

PLC + BROSOK + PF+ AVANCERADE TEKNIKER


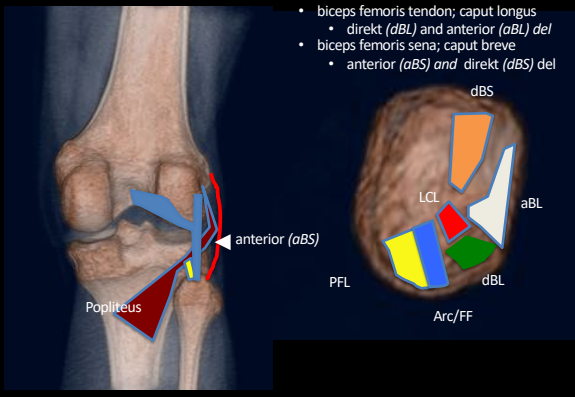
SEPPO KOSKINEN

DISPOSITION

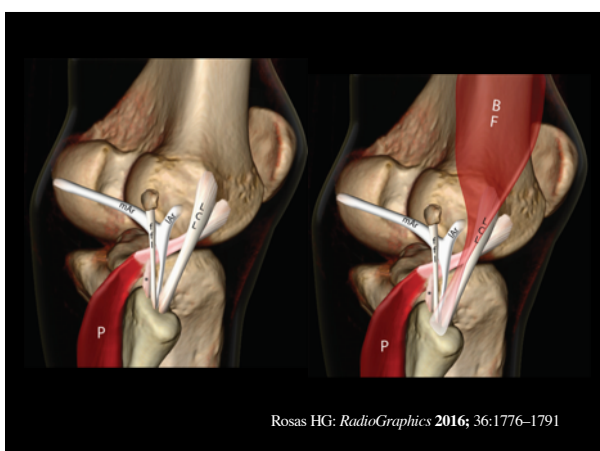
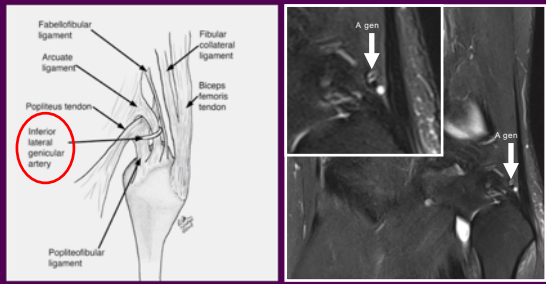
- MR-SEKVENSER – THE GOOD, THE BAD, THE UGLY
- FRÄMRE KORSBAND, SCANPLAN, ASSOCIERADE SKADOR
- PLC + BROSOK + AVANCERADE TEKNIKER

PLC – PosteroLateral Corner PLC komplex

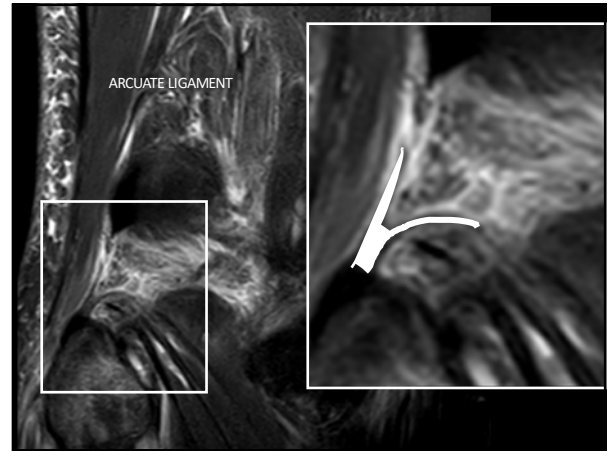
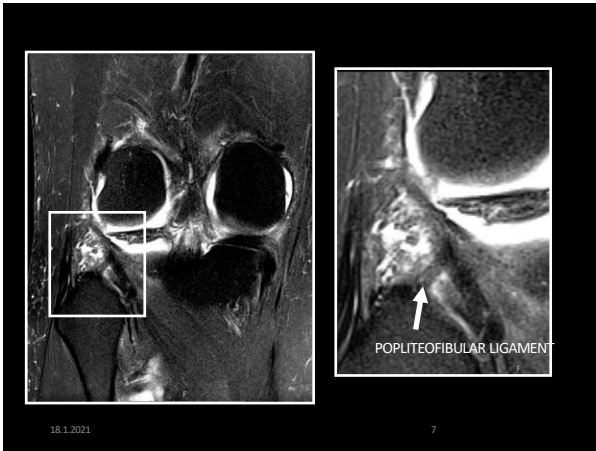
- PLC komplex
 - Fibular (lateral) kollateral ligament
 - Bicipssena
 - Lateral ledkapsel
 - Arcuata och fabelofibular ligament
 - Popliteomeniskala sträng (fascicles)
- Motstå medial tibial rörelse & varus felställning
- Isolerade PLC skador är sällsynta (2%)
- Högenergitrauma
- Trafikolyckor, sport
 - Hyperekstension
 - Utåttrotation av tibia
 - Varus stress
 - (fraktur kan ses i tibias mediala kondyl)

- biceps femoris tendon; caput longus
- direkt (dBL) and anterior (aBL) del
- biceps femoris sena; caput breve
- anterior (aBS) and direkt (dBS) del

Pacholke and Clyde et al; 2007, JMIRI, 26:250-255

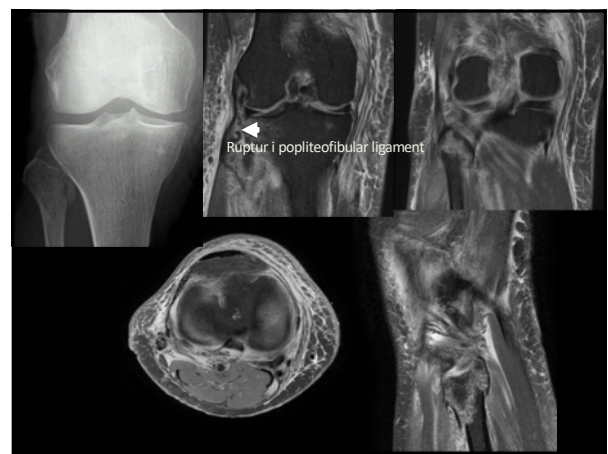
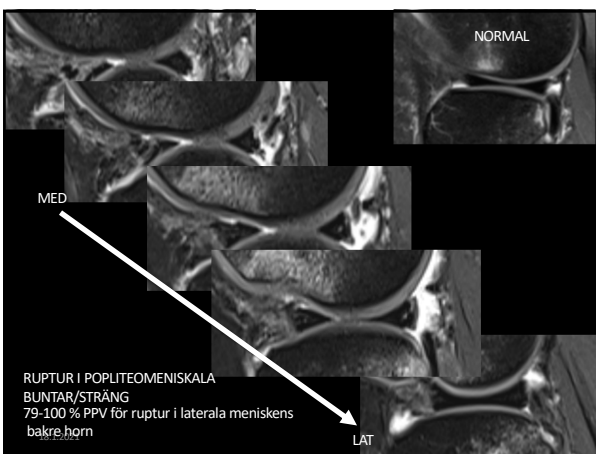


PLC – PosteroLateral Corner

- Med eller utan avulsionfragment från fibula
- ett stort fragment (15-25 mm) på avulsion av LCL-biceps-komplex (A)
- ett 1-8 mm stort fragment tyder på avulsion av arcuatalligamentet (B) ("arcuate sign")
 - Trauma på PLC associerad med tibias mediala kondylens frakturer

ARCUATE SIGN

- Avulsion fraktur i caput fibulae
- Tecken på en signifikant posterolateral corner (PLC) skada, ffa posterolateral instabilitet
- Associerad med ACL och PCL rupturer
- Om PLC instabilitet inte är diagnostiserats, ACL och PCL rekonstruktionsresultat kan vara suboptimala eller misslyckas helt



POSTEROLATERALA SKADOR

- Det är inte viktigt att bedöma vilket specifikt posterolaterala ligament som har ruptur
- Det är viktigt att bedöma om det finns en skada posterolateralt



HYALINBROSK

- Cellulärmatrix: kondrosyter 4%
- Extracellulärmatrix:
 - Collagen II (15-20%)
 - Proteoglykaner (3-10%)
 - Vatten (65-85%)
 - GAG

HYALINBROSK

- Senare broskdegeneration
 - Nedbrytning och minskning av proteoglykaner
 - Ulceration – flöde av proteoglykaner till ledvätska
 - Vatten ↓ → förmåga att tåla belastning ↓

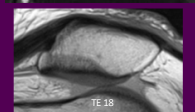
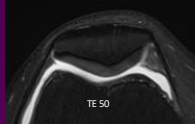
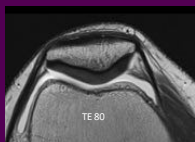
SEKVENNS

- 2D IM-v FSE med och utan fatsat
- 3D FSE (CUBE, SPACE)

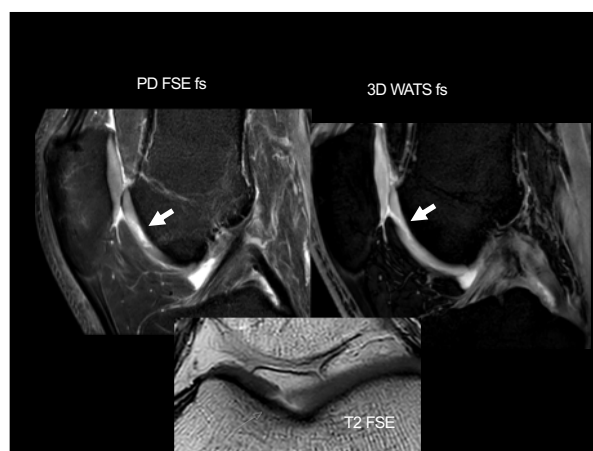


2D-FSE

Sekvens	Ekotid
T2	>60 ms
Intermediär	30-60 ms
PD	10-30ms



Link TM. MR imaging in osteoarthritis: hardware, coils, and sequences. Radiol Clin North Am 2009;47:617-32



Zones

GRADERING AV BROSKSKADOR

- G I - uppmjukat och fibrillerat brosk, ytliga sprickor i brosket
- G II - broskador som sträcker sig ner till ett djup som är mindre än 50% av broskskiktet
- G III - broskador som sträcker sig ner i mer än 50% av broskskiktet, blåsbildning
- G IV - osteokondrala skador gående precis genom benplattan

G II

G II - broskador som sträcker sig ner till ett djup som är mindre än 50% av broskskiktet

G III

G III - broskador som sträcker sig ner i mer än 50% av broskskiktet, blåsbildning

G IV

G IV - osteokondrala skador gående precis genom benplattan

ANGE

- Anatomisk lokalisering
- Storlek
- % broskets tjocklek
- STABIL vs. Instabil
- Subkondrala benets kondition (cystor, ödem)
- Beskriv fyndet, ange inte bara Graden

OLIKA BROSKSKADOR

Delaminering

Skalformat fragment (flake fracture)

Dislocerat fragment

Osteokondral fraktur

Link TM. MR imaging in osteoarthritis: hardware, coils, and sequences. *Radiol Clin North Am* 2009;47:617-32

• "SVART BROSK" - sannolikt en fissur utan vätska

• Kan progrediera till delaminering eller till andra djupgående broskskador

18.1.2021

23

Kan du se broskskadan?

6/19

11/19

11/19



OCD- OSTEOKONDRITIS DISSECANS

- Lateral omfånget av mediala femurkondylen (75%)
- Ledyta bärande mediala femurkondylen (10%)
- Ledyta bärande laterala femurkondylen (10%)
- Främre interkondylar groove eller patella (5%)

MR KLASSIFIKATION AV OCD

- I. Subchondral kompression & benmärgsödem (stabil)
- II. Subchondral cysta / Lägsignal kant i periferi av fragment / Partiell dislocerad fragment (stabil)
- III. Synovial vätska omkring odislocerad osteochondral fragment (instabil)
- IV. Dislocerad osteochondral fragment (instabil)

PATELLALUXATION

- Lateral dislocation
- MPFL – Medial PatelloFemoral Ligament
- Kondrala – osteokondrala skador
- Benkontusioner på typiska ställen

MPFL – MEDIAL PATELLOFEMORAL LIGAMENT

- MPFL ett starkt ligament
- Ligger posteriort om VMO (vastus medialis obliquus)
- Distalt om VMO -> medial retinakulum

MPFL – MEDIAL PATELLOFEMORAL LIGAMENT – infästning vid patellas superiora 2/3

MPFL

Medial retinakulum

Adductor tubercle

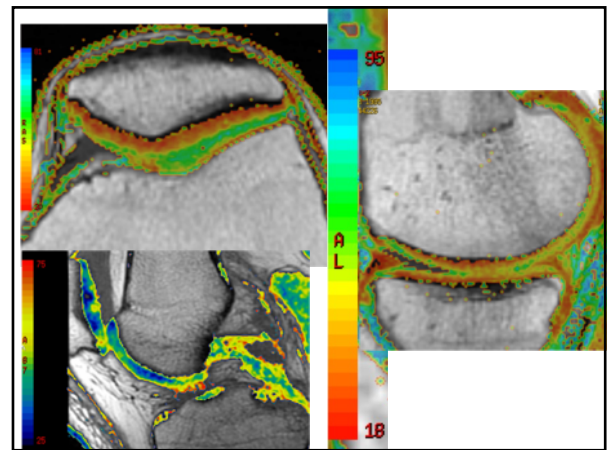
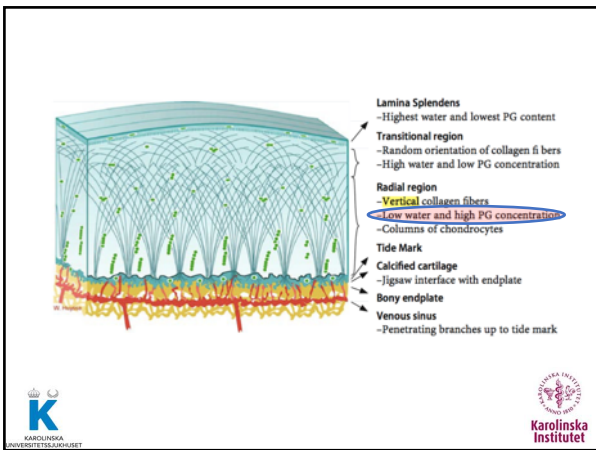
MPFL avulsion

18.1.2021

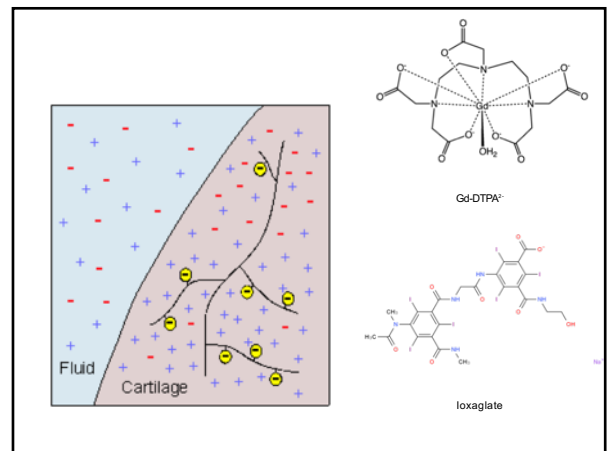
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AVANCERADE TEKNIKER



Compositional MR Imaging Technique	Cartilage Component Assessed	Strengths	Reported Applications for Cartilage Repair Imaging	Limitations
T2 mapping	Collagen network, water content	Well validated, compatible with most MR systems; does not require contrast material administration	Evaluation of cartilage repair tissue after microfracture (106, 115-119, 139), osteochondral grafting (120-123), and matrix-assisted autologous transplantation (124-126), evaluation of graft maturation after autologous chondrocyte implantation (127)	Long acquisition times with multiecho spin-echo sequence; cannot assess calcified cartilage at osteochondral junction
T2* mapping	Collagen network, water content	Faster acquisition than T2 mapping; does not require contrast material administration	Use with ultrashort echo times to assess calcified cartilage at osteochondral junction (11); evaluation of cartilage repair tissue after microfracture (135)	Not fully validated; susceptible to postoperative magnetic field inhomogeneities and magic angle effects
T1ρ imaging	Collagen network, GAG	Sensitive to early cartilage degeneration; may complement T2 and/or T2* mapping; does not require contrast material administration	Evaluation of cartilage repair tissue after microfracture (119, 139)	Non-specific for cartilage components assessed; special pulse sequences only available at a few academic institutions; acquisition can be time consuming
Sodium imaging	GAG	Correlates directly with GAG content; does not require contrast material administration	Differentiation between normal articular cartilage and matrix-assisted autologous transplantation repair tissue (150-152)	Requires specialized hardware; long examination times; low spatial resolution



Guerhazi et al. State of the Art: MR Imaging after Knee Cartilage Repair Surgery. *Radiology*: Volume 277: Number 1—October 2015

dGEMRIC	GAG	Indirect assessment of GAG content; well validated, clinically useful	Evaluation of cartilage repair tissue after microfracture (144, 145) and matrix-assisted autologous transplantation (145); evaluation of graft maturation after autologous chondrocyte implantation (146)	Requires intravenous administration of contrast material and delay between injection and imaging
MTC and gagCEST*	GAG	Does not require contrast material administration	Evaluation of cartilage repair tissue after microfracture (145); differentiation between normal articular cartilage and matrix-assisted autologous transplantation repair tissue (152)	Difficult to implement owing to technical complexity; requires high-field-strength MR imaging; not fully validated
Diffusion-weighted imaging	Collagen network, GAG	Provides additional information regarding cartilage microstructure; does not require contrast material administration	Differentiation between normal articular cartilage and microfracture and/or matrix-assisted autologous transplantation repair tissue (153)	Semi-quantitative image processing is demanding; susceptible to movement artifacts
Ultrashort echo time imaging	Collagen network, water content, GAG	Can be used to assess tissue with intrinsic short T2 such as cartilage near osteochondral junctions; can demonstrate the calcified cartilage as curvilinear increased signal intensity just superficial to the subchondral bone	Evaluation of the calcified cartilage layer in osteochondral allografts (154)	Special pulse sequences only available at a few academic institutions

dGEMRIC = delayed gadolinium-enhanced MRI imaging of cartilage, gagCEST = GAG chemical exchange saturation transfer, MTC = magnetization transfer contrast.

Guermazi et al. State of the Art: MR Imaging after Knee Cartilage Repair Surgery. *Radiology*: Volume 277: Number 1—October 2015

Karolinska Institutet

Delayed gadolinium-enhanced MRI of cartilage (dGEMRIC) is an imaging technique to estimate joint cartilage glycosaminoglycan content by T1-relaxation time measurements after penetration of the hydrophilic contrast agent Gd-DTPA(2-).

In vivo comparison of delayed gadolinium-enhanced MRI of cartilage and delayed quantitative CT arthrography in imaging of articular cartilage. J. Hirvasiemi, K.A.M. Kulmala, E. Lammentaus, R. Ojala, P. Lehenkari, A. Kamei, J.S. Jurvelin, J. Toyras, M.T. Nieminen, S. Saarakkala. *Osteoarthritis and Cartilage* 21 (2013) 434e442

Arthrographic image - Cartilage lesions

Delayed image - Cartilage integrity and lesions

Subtraction image - Cartilage quality

High Normalized contrast agent concentration Low

1 cm

In Vivo Diagnostics of Human Knee Cartilage Lesions Using Delayed CBCT Arthrography. HT Kokkonen et al. *J Orthop Res*, March 2014

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