

DES
2018



IRM du cartilage au quotidien

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CLINIQUES UNIVERSITAIRES SAINT-LUC



Objectifs

- Physio-anatomie du cartilage normal et pathologique
- IRM du cartilage normal et variantes
- IRM des chondropathies
- Le compte-rendu

Nous ne verrons pas

- Histoire naturelle des chondropathies
- Modifications sous-chondrales
- Suivi thérapeutique
- Imagerie quantitative
- Recherche

A visée éducative

Correlations IRM vs arthro-CT

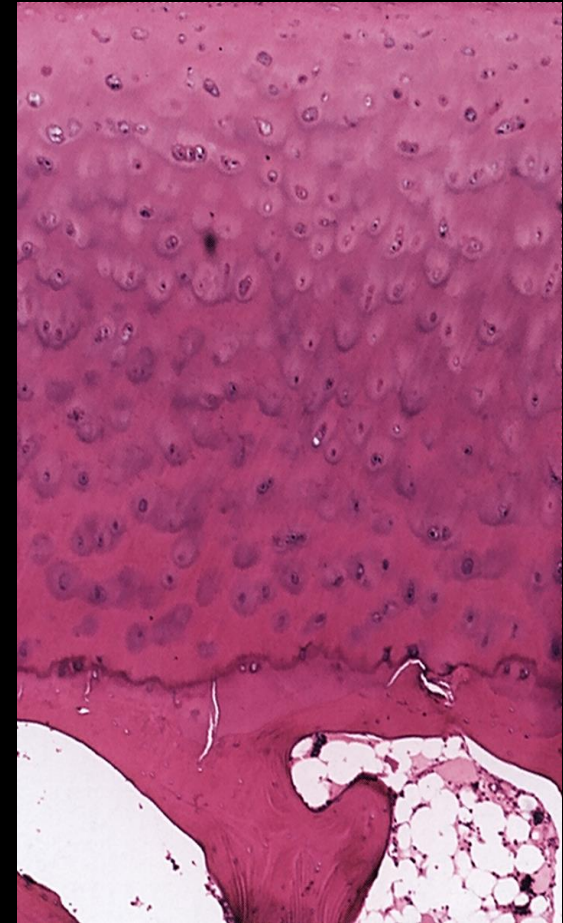
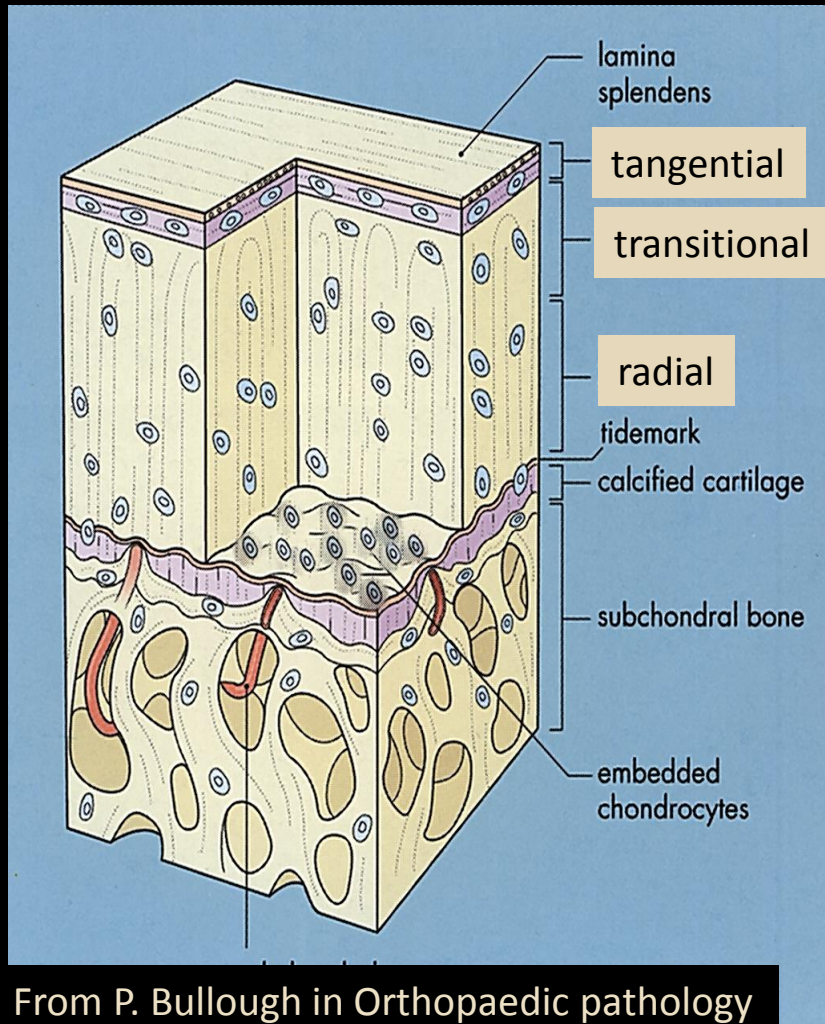
A la fin de cette présentation, vous devriez

- Utiliser les bonnes séquences
- Comprendre IRM des chondropathies
- Pouvoir élaborer un compte-rendu adéquat
- Reconnaître les limites de l'IRM

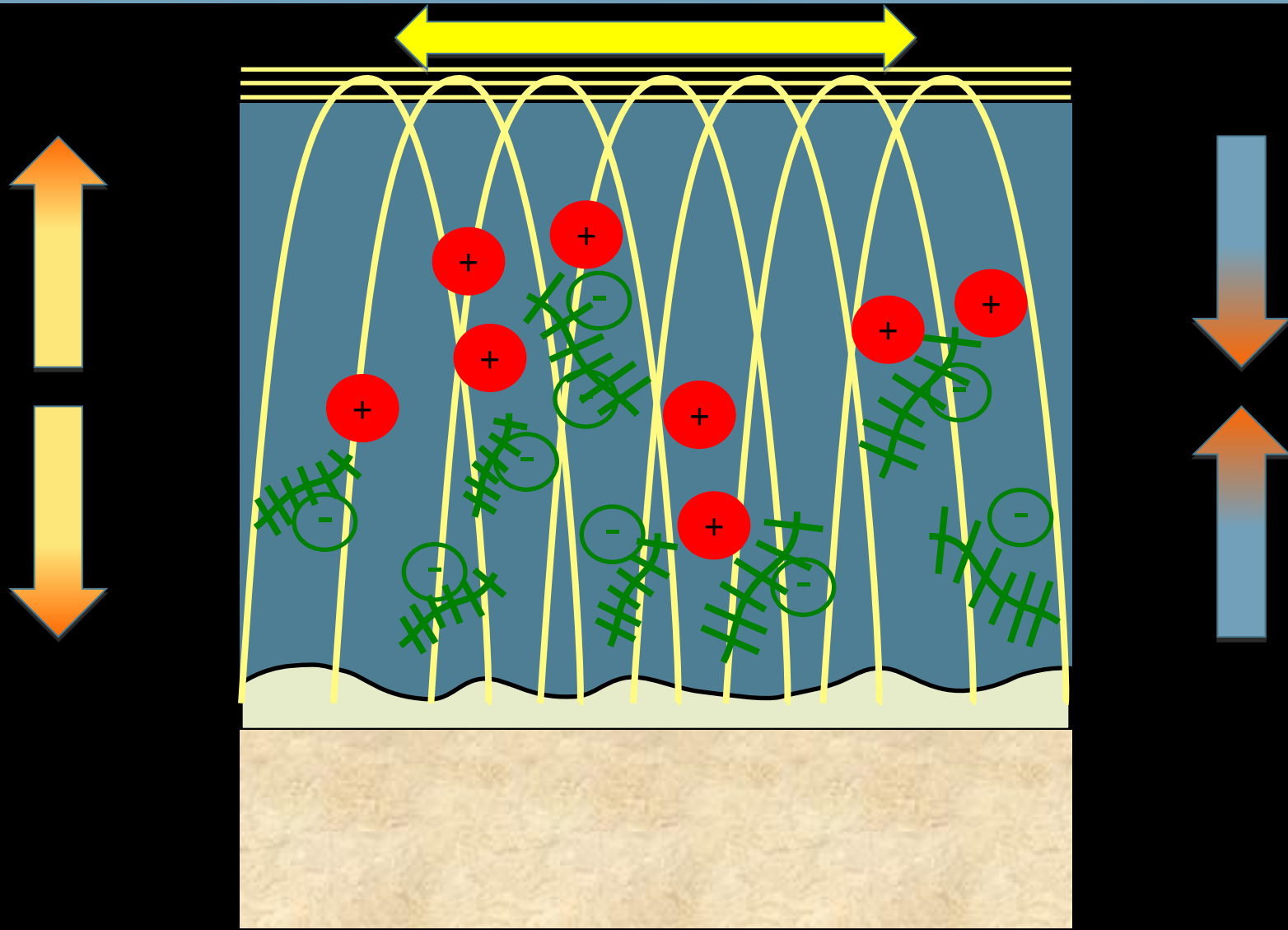


1. Cartilage normal

Cartilage hyalin: tissu conjonctif très complexe
composition (PG, collagen..)
Organisation interne
degré d'hydratation

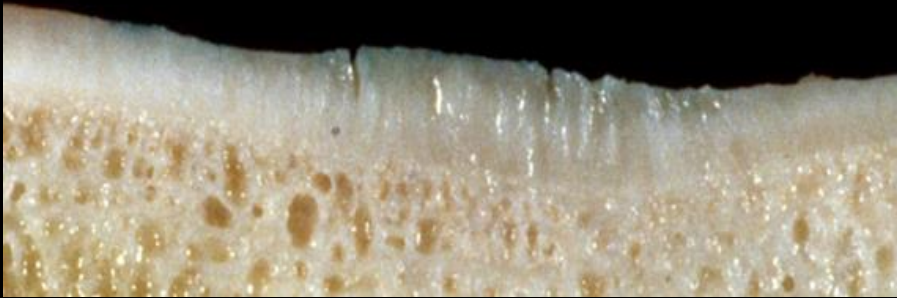


Composition et architecture

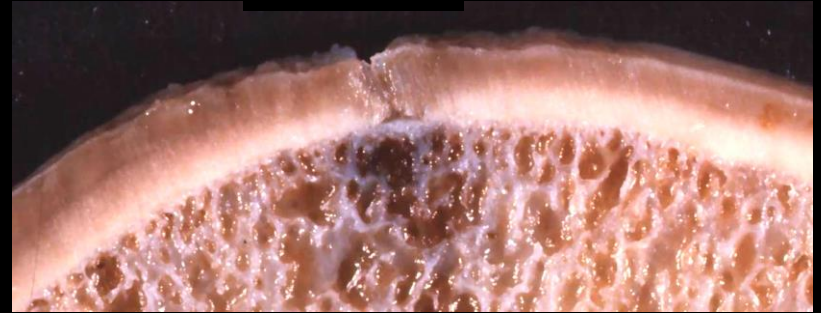


Chondropathies ouvertes

Fibrillations (chair de crabe)



Fissure



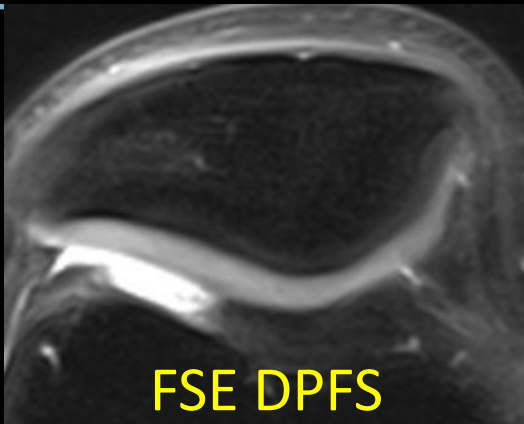
Ulcération superficielle





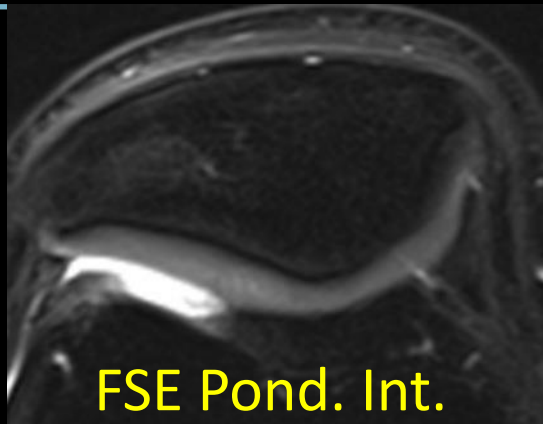
2. IRM cartilage normal

Quelle pondération? (quel TE?)



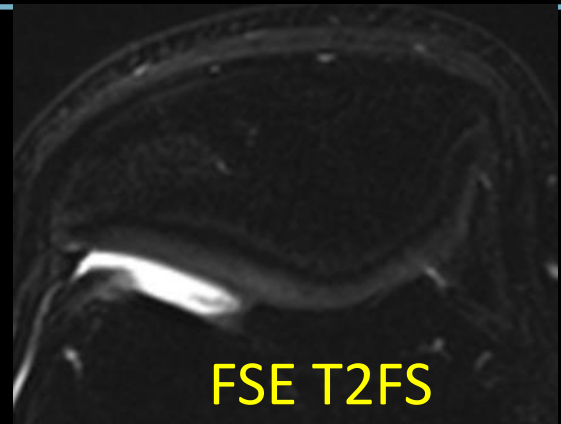
FSE DPFS

$TE=10ms$



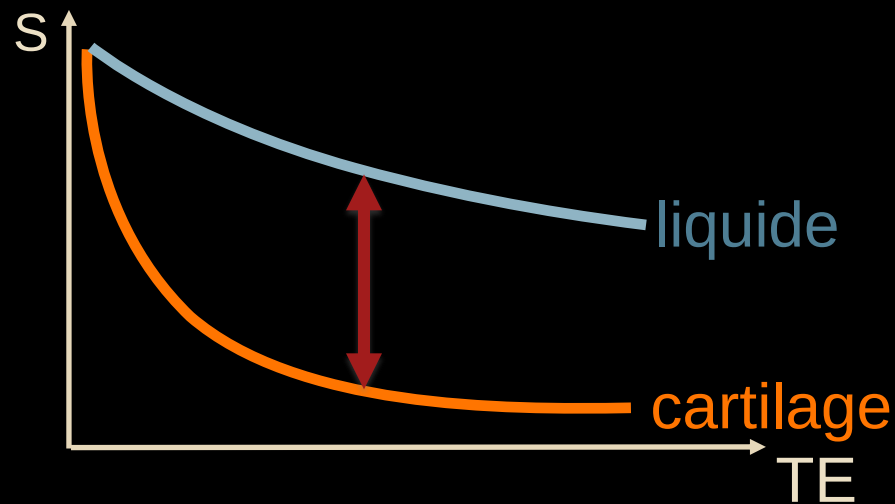
FSE Pond. Int.

$TE=35ms$

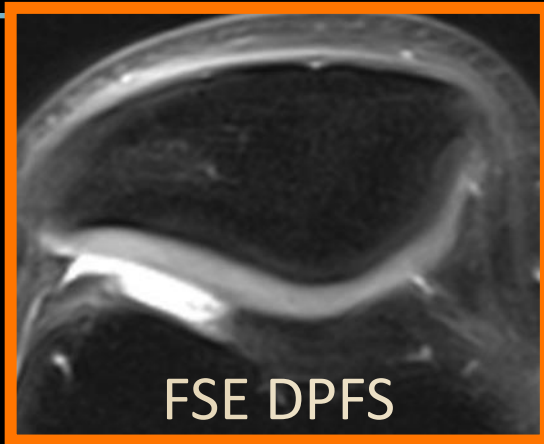


FSE T2FS

$TE=80ms$

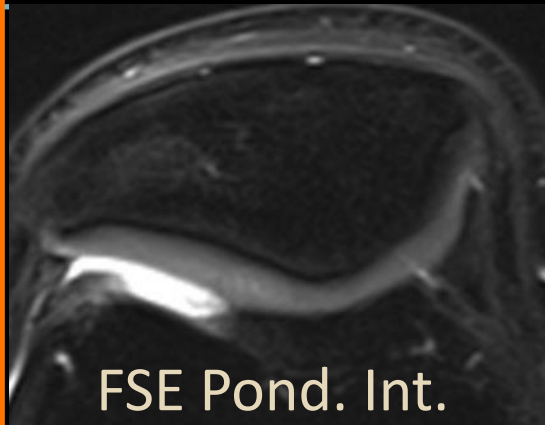


Quelle pondération? (quel TE?)



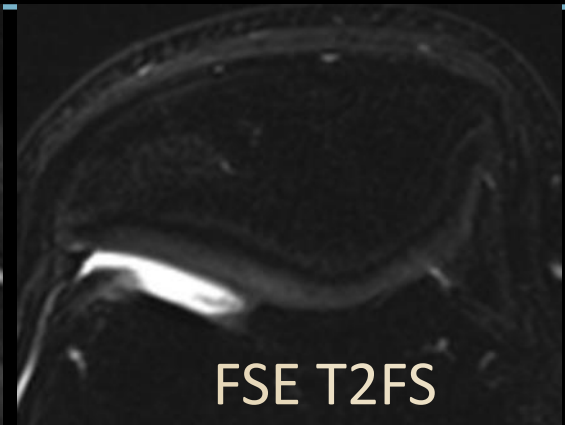
FSE DPFS

$TE=10ms$



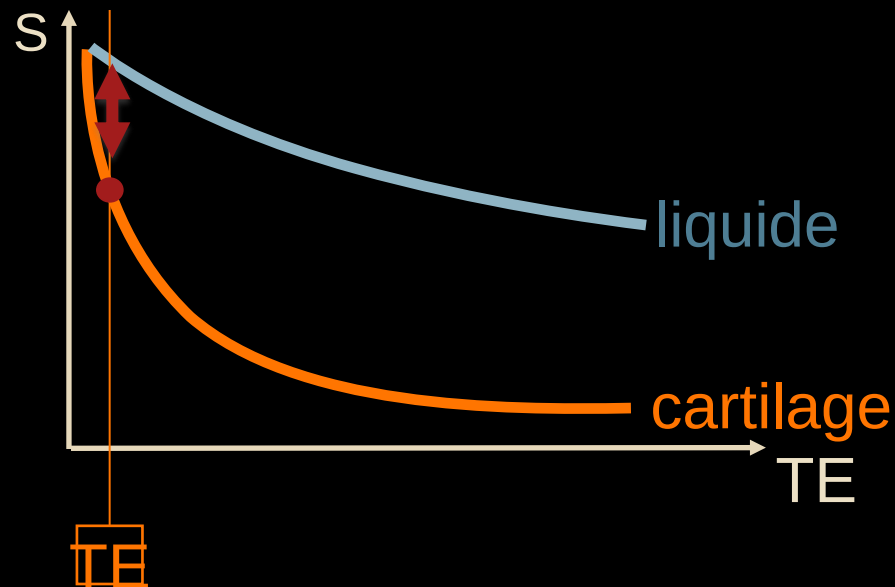
FSE Pond. Int.

$TE=35ms$

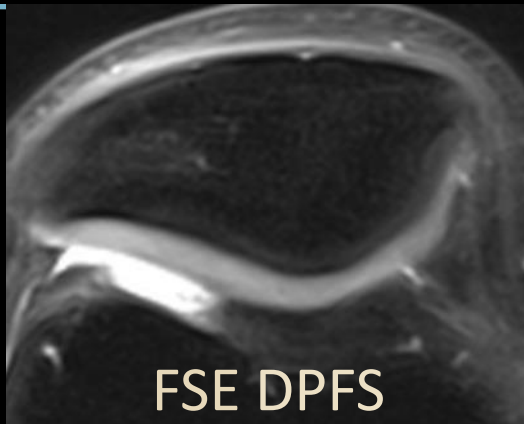


FSE T2FS

$TE=80ms$

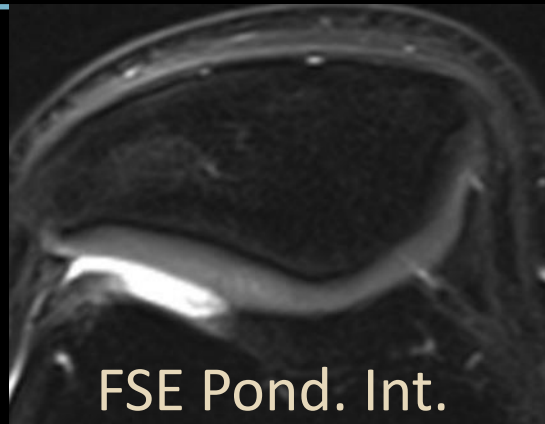


Quelle pondération? (quel TE?)



FSE DPFS

$TE=10ms$



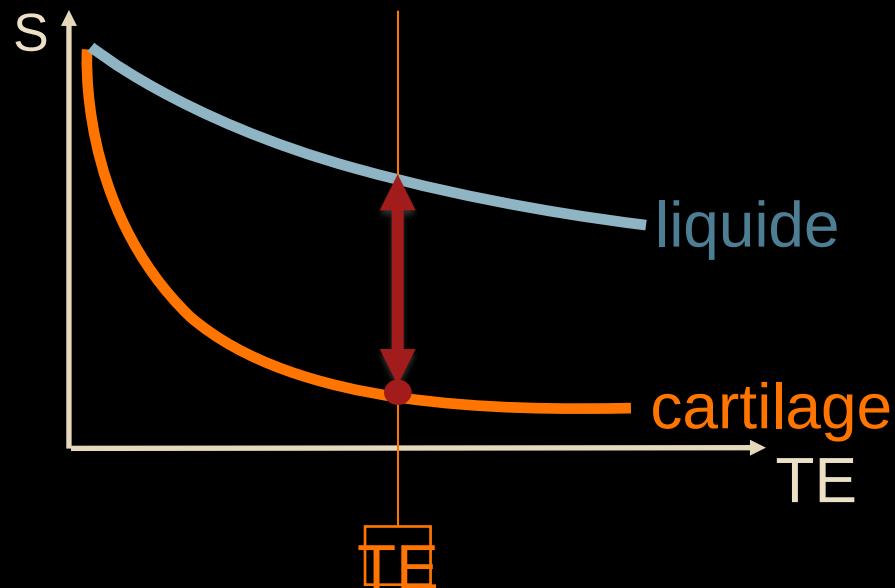
FSE Pond. Int.

$TE=35ms$

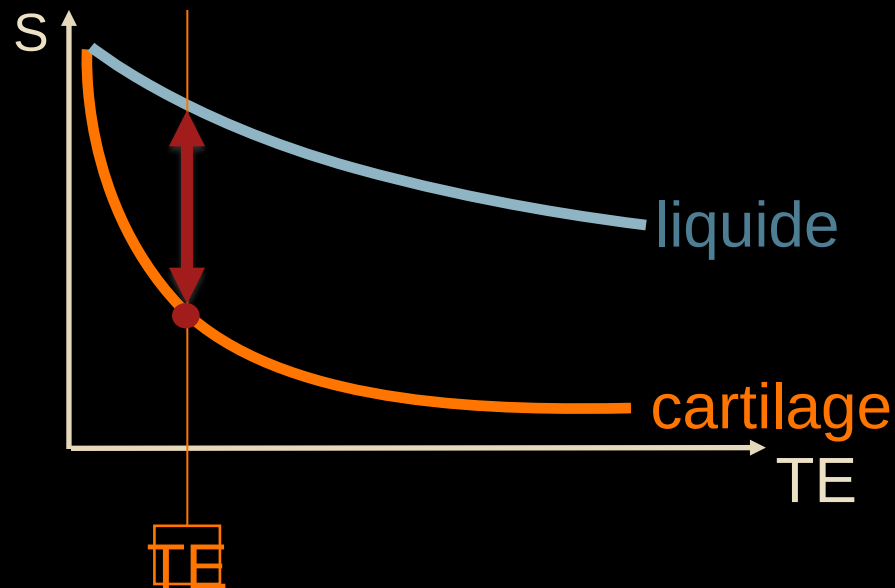


FSE T2FS

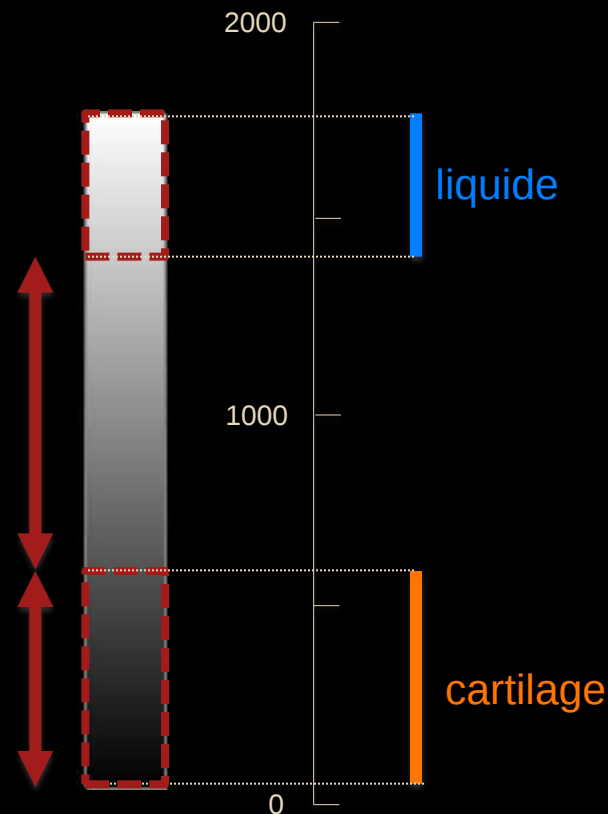
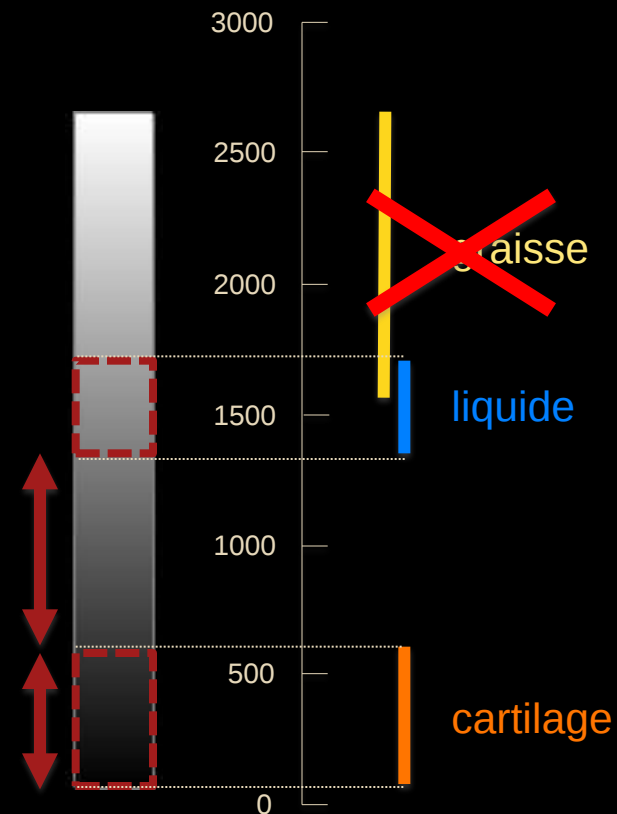
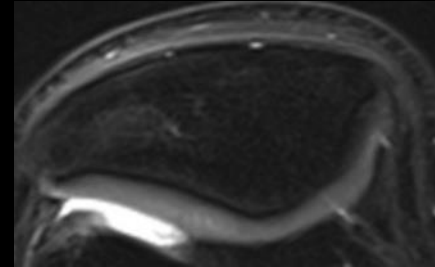
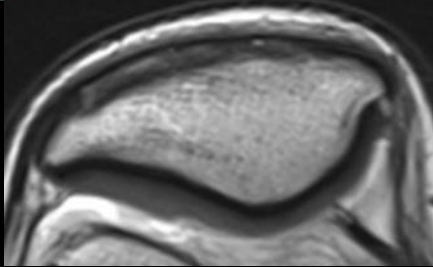
$TE=80ms$



Quelle pondération? (quel TE?)



Effet de la FAT SAT sur le contraste



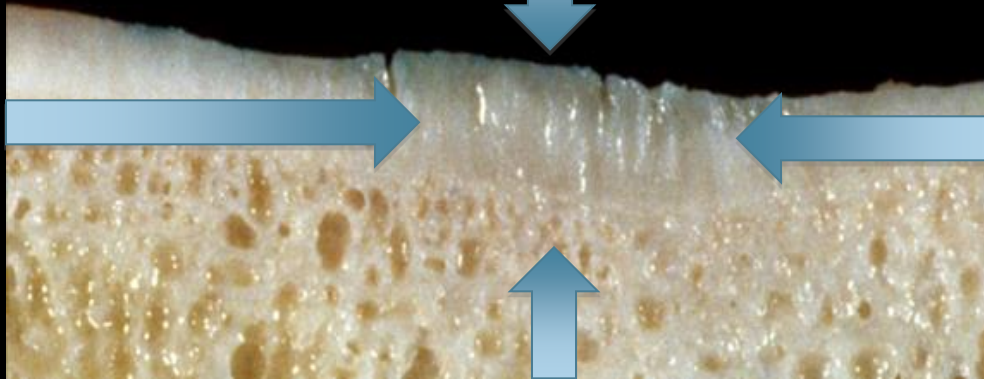
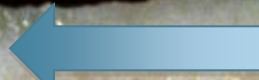
Altérations morphologiques du cartilage

3 zones cibles

1. Surface



2. Substance



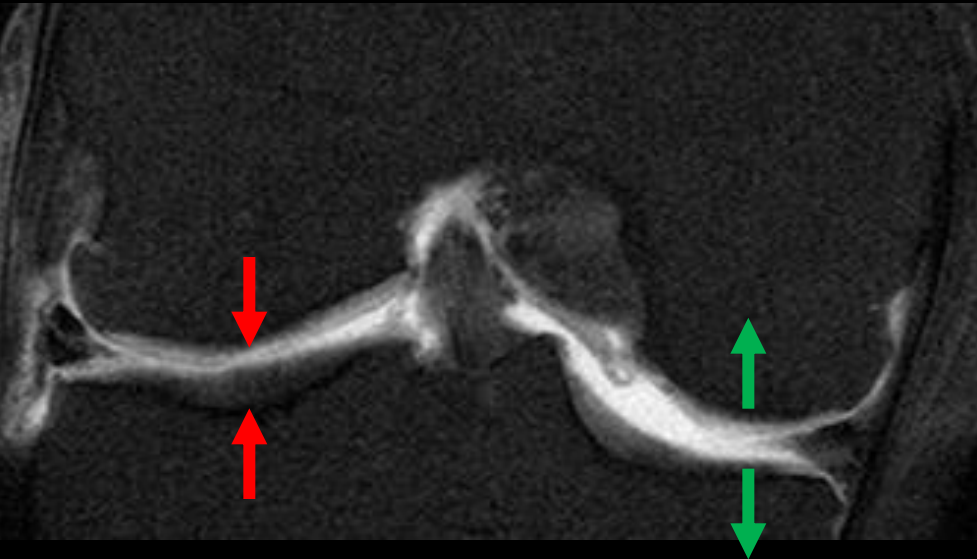
3. Os

1. La surface (interface liquide synovial – cartilage)

Présence de liquide articulaire



Visibilité de la surface

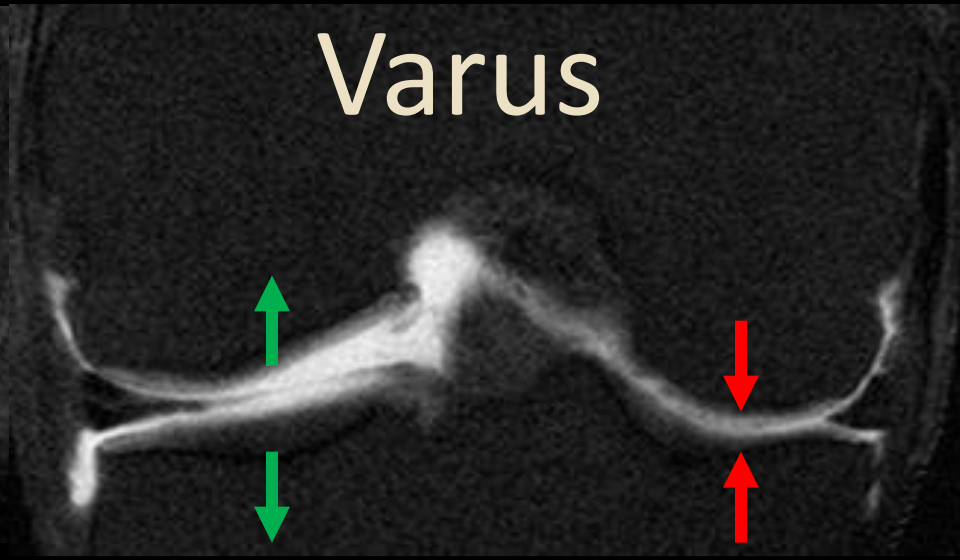
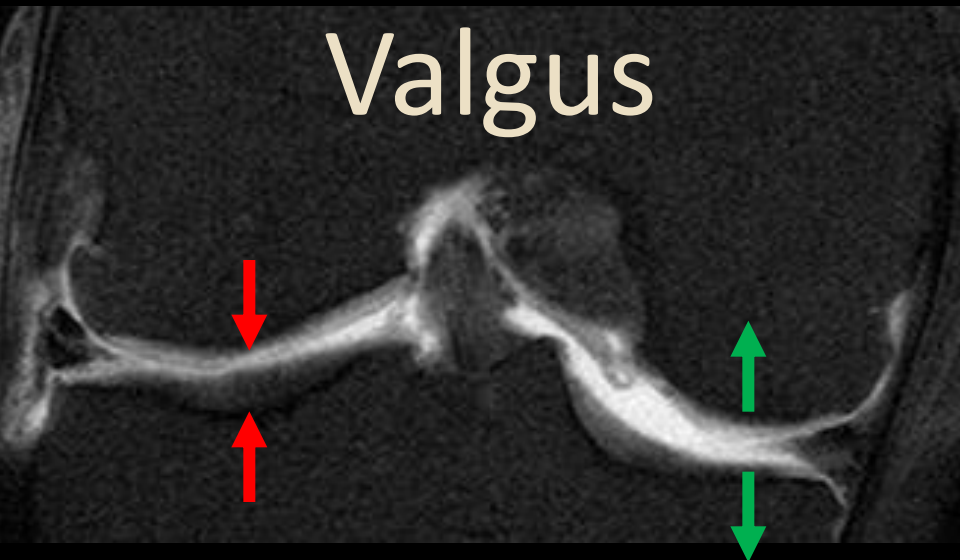


1. La surface (interface liquide synovial – cartilage)

Présence de liquide artériel



Visibilité de la surface



Signal IRM du cartilage :

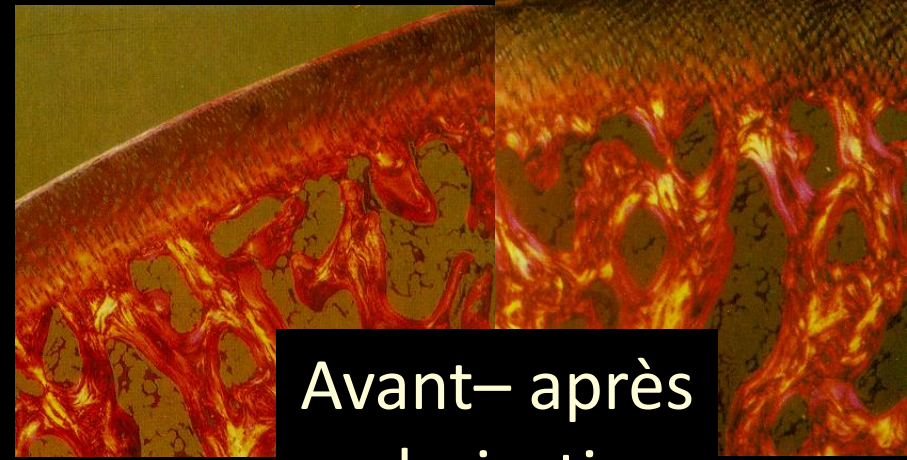
Densité de protons

Richesse collagène

Orientation des fibres

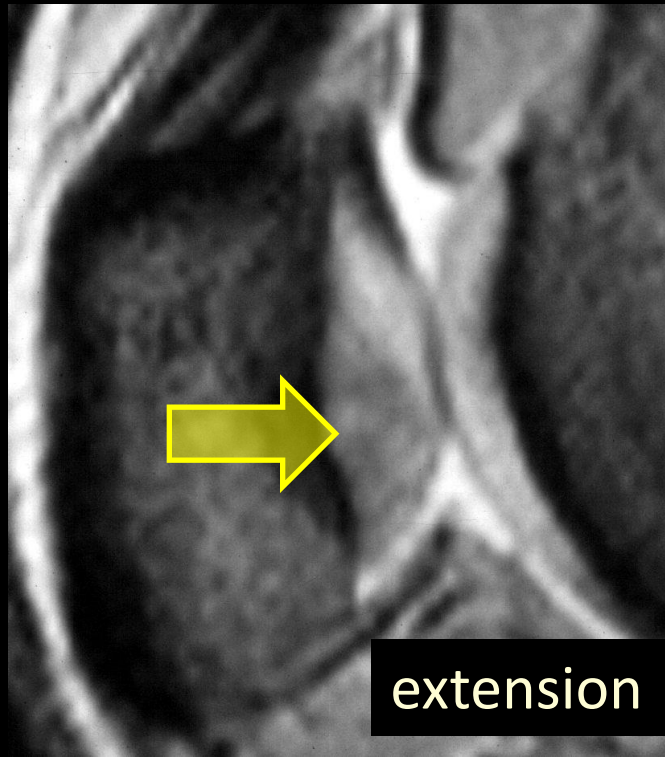
Interactions eau-PG

.....



Avant– après
polarisation

After Resnick



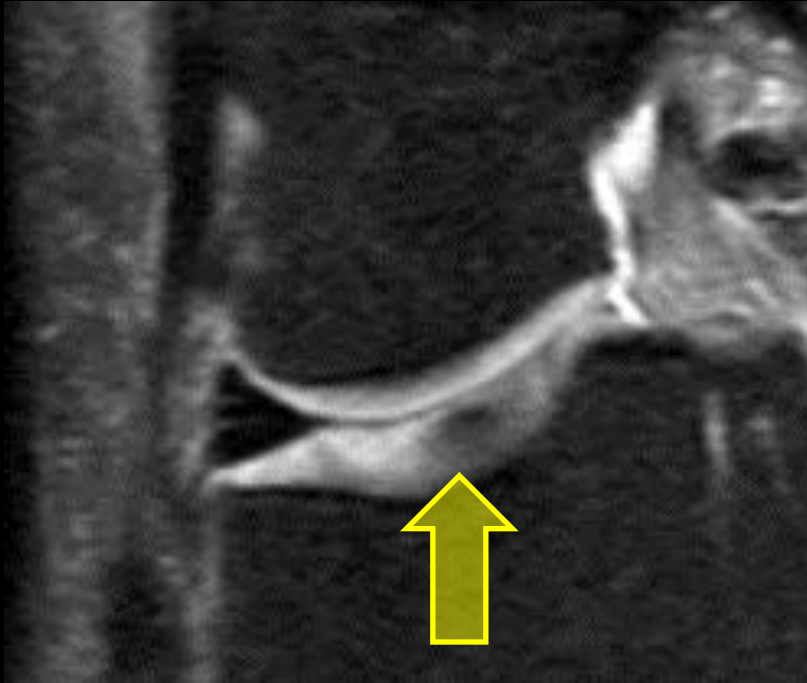
extension



flexion

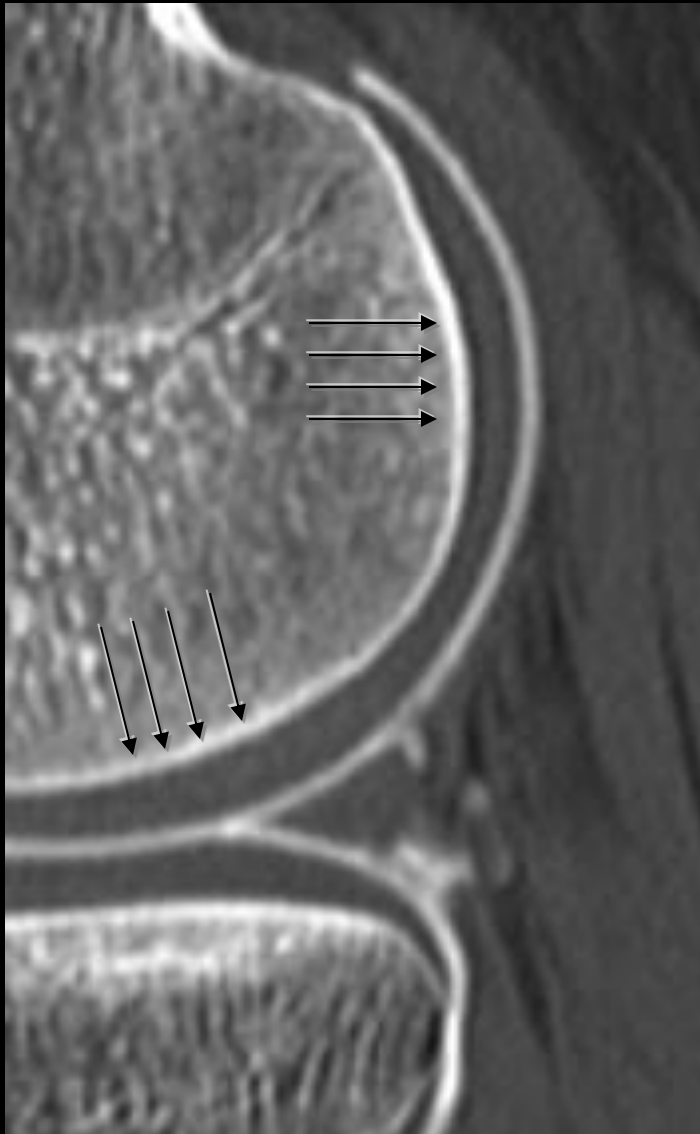
2. Signal IRM du cartilage normal

Variations du cartilage normal
Signal
Epaisseur

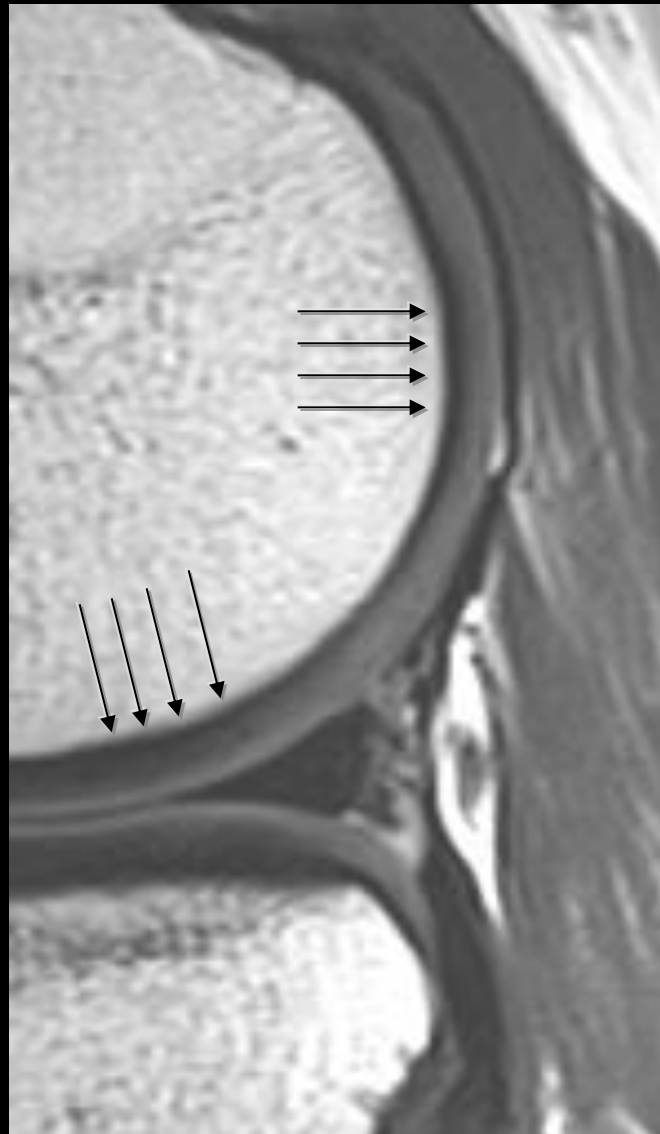


Plateau tibial latéral

3. Interface os-cartilage et moelle osseuse



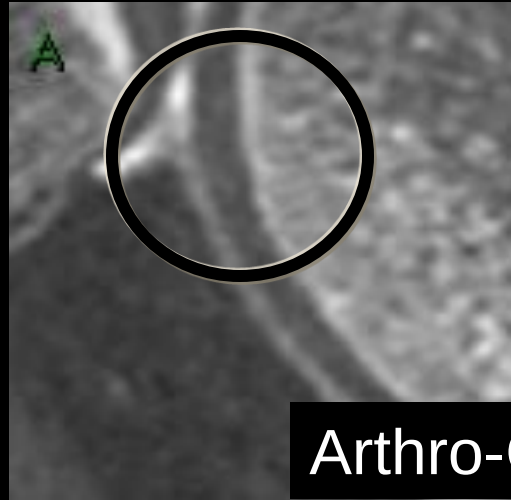
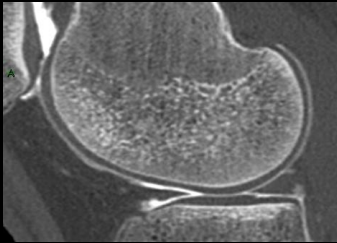
Arthro-CT



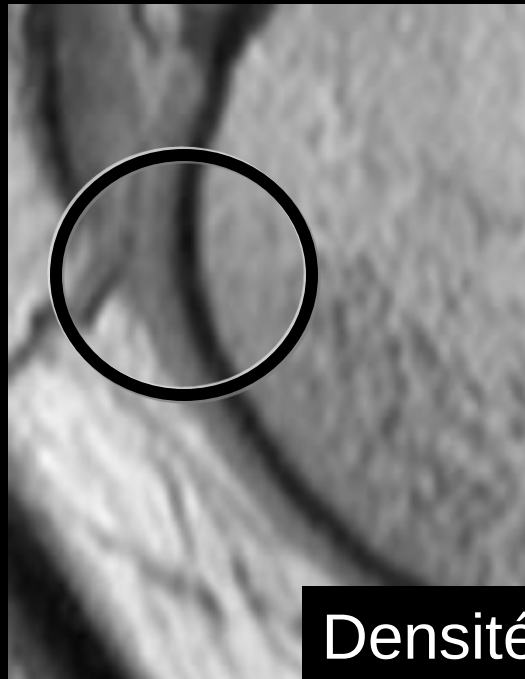
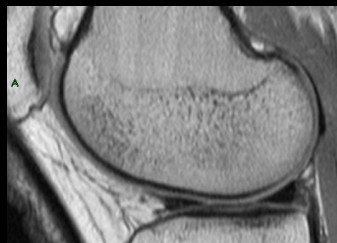
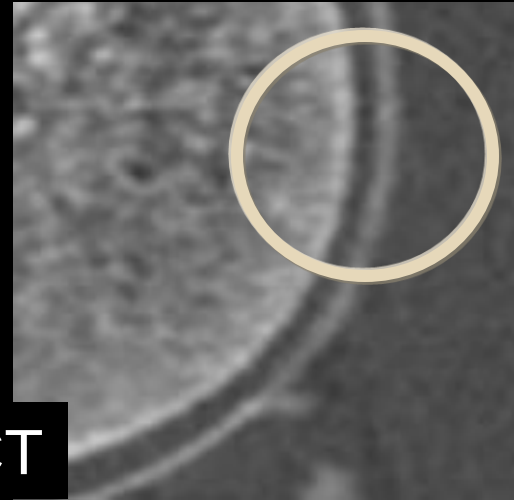
DP

3. Interface os-cartilage et moelle osseuse

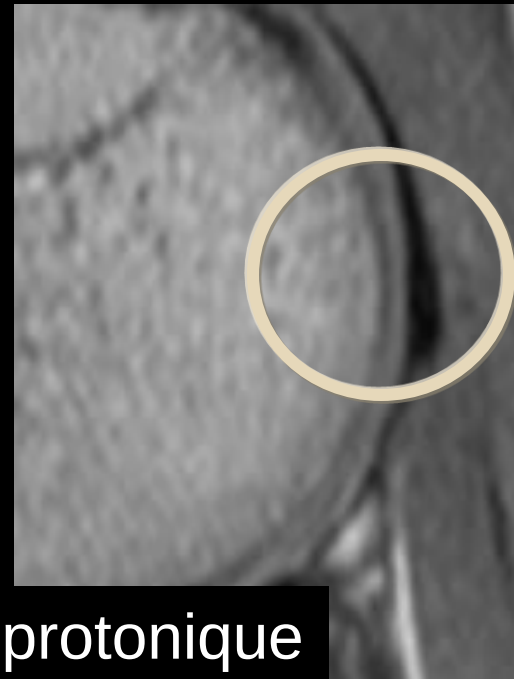
Artéfact de déplacement chimique à l'interface cartilage - moelle



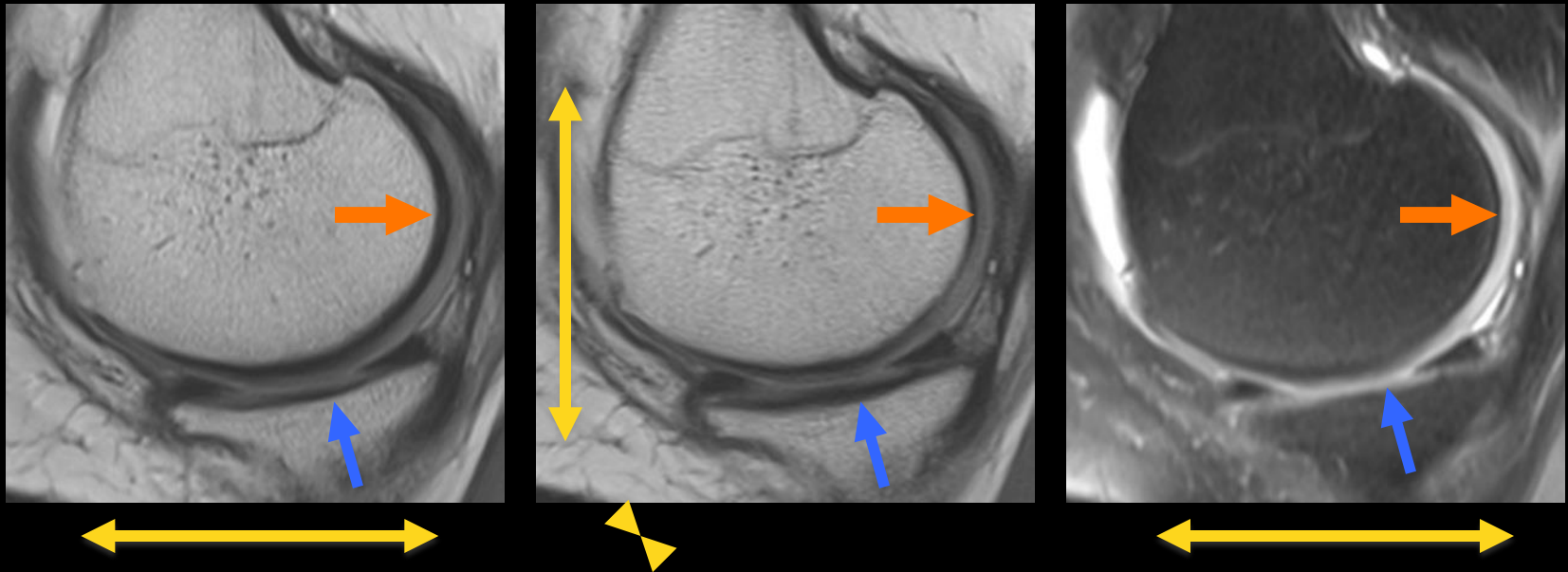
Arthro-CT



Densité protonique



Artéfact de déplacement chimique

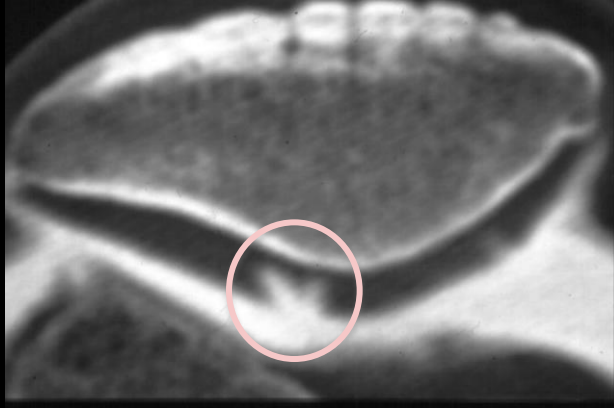


Sens du codage en fréquence

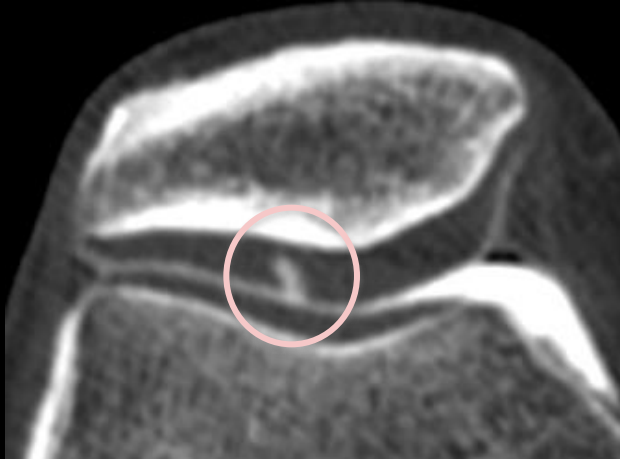


4. IRM des chondropathies focales ouvertes

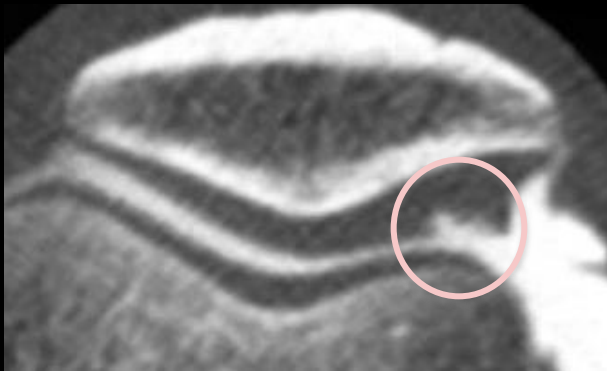
IRM des chondropathies ouvertes focales



Signal IRM ?



Signal IRM ?

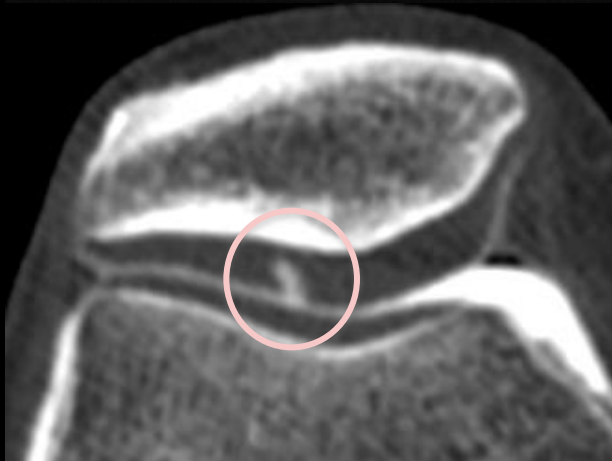


Signal IRM ?

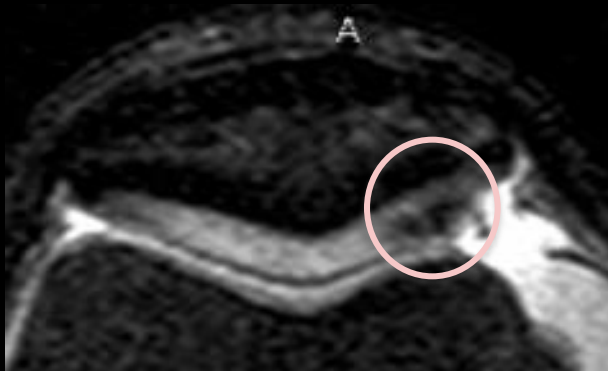
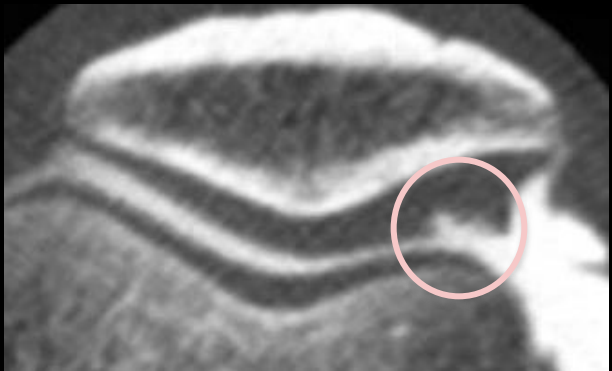
IRM des chondropathies ouvertes focales



Hypersignal (65%)

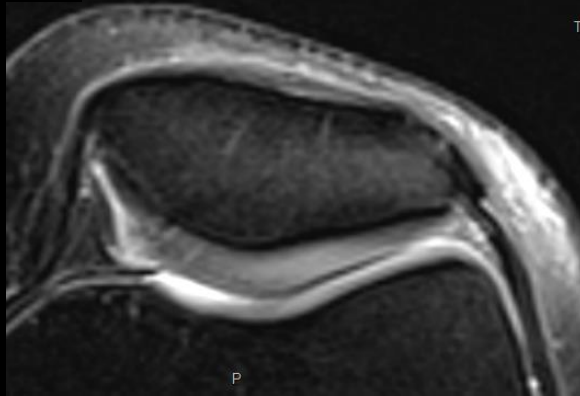
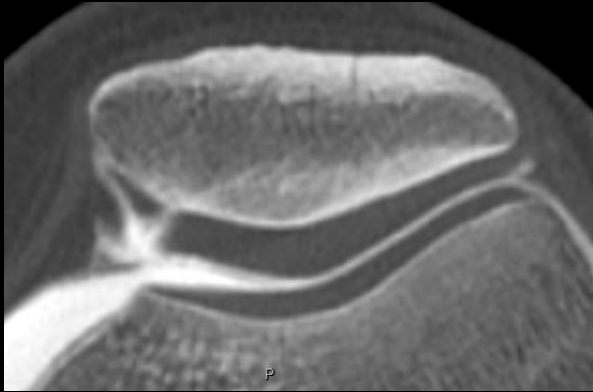


isosignal (20%)



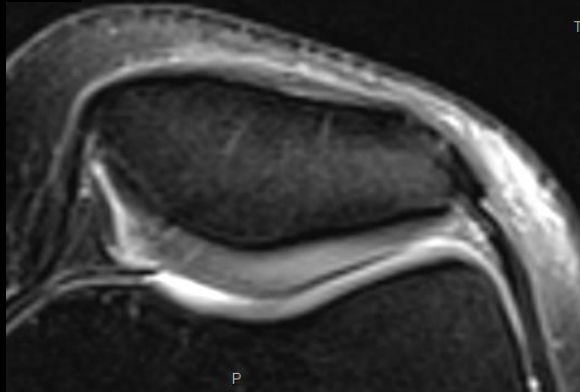
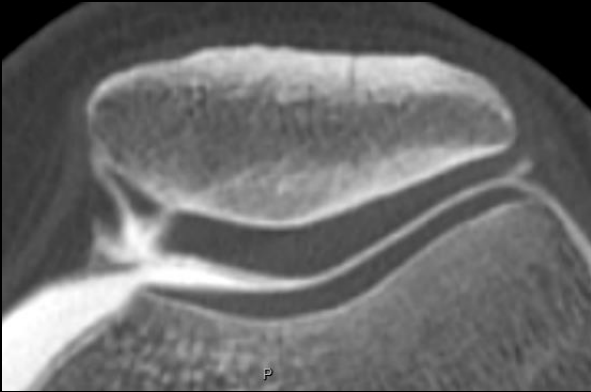
Hyposignal (15%)

Tout n'est pas simple !

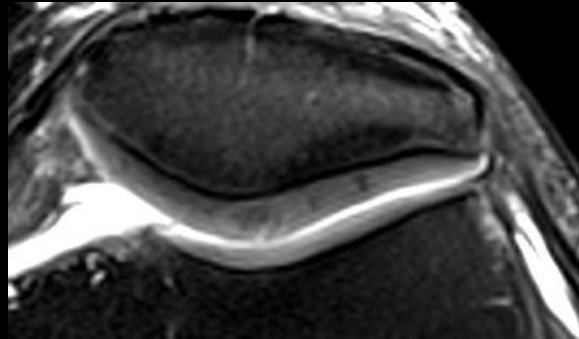
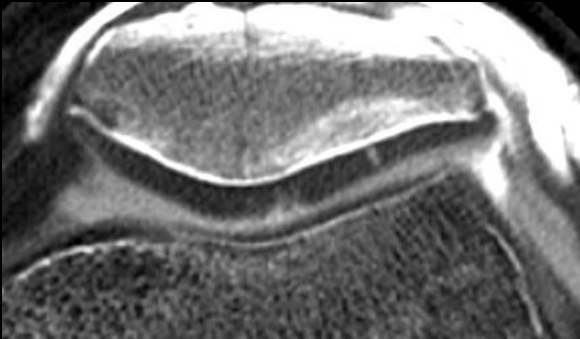


Mélange hypo/hyper

Tout n'est pas simple !

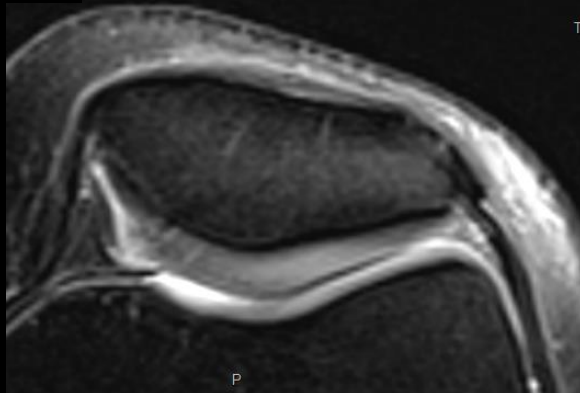
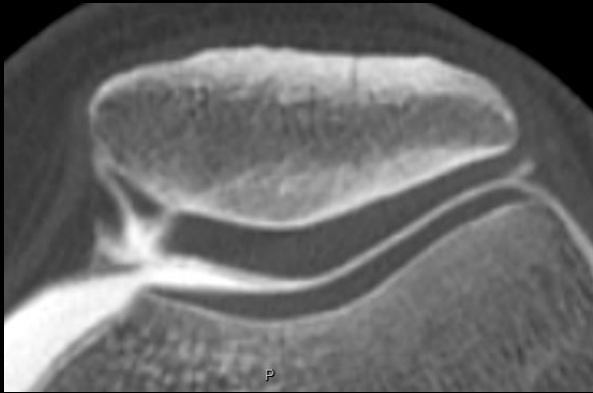


Mélange hypo/hyper

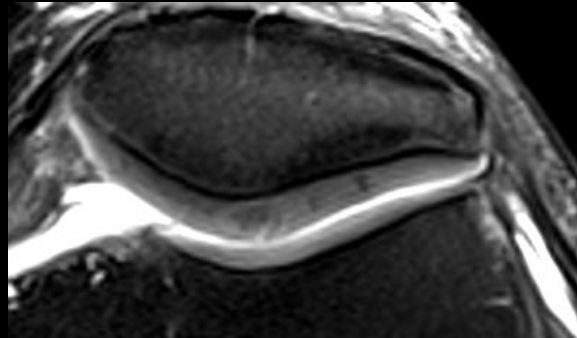
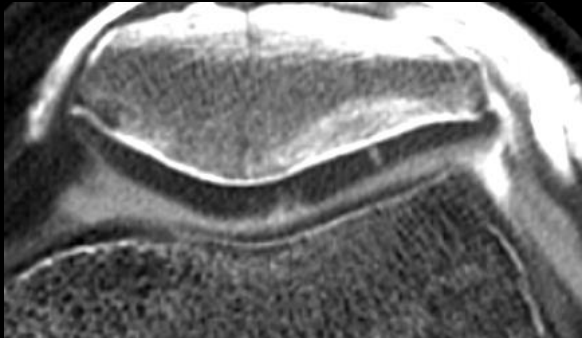


Fissure et
Chondrocalcinose

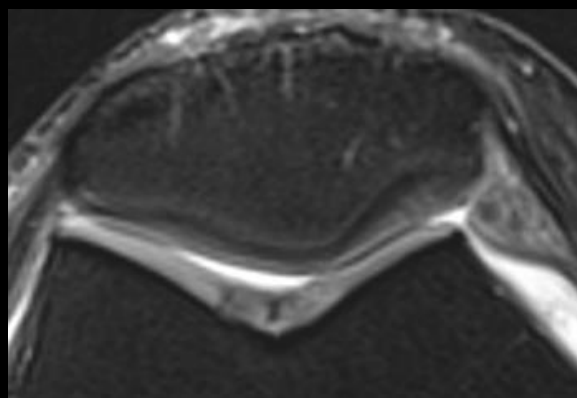
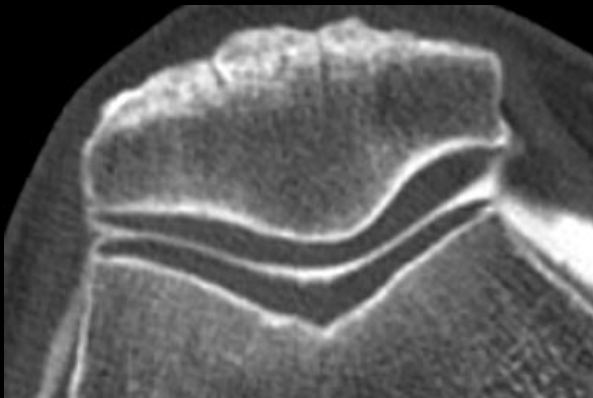
Tout n'est pas simple !



Mélange hypo/hyper

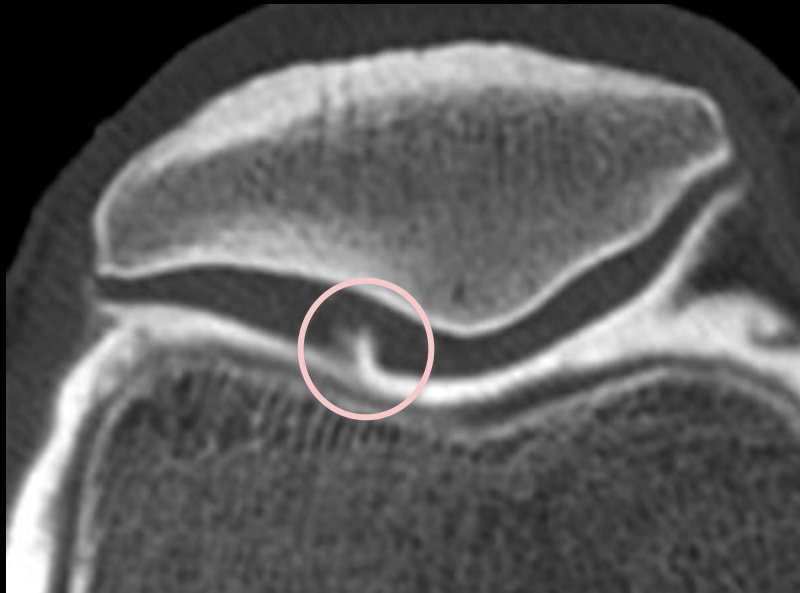


Fissure et
Chondrocalcinose

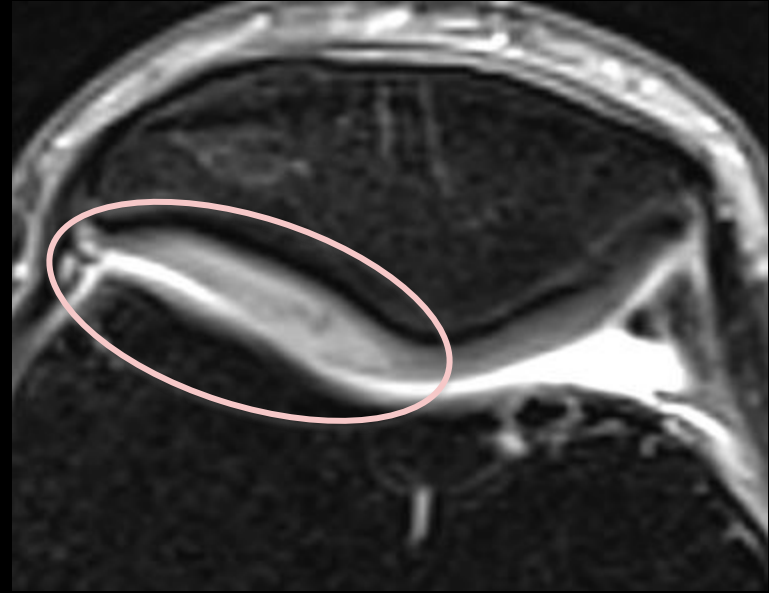


Fissure fermée ?

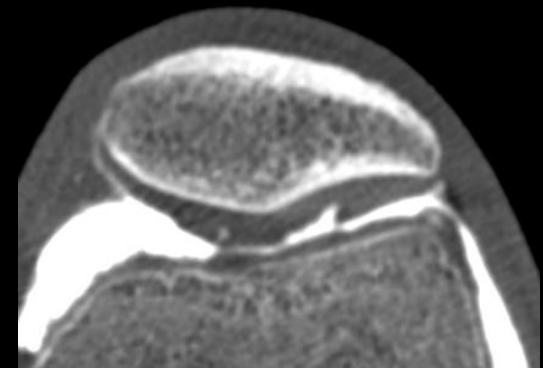
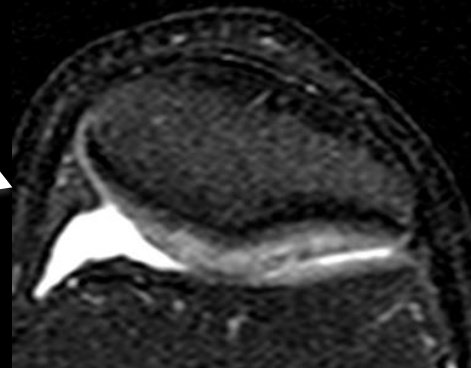
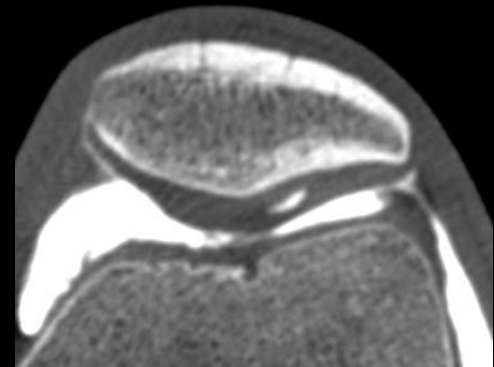
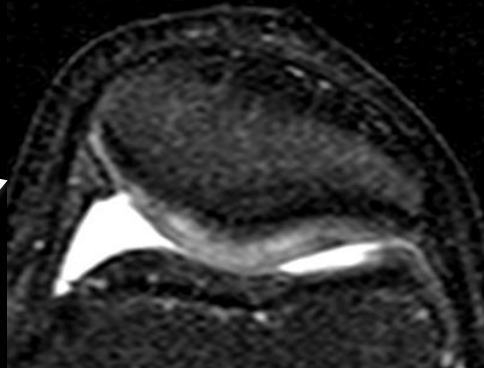
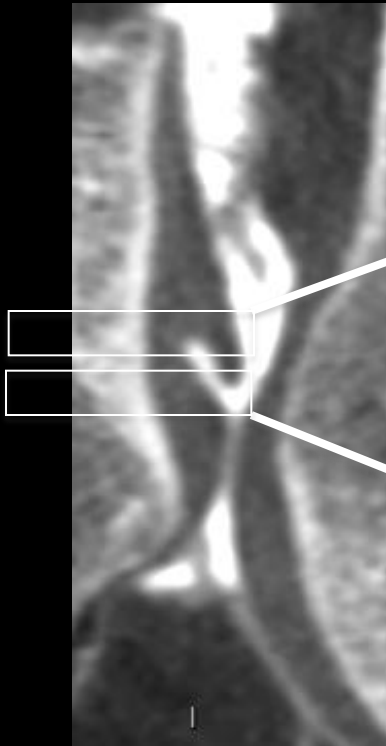
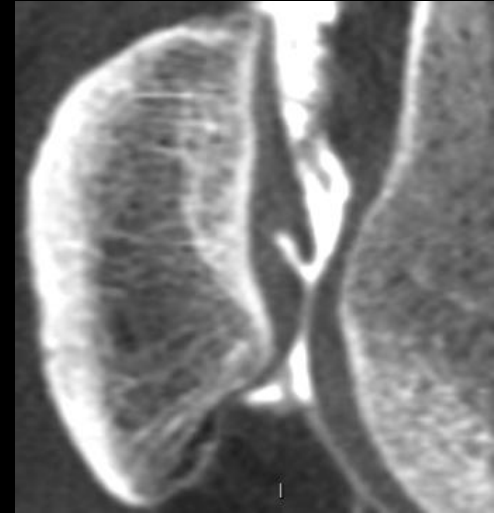
Chondropathie focale
Fissure



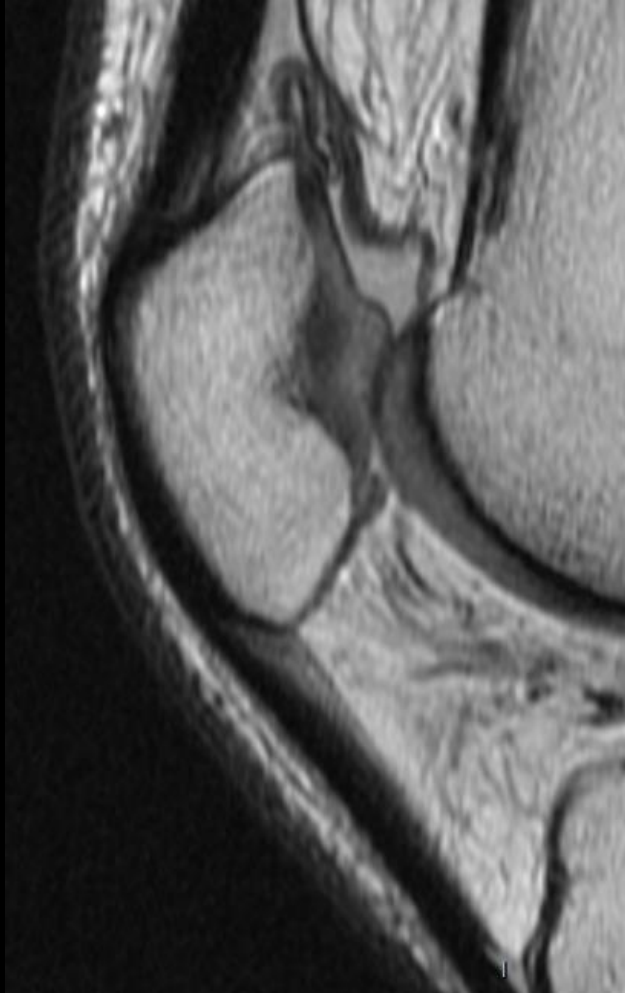
Chondropathie extensive
?



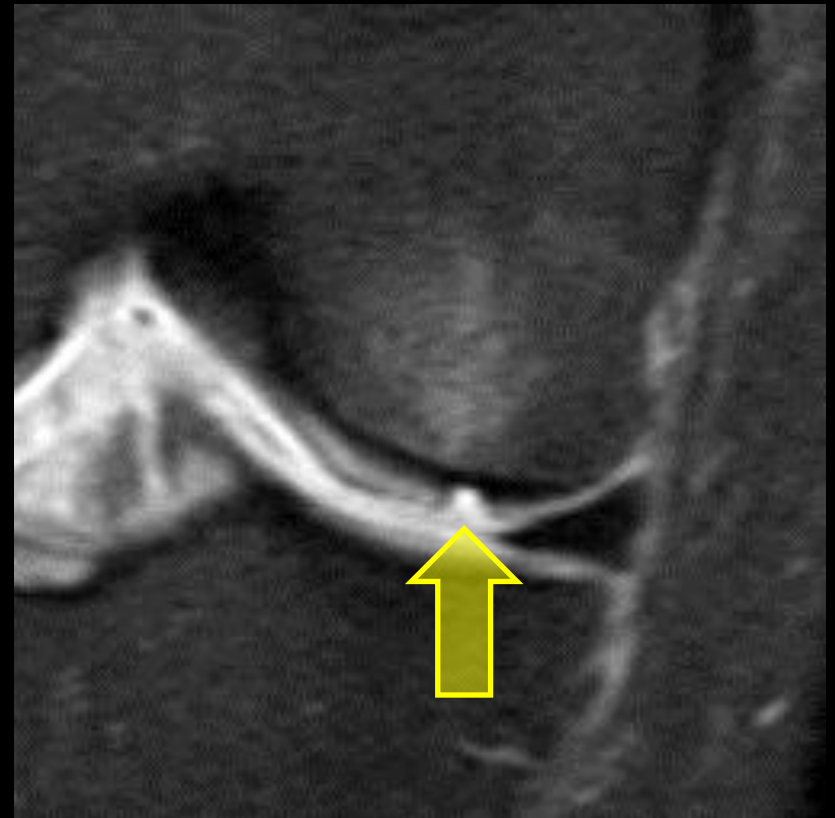
Orientation complexe des plans fissuraux



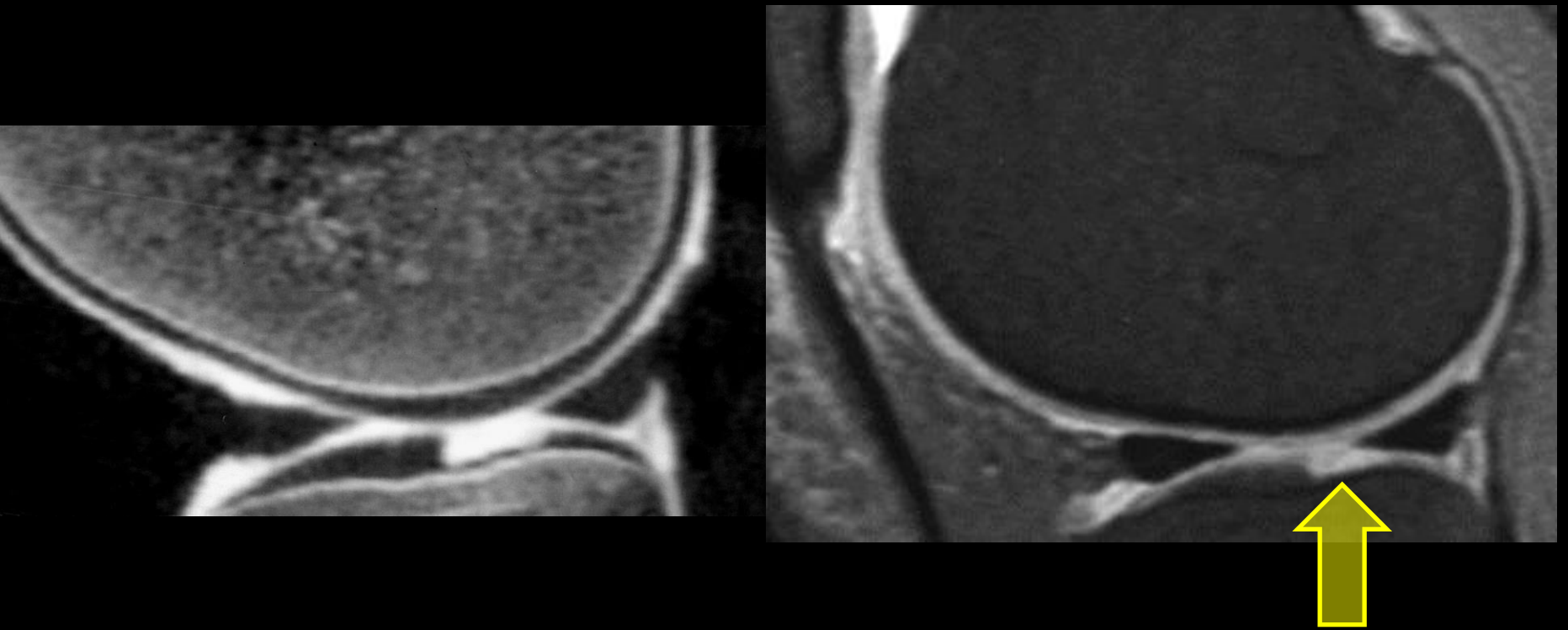
Chondromalacie : cartilage mou
Variation non prévisible du signal cartilagineux



Signal élevé (liquidien)
dans 65% des défauts arthrographiques

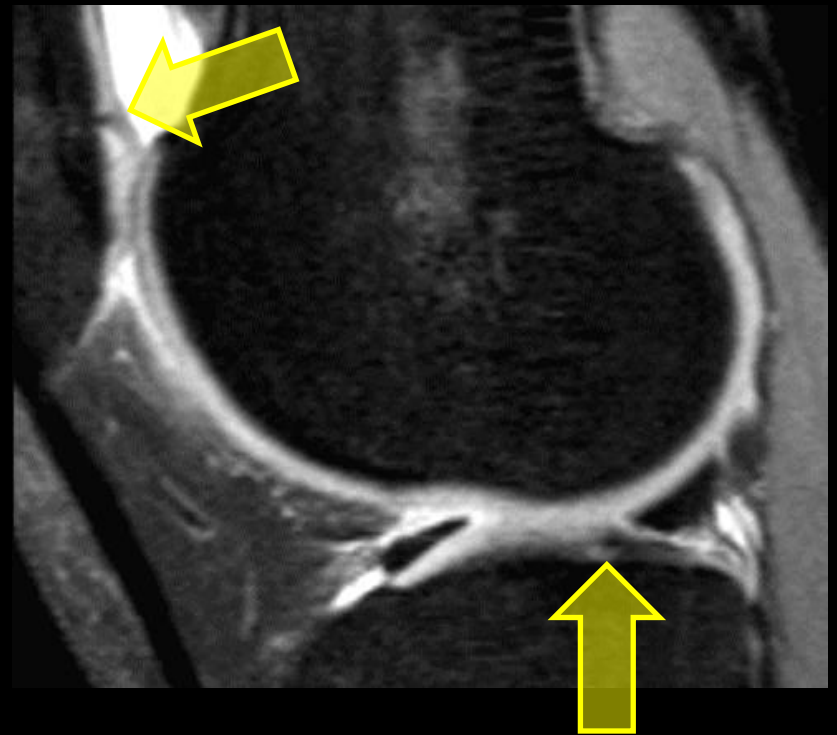


Signal intermédiaire
dans 20 % des défauts arthrographiques



Signal faible

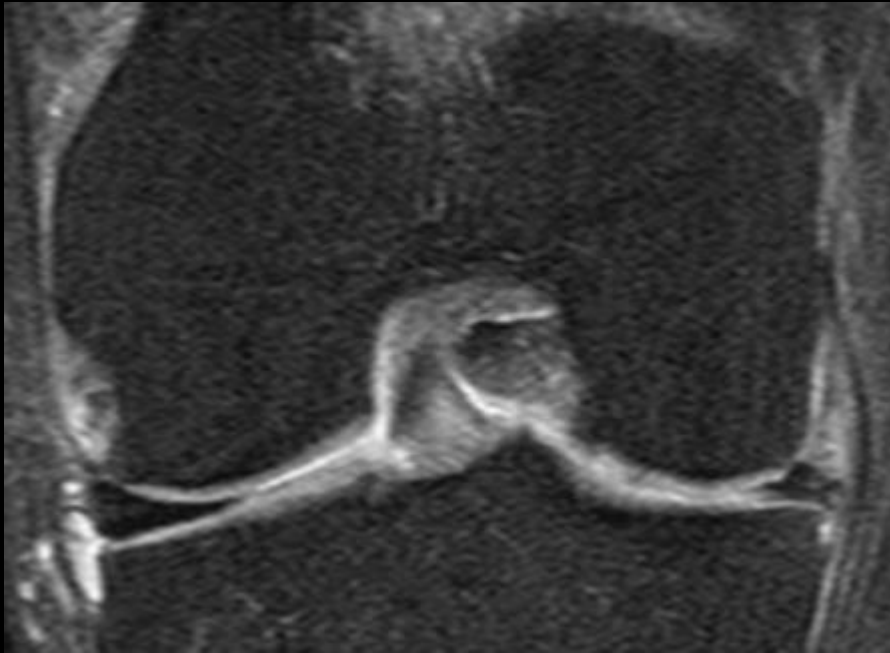
dans 15% des défauts arthrographiques



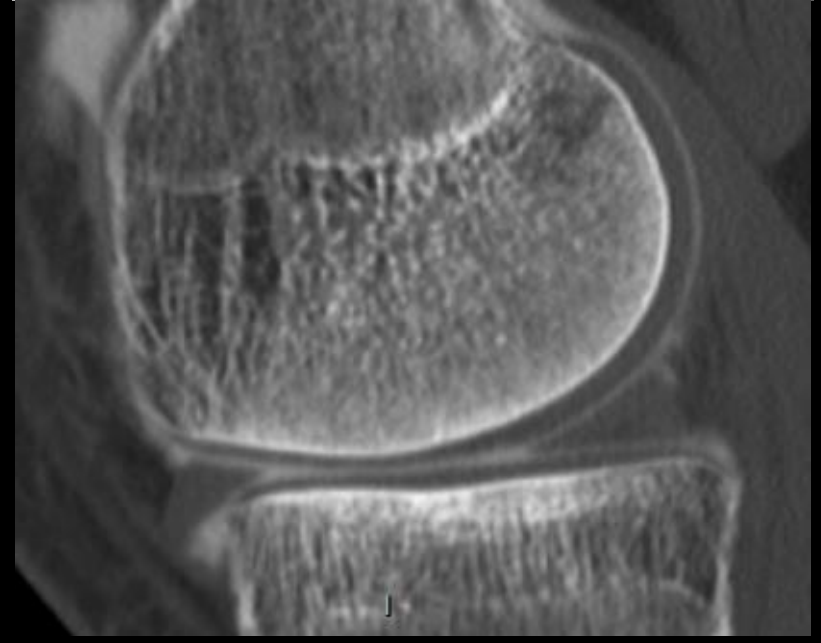
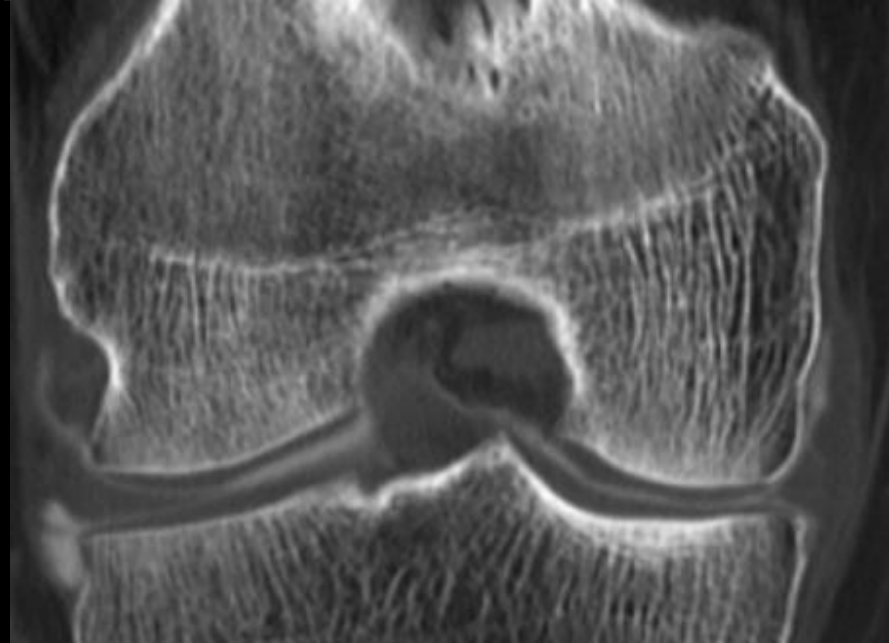
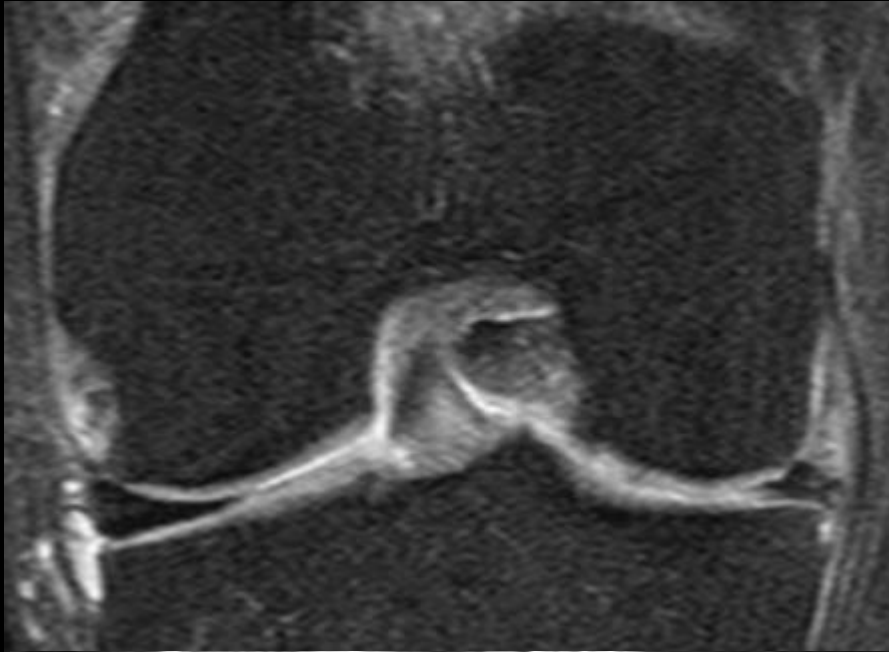


5. IRM des amincissements cartilagineux étendus

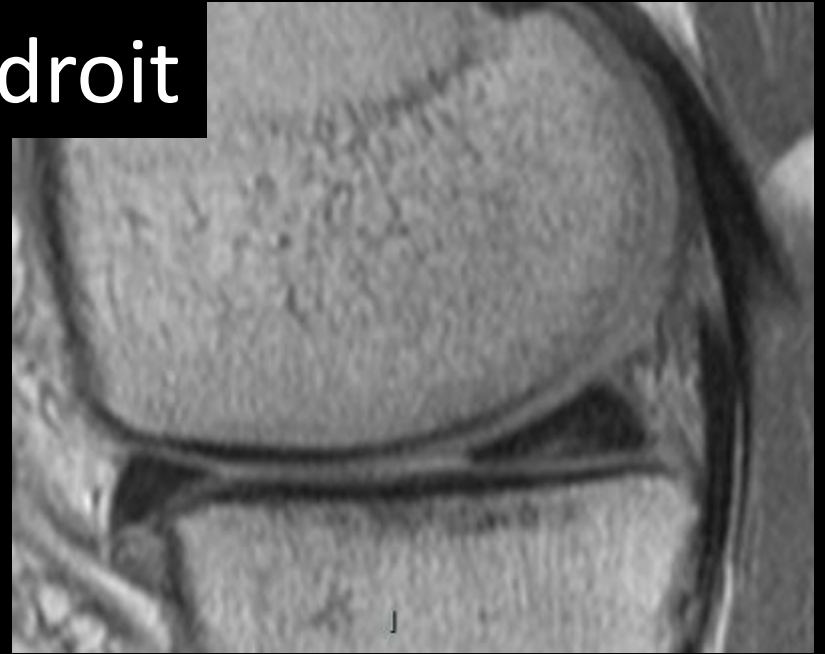
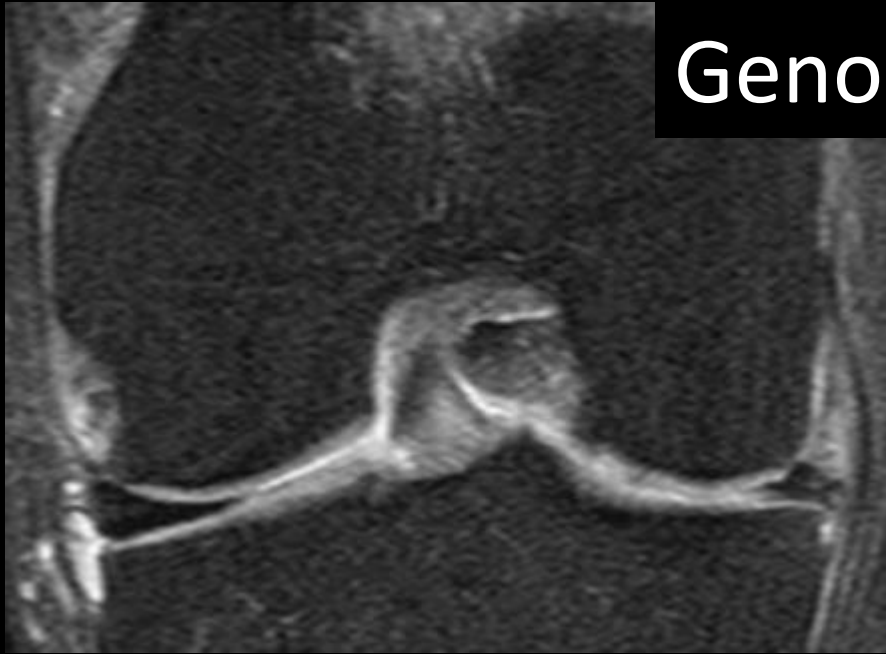
Compartiment fémoro-tibial médial : normal ou anormal ?



Compartiment fémoro-tibial médial : normal ou anormal ?



Genou droit



Droit



gauche





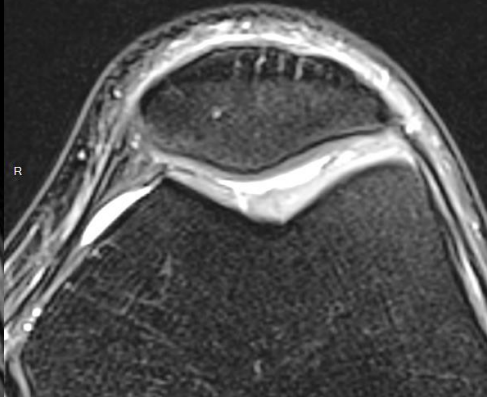
6. Histoire naturelle

< 801 - 14 >



Début

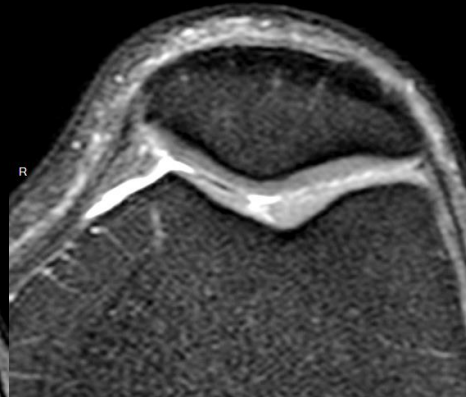
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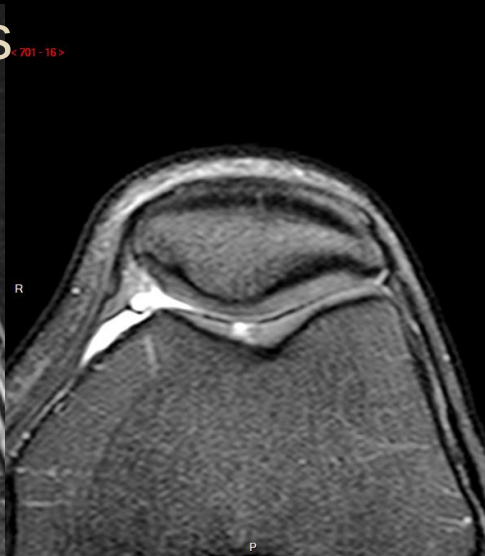
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ans



+ 10 ans



+ 4 ans

+ 7



7. Le compte-rendu

	Arthroscopy	MR imaging
Grade 1	Fibrillations without substance loss and softening	Smooth surface and normal cartilage thickness
Grade 2	Less than 50% thickness substance loss	Heterogeneities, irregularities in < 50% thickness
Grade 3	Between 50% and 100% thickness substance loss	Heterogeneities, irregularities in > 50% but < 100% thickness
Grade 4	100% thickness substance loss	Heterogeneities in 100% of cartilage thickness

Adapted from Outerbridge classification

Doit-on grader les chondropathies ?

- Oui en recherche
- Prudemment* en pratique clinique
 - Peu reproductible
 - Pourquoi focaliser sur profondeur et pas sur longueur ou largeur ?
 - Pas relevant ./ . clinique

* personnellement, pas de grade dans compte-rendu

Terminologie

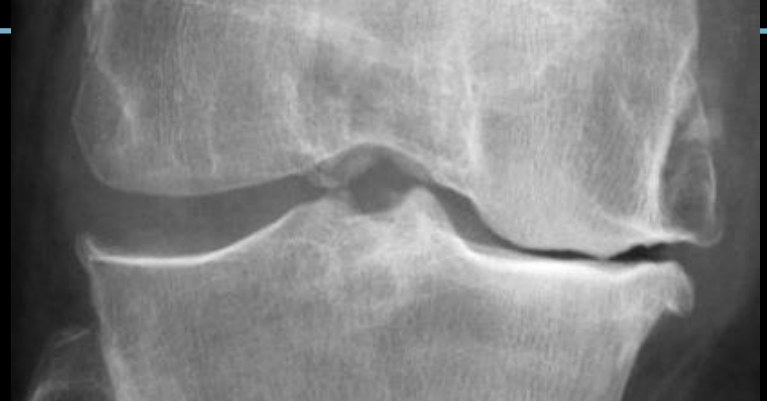
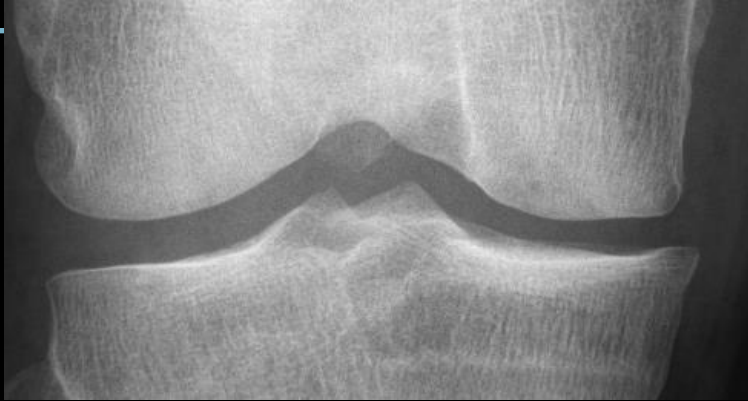
- Cartilage normal
- Chondropathie superficielle ou profonde
- Avec ou sans modifications osseuses sous-chondrales

Prudence

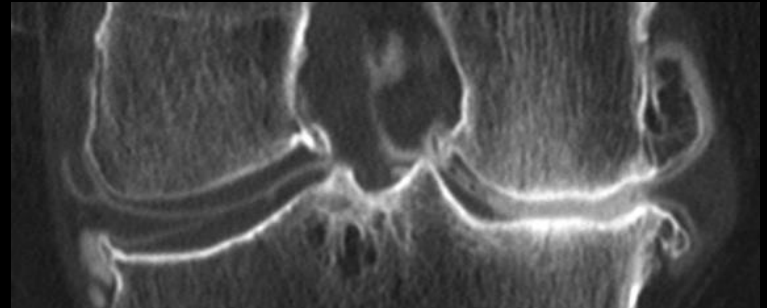
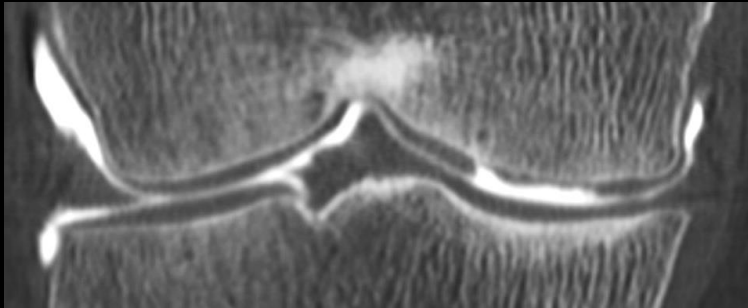
- Arthrose

Imagerie morphologique: Définitions

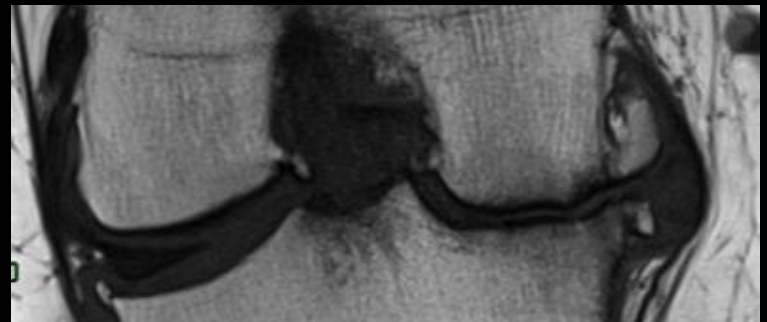
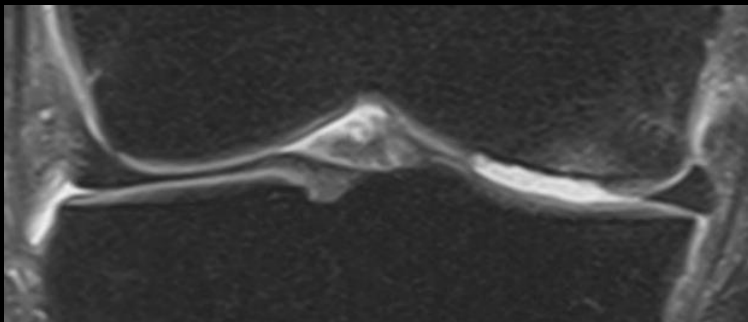
Rx



Arth
ro
-CT



IR
M

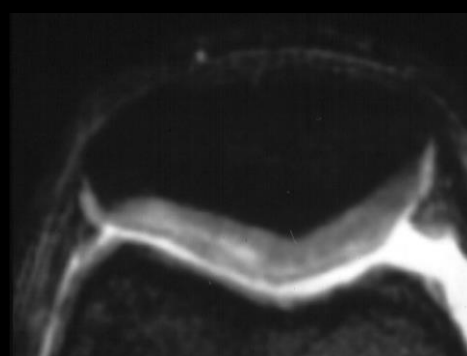
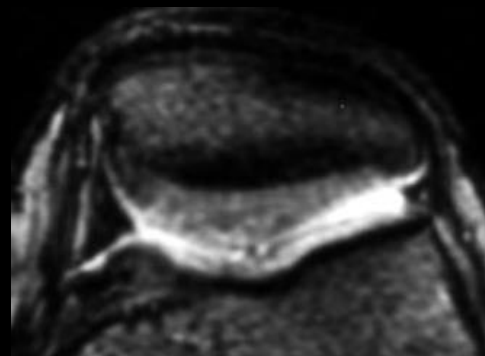
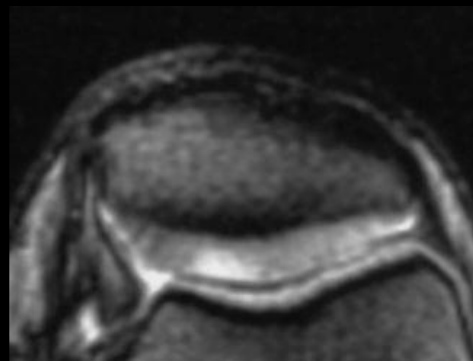
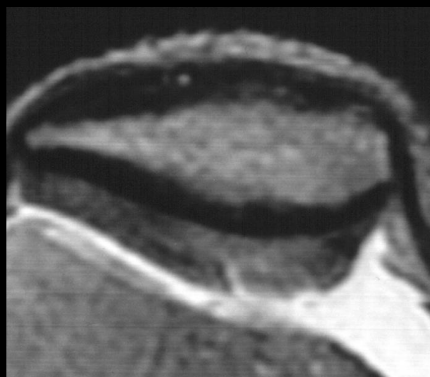


Chondropathie

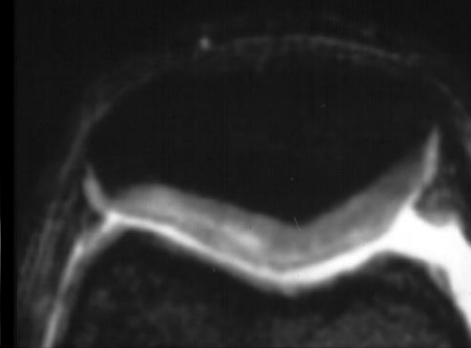
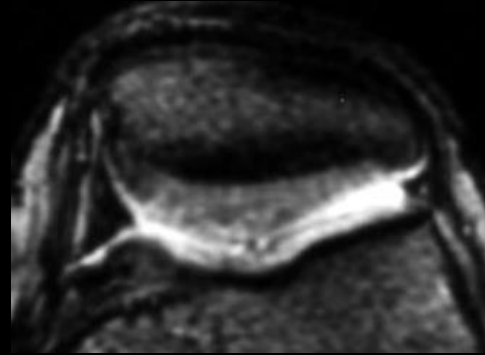
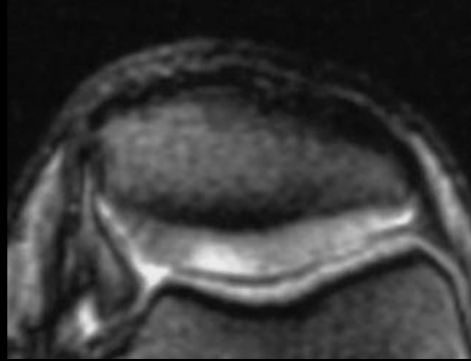
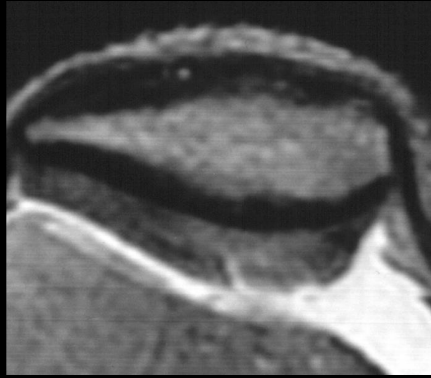
vs.

Arthrose

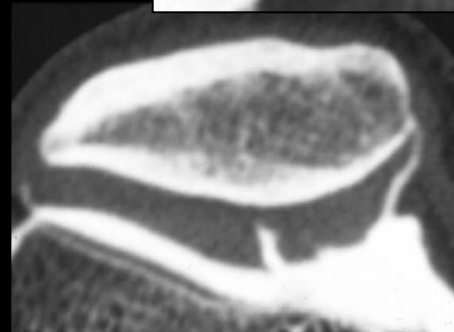
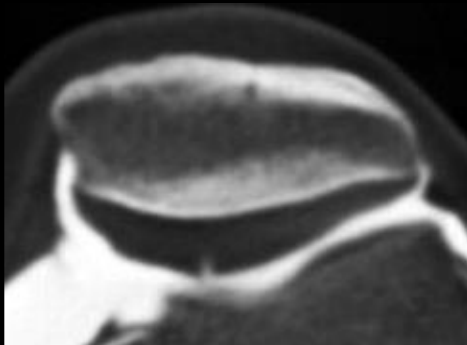
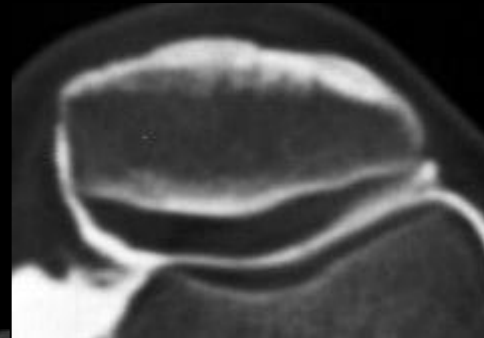
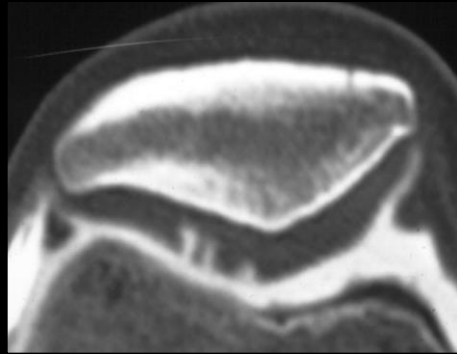
Jouons....

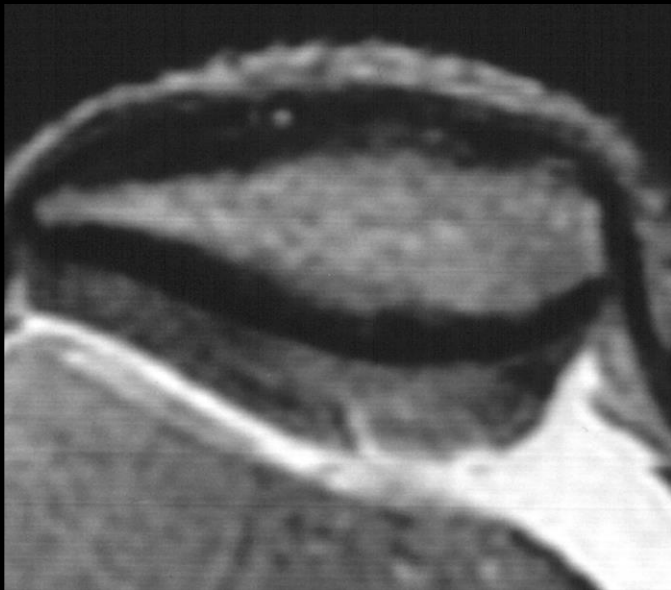


Quelle paire ?

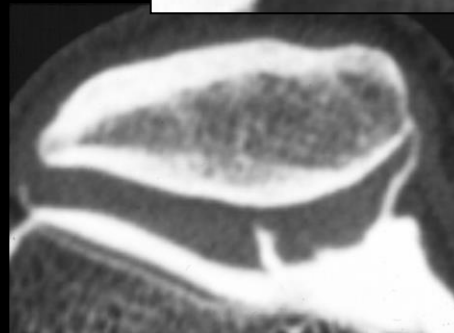
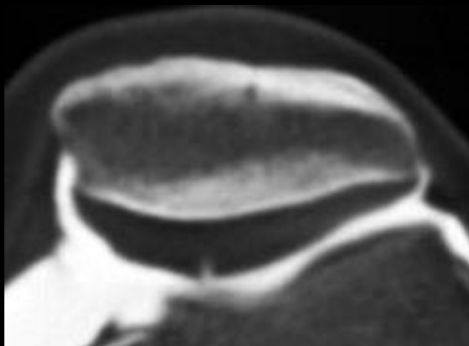
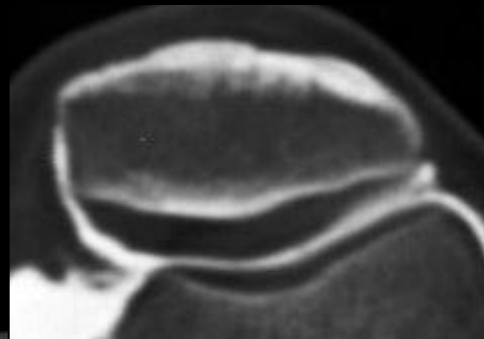
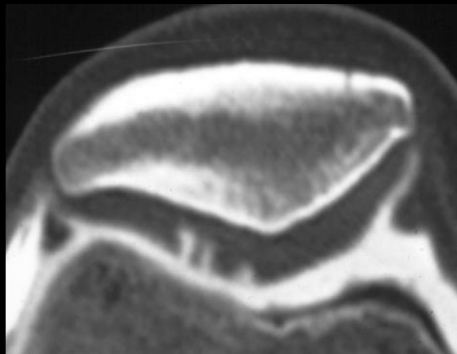


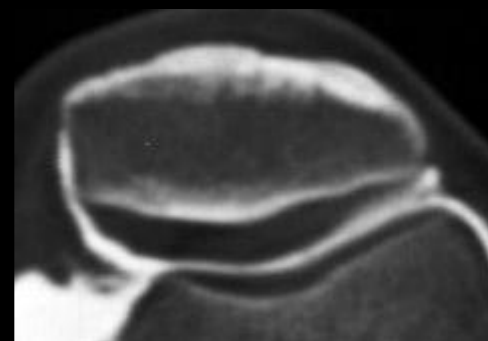
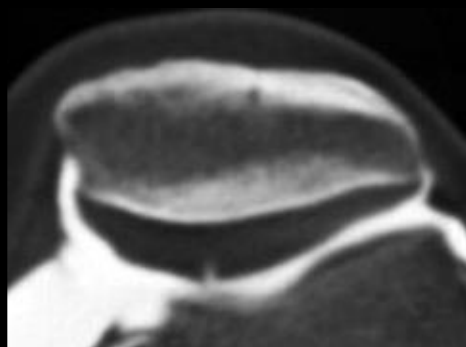
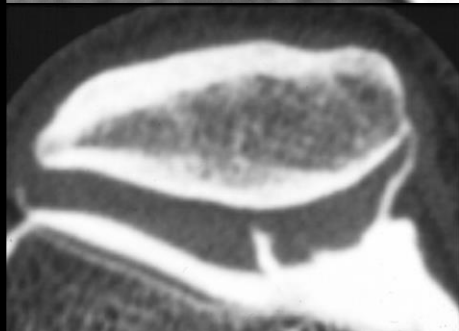
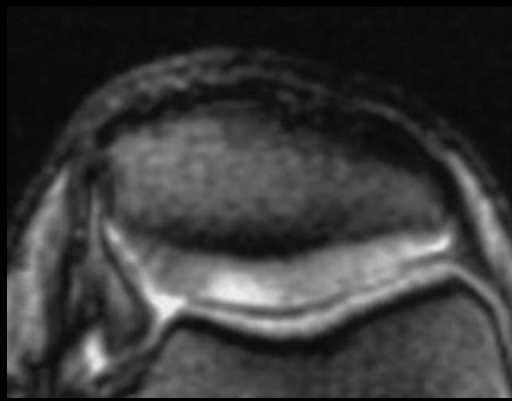
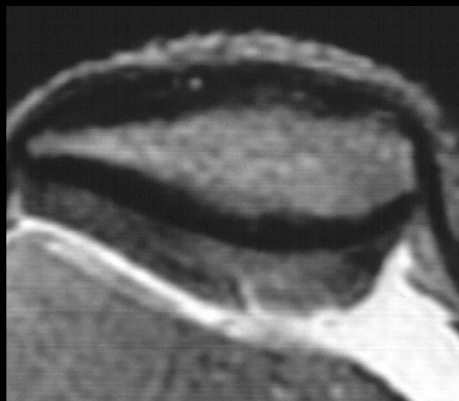
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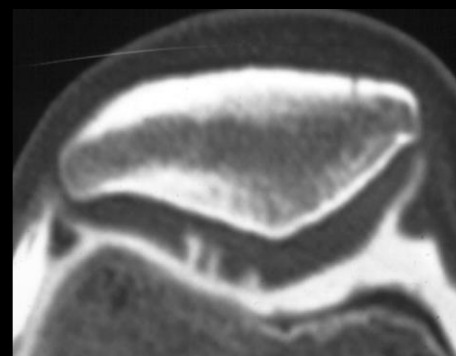


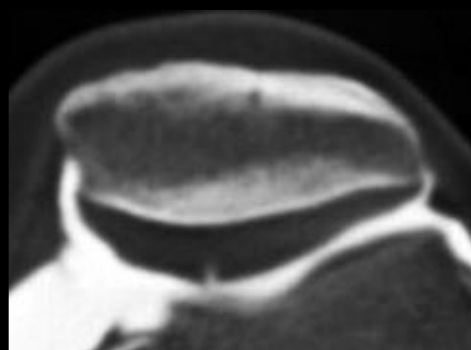
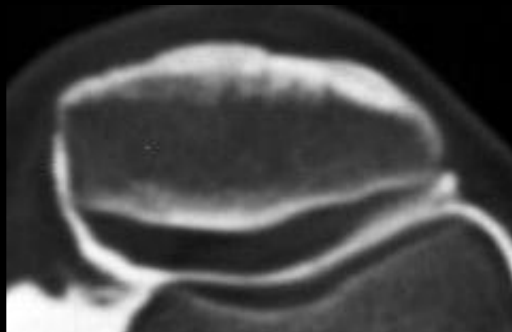
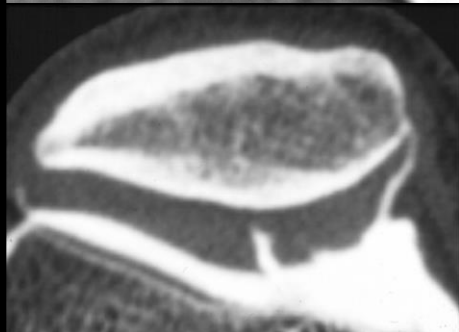
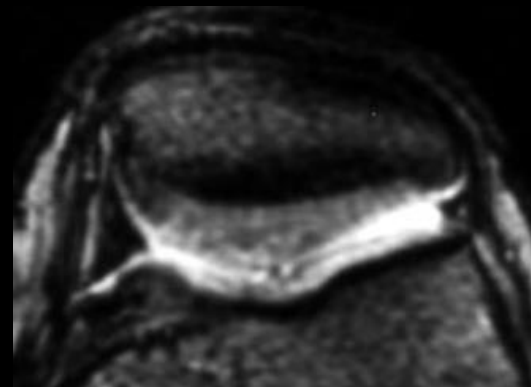
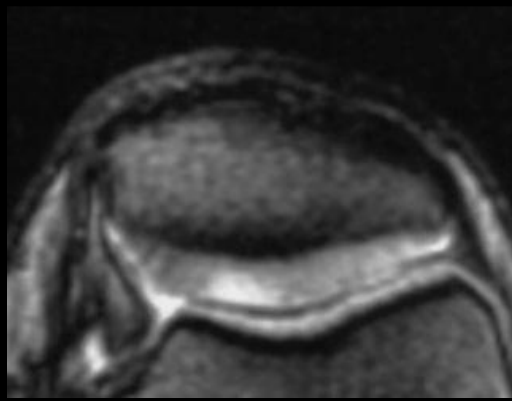
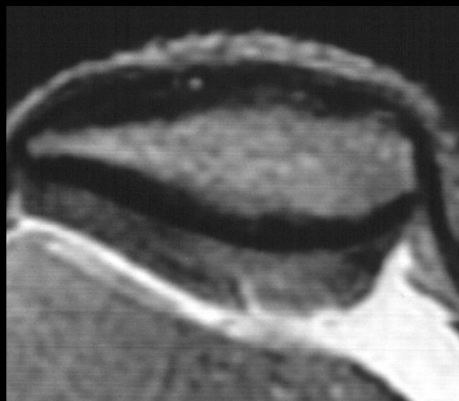
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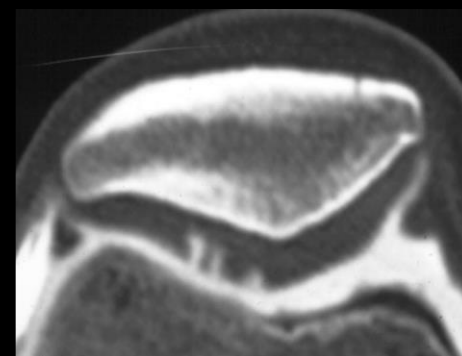


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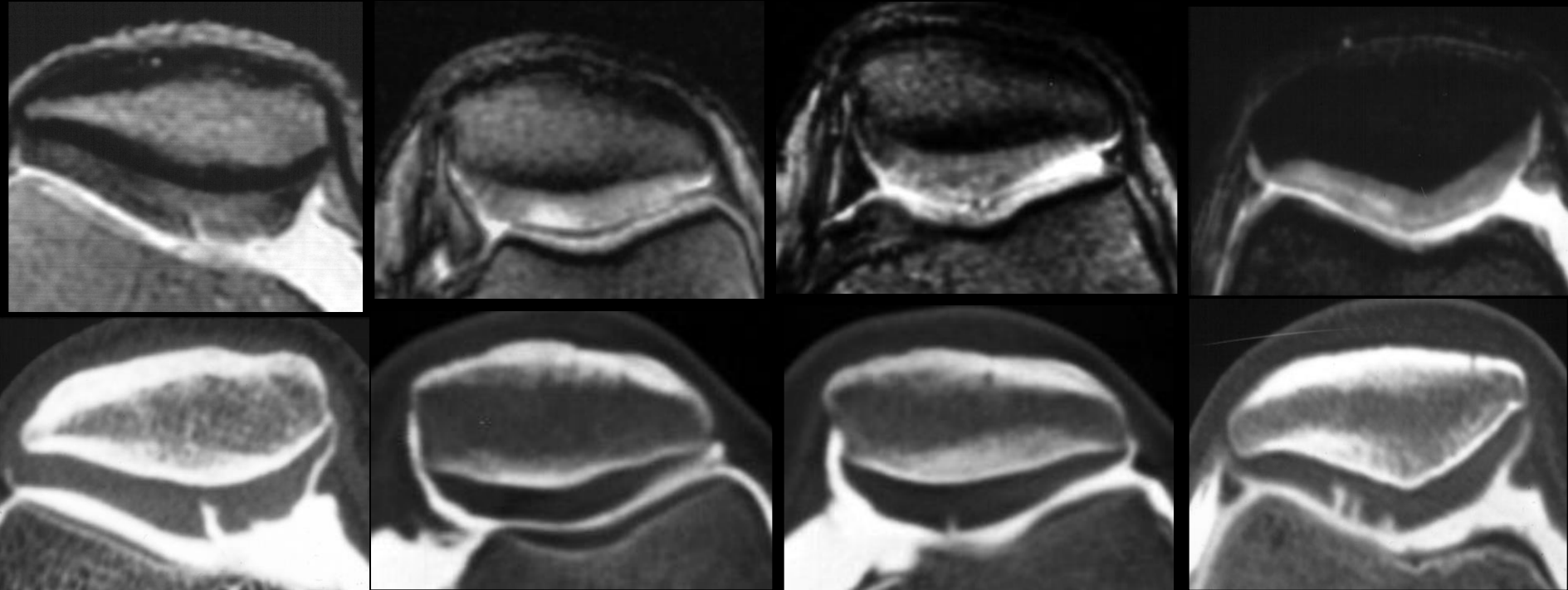




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IRM : chondropathie



Arthro-CT : fissure, ulcère..

Take-home messages

1. Le cartilage hyalin est un tissu complexe.
2. IRM : variations importantes et artéfacts.
3. DP fat-sat : meilleur compromis.
4. DP 3D isotropique est meilleure pour cartilage mais ne peut pas remplacer les autres séquences.

Take-home messages

5. Défect cartilagineux focal : signal variable.
6. Attention à l'amincissement global (FT).
7. Compte-rendu : termes limités et prudents.
8. Chondropathie avec/sans modification de la moelle sous-chondrale.

DES
2018



IRM du cartilage au quotidien

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Thomas Kirchgesner, Frédéric Lecouvet

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Université catholique de Louvain UCL
Brussels Belgium*

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Mexico 2015
Sims



IRM du cartilage au quotidien

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V. Perlepe, A. Larbi, F. Lecouvet

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