

the role of ultrasound in

Anterior Knee Pain

caused by a plica

how can a asymptomatic plica become symptomatic?

Disclaimer

The author has no commercial objectives with: *Anterior Knee Pain caused by a plica*. When using text quotes or images, the source is always referred to as far as possible. The images have no decorative intention but are always part of the argument. The author hereby invokes the image and quotation law.

Preface

The *plicasyndroom in the knee*; that sounds many therapists and physicians familiar. But what should you do with it as a practitioner? It is known that symptoms of synovial plicae often overlap with other pathologies, therefore the plicasyndroom has gradually been forgotten. The training of the musculature is paramount in virtually all knee-related problems, with the objective of stability, and hence control over the joint.

The training of knee muscles, with repeated flexion and extension, and making squats is notorious for developing symptoms in folds that previously had no complaints. In this presentation an option which could be a reason for that.

Further attention to differential diagnostics, therapeutic options and the role of ultrasound

Plica

inward fold of the 'synovial membrane'*

thin and pliable in normal state, can be found anywhere in the knee joint but especially suprapatellair, infrapatellair and medial

asymptomatic: the plica is irrelevant

symptomatic: acute or chronic irritation or inflammation of plica and surrounded tissues, can cause 'plica syndrome', the most common version is the medial plica syndrome

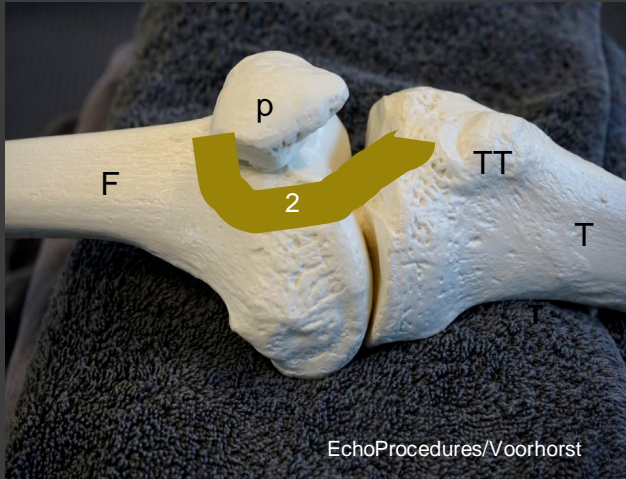
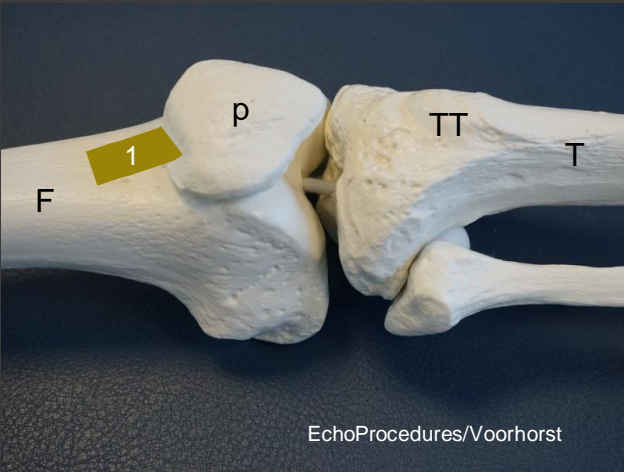
* Synovial plicae are intra-articular fibrous embryonic remnants. Although they are found in approximately 30% of patients, symptomatology is present only in a small number of cases. The medial plica frequently causes pain in the upper and medial edges of the patella, which increases with knee flexion and extension (**Ultrasound-guided pain interventions in the knee region (2014)**).

Plicae around the patellofemoral joint (1)

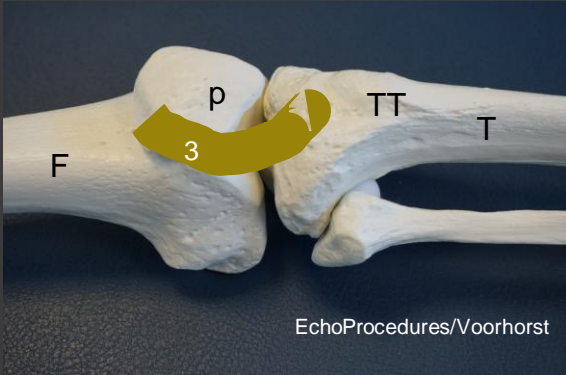
1. **plica suprapatellaris:** commonly a crescent-shaped* fold arising from the under-surface of the quadriceps. Depending on size and elasticity, suprapatellar plicae may impinge between the quadriceps tendon and femoral trochlea
2. **plica mediopatellaris:** also known as 'medial shelf' from the m. articularis genu running medial of the patella to the infrapatellar fat pad
3. **plica infrapatellaris:** arising in the intercondylar notch, traversing downwards and forwards in a sagittal plane, blending into the synovium covering the infrapatellar fat pad.
4. **plica lateropatellaris:** counterpart to plica mediopatellaris, traversing from the m. articularis genu toward the infrapatellar fat pad

*halve-maan-vormig

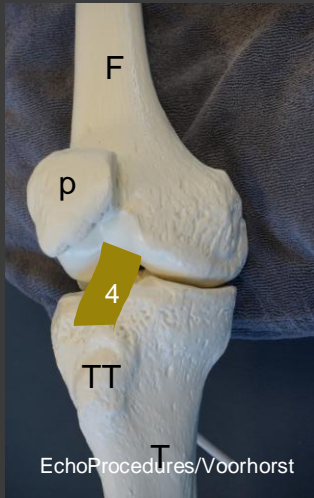
Plica around the patellofemoral joint (2)



plica suprapatellaris (1) and mediopatellaris (2)



plica lateralis (3)

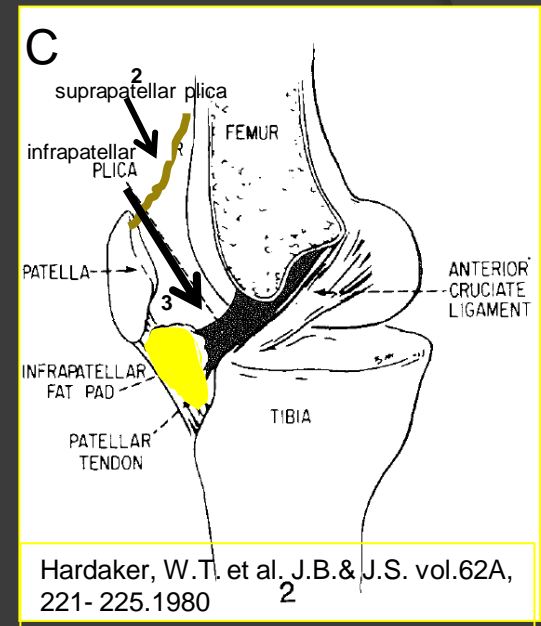
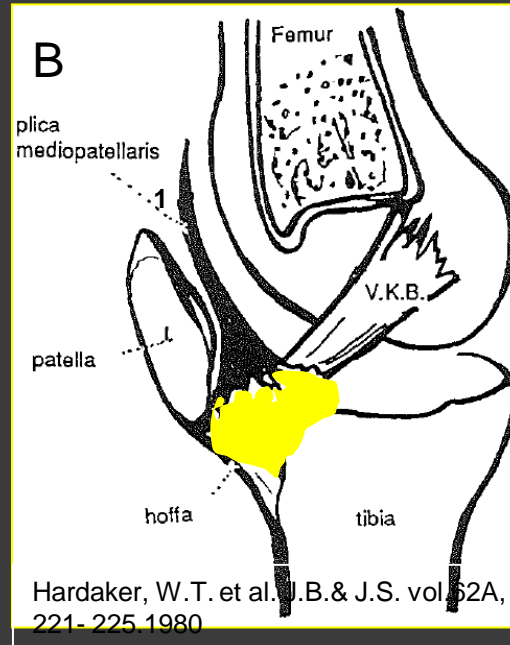
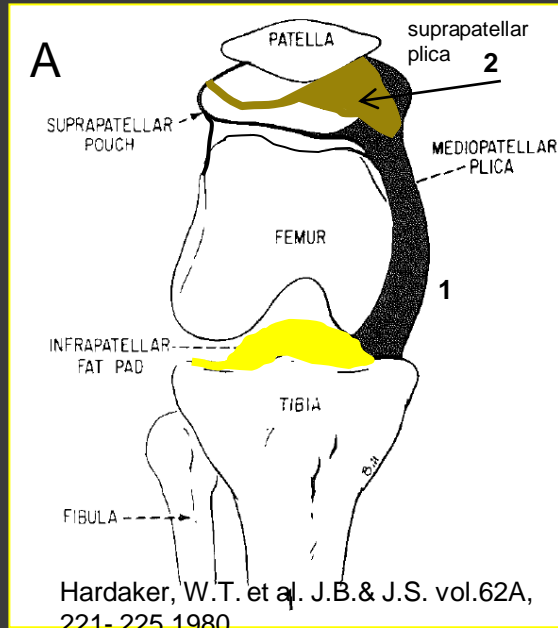


plica infrapatellaris (4) *

F: femur, p: patella, T: tibia, TT: tuberositas tibiae

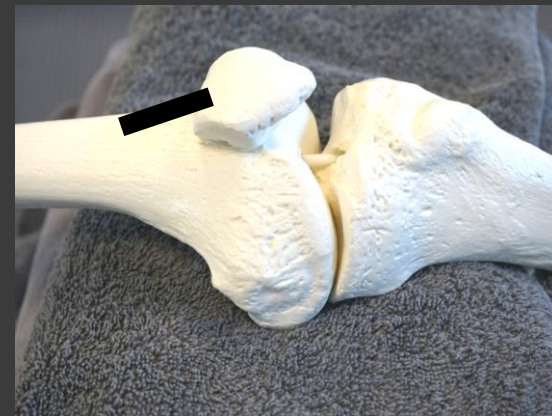
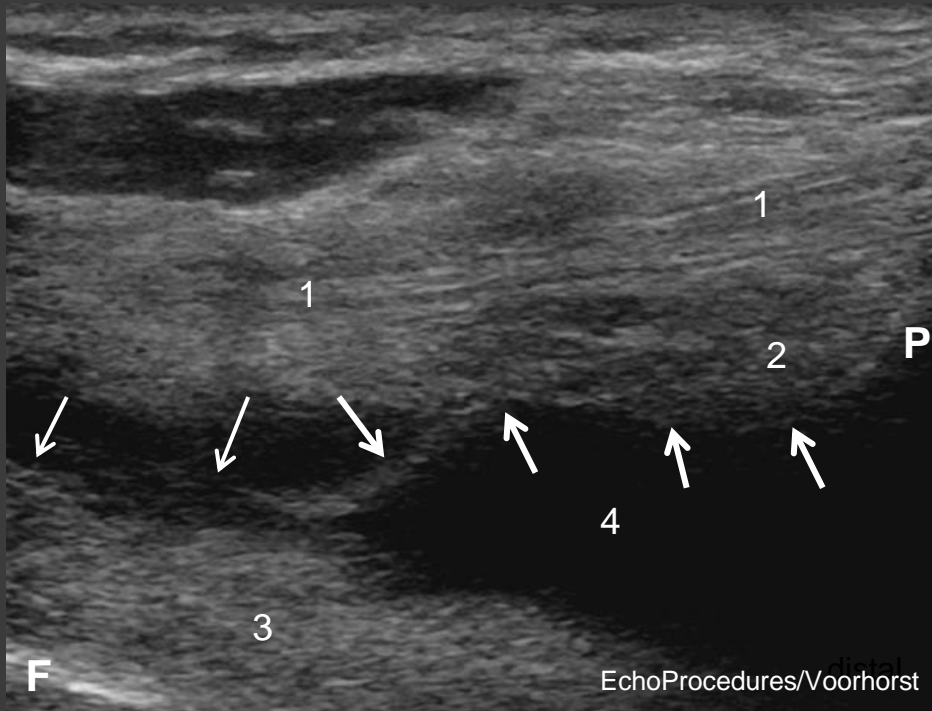
* ligamentum mucosum

Plica mediopatellaris, suprapatellaris and infrapatellaris



A, B and C somewhat modified drawings. The mediopatellar plica (1); the suprapatellar plica/ braun (septum in the suprapatellar pouch) (2) and the infrapatellar plica (3). The infrapatellar fat body (Hoffa) is colored yellow.

Plica suprapatellaris



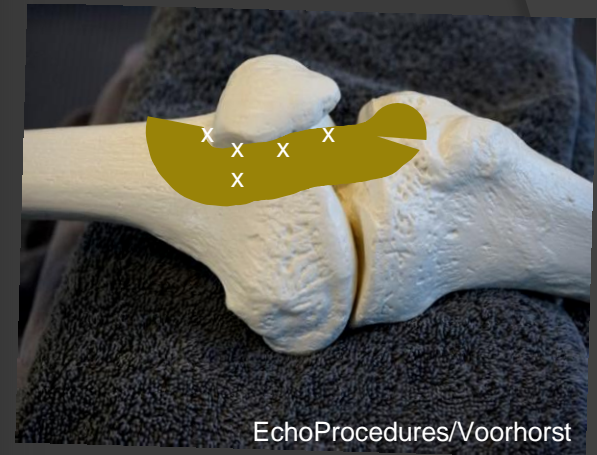
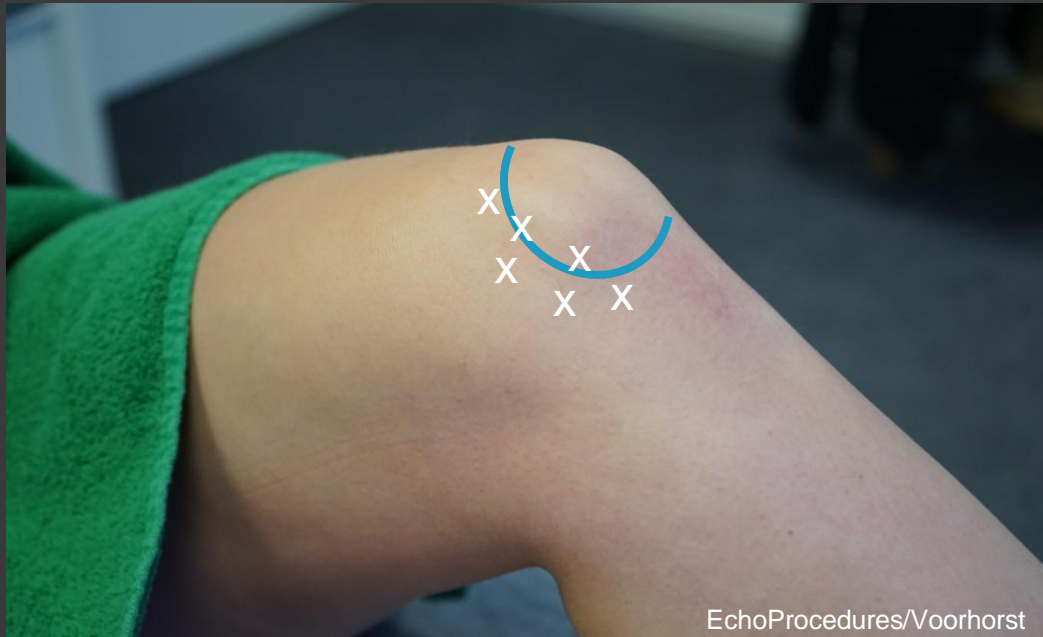
probeposition

plica suprapatellaris/longitudinal probeposition
P: patella; 1+1: quadriceps tendon; 2: suprapatellar fat pad; 3: prefemoral fat pad; 4: suprapatellar recess; arrows: plica suprapatellaris; F: femur

Diagnosing a (medial) plica:

1. anamnesis:
exclusion other painsyndromes in the region
2. clinical test:
Hughstons *
Stutter **
3. Palpation ***
4. imageforming techniques:
MRI and Ultrasound

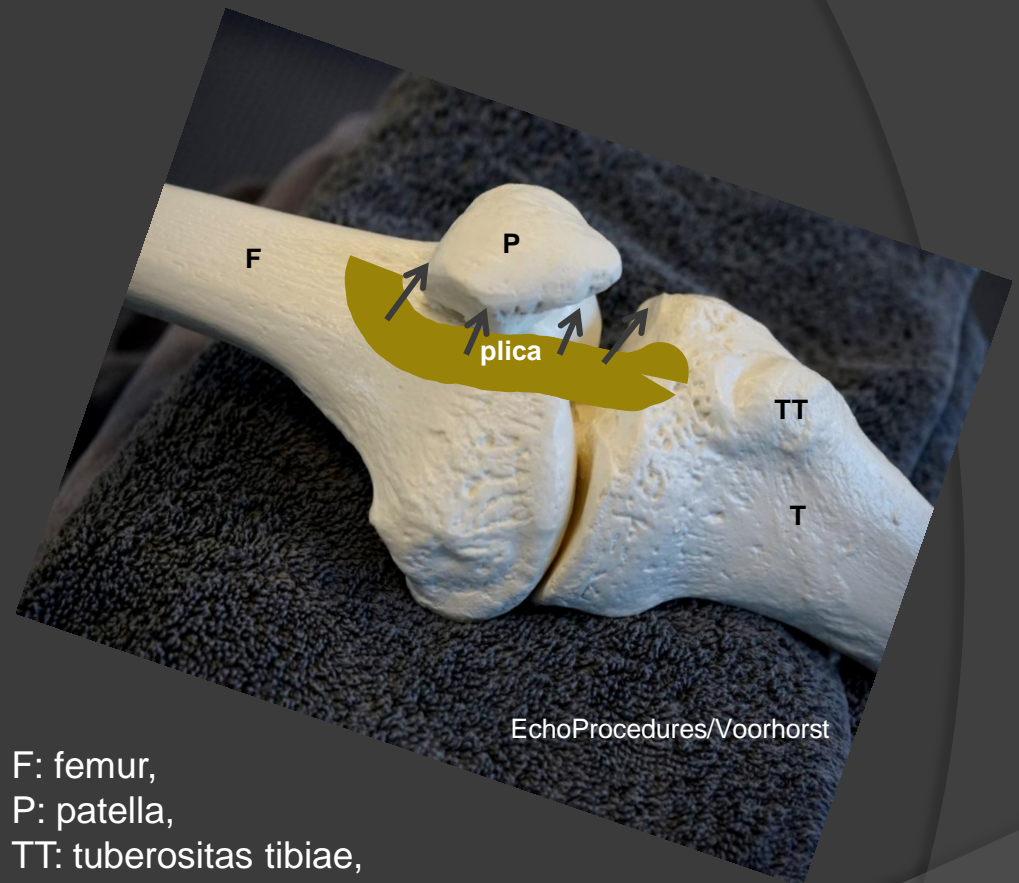
Clinical test plica mediopatellaris: Hughston *



xxx: painfull area's

* The examiner flexes the knee with medial rotation of the tibia and pressing the patella medially with the heel of the hand and palpating the region just medial to the patella. While flexing and extending the knee a snapping or popping will be felt or heard.

Clinical test plica mediopatellaris: Stutter **



F: femur,
P: patella,
TT: tuberositas tibiae,
T: tibia

** The patient is seated on the edge of the table with both knees flexed 90 degrees. The examiner places a finger over one patella to palpate during movement. The patient is then instructed to slowly extend the knee. If the test is positive, the patella stutters or jumps between 60 degrees and 45 degrees of flexion

Palpation ***

in symptomatic medial synovial plica:

Palpation is the best way to localize where the pain is coming from

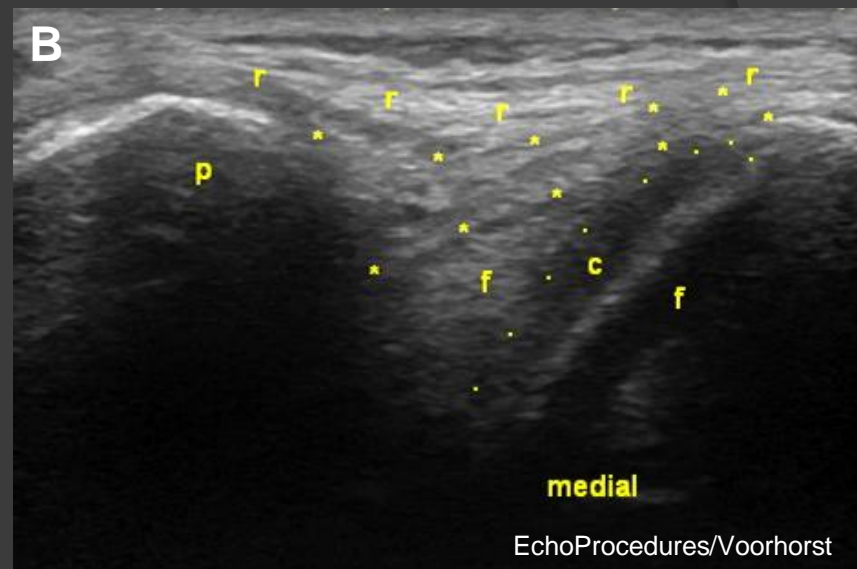
'You can feel it as a thickened band running diagonally. When you flick over it, it feels thick and sometimes swollen, and reproduces the patient's pain.'

Where to locate a medial plica:

under the retinaculum and fibrous membrane



probeposition



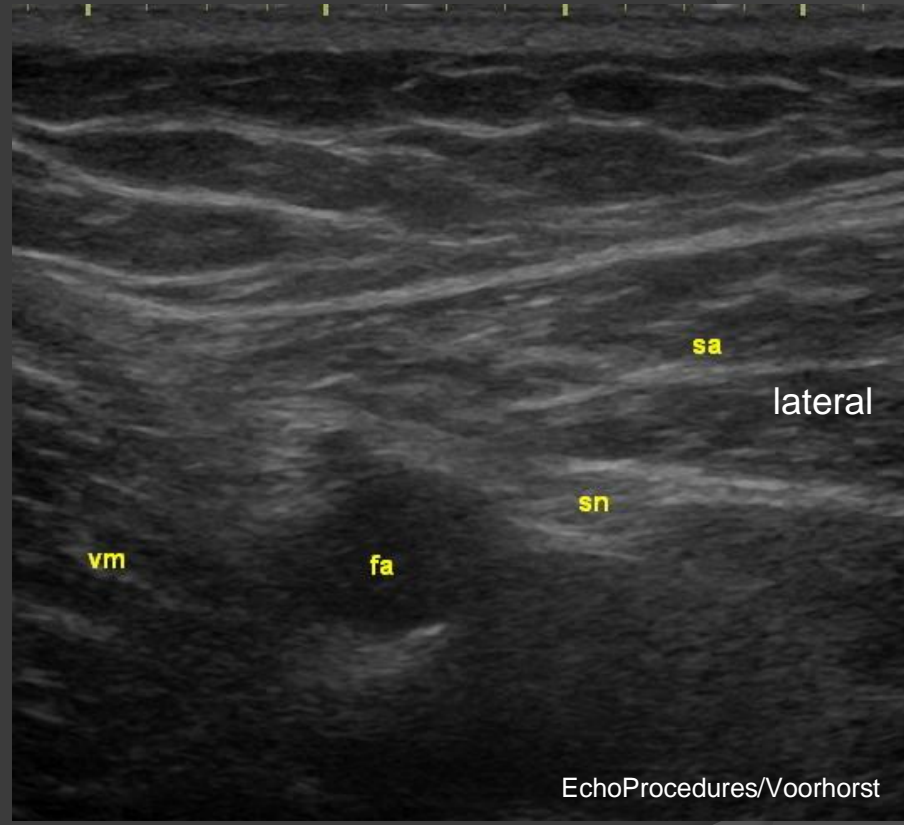
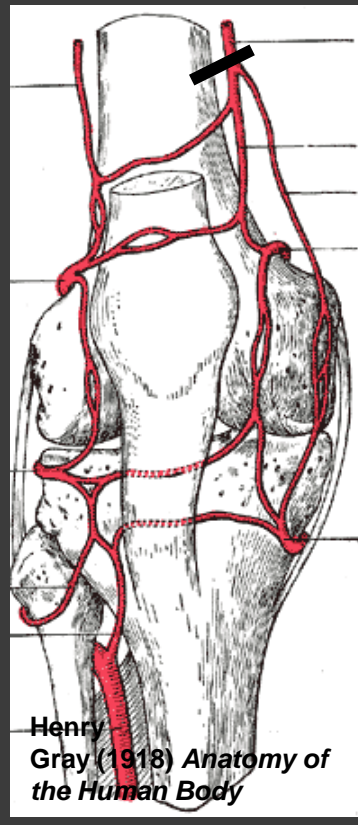
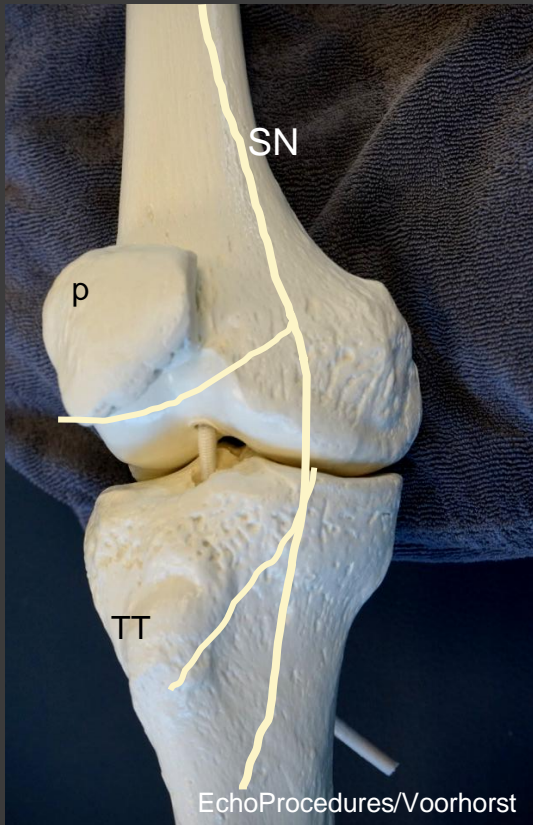
A and B: same image

arrows: synovial membrane/synovial stratum

p: patella; f: femur; f: intra-articular fat; c: cartilage femur; rrrrr: retinaculum; between ** articular capsule*

* The articular capsule consist of two layers, the synovial membrane and the fibrous membrane

Nerves and blood vessels that you have to take into account



SN: saphenous nerve with infrapatellar branch

artery's and probe position

saphenous nerve (transverse)
 vm: M. vastus medialis; sa: M. sartorius; fa: femoral artery; sn: saphenous nerve

Symptoms medial plica

1. antero medial knee pain: 75% of cases
2. clicking: 50% of cases,
3. tenderness on palpation,
4. reduced knee range of movement: 8% of cases
5. difficulty with loading tasks
6. giving way knee joint
7. hydrops
8. atrophied quadriceps

*Synovial plicae of the knee

<https://pdfs.semanticscholar.org/105c/8e86cfeac5058ce30d9a368fc856855efc6d.pdf>

Exclusion other causes

1. referred pain medial joint line
2. medial collateral ligament injury
3. patellofemoral syndrome
4. infrapatellar fat irritation
5. torn meniscus
6. chondral lesions femoral condyl
7. bone bruise
8. periostitis
9. neuritis n. saphenus (infrapatellar branch)
10. Osgood-Schlatter

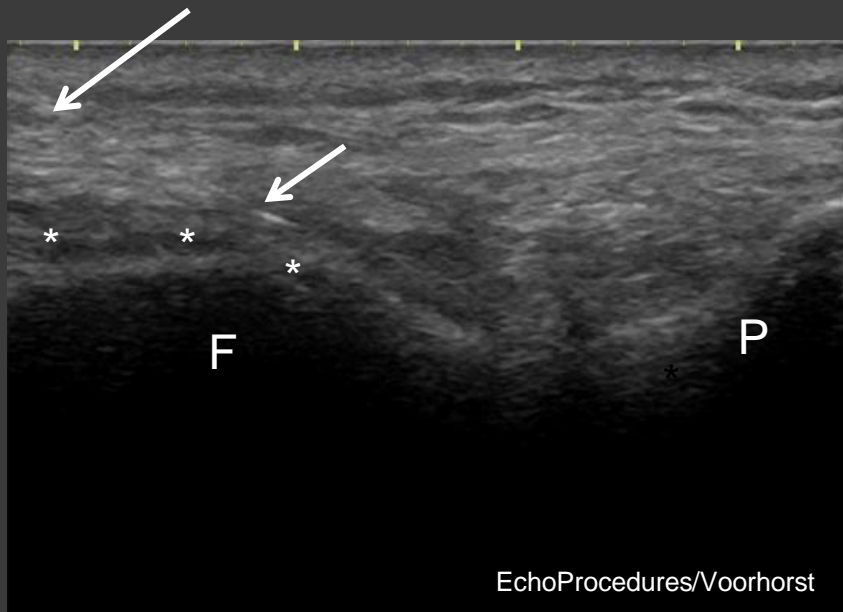
Image-forming techniques

1. X-ray: plicae cannot be visualized
2. MRI: useful in detection of plicae. MRI-imaging visualization of the presence of medial plicae is possible, but the dynamic behavior of the plicae cannot be visualized
3. CT-artrografya: invasive
4. Ultrasound: (dynamic) ultrasound allows detection of abnormalities of medial plicae in the knee with good sensitivity and specificity.
5. Arthroscopy: golden standard (but invasive)

Therapy

1. rest
2. nsaid's
3. cryotherapy (cooling not freezing! [A.R.V.])
4. iontoforese
5. frictions in case of fibrosis (to mobilise the plica)
6. gedoseerde activiteit
7. steroid injections (next page)
8. operation

Therapy: injection plica mediopatellaris



probe position

'Injection' with steroid's in plica mediopatellaris
P: patella; F: femur; arrow's: needle; *** cartilage
medial femurcondyl

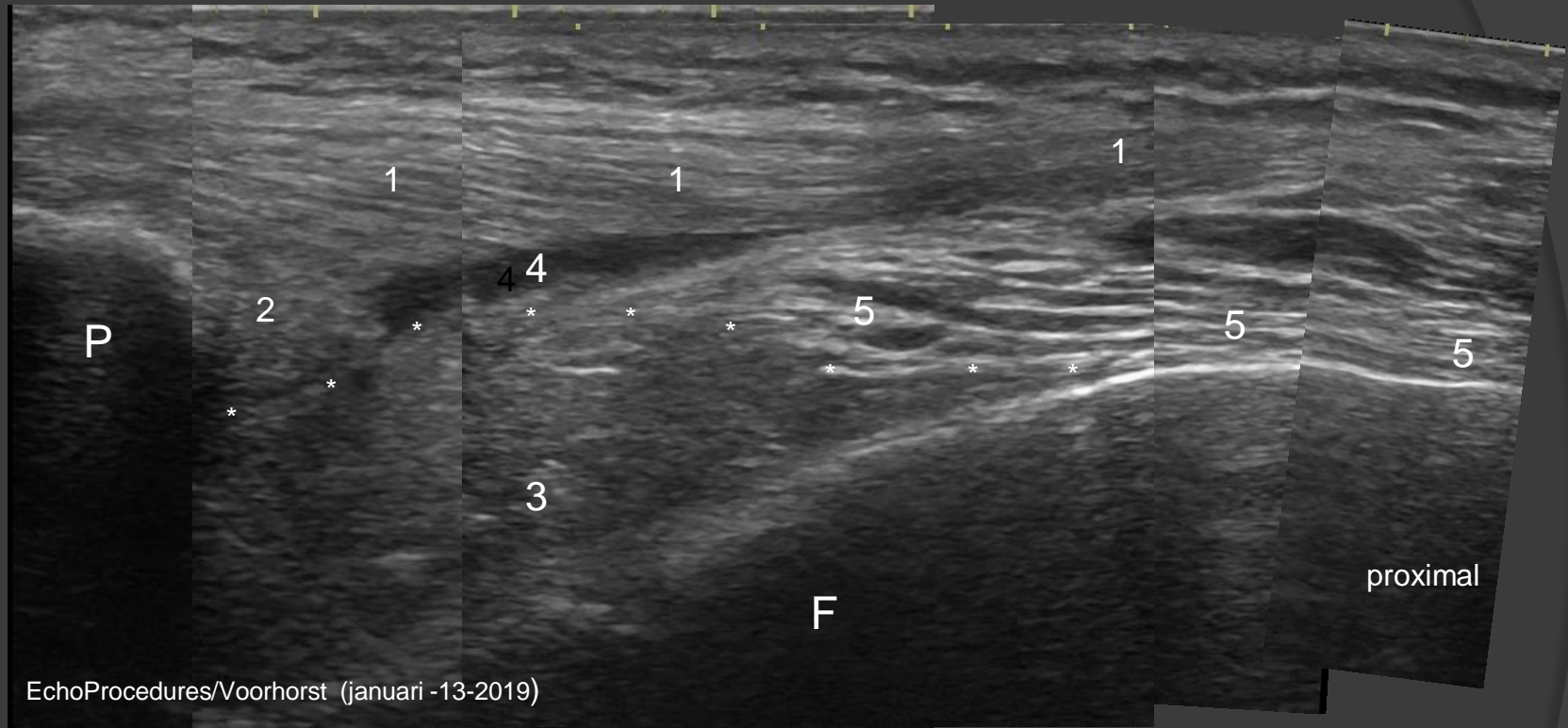
The M. articularis genus

'The articularis genus, vastus medialis, and vastus intermedius have a complex, interacting architecture, suggesting that the articularis genus most likely does not act as an independent muscle. With support of the vastus intermedius and vastus medialis, the articularis genus might be able to function as a retractor of the suprapatellar bursa. The finding of likely interplay between the articularis genus, vastus intermedius, and vastus medialis is supported by their concurrent innervation.' *

See picture nex page

* The Anatomy of the Articularis Genus Muscle and Its Relation to the Extensor Apparatus of the Knee (2017)

Suprapatellar recess in close relation with the M. articularis genus



suprapatellar recess in close relation with the M. articularis genus (longitudinal)

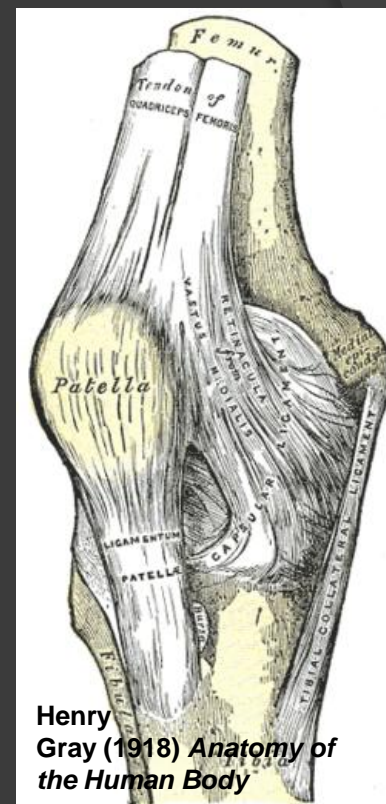
P: patella; F: femur; 1/1/1: quadriceps tendon; 2: suprapatellar fat pad; 3: prefemoral fat pad; 4: suprapatellar recess; 5/5/5: m.articularis genus; **border prefemoral fat pad.

*'Distally, the articularis genus bundles inserted gradually into the suprapatellar bursa and the joint capsule...'**

*'...the insertion of the vastus medialis expanded from the joint capsule and the patella to the medial edge of the rectus femoris and the aponeurosis of the vastus)...'**

how can a asymptomatic plica become symptomatic?

My assumption is that continuous traction on both the suprapatellar bursa and the joint capsule - in case of squats for example - increases the compression between the mediopatellar plica and the medial femoral condyl. A previously asymptomatic bursa can thereby become inflamed and possibly be responsible for erosive abnormalities on the medial femoral condyl (At Voorhorst).



Henry Gray (1918) *Anatomy of the Human Body*

Close relation between M. vastus medialis and the joint capsule

* The Anatomy of the Articularis Genus Muscle and Its Relation to the Extensor Apparatus of the Knee (2017)

Ultrasound

1. plica dimensions
2. guided interventions
3. exclusion other causes
4. dynamic investigation
5. color doppler
6. cheap
7. reliable

Role of (dynamic) ultrasound

diagnostic accuracy:	88%
sensitivity:	90%
specificity:	83%

conclusion:

‘dynamic ultrasound allows detection of abnormalities of medial plicae in the knee with good sensitivity and specificity.’ *

* Medial Plica Syndrome of the Knee: Diagnosis with Dynamic Sonography (2009)

References

- **Synovial plicae of the knee Oliver S. Schindler (2004).**
- <https://pdfs.semanticscholar.org/105c/8e86cfeac5058ce30d9a368fc856855efc6d.pdf>
- **Imaging appearances of synovial plicae syndrome of the knee.**
- Osama Abdalla Mabrouk Kheiralla, Assistant Professor of Radiology - Department of Radiology - Faculty of Medicine – Najran University –, Consultant Radiologist – NUH – KSA, Corresponding Email: drkheiralla@gmail.co (PDF) *Imaging appearances of synovial plicae syndrome of the knee*. Available from: https://www.researchgate.net/publication/308305003_Imaging_appearances_of_synovial_plicae_syndrome_of_the_knee [accessed Jan 02 2019].
- **Medial Plica Syndrome of the Knee: Diagnosis with Dynamic Sonography (2009).**
- [Łukasz Paczesny](#), [Jacek Kruczyński](#)
- <https://pubs.rsna.org/doi/full/10.1148/radiol.2512081652>
- **The Anatomy of the Articularis Genus Muscle and Its Relation to the Extensor Apparatus of the Knee (2017).**
- [Karl Grob](#), MD,^{1,a} [Helen Gilbey](#), PhD,^{2,b} [Mirjana Manestar](#), MD,^{3,c} [Timothy Ackland](#), PhD,^{4,d} and [Markus S. Kuster](#), PhD, MD⁴,
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6133144/>
- **The saphenus block.**
- http://neuraxiom.com/html/saphenous_block.php

- **Infrapatellar Saphenous Neuralgia – Diagnosis and Treatment (2013).**
- <http://www.painphysicianjournal.com/current/pdf?article=MTkyNw%3D%3D&journal=75>
- **Ultrasound-guided pain interventions in the knee region (2014).**
- Domingo Manzano, MDa,n , Fernando Jimenez, MDb , Marc Blasi, MSc,
- <https://pdfs.semanticscholar.org/96c8/b0fe0a5e64055cc8edfb8d5da6a778087489.pdf>
- **Functional status of the articularis genus muscle in individuals with knee osteoarthritis (2016).**
- [Saito,¹ K. Okada,¹ I. Saito,² K. Kinoshita,³ A. Seto,³ Y. Takahashi,⁴ K. Shibata,⁵ H. Sato,⁶ and M. Wakasa¹](#)
- [J Musculoskelet Neuronal Interact.](#) 2016 Dec; 16(4): 348–354
- HET PLICA SYNDROOM VAN DE KNIE EEN KLINISCH ONDERZOEK: Derks W.H.J.D (1988).
- Medial plica in patients with knee osteoarthritis: A histomorphological study (2009).
- [Knee Surgery Sports Traumatology Arthroscopy](#) 18(6):769-76