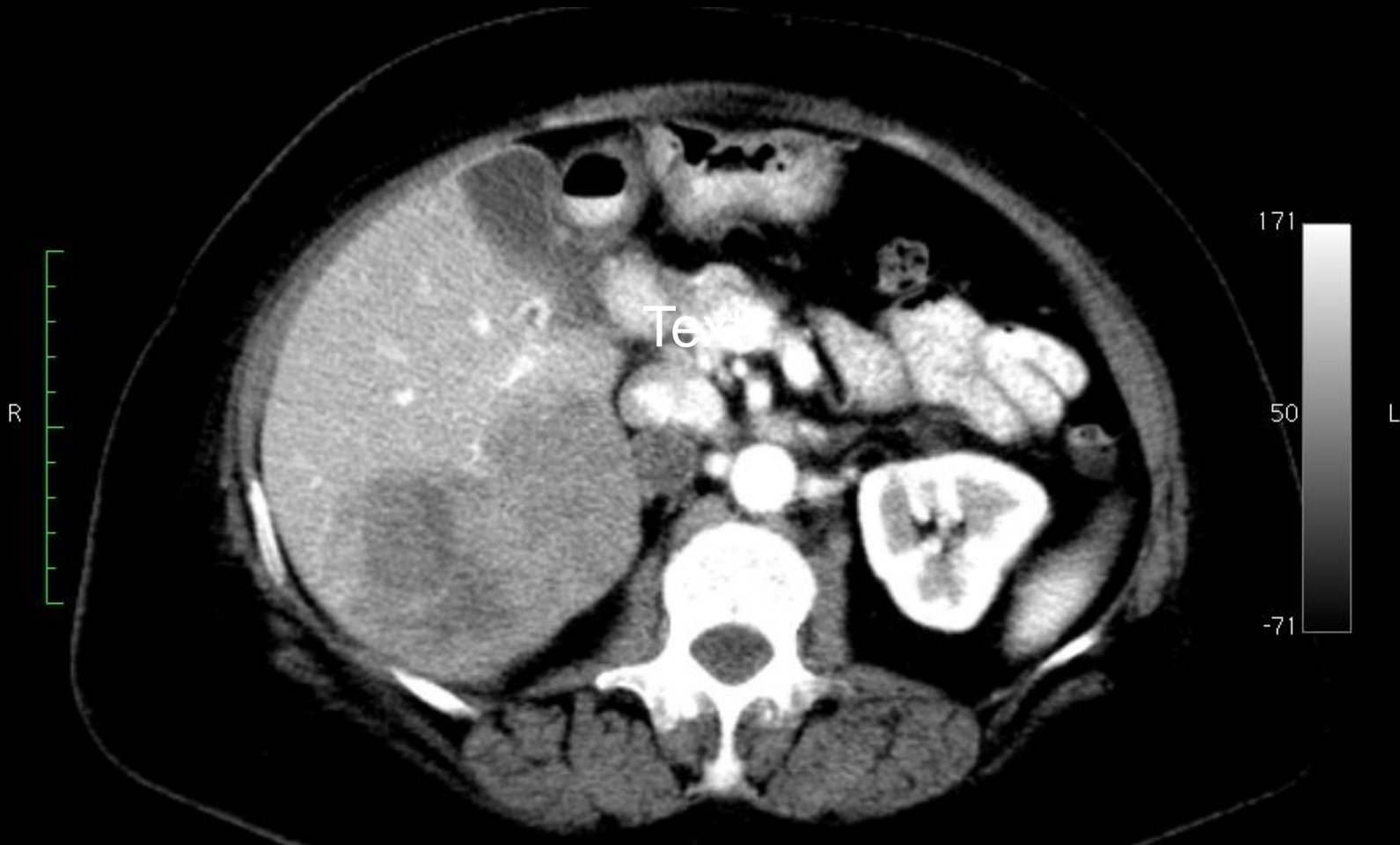
29/07/2010



02/08/2010



02/08/2010



02/08/2010

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D



Mélanome multimétastatique

# Fracture pathologique: y penser devant...

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Clinique: Fracture par traumatisme minime, symptomatologie douloureuse pré-existante

Rx:

- Lyse osseuse autour du foyer de fracture.
- Réaction périostée précoce (préexistante)



# Fractures d'insuffisance: Métabolisme osseux

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Ostéoporose

Ostéomalacie

Ostéodystrophie rénale

Paget



Goh S. JBJS. 2007

# CONCLUSION

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- *Analyse systématique*
- *Aller voir le patient+++*
- Faire des incidences complémentaires
- Comparatifs pour éliminer les diagnostics différentiels
- Autre technique: CT/ IRM/ US/ Scinti
- Suivi à J10-15

# TRAUMATISMES DU SQUELETTE APPENDICULAIRE

Patrick Omoumi  
Bruno Vande Berg  
*Cliniques Universitaires St Luc*

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