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Bern Hip Symposium 2026: Precourse

Miss the forest for the trees:
MRI and intraoperative Correlation

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Department of Radiology, Balgrist University Hospital, University of Zürich

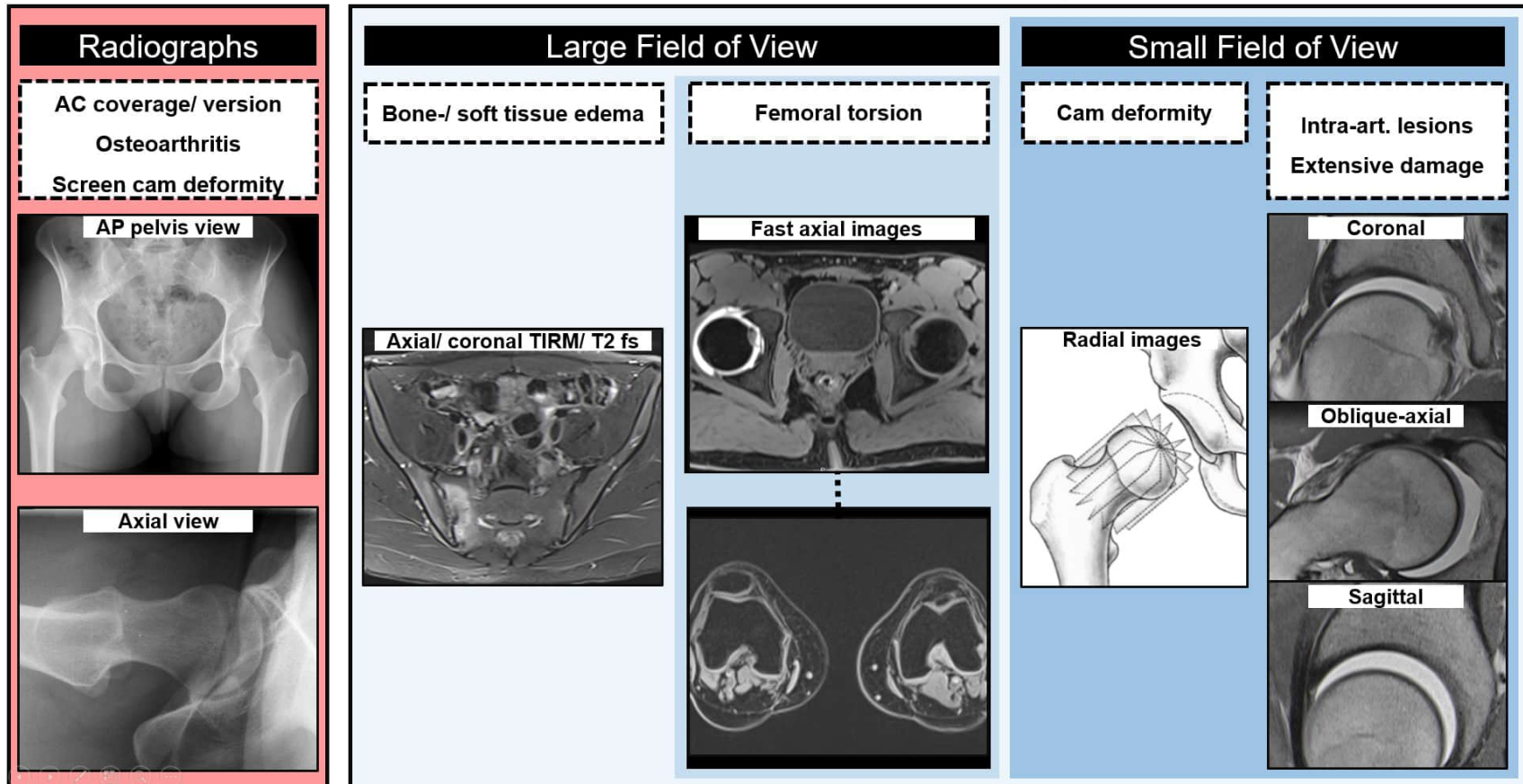
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Disclosures

- Institutional funding from the Swiss National Science foundation
- Speaker royalties from Geistlich Pharma AG

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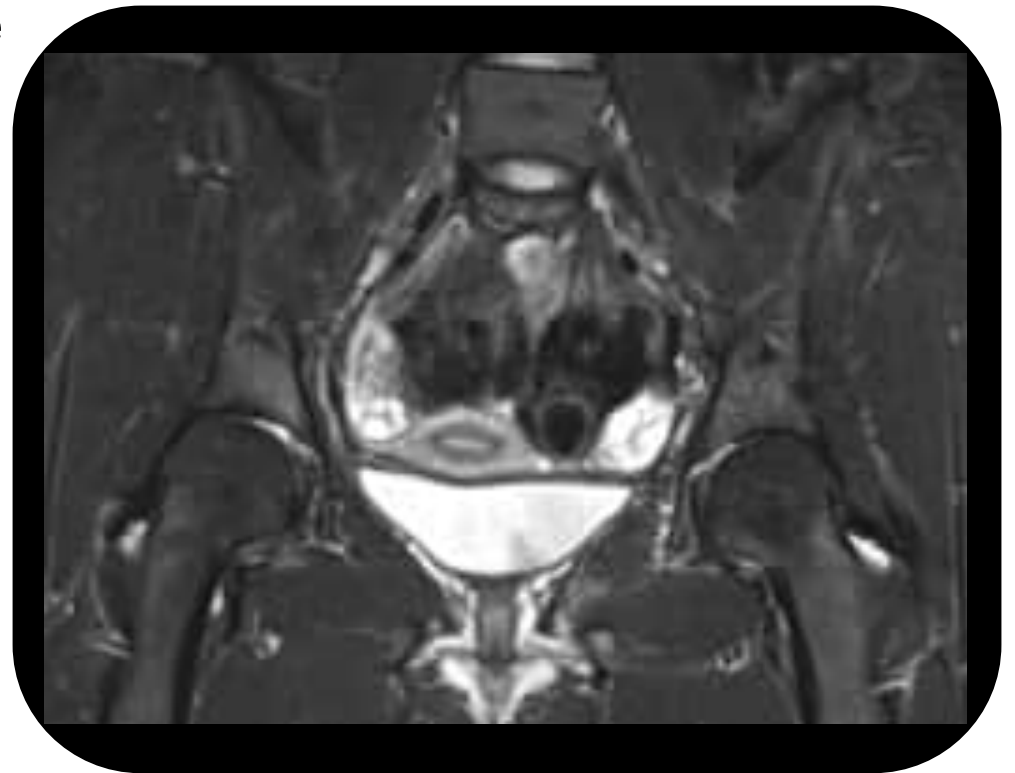
Diagnostic pyramid



u^b Screening image

Coronal/ axial fluidsensitive sequence

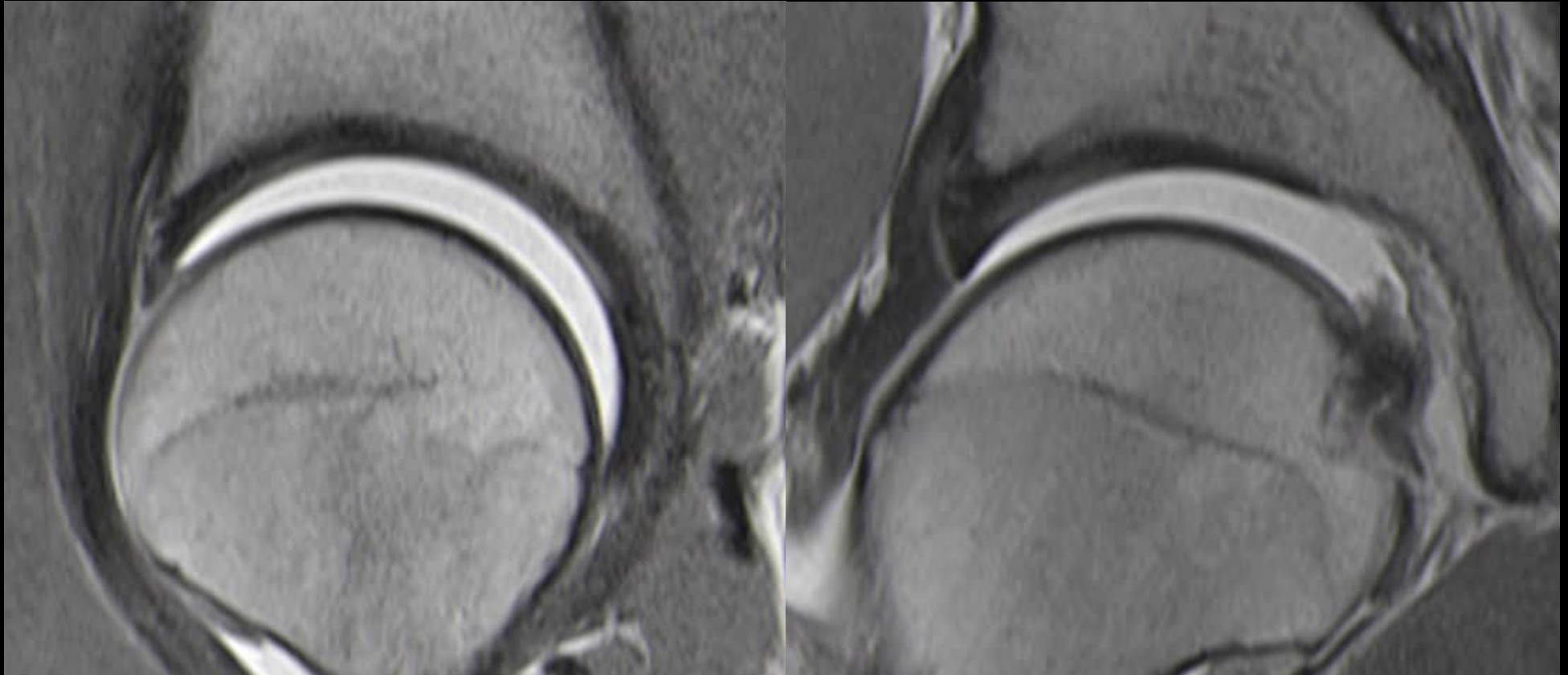
- T2 TSE fs, STIR
- Lesser trochanter – iliac wing
- SAIS – sacrum



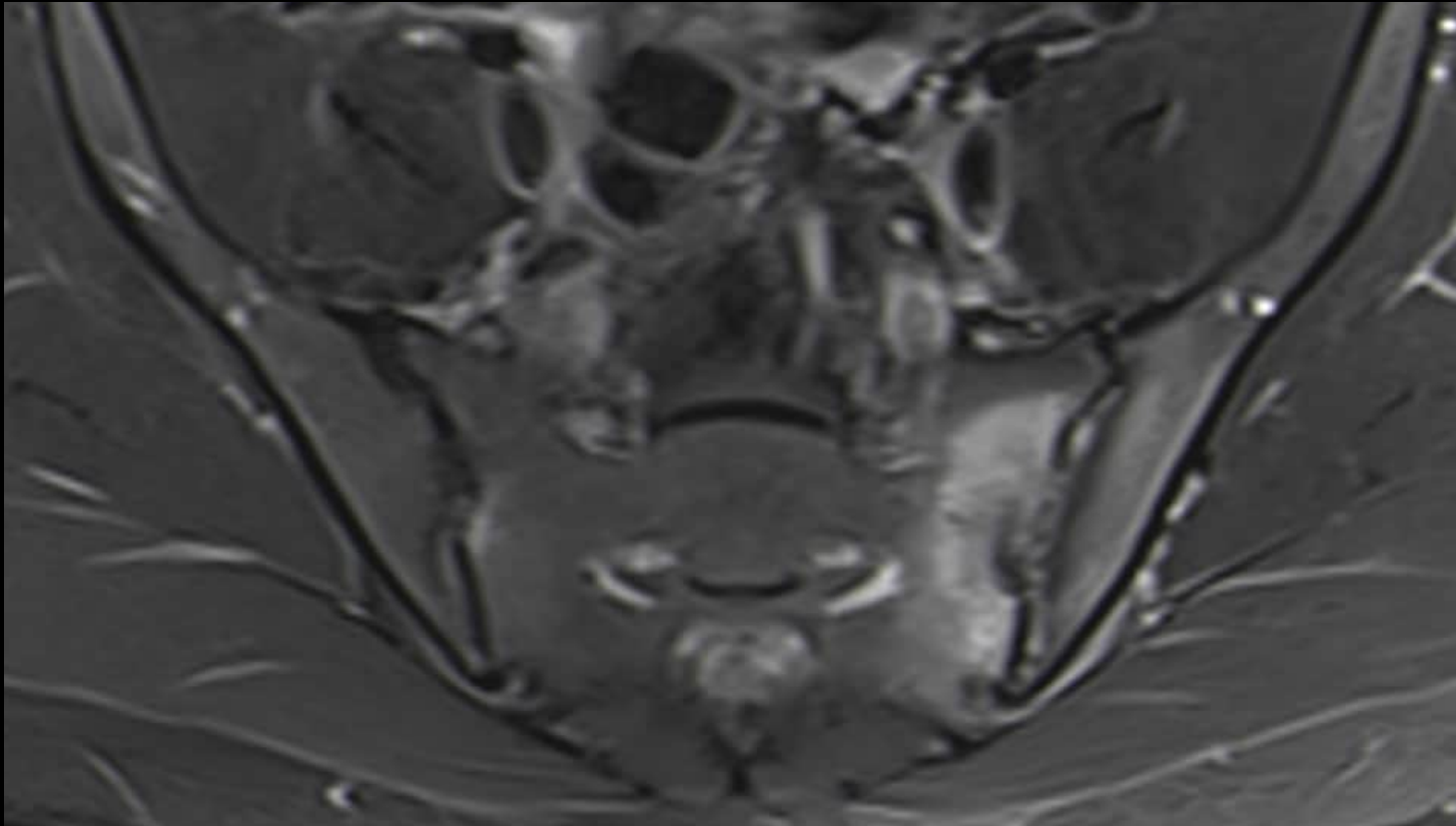
24y with back and bilateral groin pain



Normal labrum/ cartilage

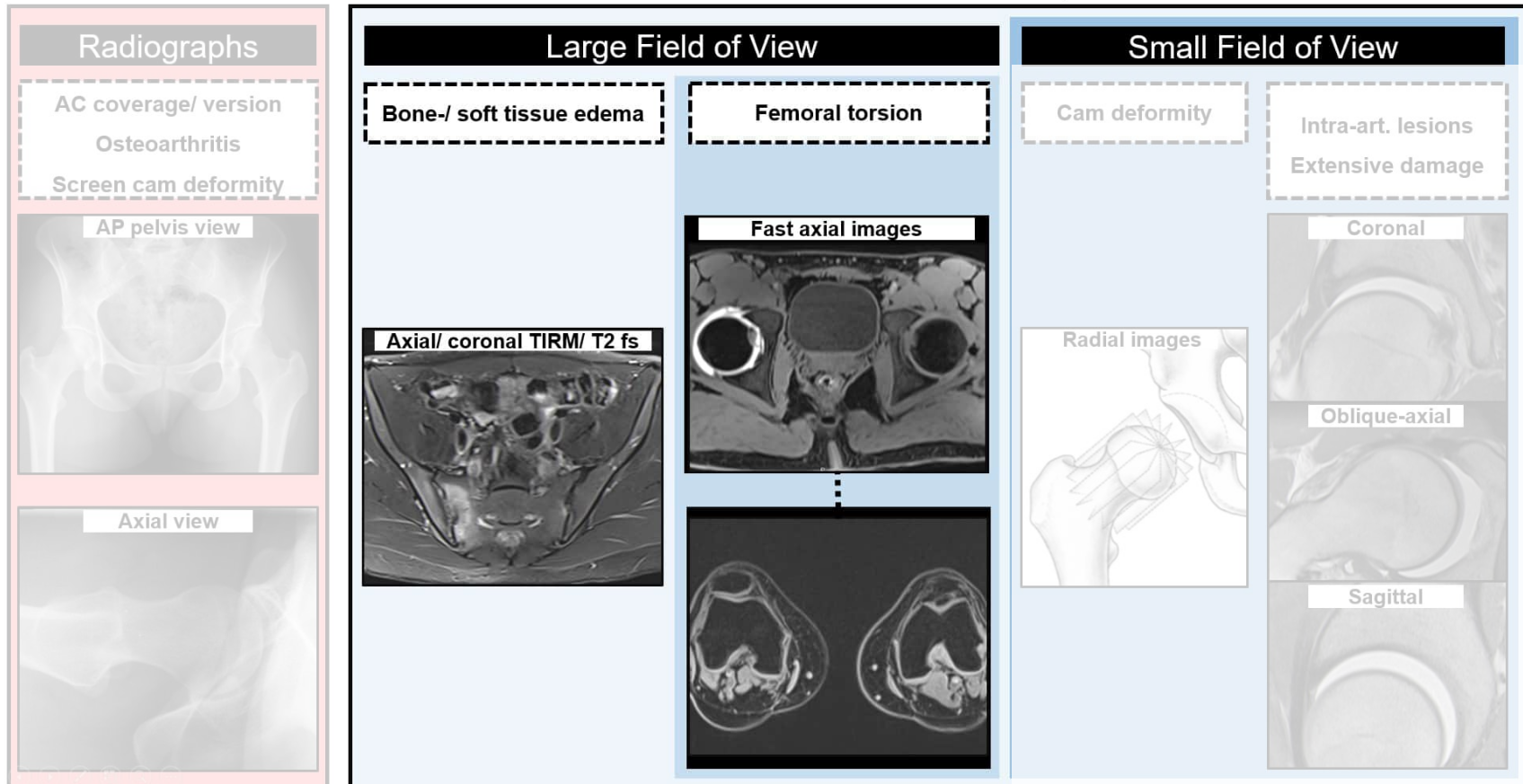


axSpa



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MRI: Femoral torsion



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How frequent are torsional deformities?

>500 hips with FAI or hip dysplasia

- 17% with severe torsional deformities
 - i.e. retrotorsion ($<0^\circ$)
 - or increased antetorsion ($>35^\circ$)

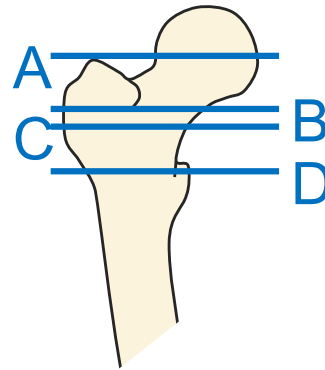
Routine measurement on MRI (CT)



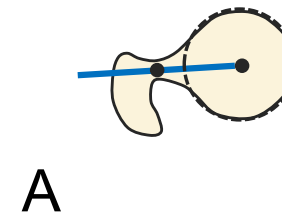
u^b Femoral torsion: Landmarks

- Proximal

- FH center
- **Base neck at level LT**

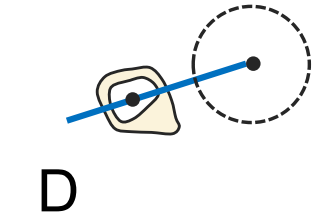


Lee



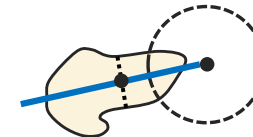
A

Murphy



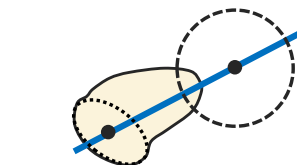
D

Reikeras



B

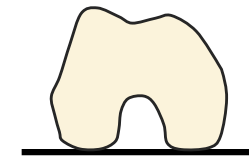
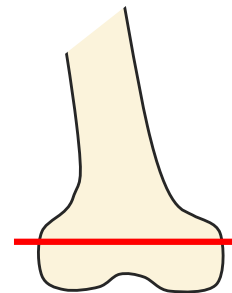
Tomczak



C

- Distal

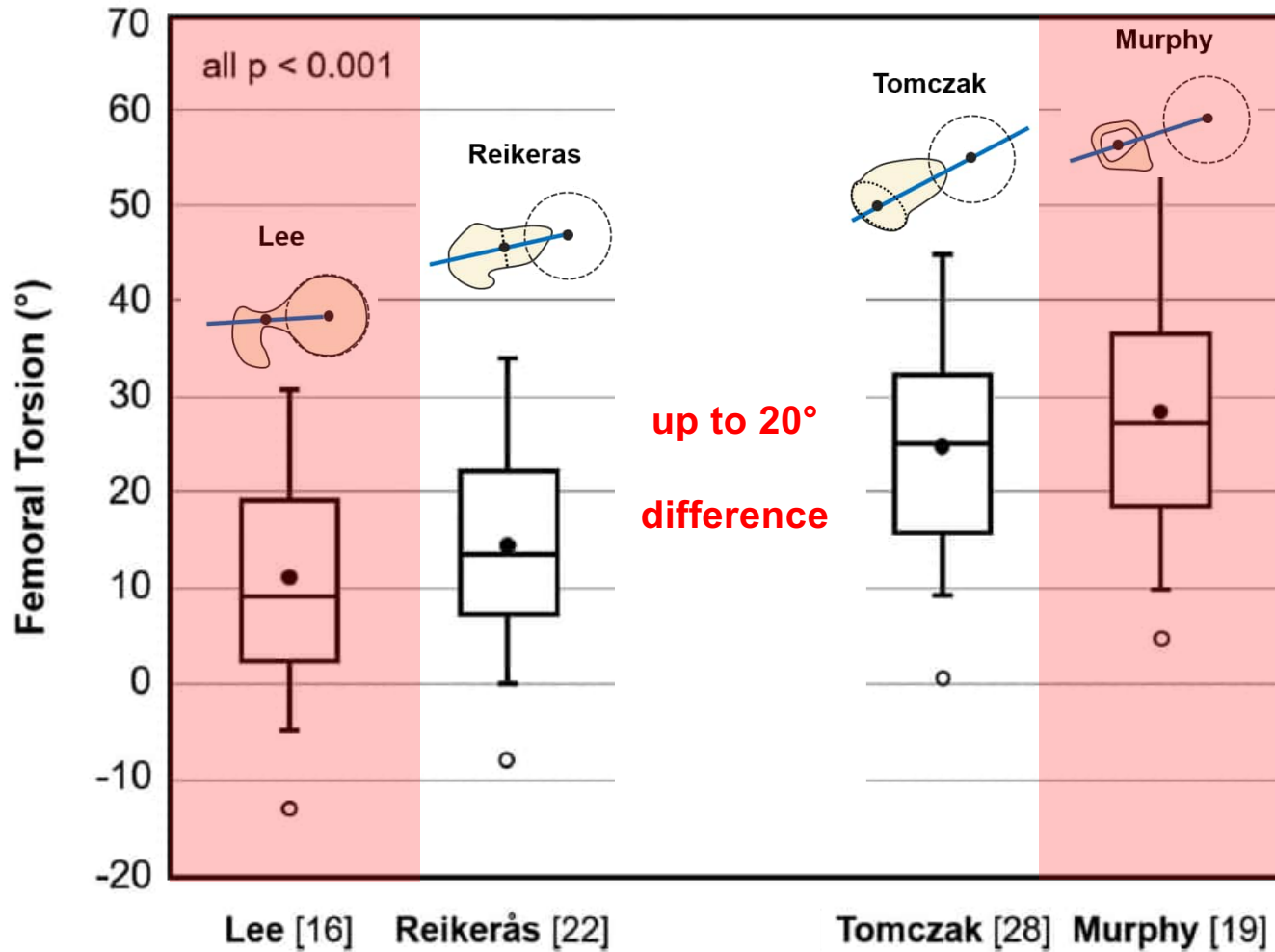
- Condyles



Schmaranzer F et al. Radiology 2020

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Femoral torsion: Landmarks matter



Schmaranzer F et al.
CORR 2019

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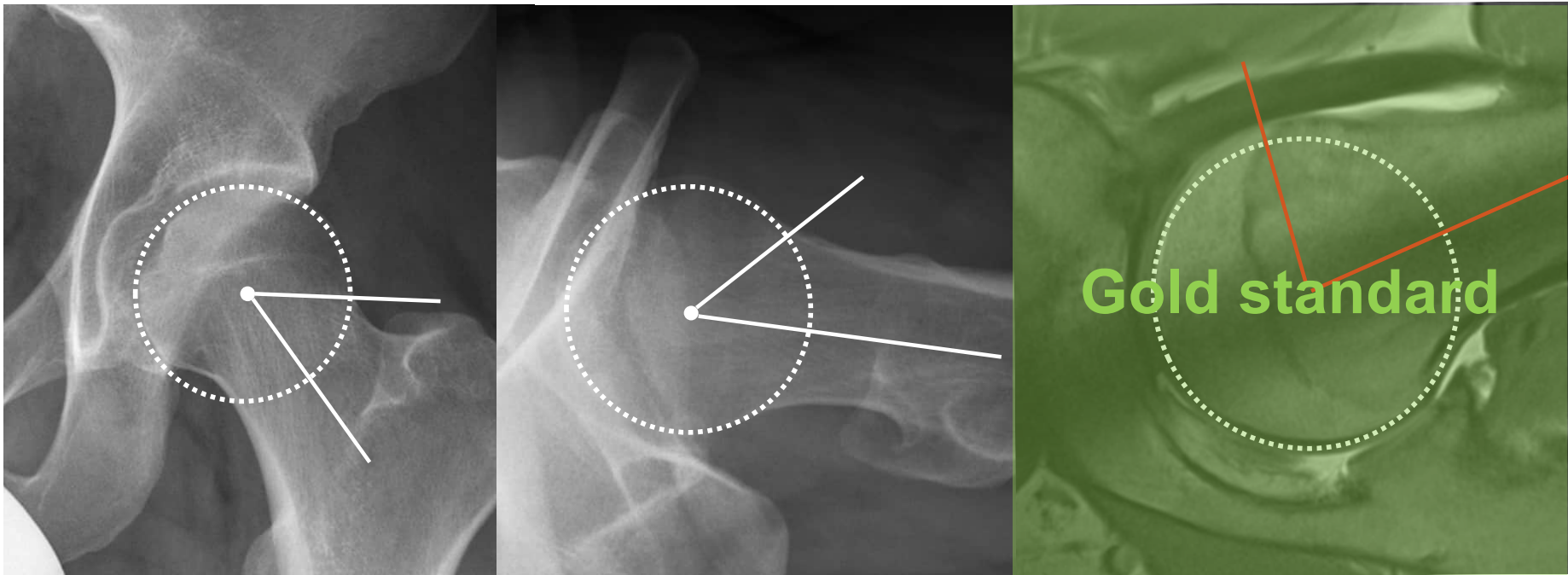
MRI: Cam Deformity

Radiographs	Large Field of View	Small Field of View
AC coverage/ version Osteoarthritis Screen cam deformity	Bone-/ soft tissue edema	Cam deformity
AP pelvis view	Femoral torsion	Intra-art. lesions Extensive damage
Axial view	Axial/ coronal TIRM/ T2 fs	Fast axial images
		Radial images
		Coronal
		Oblique-axial
		Sagittal

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X-ray vs radial imaging

- AP pelvis view → superolateral ,pistol grip deformity‘
- Axial views: 45 Dunn > cross-table lateral

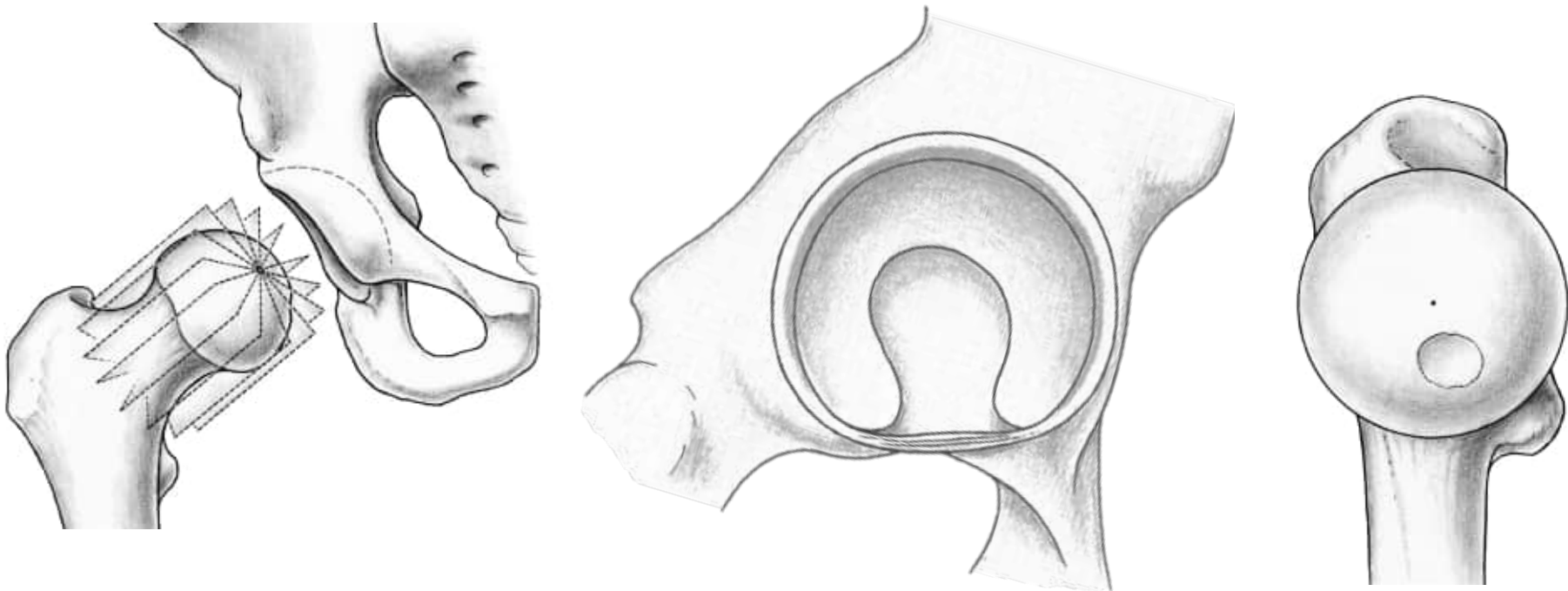


Domayer et al. CORR. 2008

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Radial imaging

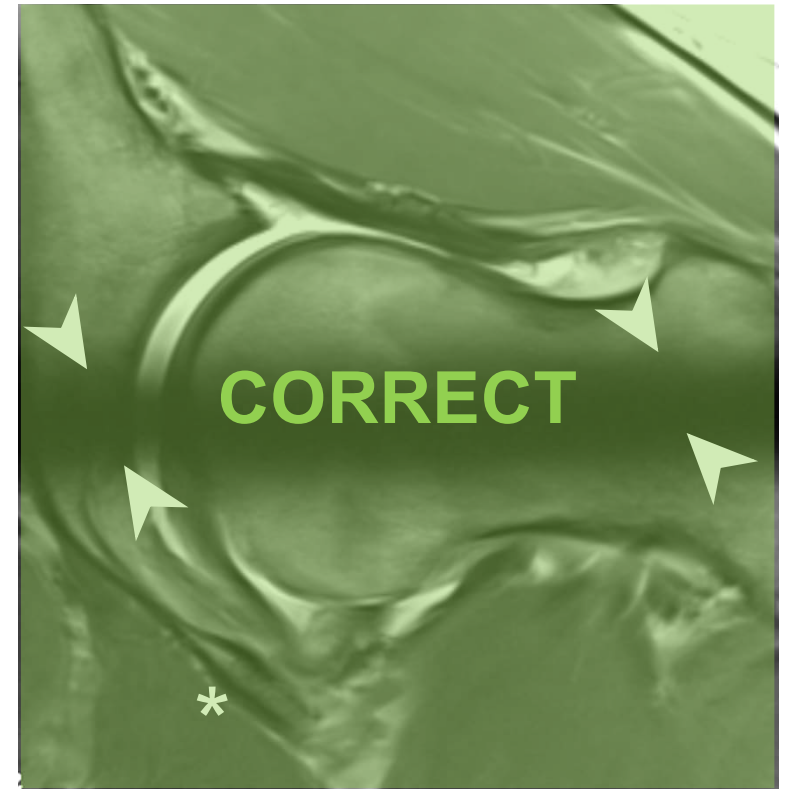
- Femoral neck serves as axis of rotation
- Circumferential, perpendicular visualization of cam deformity



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Radial imaging

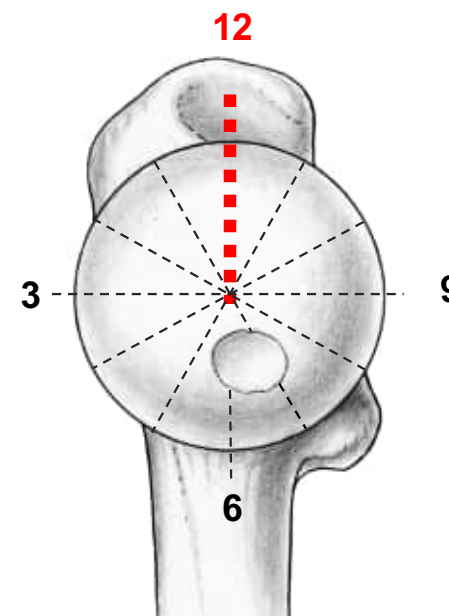
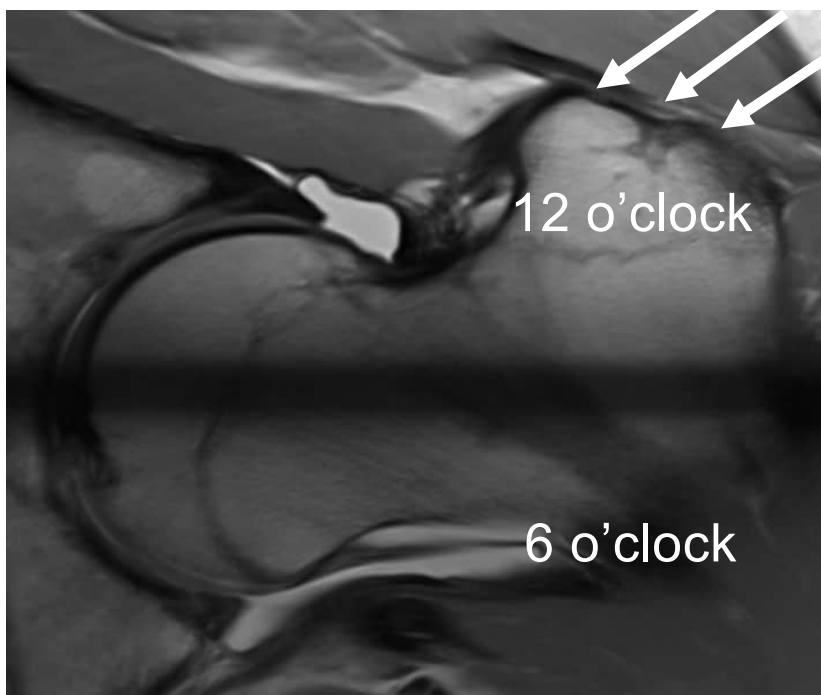
- CAVE orientation of axis of rotation



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Radial imaging

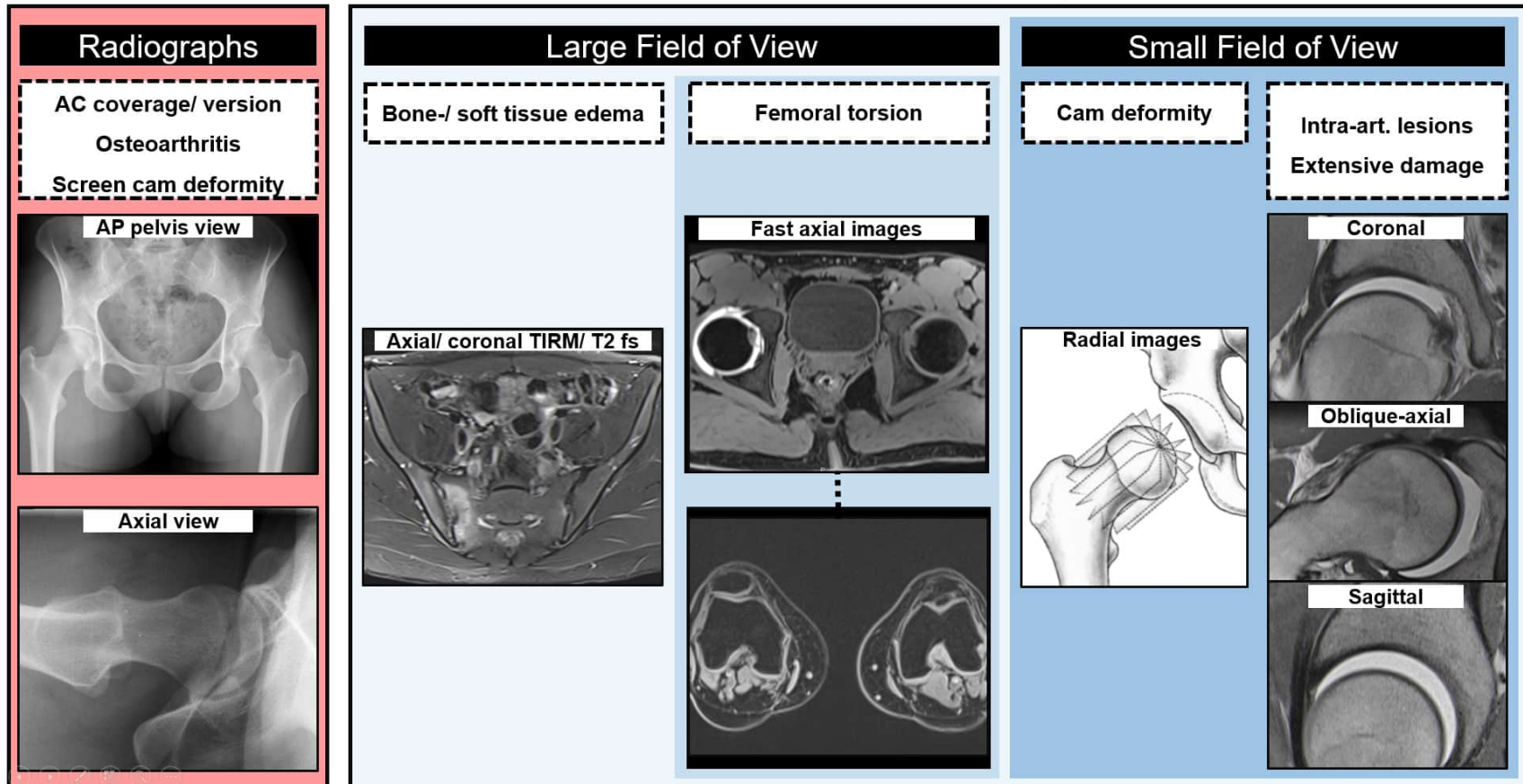
- Femoral 12 o'clock landmark: greater trochanter
- Location of cam deformity relative to the retinacular vessels



Klenke FM et al. Skeletal Radiol. 2015

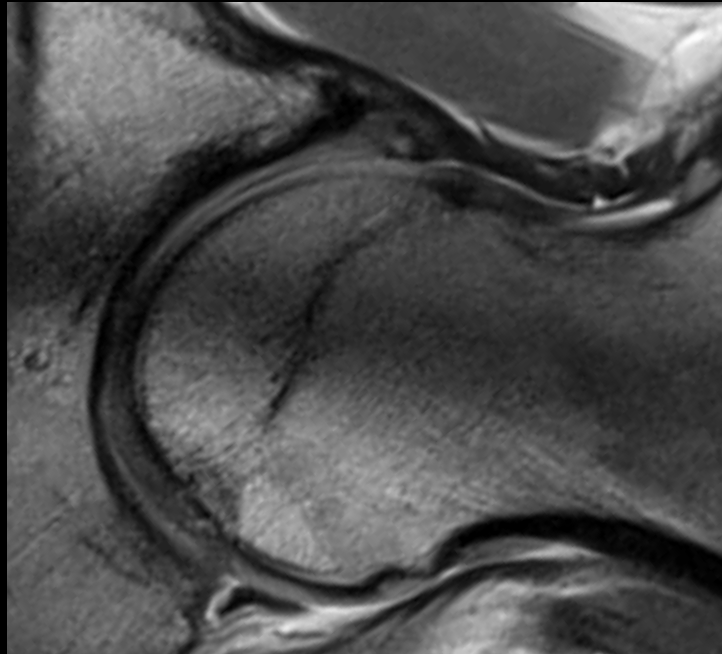
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MRI: Chondro-labral lesions

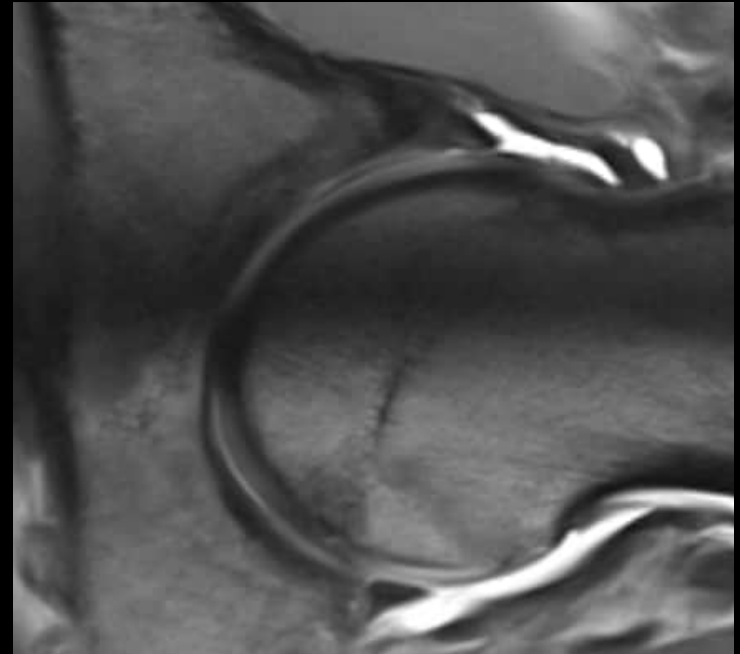


How should we image the hip?

non-contrast MRI



MR Arthrography

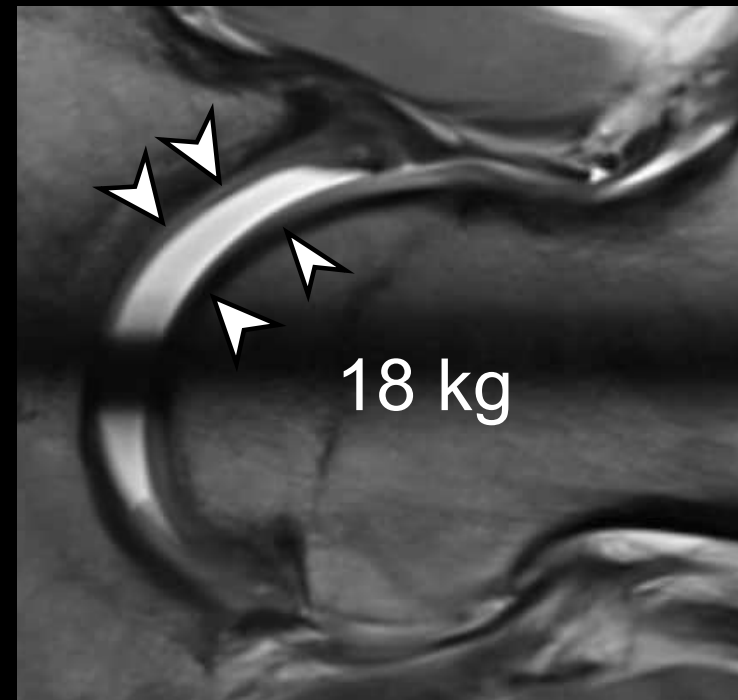


Cartilage

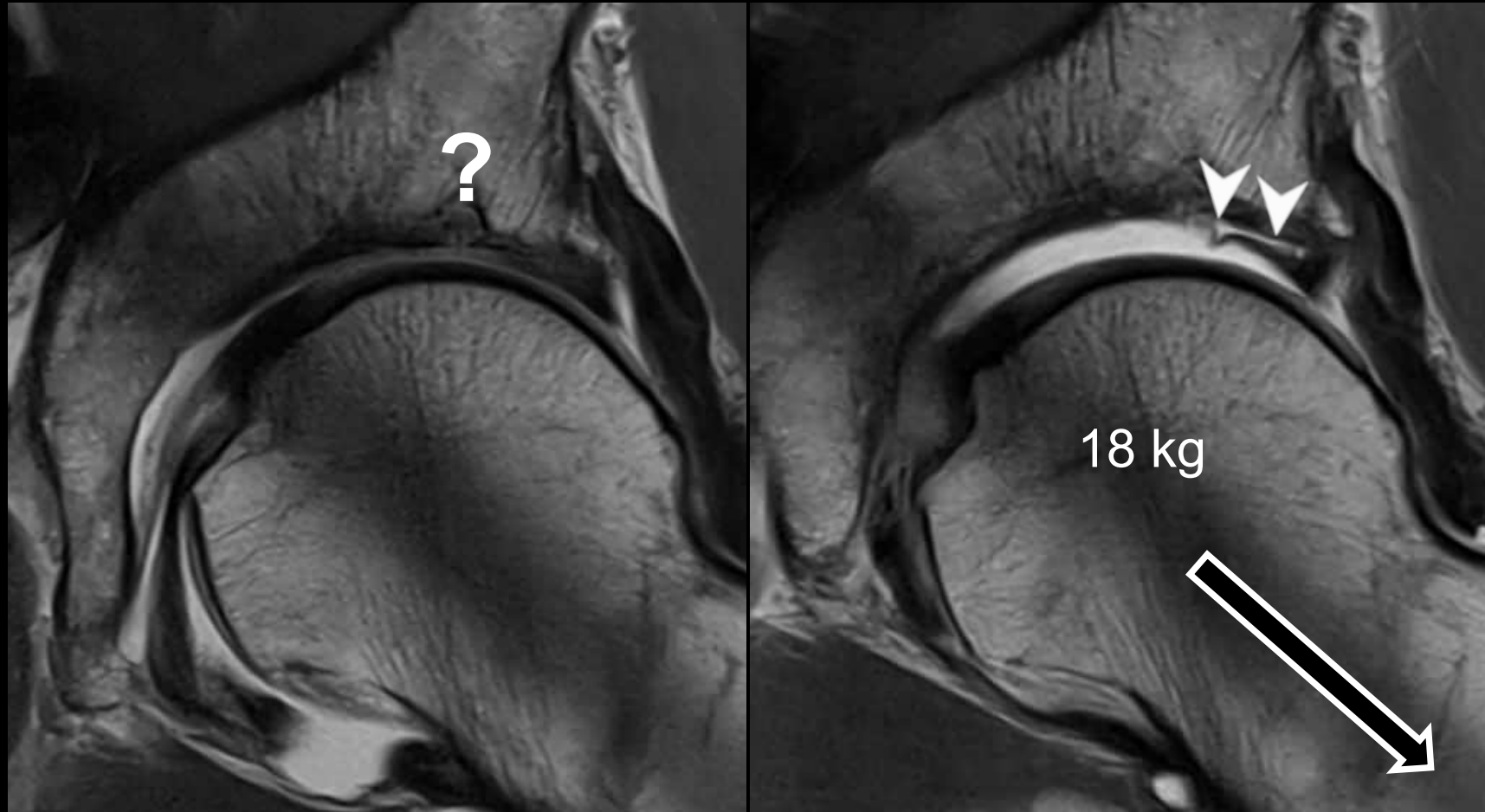
MR Arthrography



traction MRA



Cartilage Delamination



Schmaranzer F, et al. Mag Res Clin North Am. 2025.

Traction MR arthrography

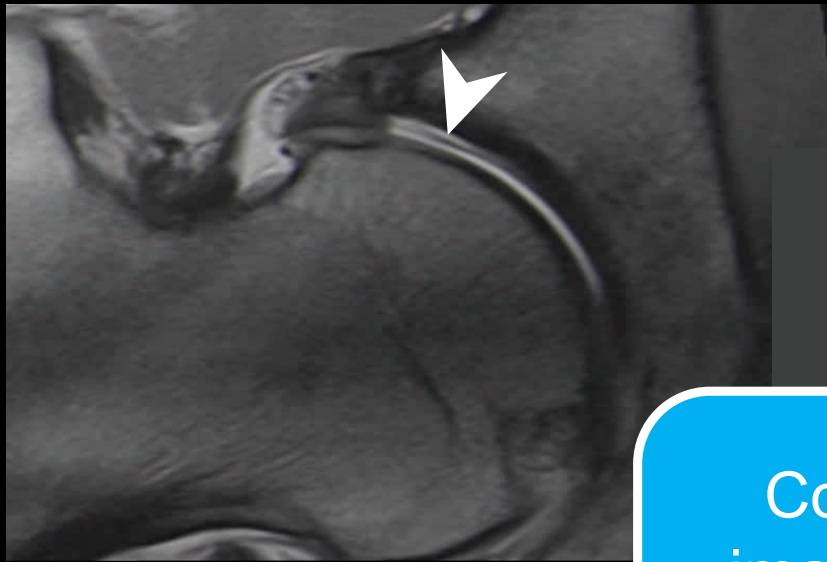


- **Improved detection of cartilage lesions**
 - Safe and reliable method
 - MRI compatible device
 - Supporting plate for contralateral leg

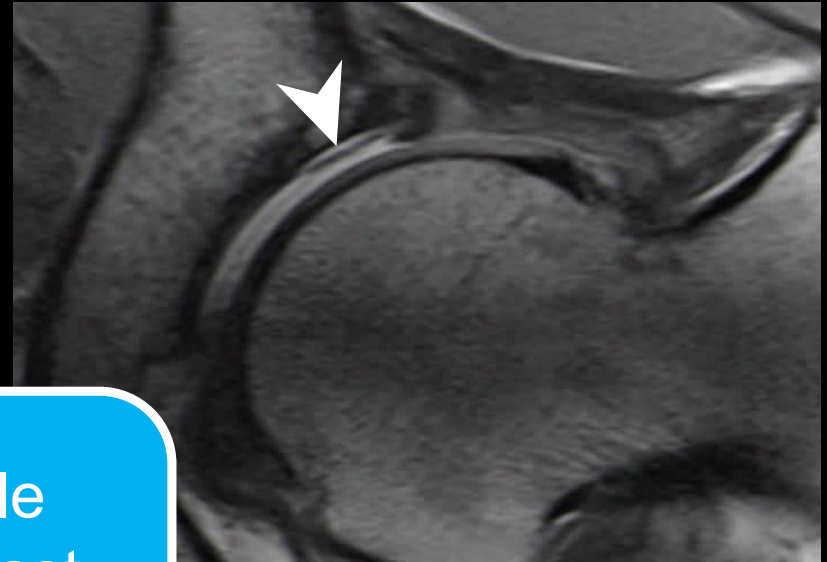
Traction MR arthrography



- **improved detection of cartilage lesions**
 - Safe and reliable method
 - MRI compatible device
 - Supporting plate for contralateral leg
- **similar to HAS (requires fluid distension)**
 - Can we replace contrast agent?



MRI contrast



0.9% Saline

Comparable image contrast and diagnostic accuracy



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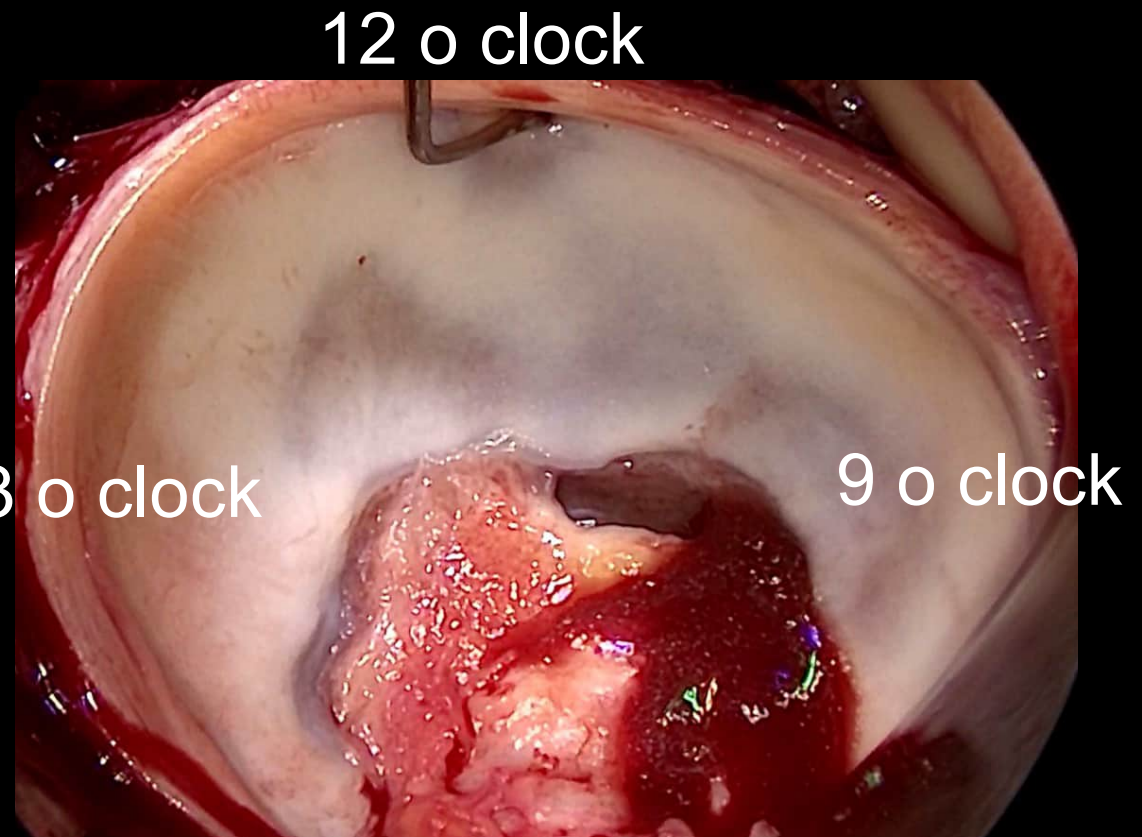
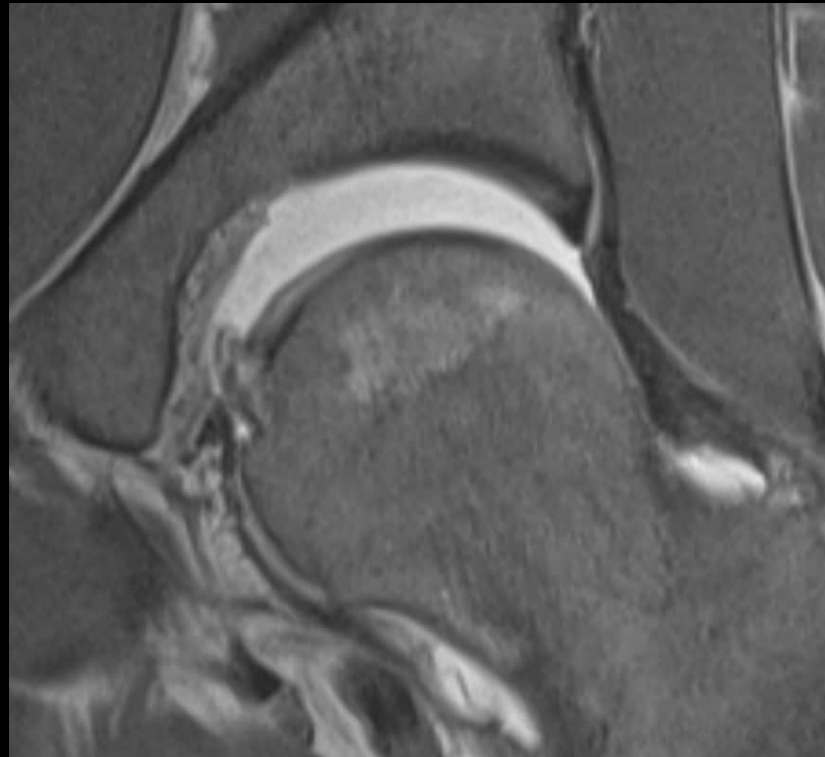
Can MRI detect different damage pattern?

Beck M. et al. BJJ 2005:

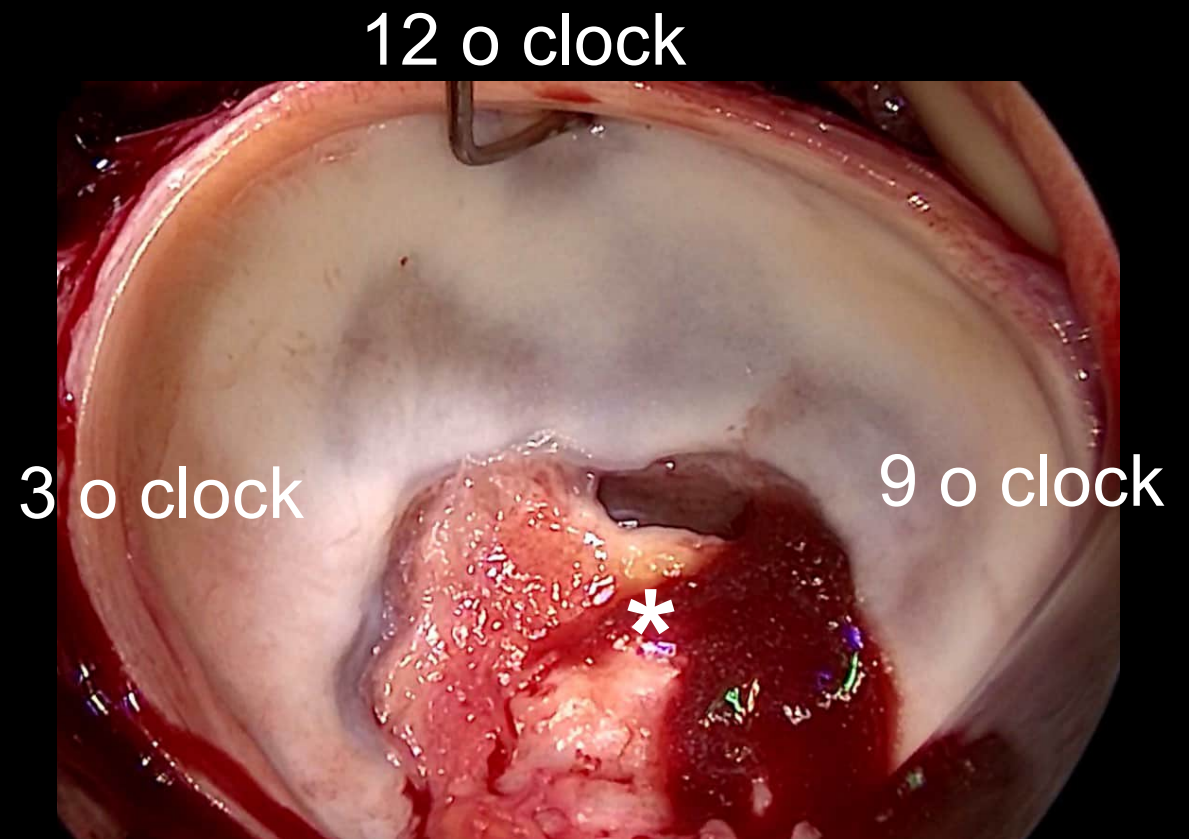
„Intra-articular damage pattern reflect underlying pathomechanics“ → potential guide for treatment planning

→ Can be visualized with current MRI techniques!

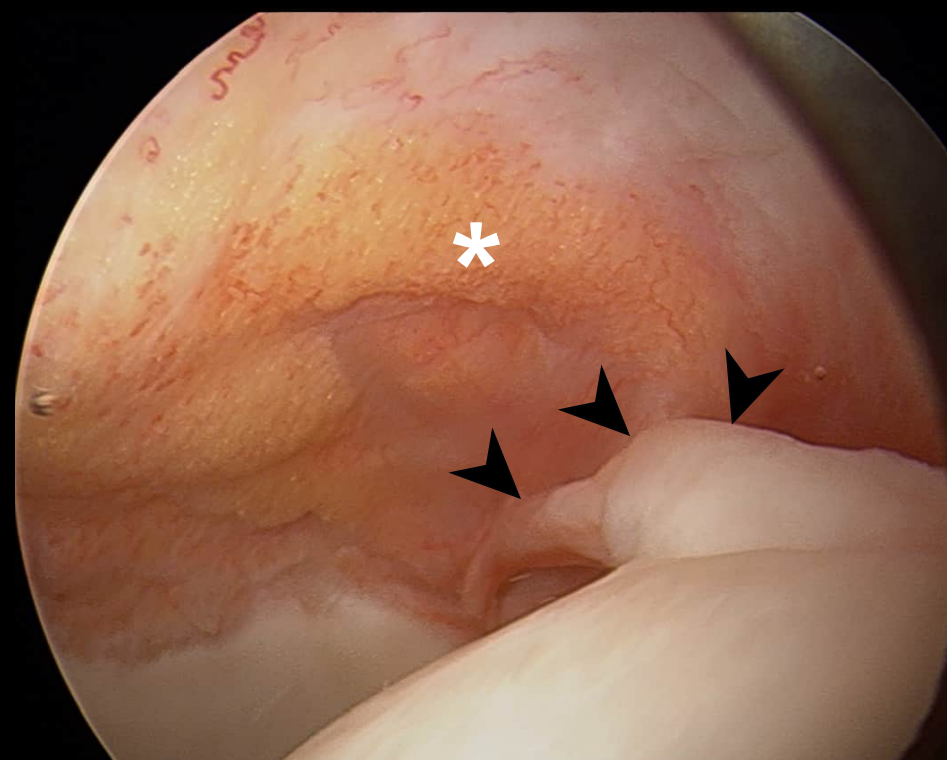
MRI versus Surgery



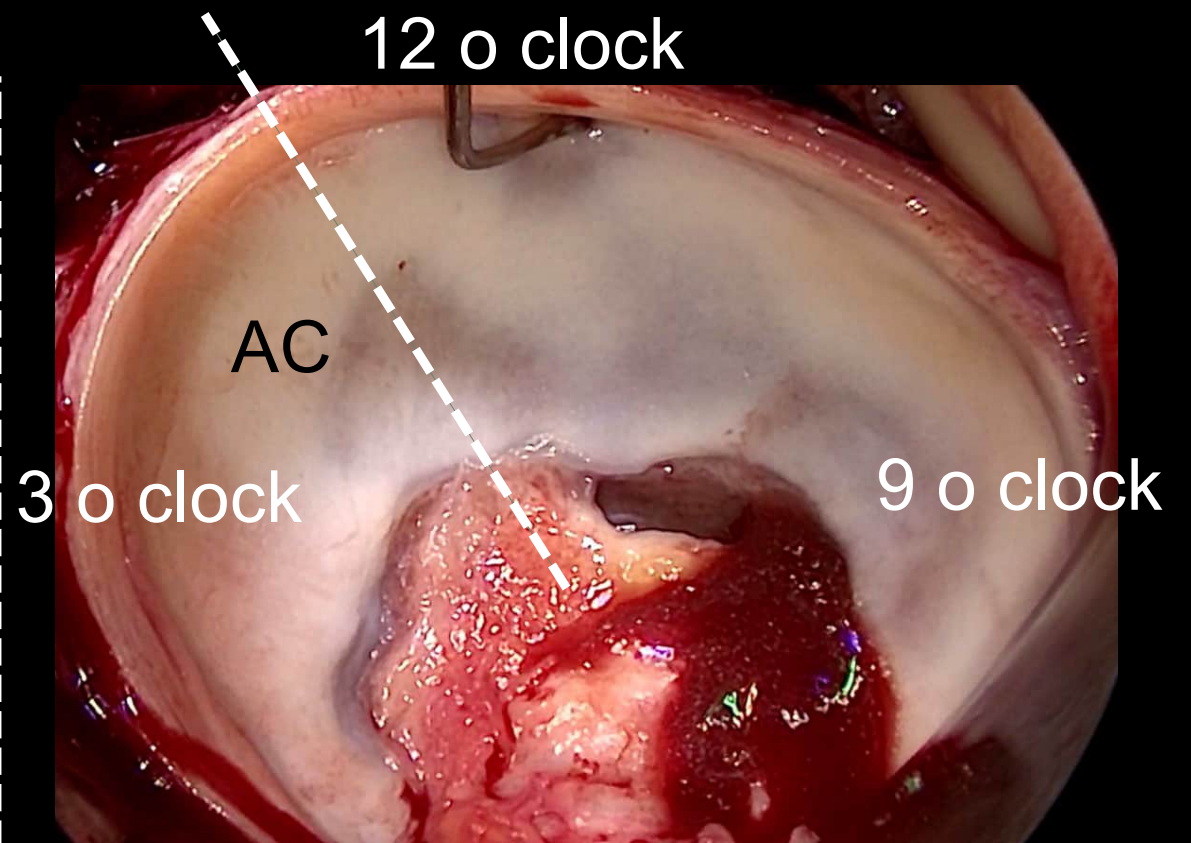
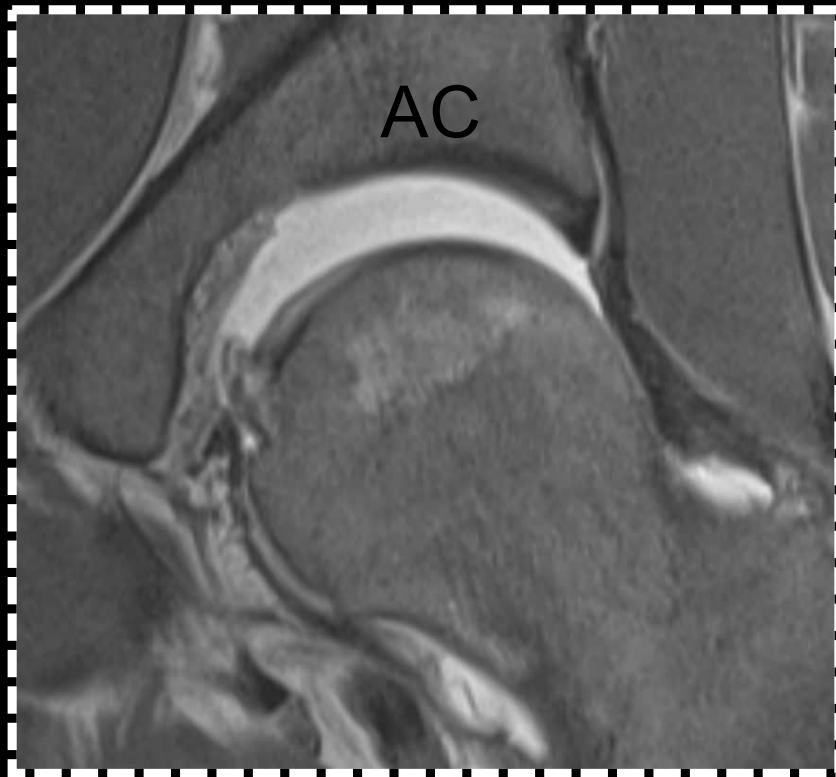
Acetabular fossa with pulvinar



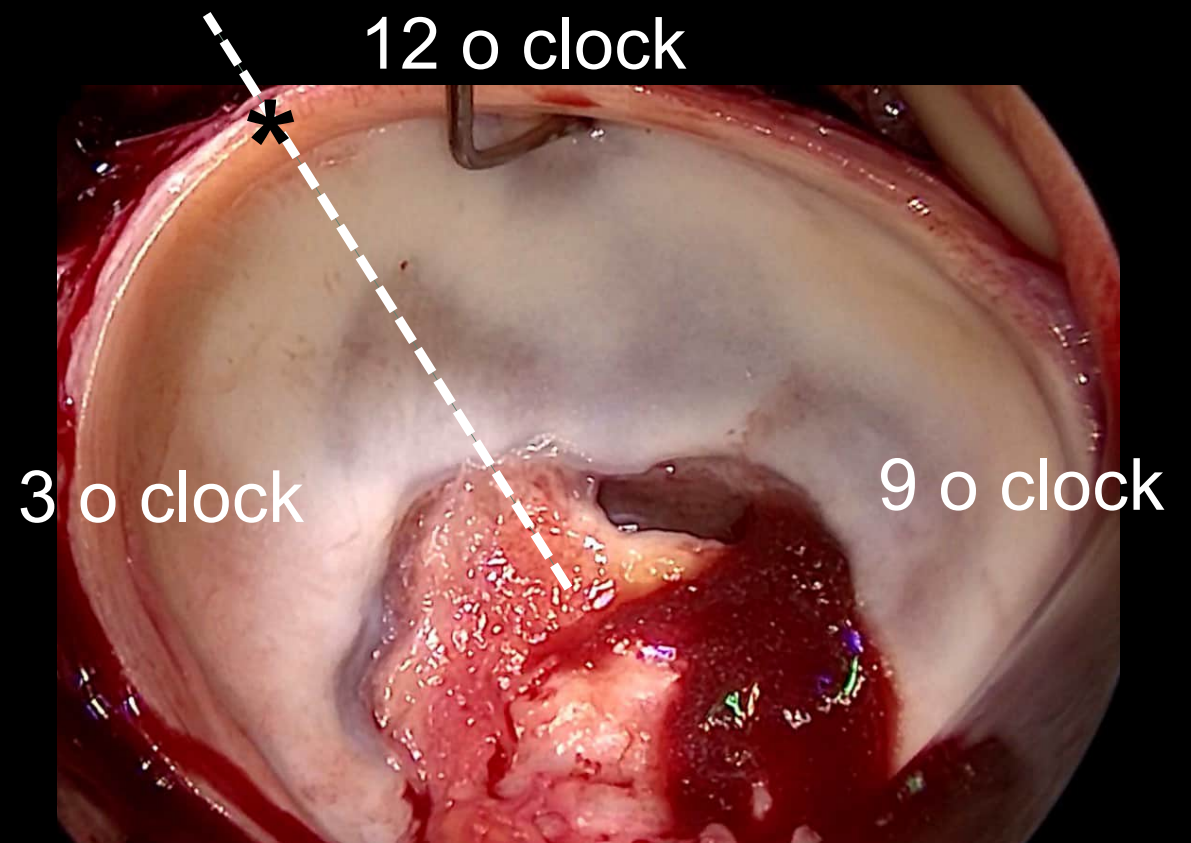
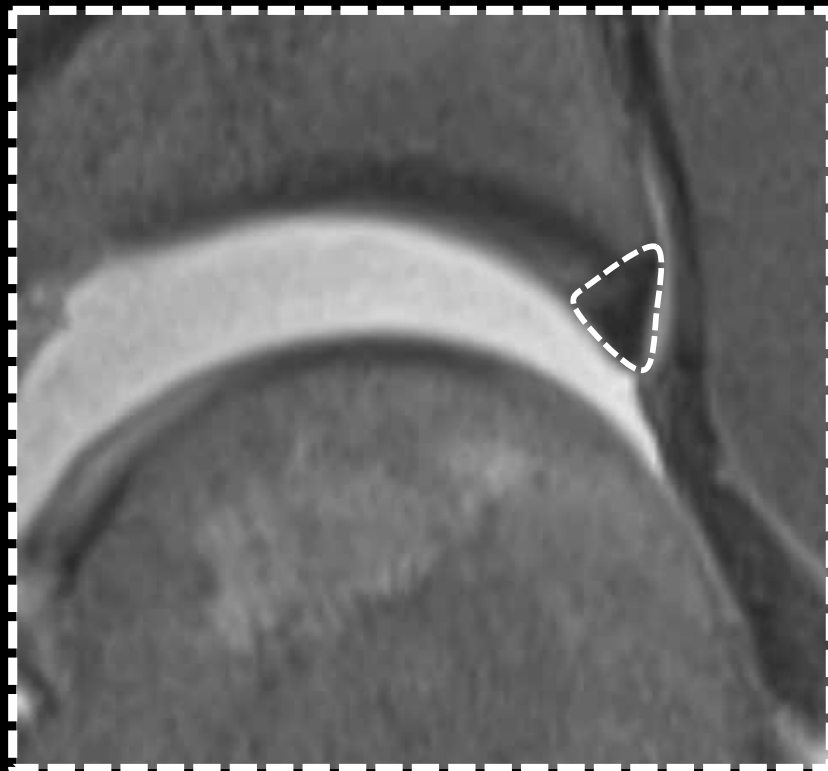
Acetabular fossa with pulvinar



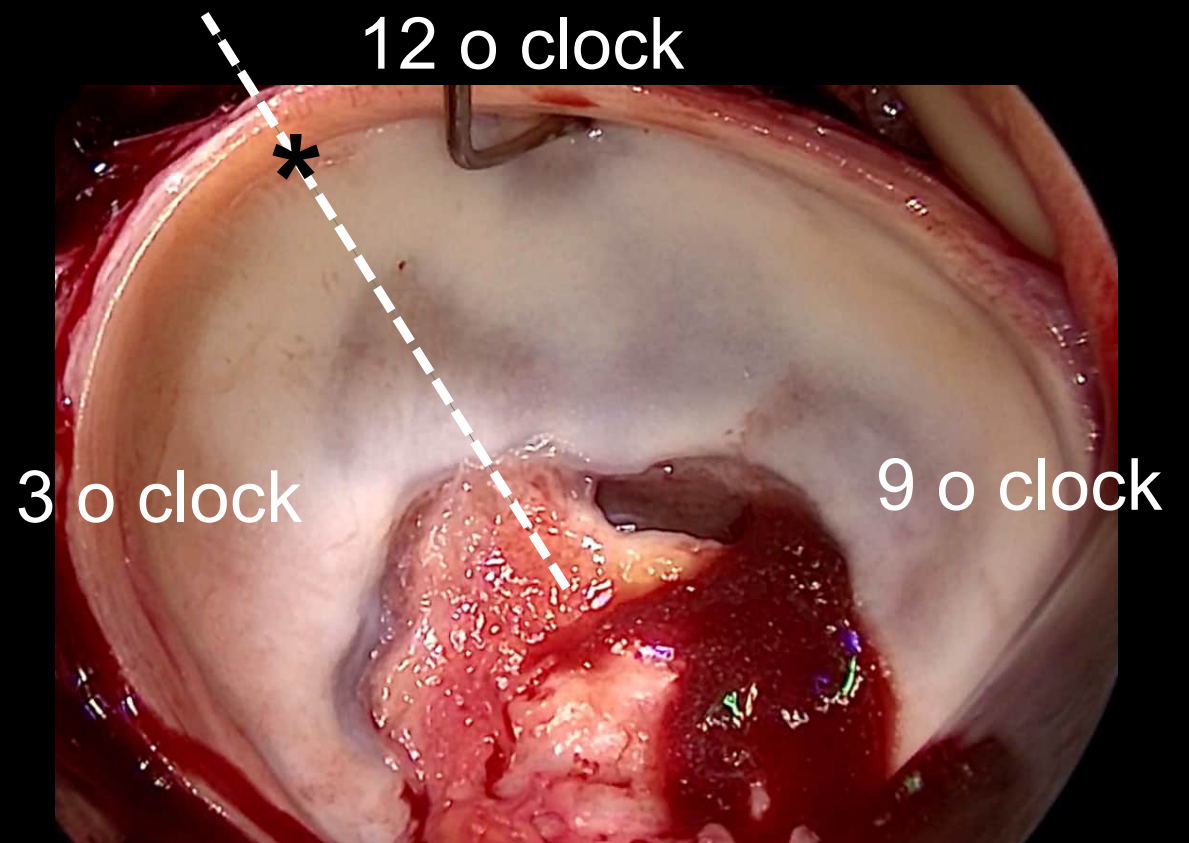
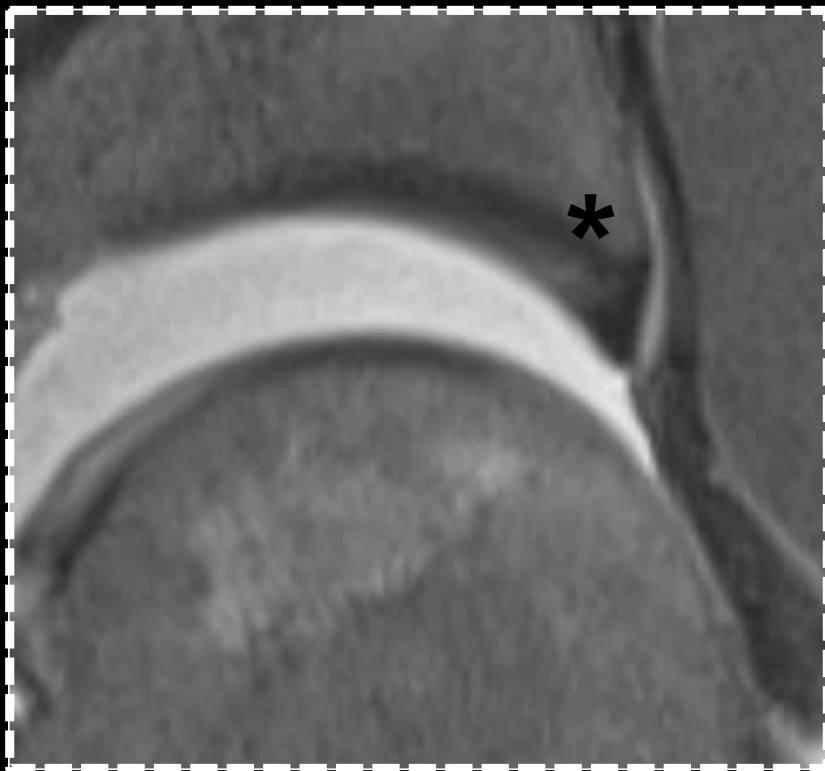
Acetabular cartilage



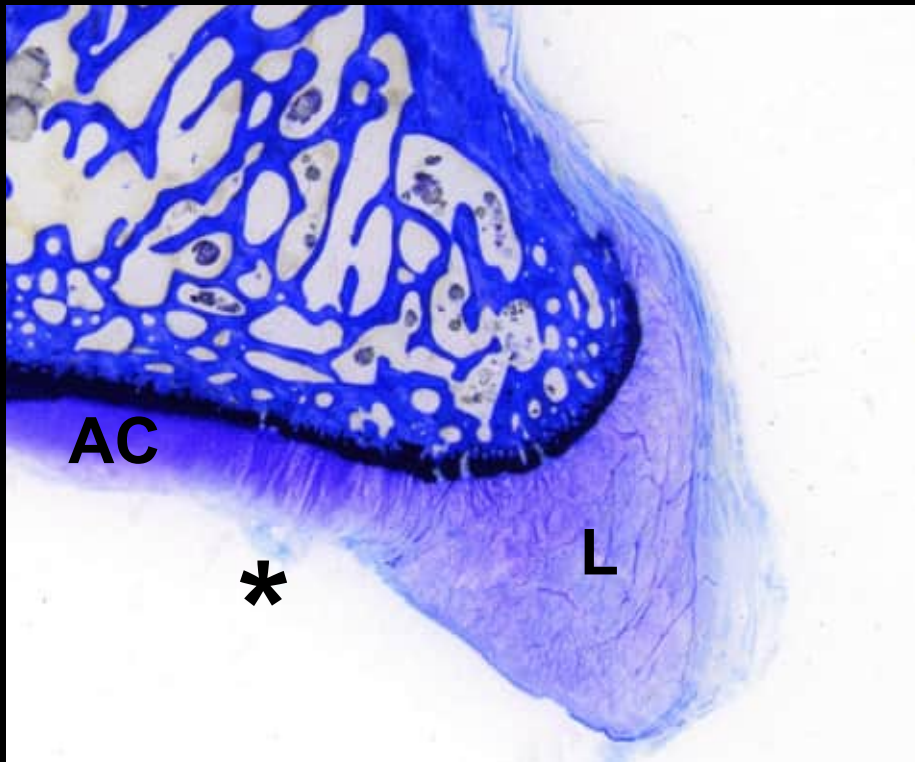
Acetabular labrum



Chondro-labral transition zone



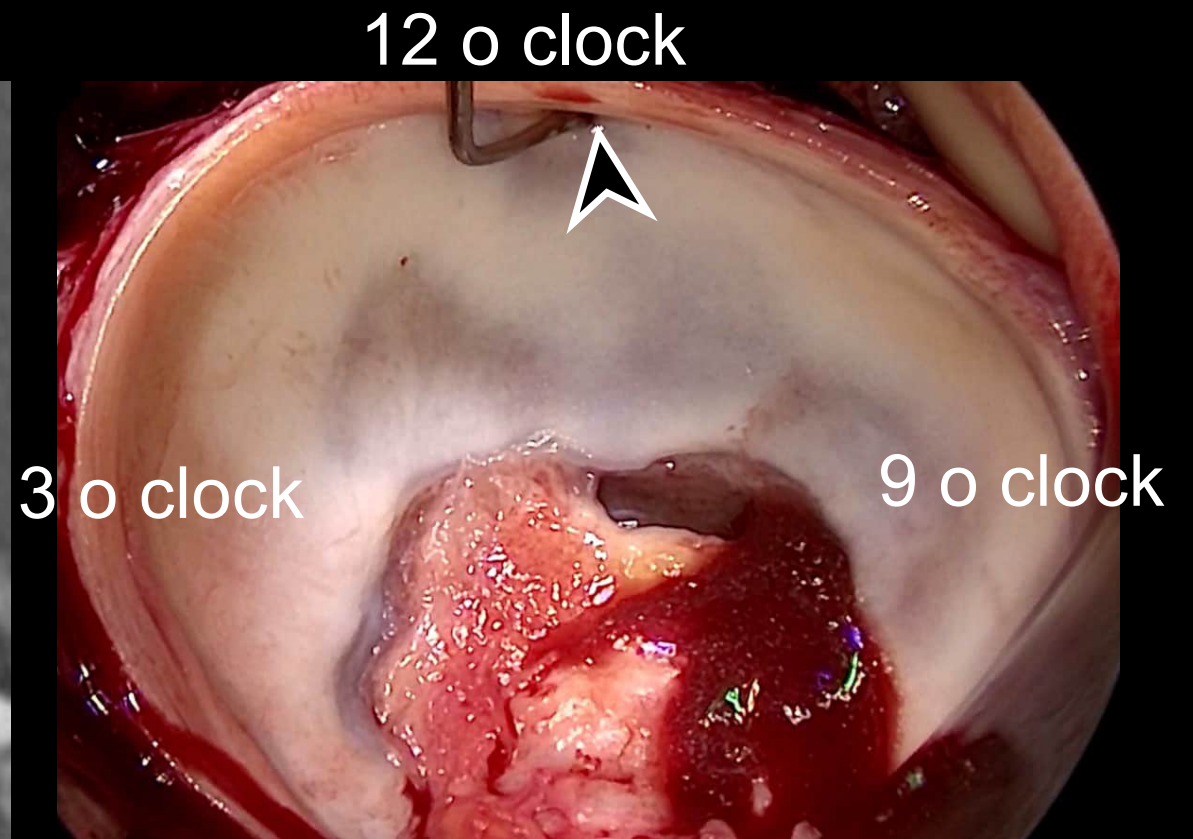
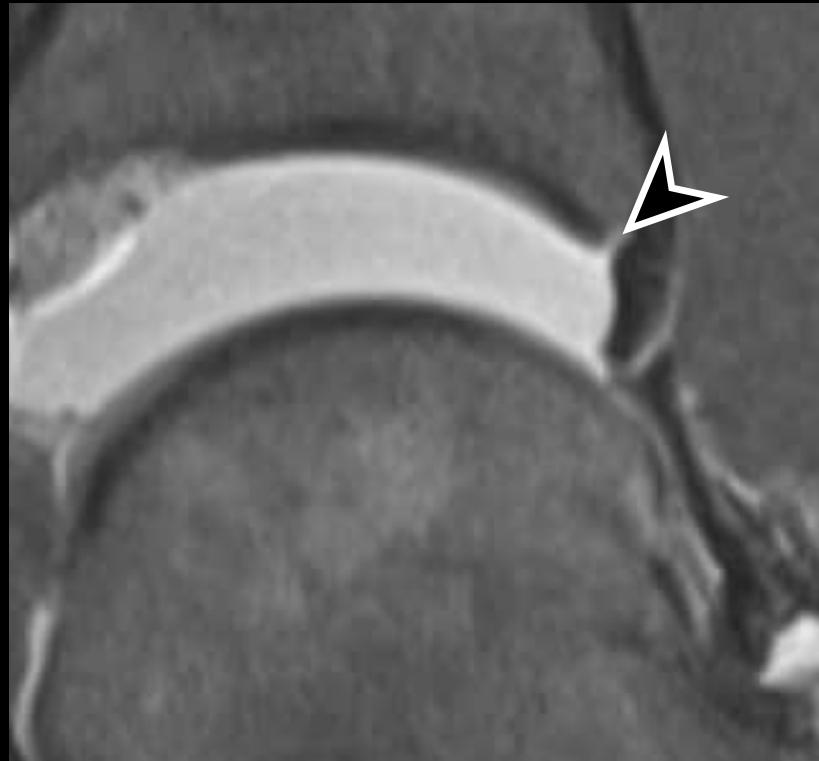
Chondro-labral transition zone



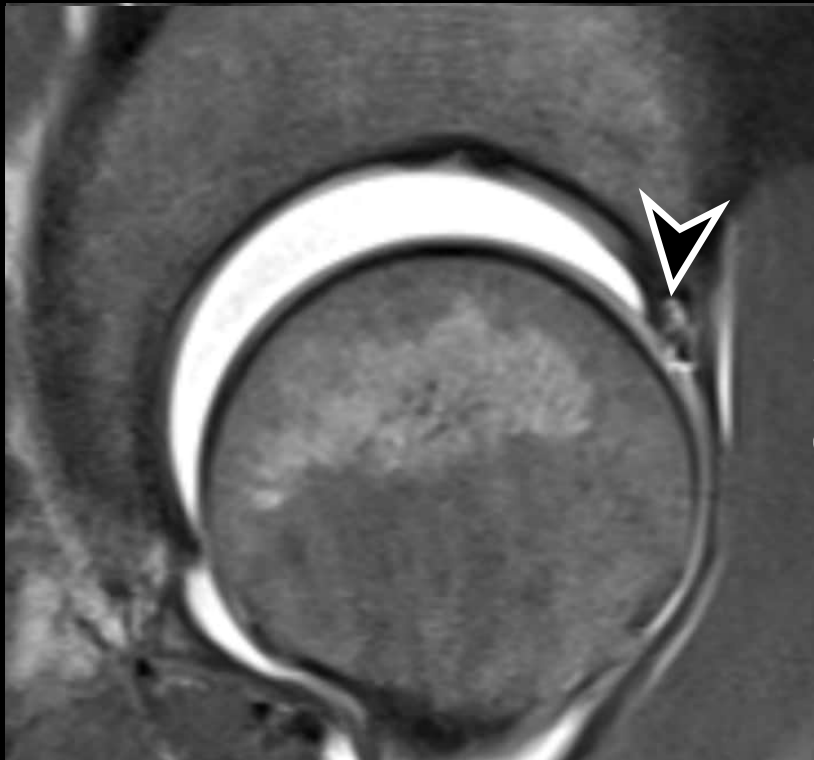
(*) Transition of labral fiber cartilage (L) into hyaline acetabular cartilage (AC)

- starting point of degenerative cascade
 - tear of the labrum
 - loss of suction seal → increased stress
 - cartilage damage
- Normal variant: **Sublabral sulcus**

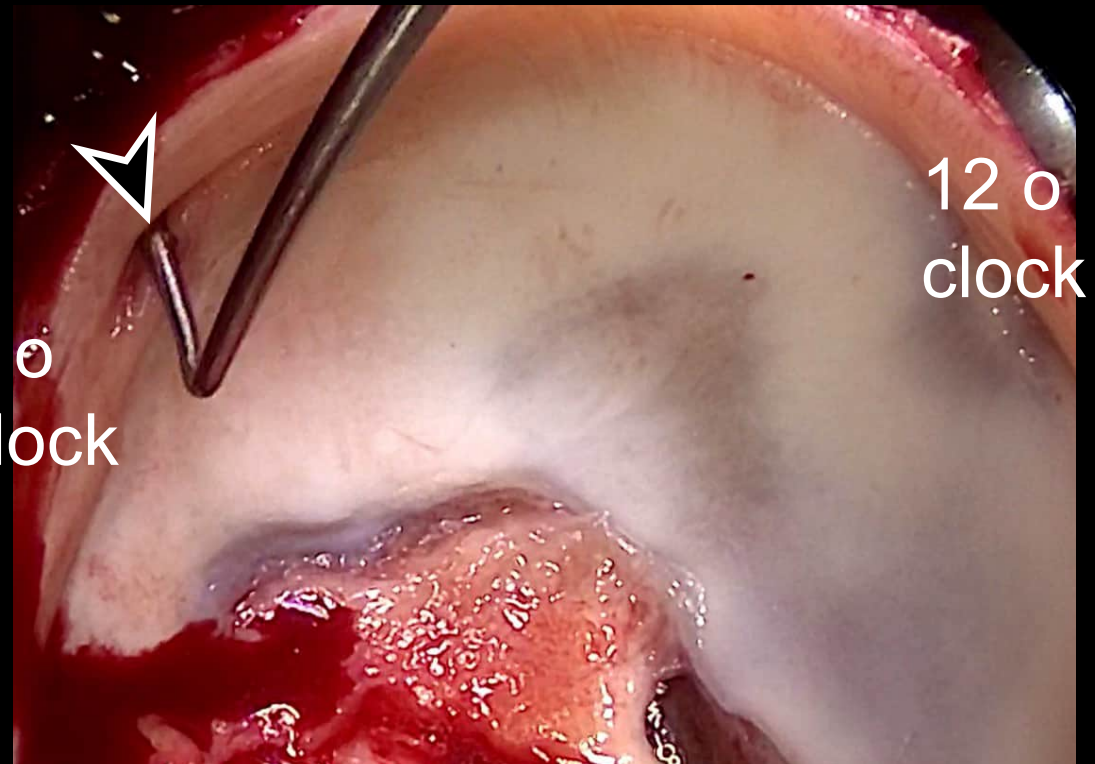
Sublabral sulcus



Labrum tear



3 o
clock



12 o
clock

Normal variants of lunate facies

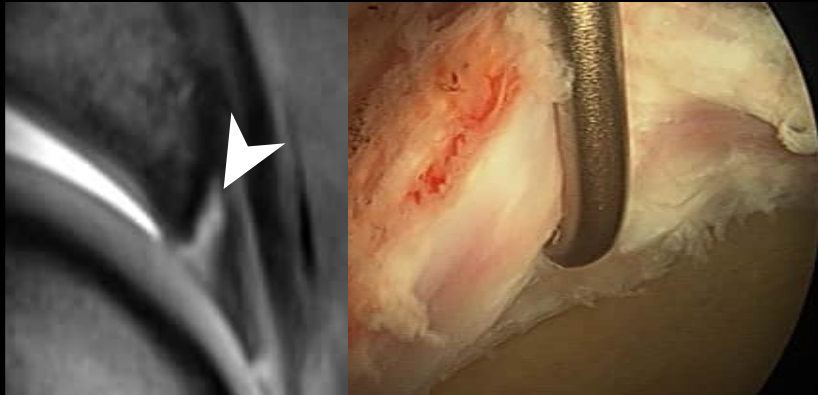


Tubular tracking
(5%)

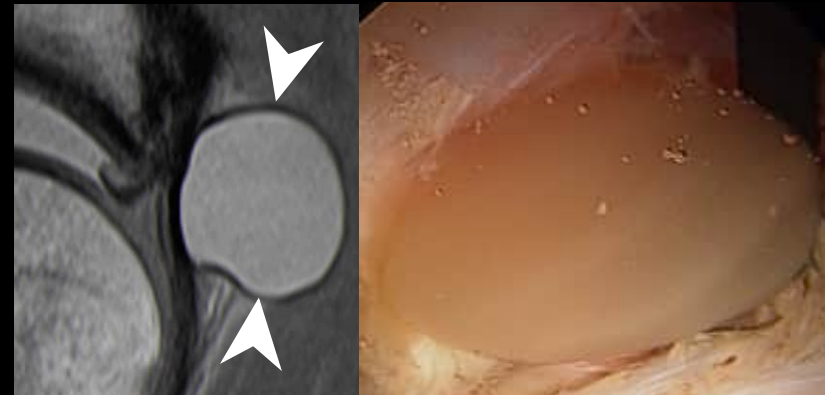


Fossa supraacetabularis
(10%)

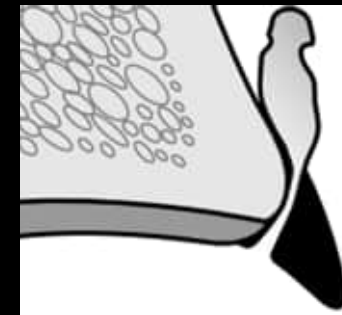
Labrum damage pattern



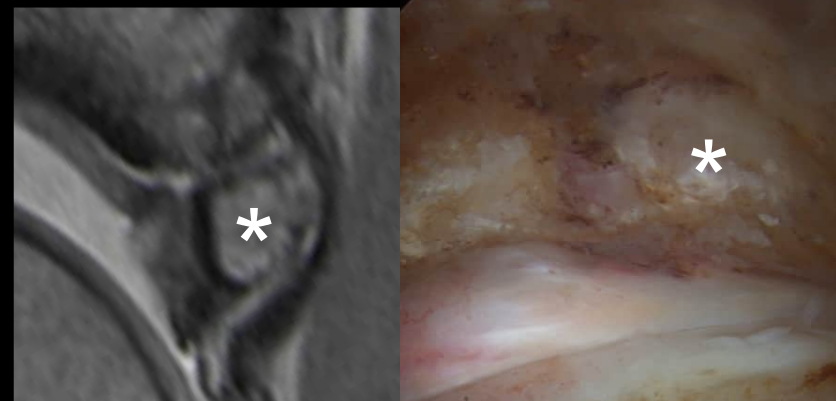
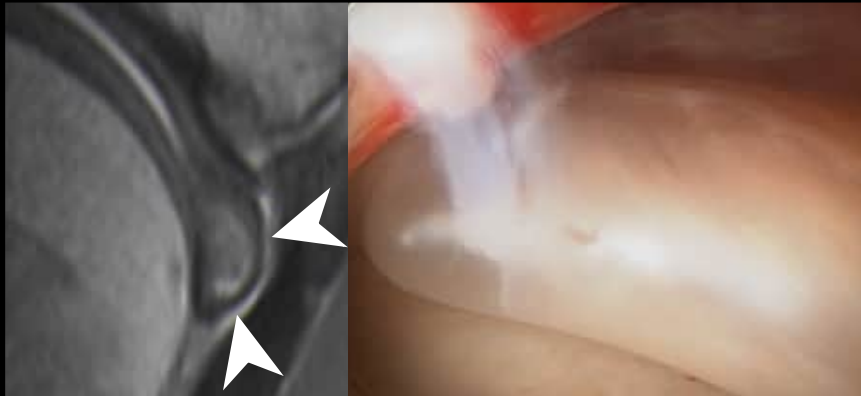
- Detachment
- Labral base
- Cam FAI



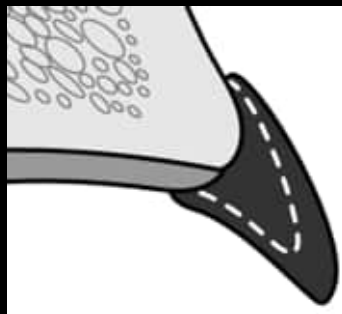
- Cyst
- Base/ intra-subst
- DDH > Cam FAI



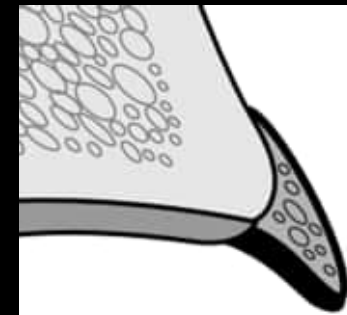
Labrum damage pattern



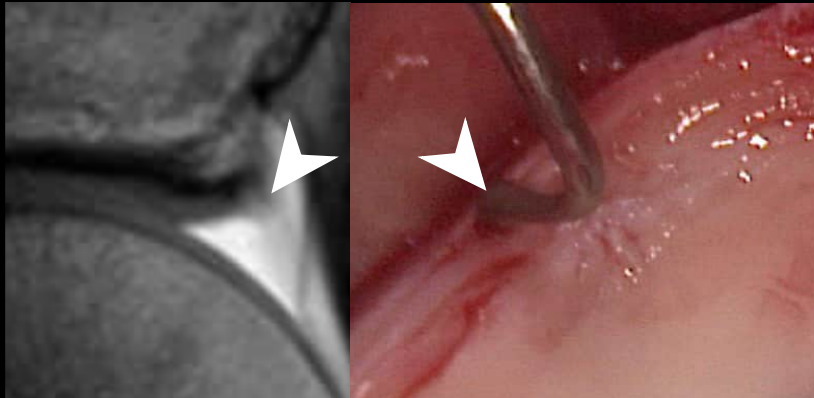
- Hypertrophy
- Mucoid degeneration
- DDH



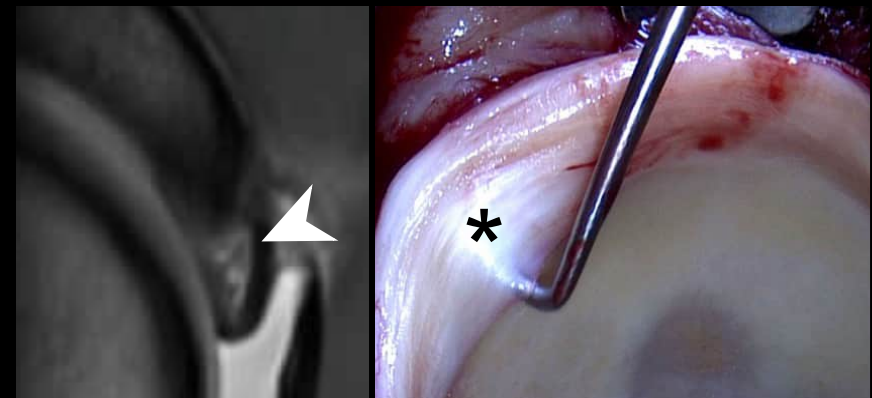
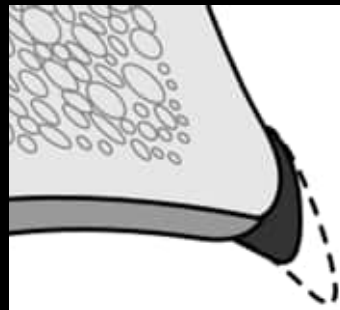
- Ossification
- peri-/ intralabral
- Pincer FAI



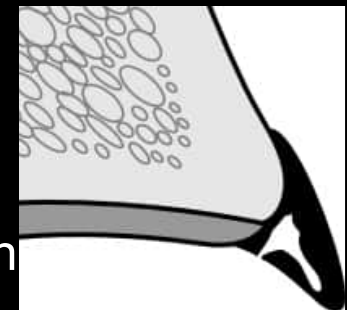
Labrum damage pattern



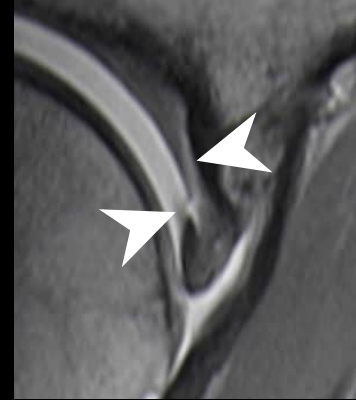
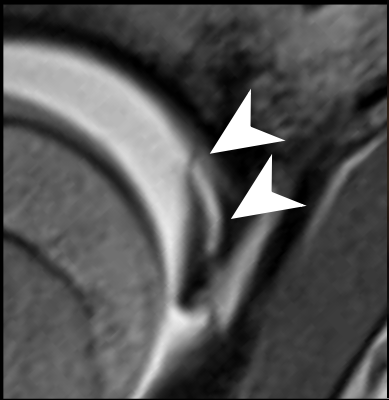
- Small, abutted
- Retrotorsion
- Pincer FAI



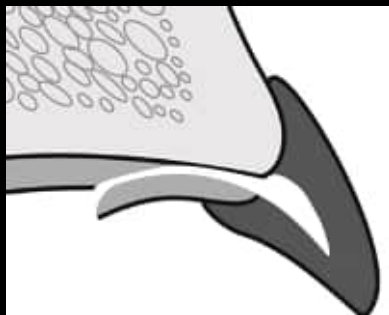
- Intrasubstance tear
- Large labrum
- High femoral torsion



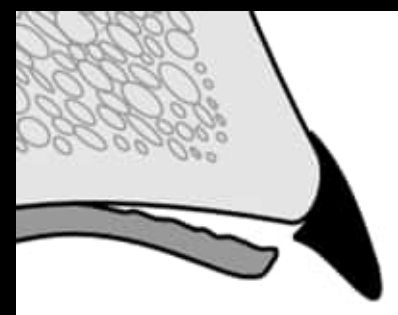
Cartilage damage pattern



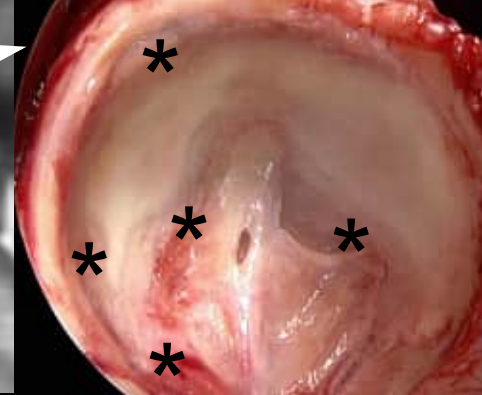
- Inside out
- Central → per
- DDH/ LCPD



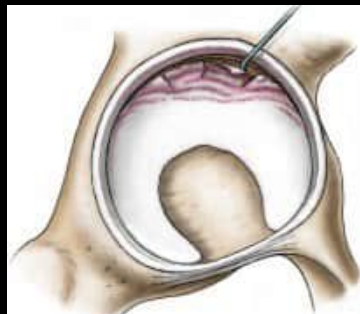
- Outside-in
- Per → central
- Cam FAI



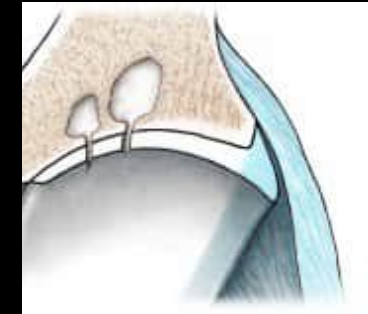
Secondary damage pattern



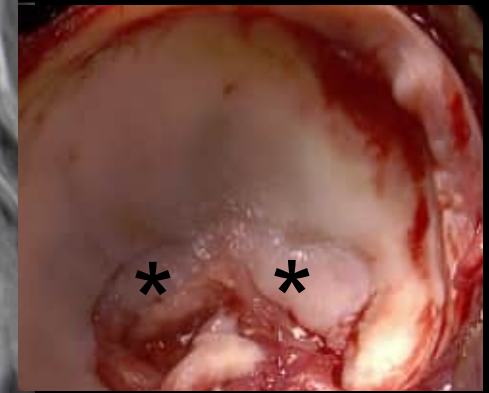
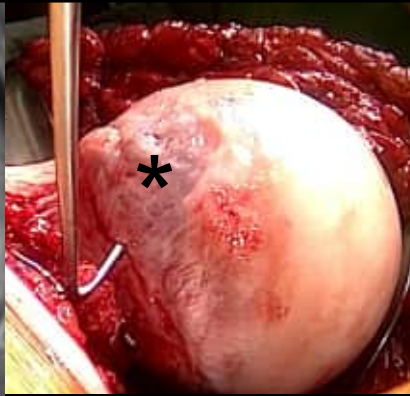
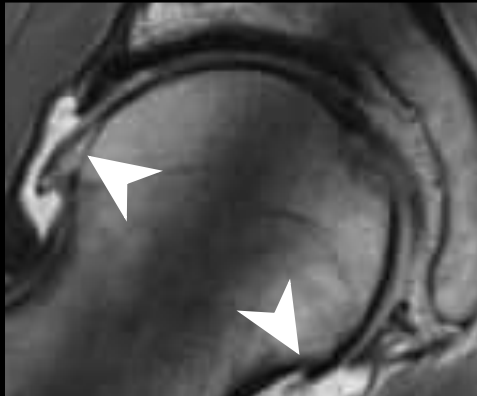
- Defect
- beg. OA
- any deformity



- Rim cyst
- beg. OA
- DDH > FAI



Secondary damage pattern



Peripheral



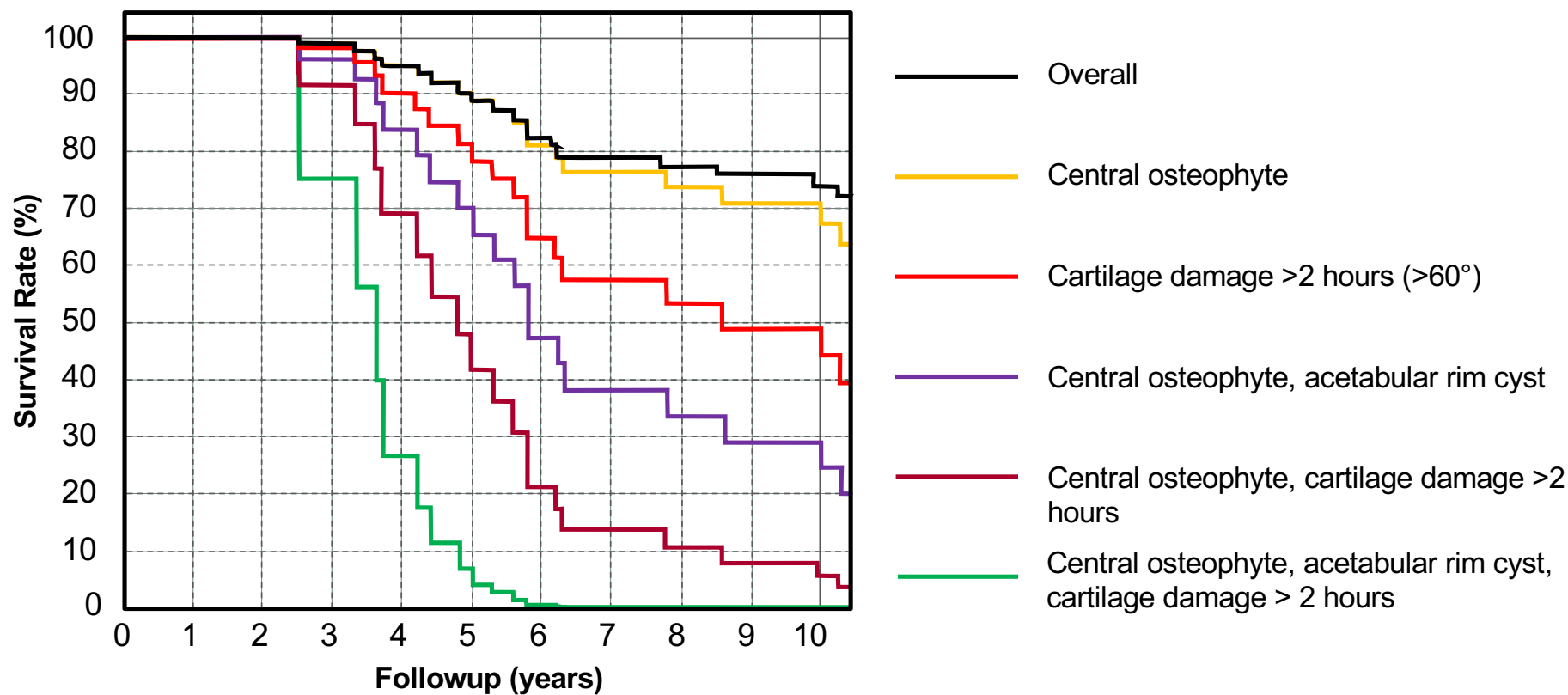
Central



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MRI as predictor for outcome of FAI surgery

Preop Arthro-MRI and 10 y f.u.



28 y man

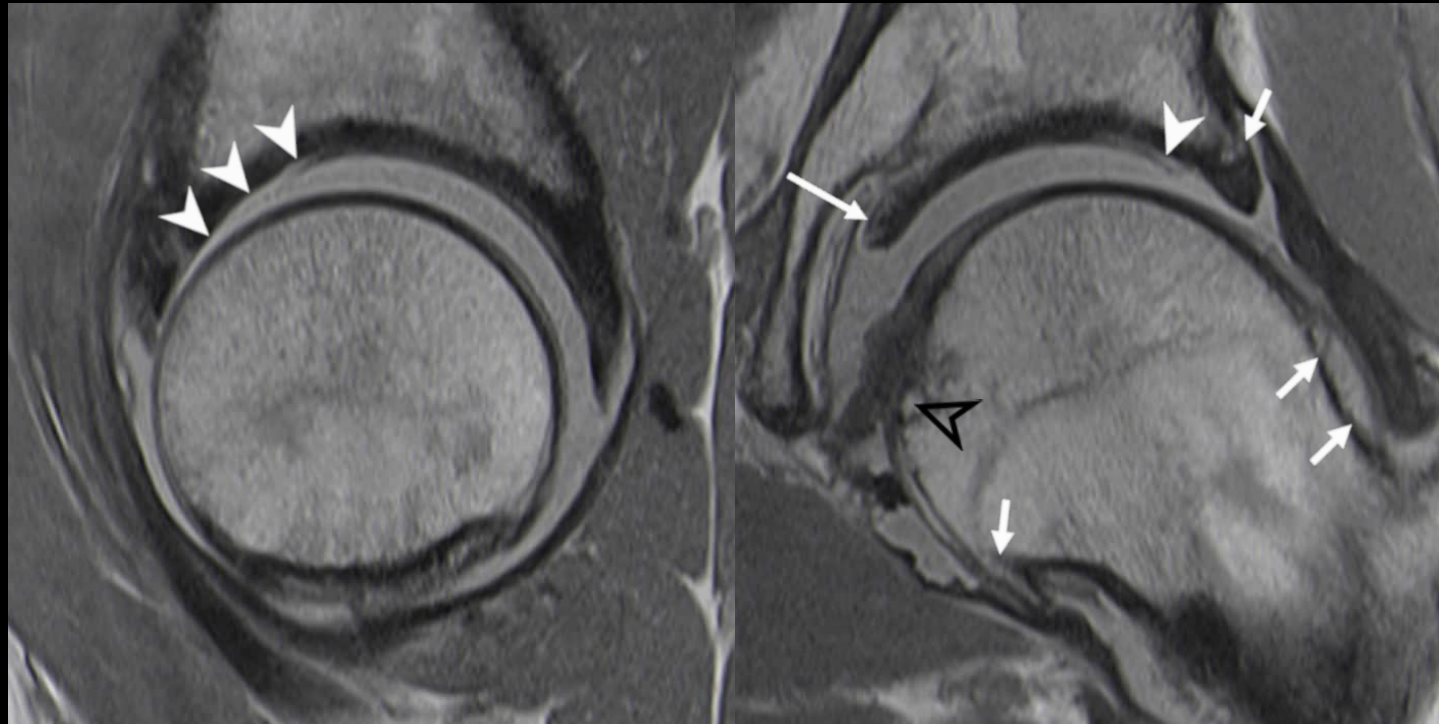


Mild joint space narrowing
Osteophytes

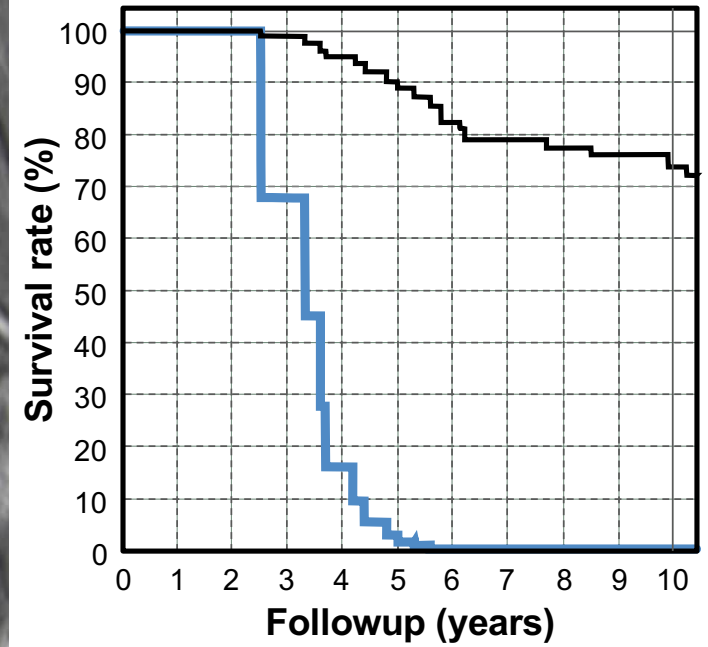
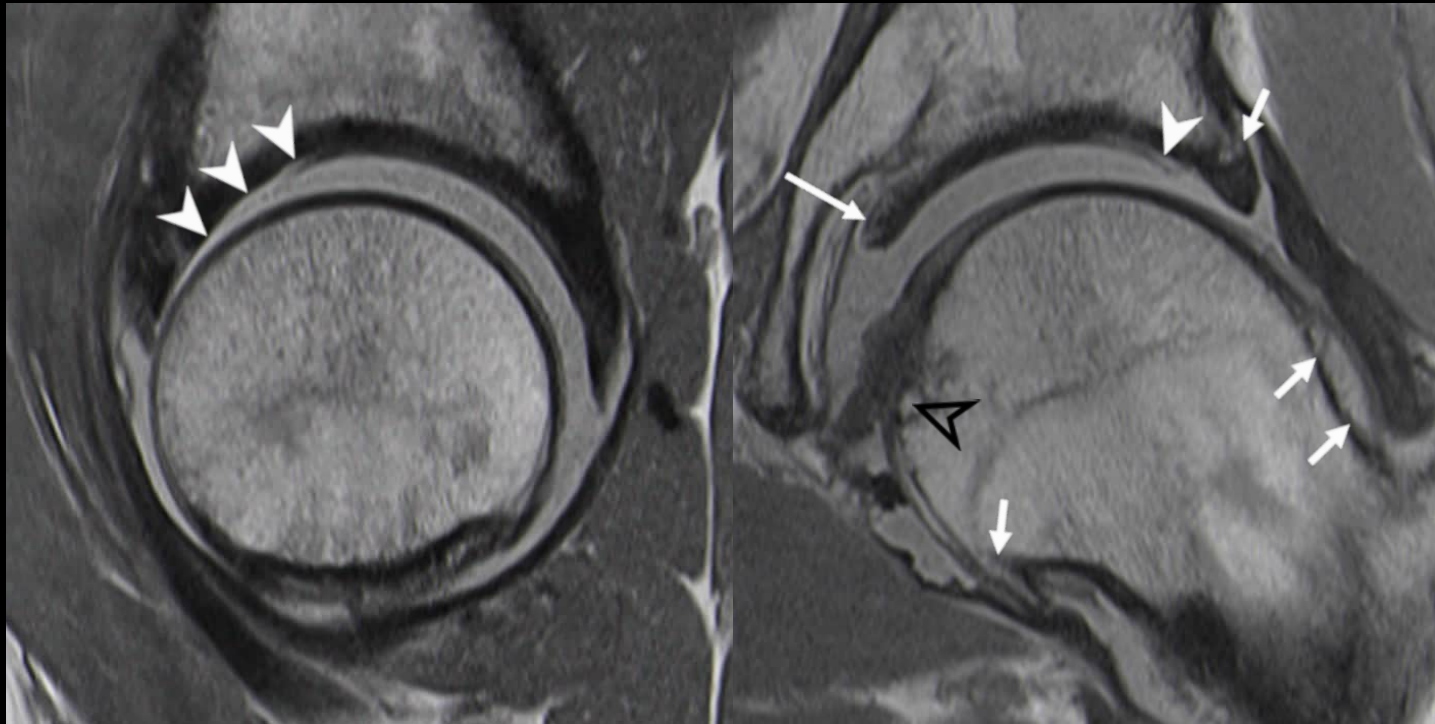
Prognosis?

Preop

Osteophytes + AC rim cysts + Cartilage damage >2 hours

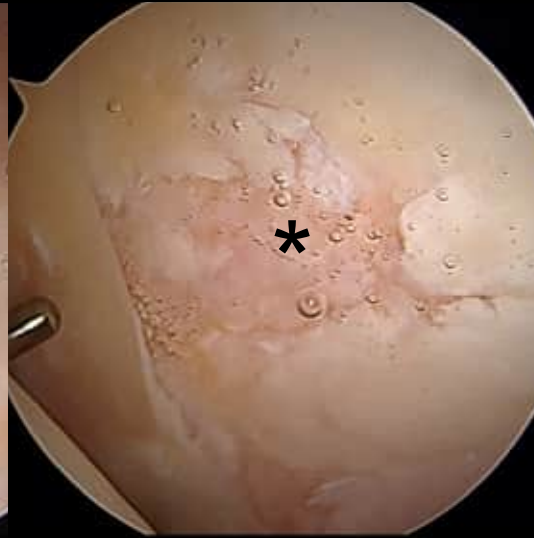
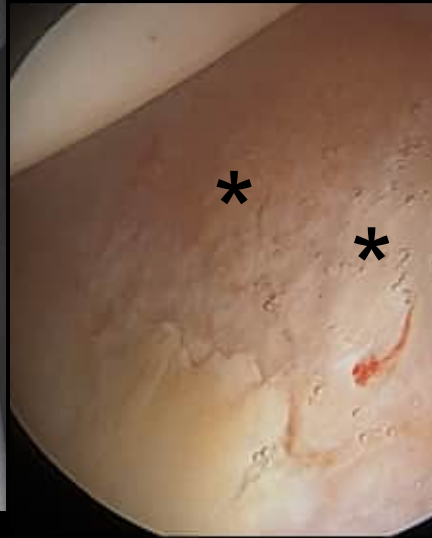
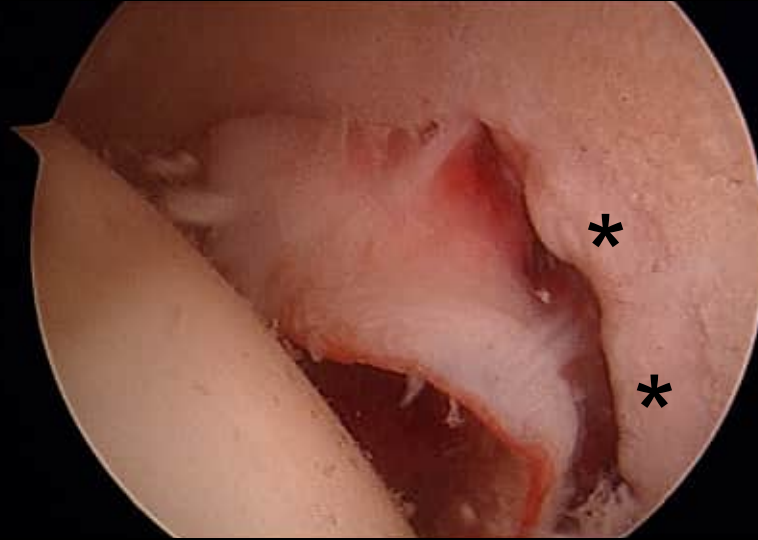


Osteophytes + AC rim cysts + Cartilage damage >2 hours





Preop



Postop



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Imaging in hip joint preserving surgery

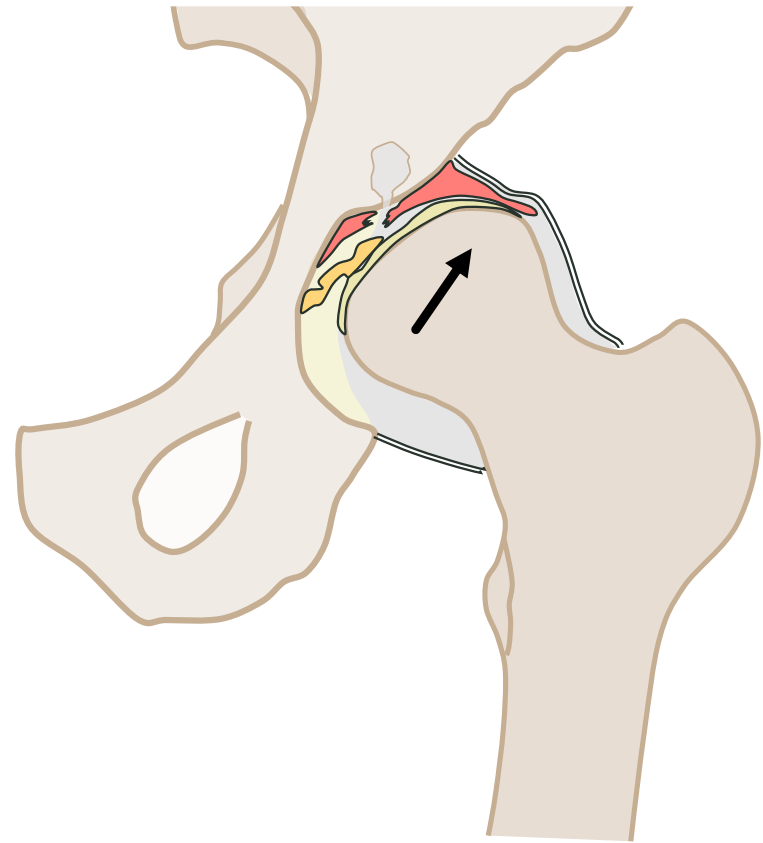
Radiographs	Large Field of View	Small Field of View
AC coverage/ version Osteoarthritis Screen cam deformity	Bone-/ soft tissue edema	Cam deformity
AP pelvis view	Femoral torsion	Intra-art. lesions Extensive damage
Axial view	Fast axial images	Radial images
	Axial/ coronal TIRM/ T2 fs	Coronal
		Oblique-axial
		Sagittal

florian.schmaranzer@balgrist.ch

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Can MRI detect signs of hip instability?

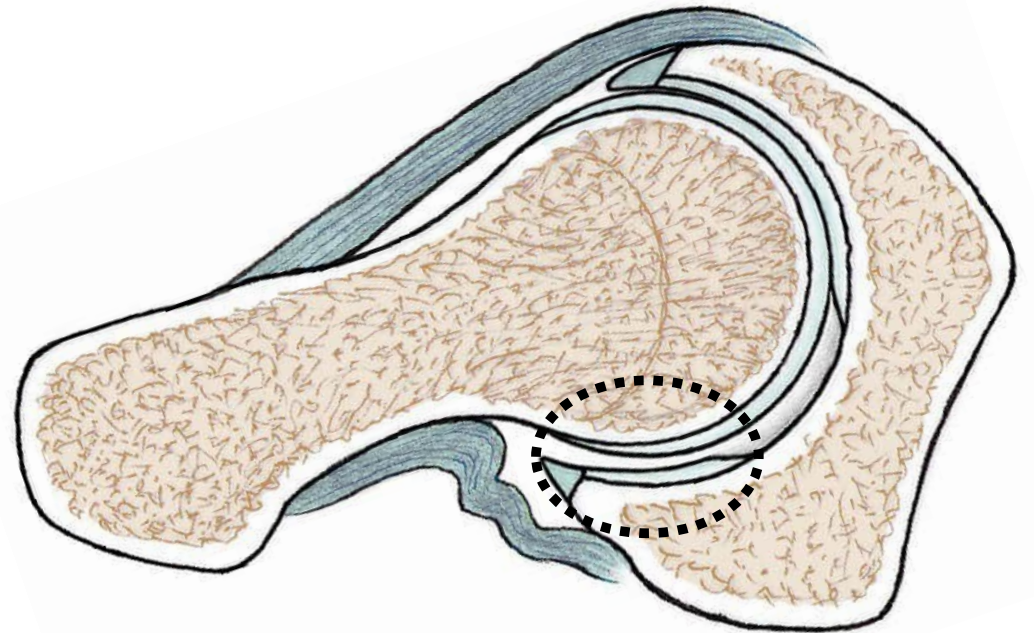
***Femoral head decentration
central pathomechanism of DDH***



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Can MRI detect signs of hip instability?

***Femoral head decentration
central pathomechanism of DDH***



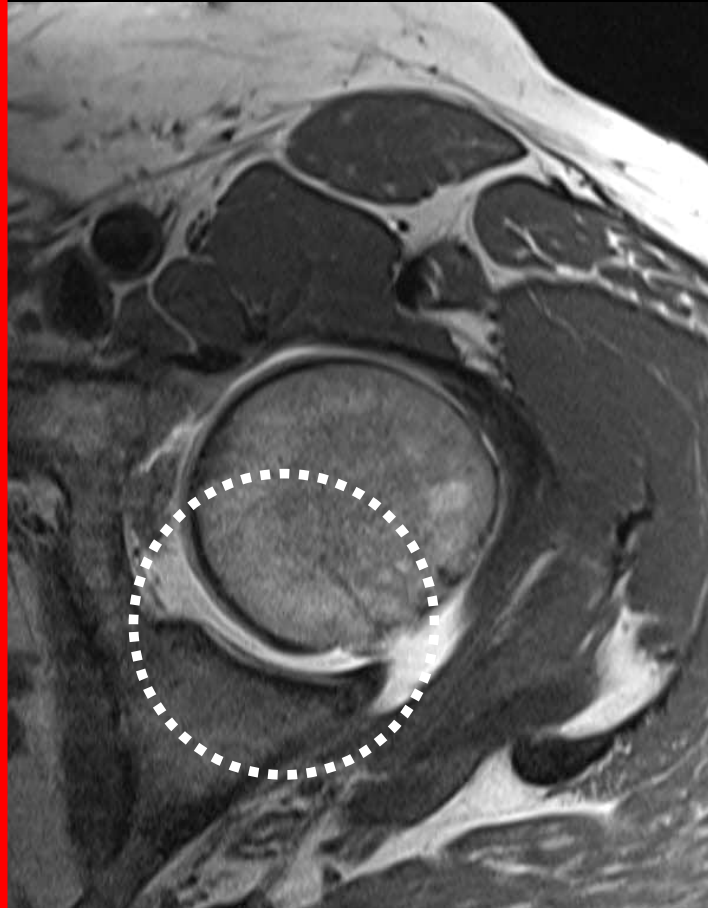
Schmaranzer F et al. Insights into Imaging. 2024

Femoral head decentration

most sensitive



Radial



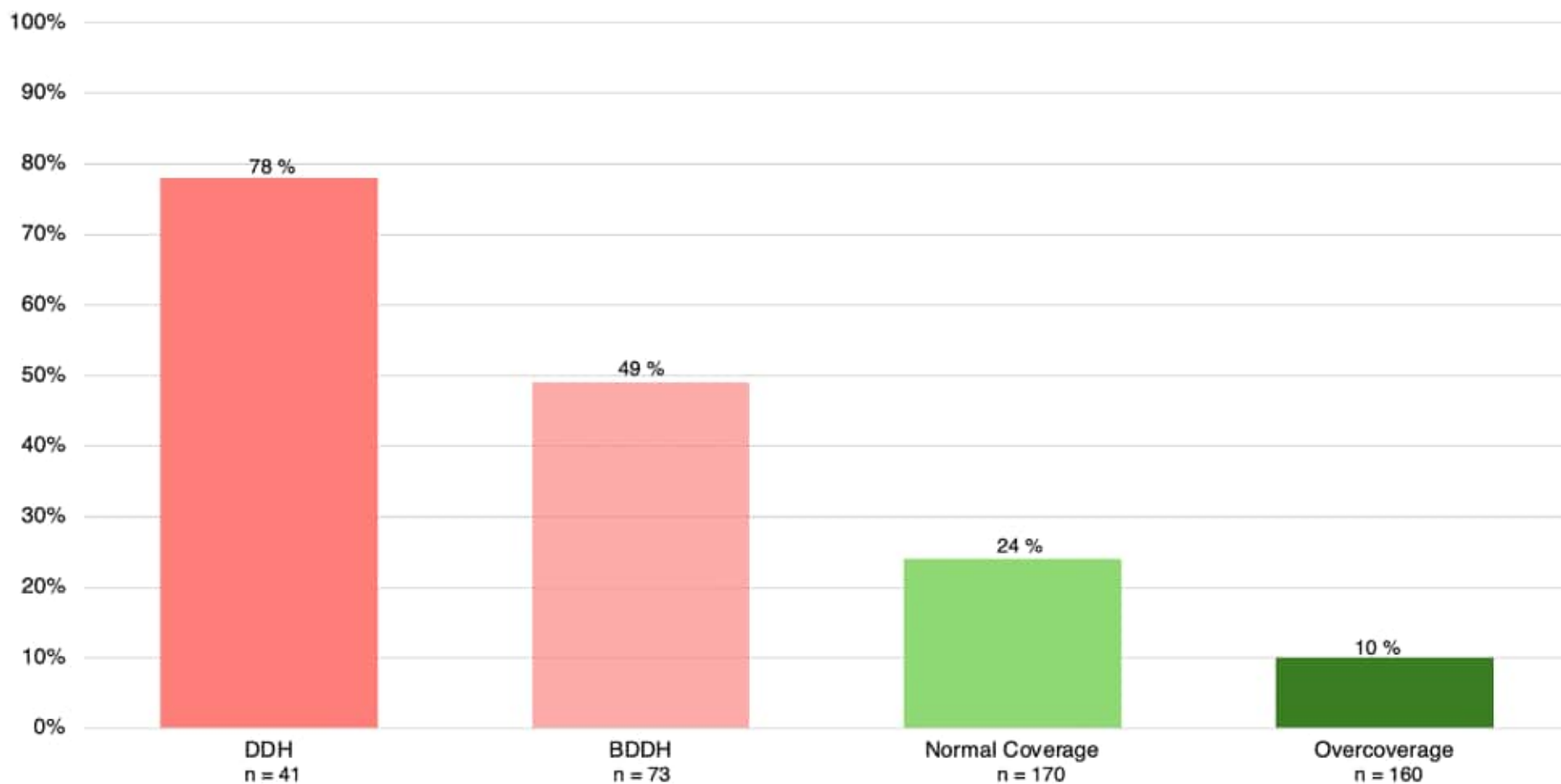
Axial



Sagittal

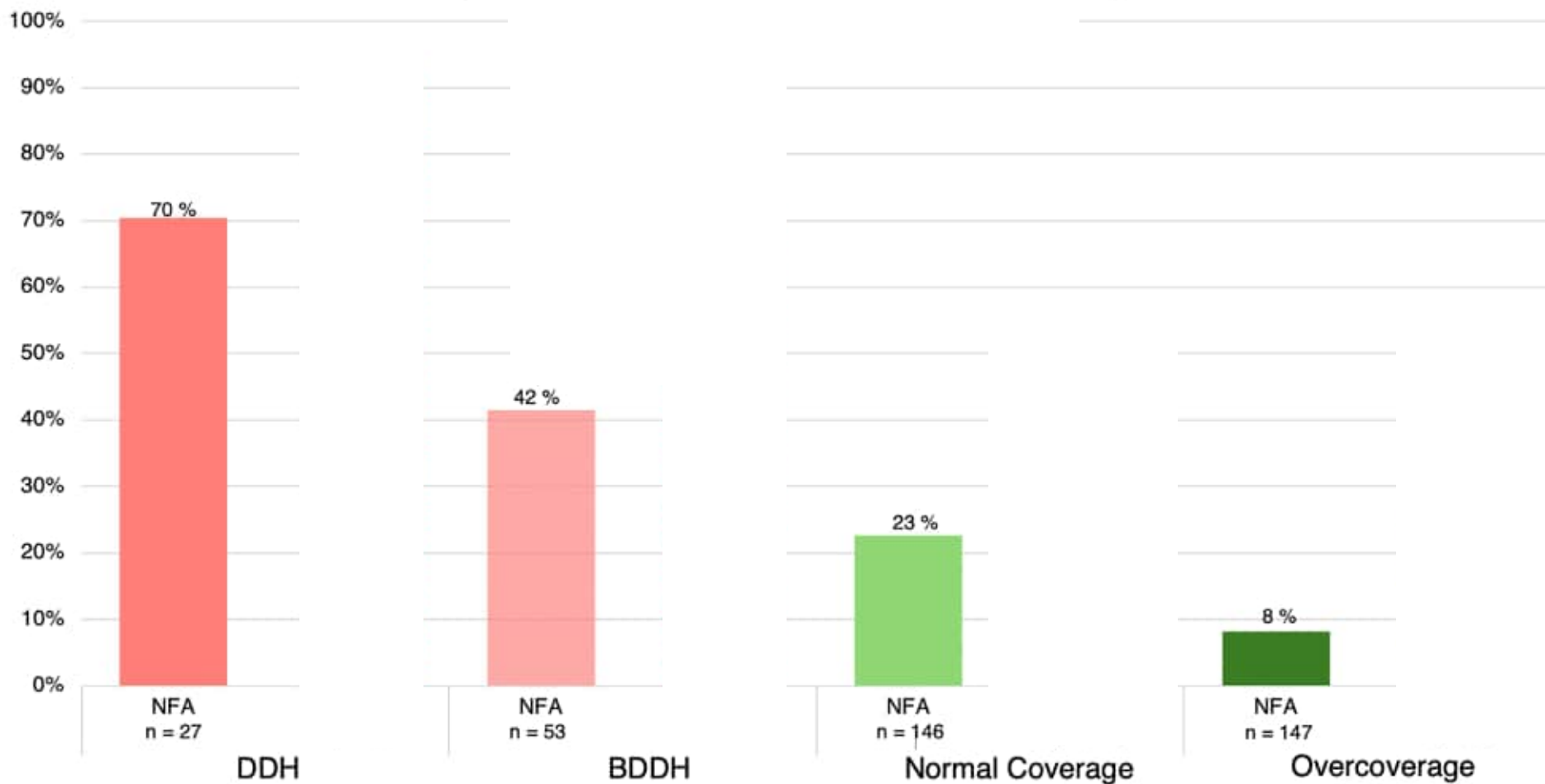
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Femoral head decentration: Coverage



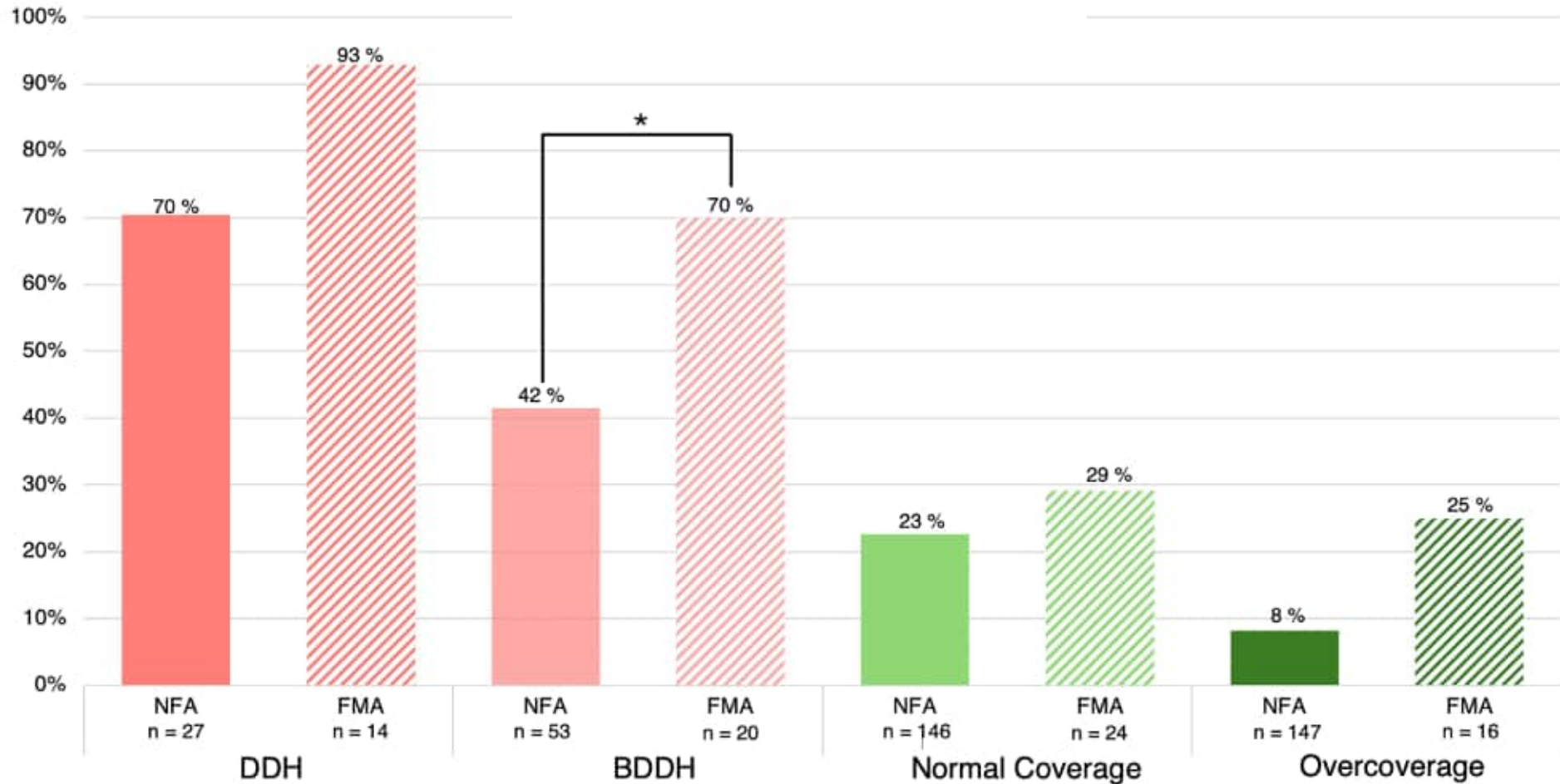
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Femoral head decentration: Valgus/ Antetorta



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Femoral head decentration: Valgus/ Antetorta



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Femoral head decentration and PAO

Odds of having a joint stabilizing surgery (PAO/ femoral osteotomy) was 11.6 times higher (**odds ratio of 11.6**) in hips with femoral head decentration

→ Potential to improve surgical decision making

