

# MPFL: Medial PatelloFemoral Ligament Anatomy and Biomechanics

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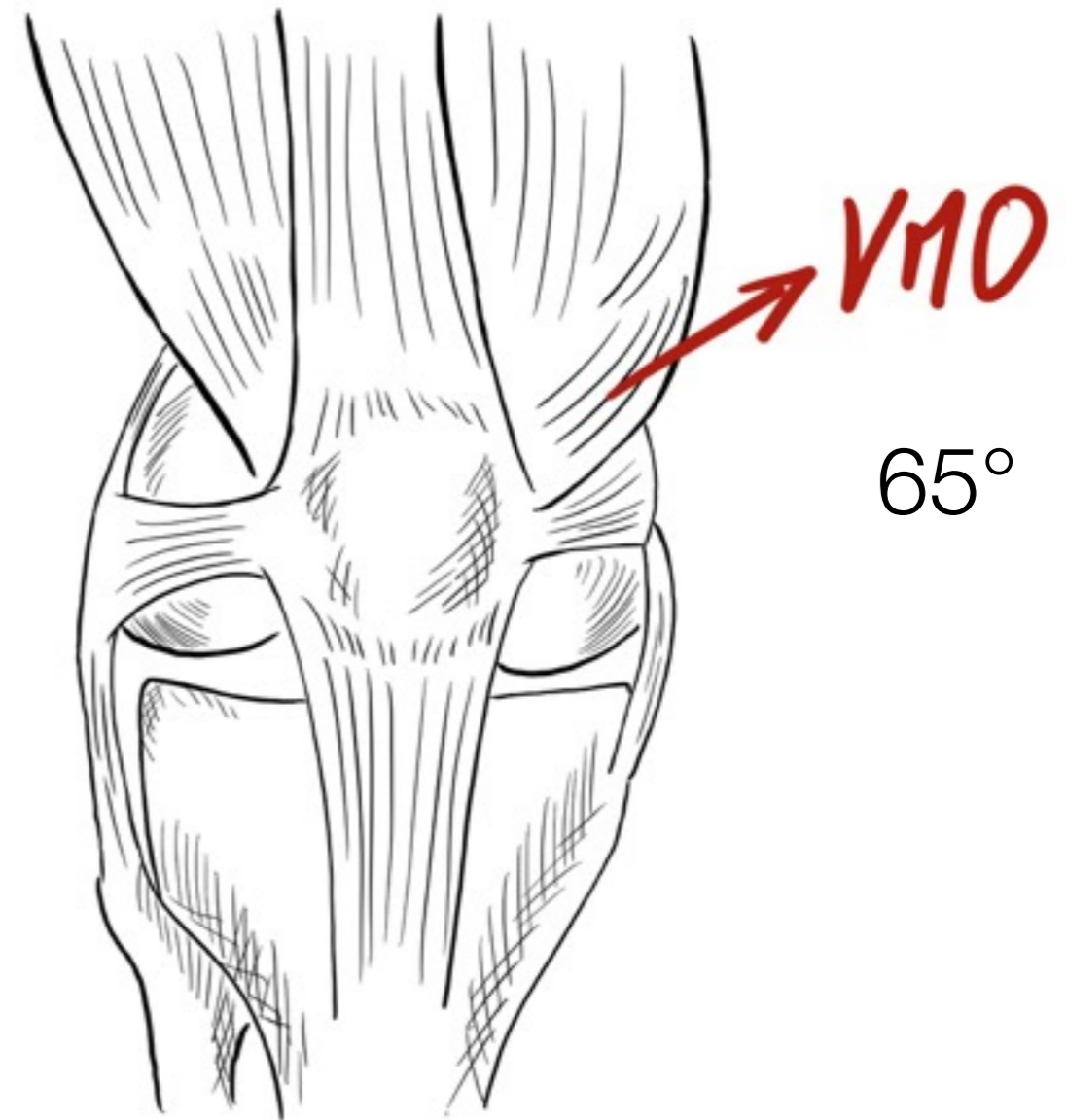
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# Quadriceps complex: Dynamic stabilizer of the patella

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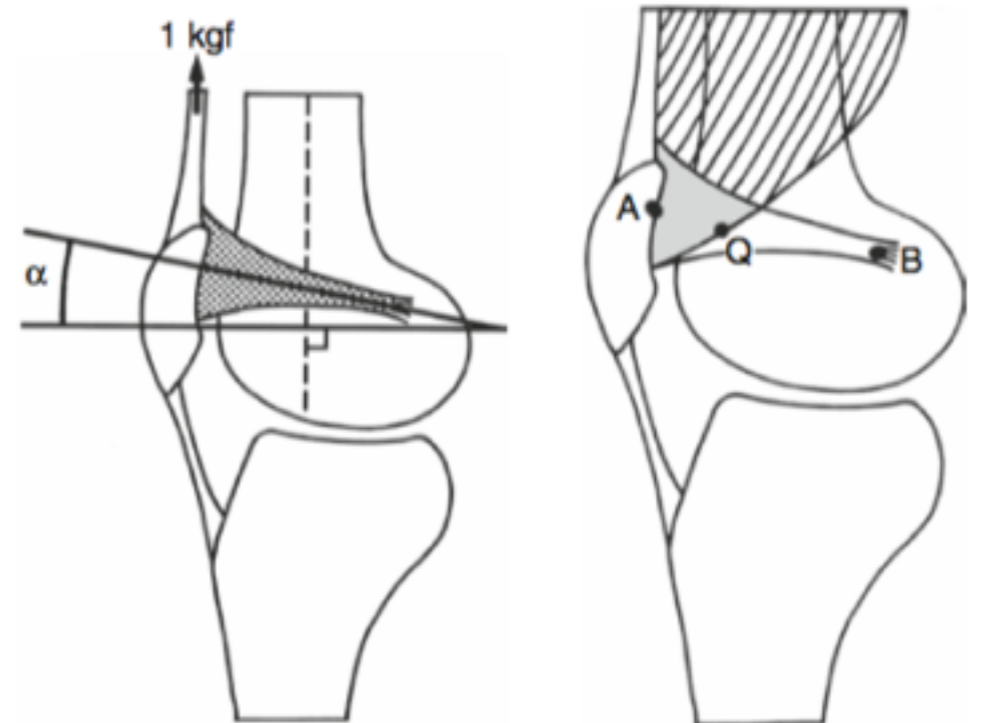
- Rectus femoris, vastus lateralis, vastus intermedius, vastus medialis.
- Vastus medialis oblique (VMO) = distinct part of the vastus medialis. Insertion on the patella at high angle, up to  $65^\circ$ .



# Soft tissue static stabilizers of the patella

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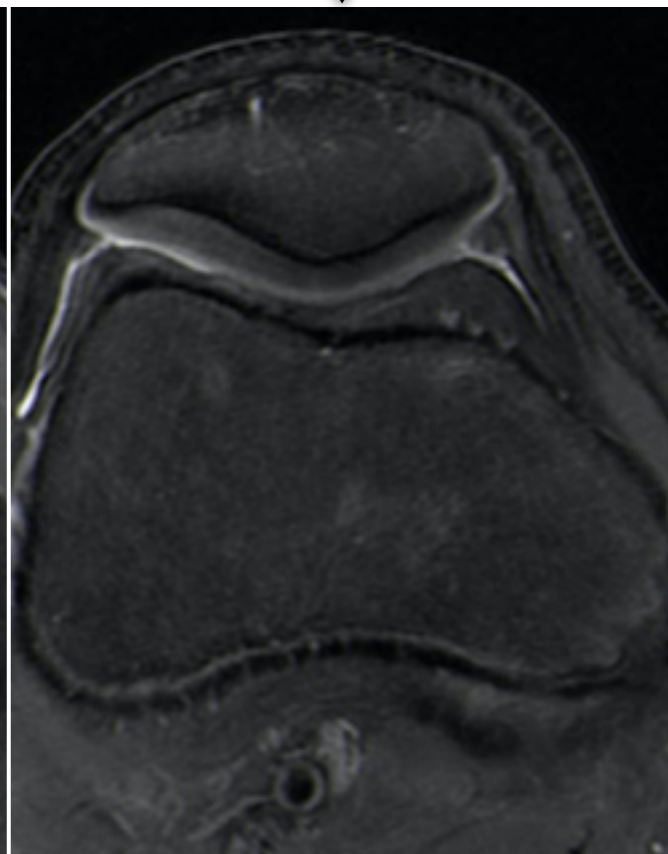
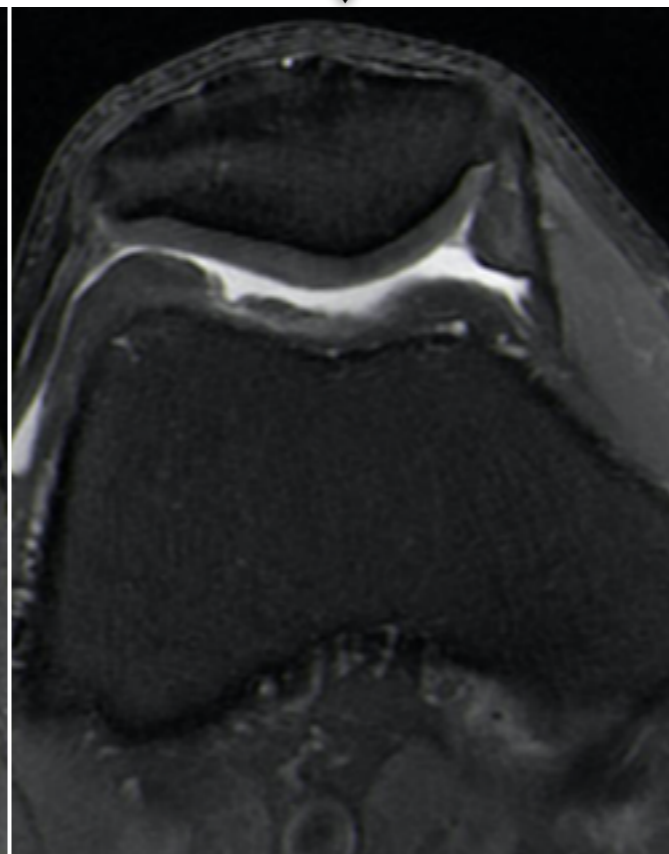
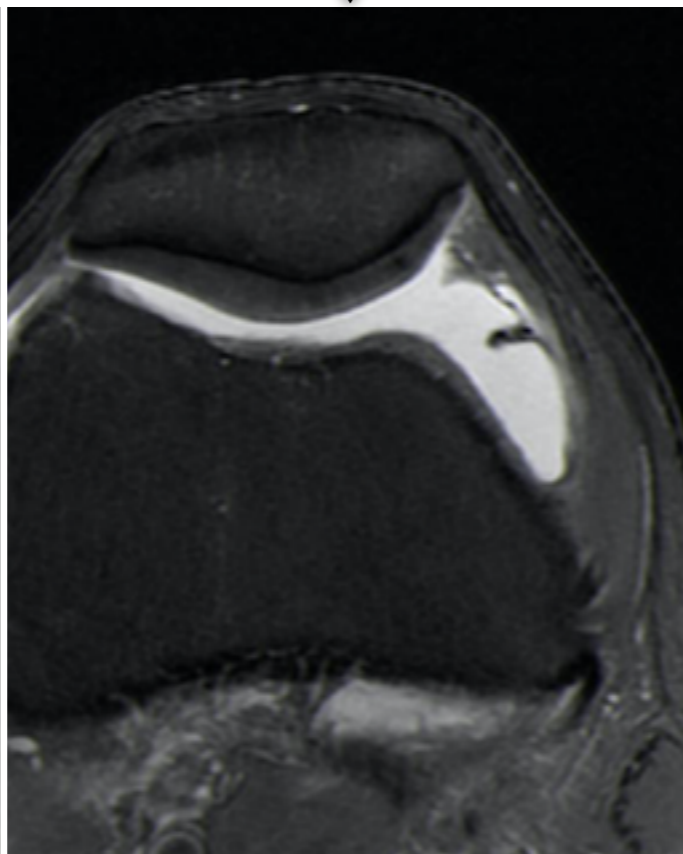
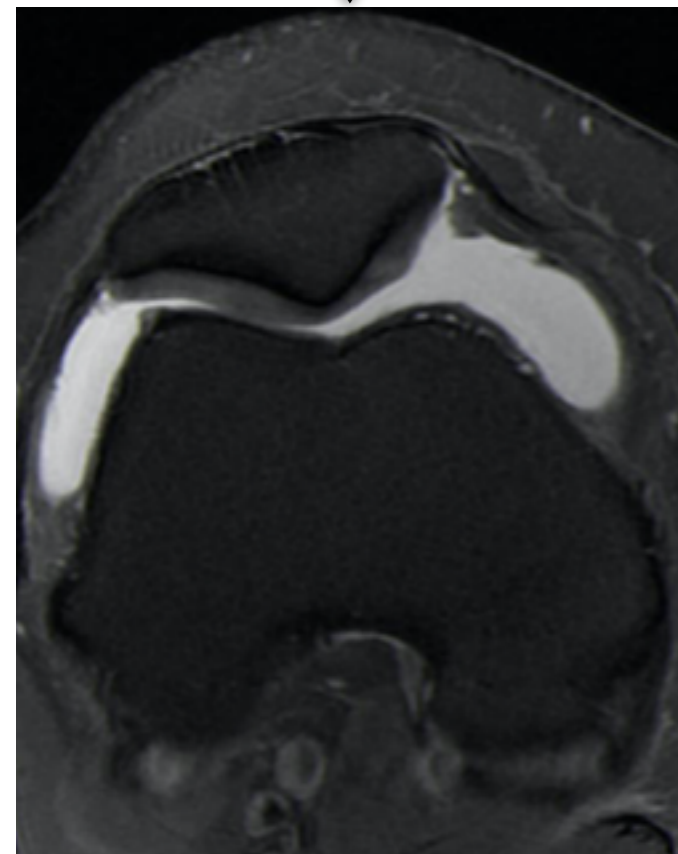
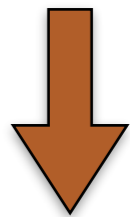
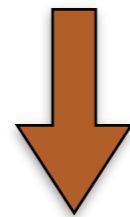
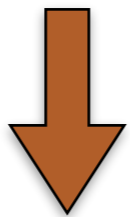
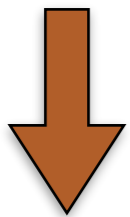
- Patellofemoral, patellotibial and patellomeniscal ligaments
- **Medial patellofemoral ligament (MPFL)**: primary passive soft tissue restraint on the medial side of the patella. 50 to 60%.
- 4.5 to 6.4 cm long. 1.9 cm wide.



# Gross Anatomy

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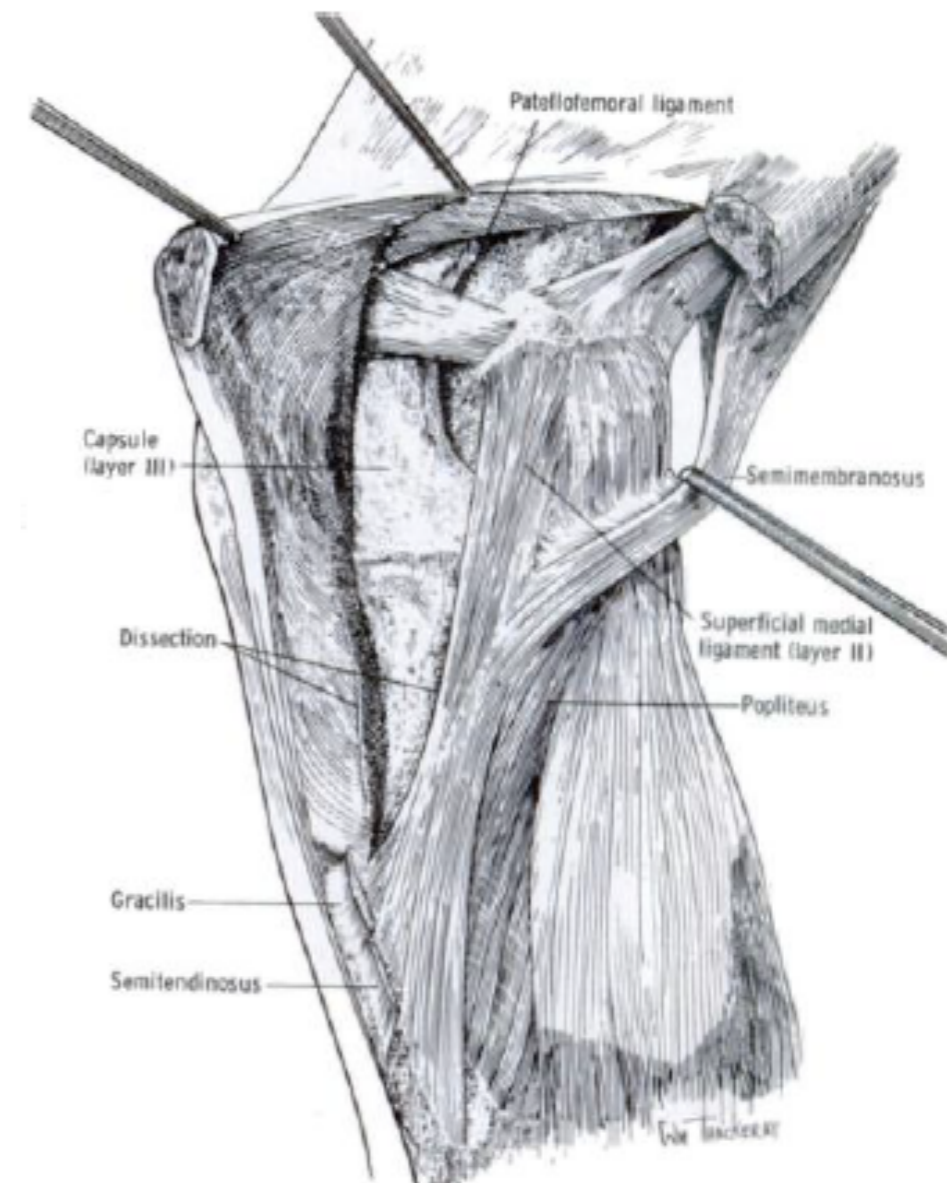
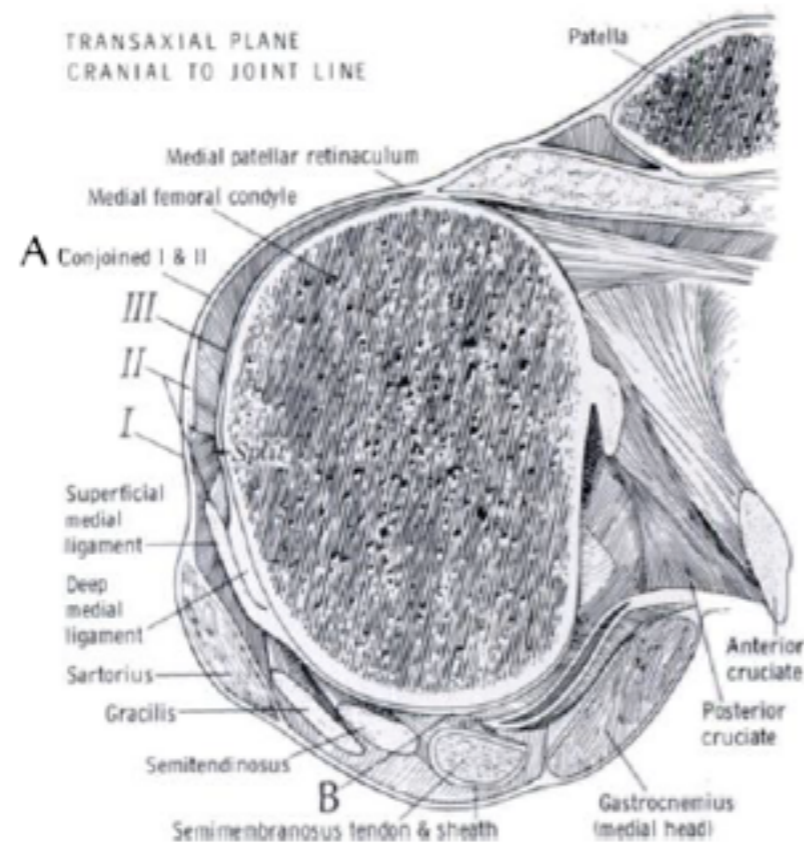
- First described by Warren and Marshall in 1979.
- MPFL present in 88% to 100% of knees (predisposal factors?).



# Layers (Warren and Marshall)

Three-layered arrangement of the tissue planes

- Layer 1: Deep Fascia
- Layer 2: MCL. **MPFL**
- Layer 3: The capsule of the knee joint



# Femoral origin

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- Anatomic studies report differing origins:
  - Medial femoral epicondyle
  - Anterior to the medial femoral epicondyle
  - Superoposterior to the medial femoral epicondyle
  - Adductor tubercle

# Femoral origin

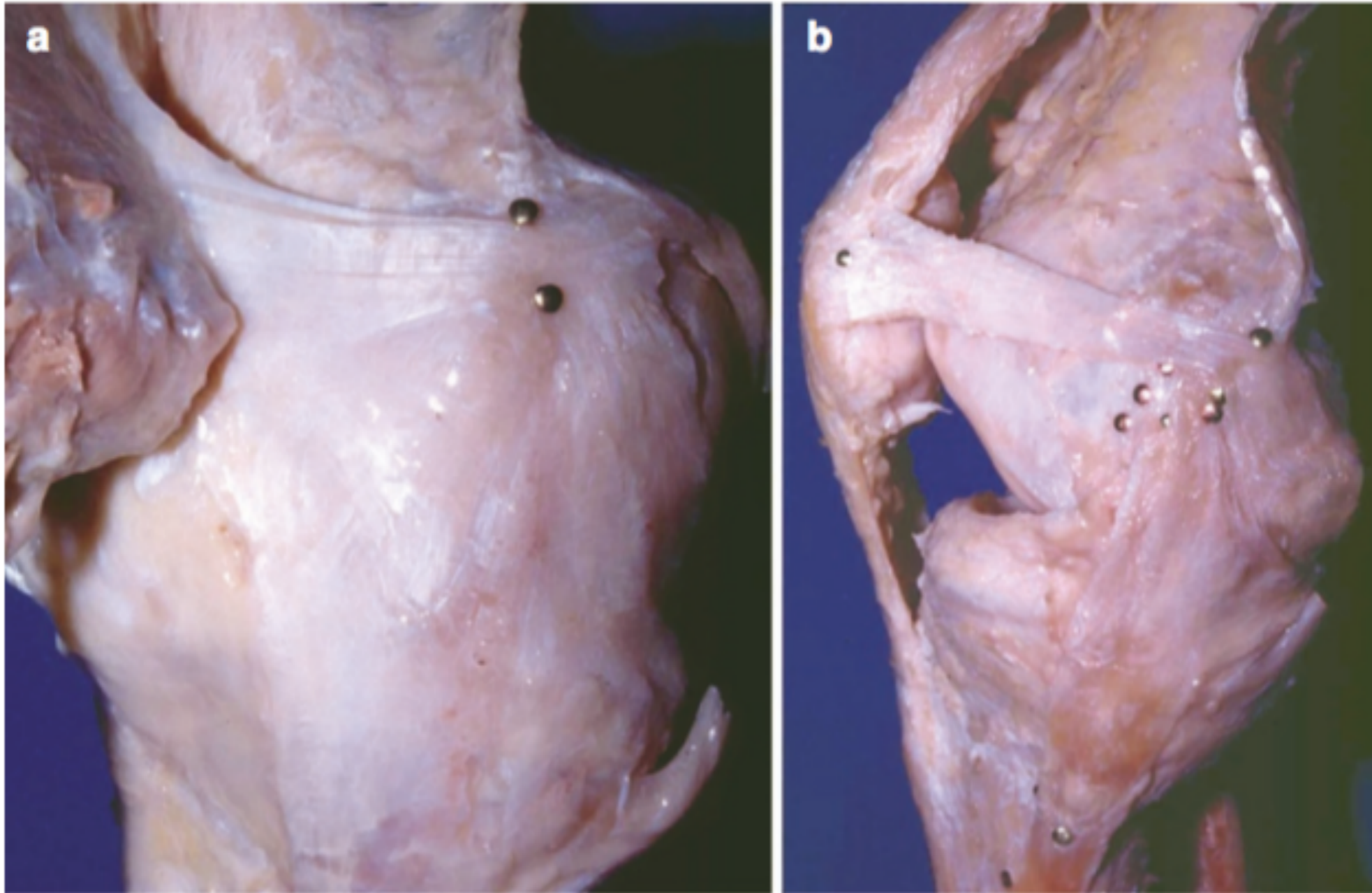
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- Baldwin (50 knees): two femoral origins of MPFL
  1. A 10.6 mm transverse origin in the groove **between the medial epicondyle and adductor tubercle.**
  2. An oblique origin from the proximal 30 mm of the leading edge of the superficial MCL.

# Femoral origin

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- Nomura

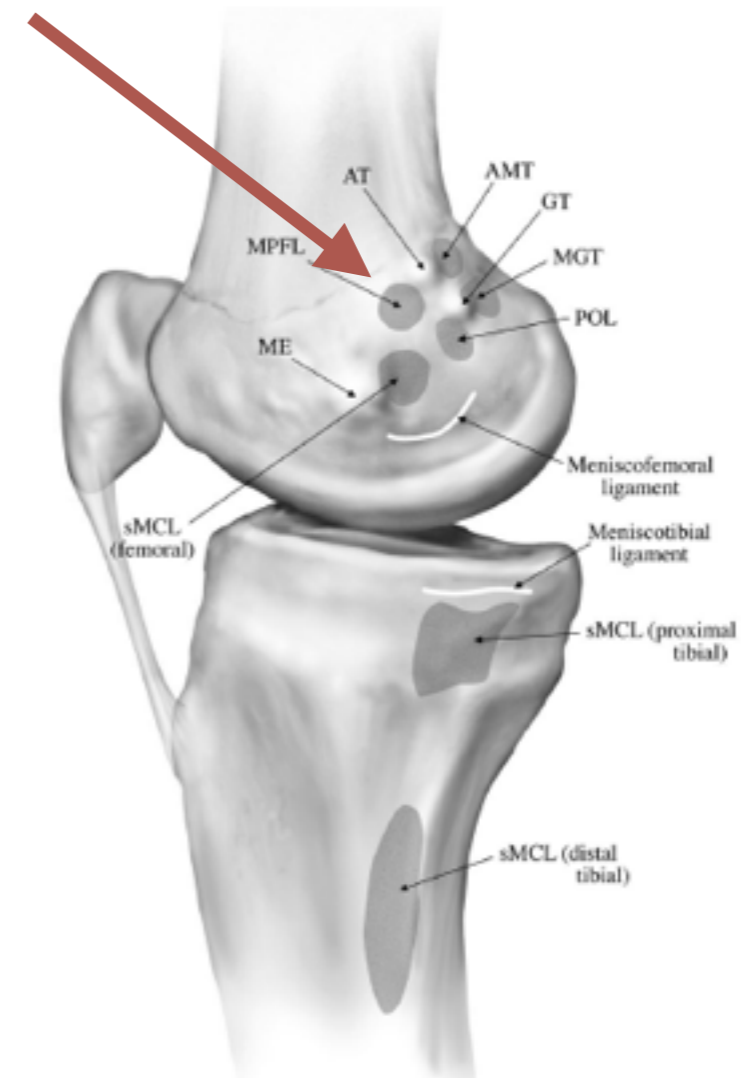
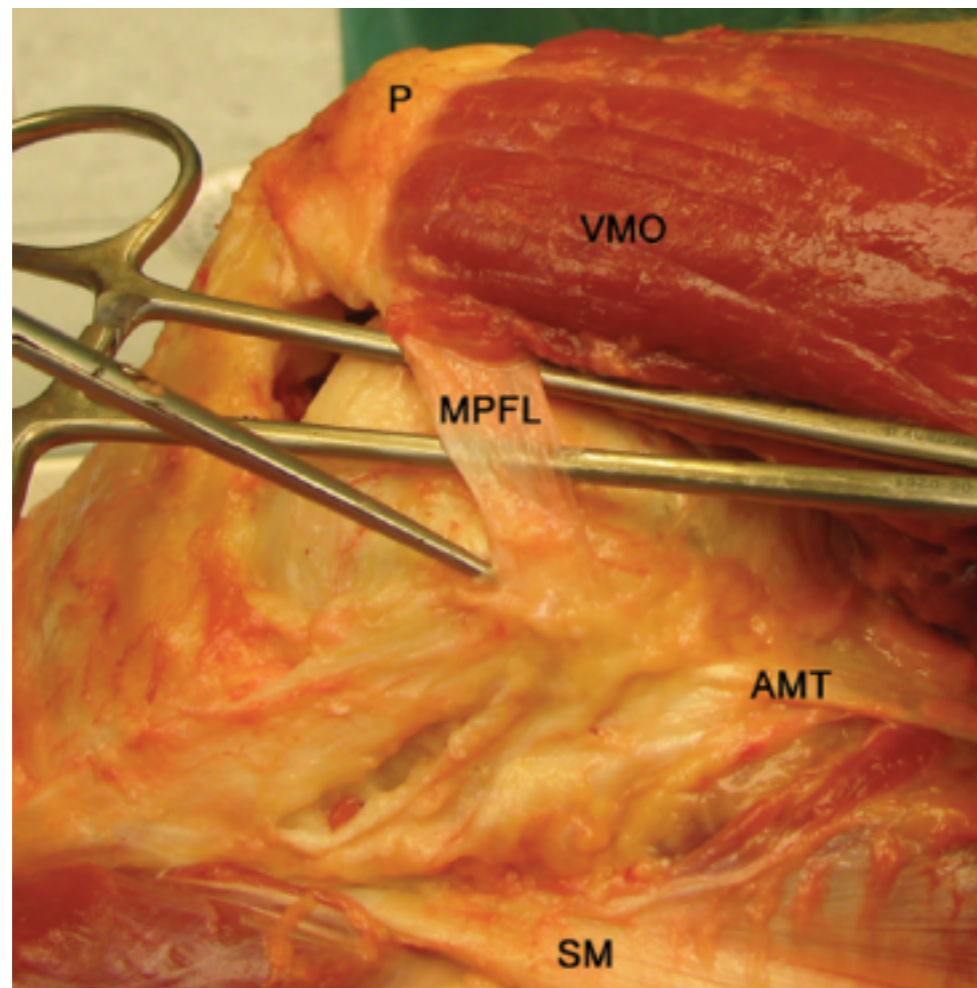




# The Anatomy of the Medial Part of the Knee

By Robert F. LaPrade, MD, PhD, Anders Hauge Engebretsen, Medical Student,  
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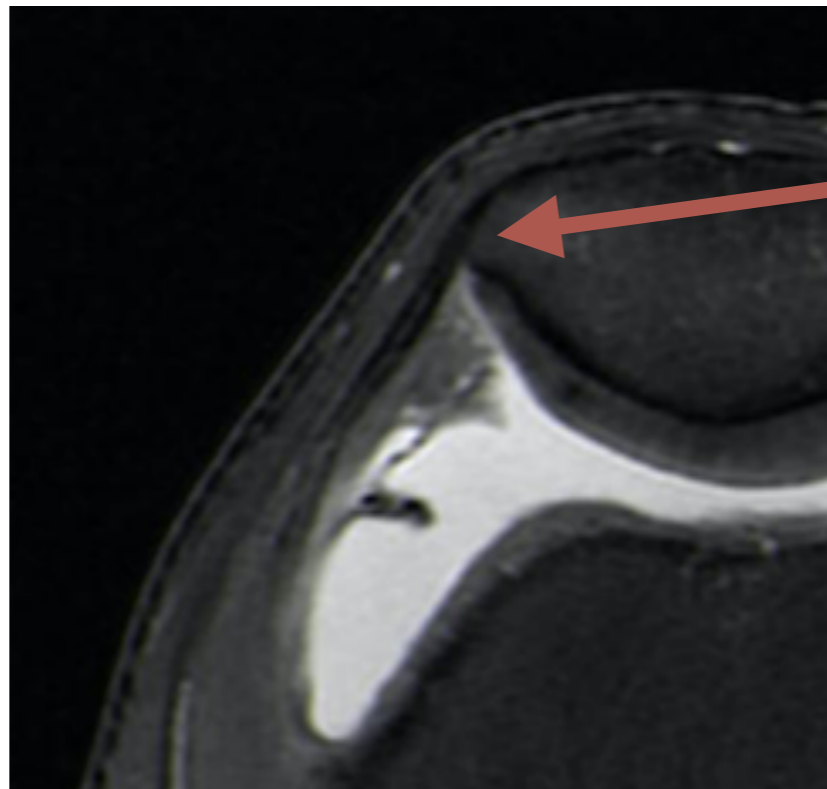


Femoral insertion:  
Between the medial epicondyle and the adductor tubercle

# Patella insertion

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- **Superomedial two-thirds** of the patella.
- Span: around **3 cm**.  $28.2 \pm 5.6$  mm (Baldwin); 16 to 38.8 mm, with a mean of 27.9 mm (Aragao).
- **Ventral edge** of the patella adjacent to the articular cartilage.



# Patella insertion

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- Nomura
- 2 of 30 knees: inserted not directly into the medial border of the patella, but into the **medial aspect of the quadriceps** tendon immediately proximal to its insertion at the patella.

# Relationship of the MPFL to the VMO tendon

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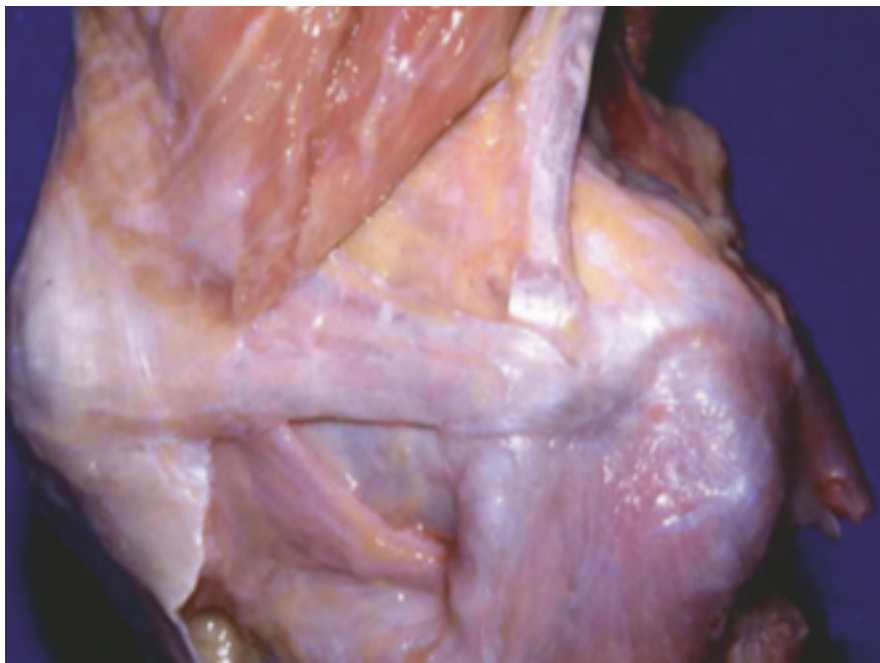
- “palpable band running along undersurface of the distal vastus medialis obliquus (VMO), attaching to both the medial femoral epicondyle and the proximal two-thirds of the patella.” (Hautamaa)



# Relationship of the MPFL to the VMO tendon

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- The VMO overlies the distal one-third of the MPFL . The angle of pull relative to the MPFL fibers changes as the knee is flexed.



0°



60°



120°

# Size and robustness

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- Conlan found it to be variable, representing a **distinct structure** in 29 of 33 fresh frozen cadaver knees.
- Desio et al. reported that the MPFL was identified in all specimens, though its **size was variable**.
- Amis et al. report the tensile strength of the MPFL to be **208 N**, with a standard deviation of 90N.

# Isometric or Anisometric?

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- “Not a settled issue”
- Nomura: **Anisometric** as it is slightly relaxed at 15–30° of knee flexion and tight at other angles.
- Steensen: **Isometric** during knee flexion from 0° to 90°, demonstrating an average change in length of 1.1 mm.

Not really Isometric!

# Isometric or Anisometric?

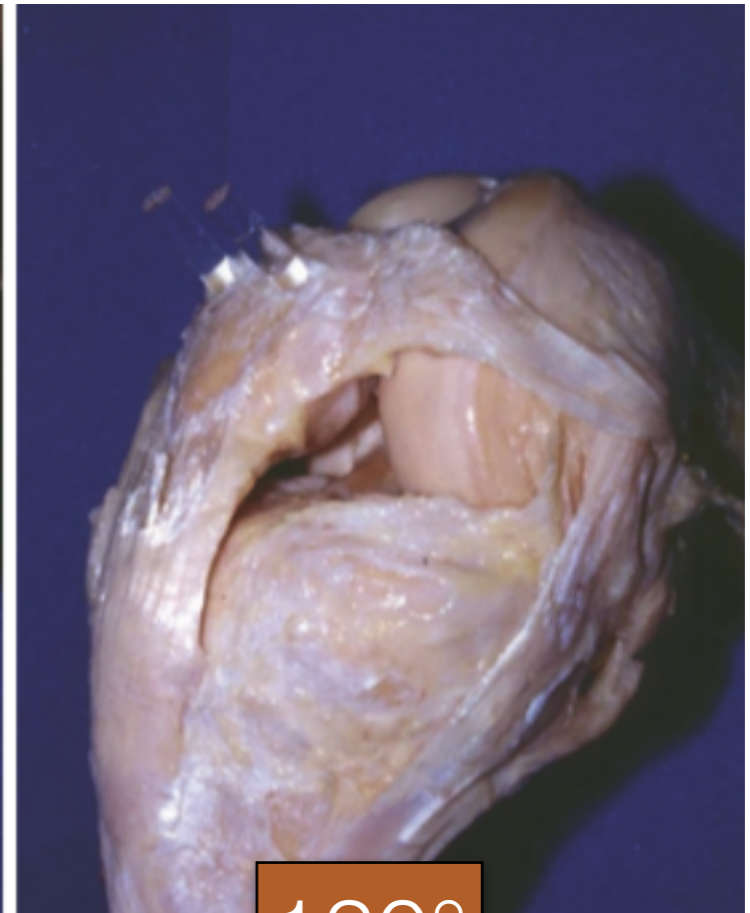
Nomura et al.



0°



60°

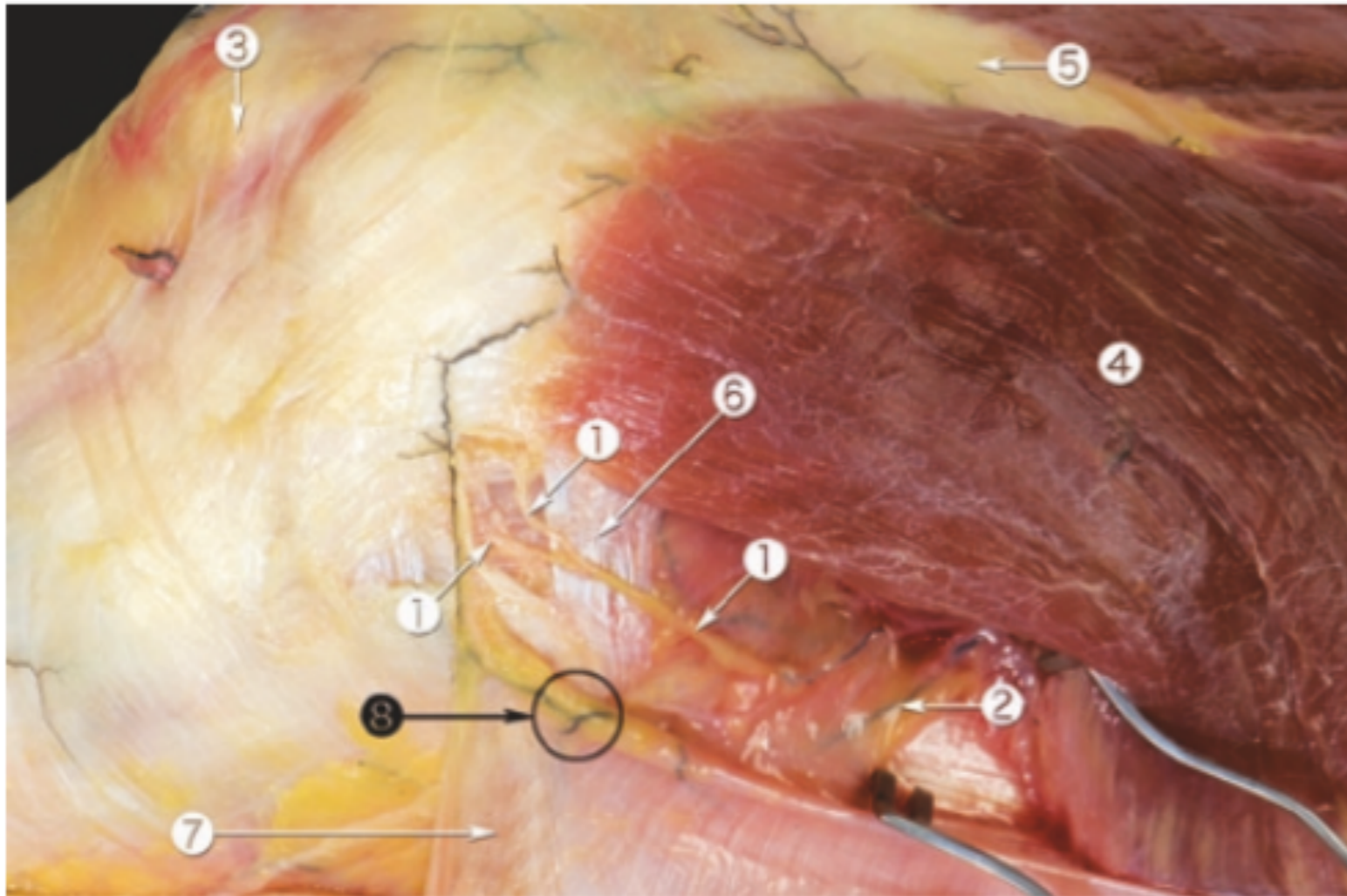


120°





# Innervation and vascularisation

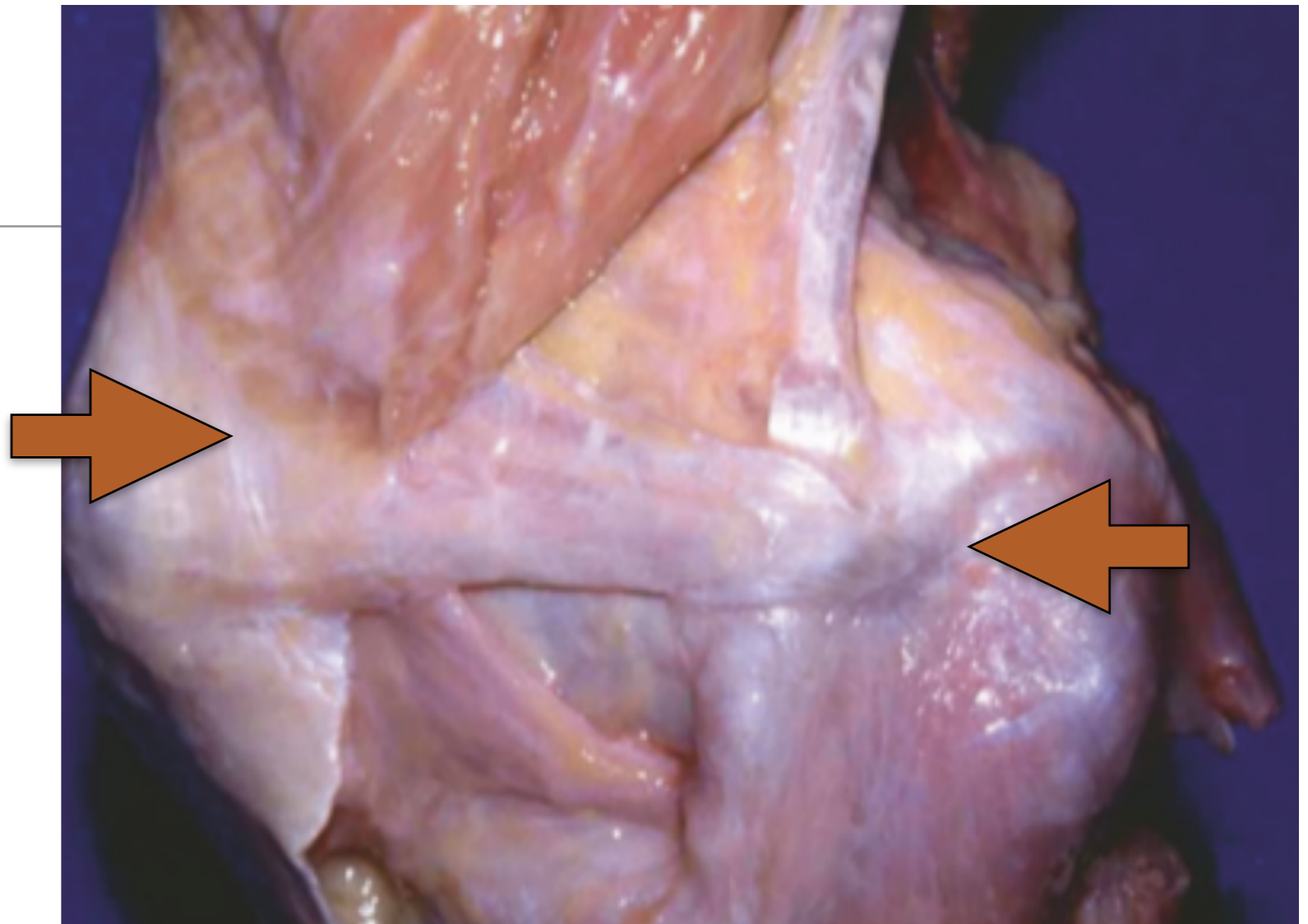


J. Vega, P. Golanó,  
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**Fig. 28.2** Anatomic dissection of the medial side of the right knee. Macrophotography. (1) Medial retinacular nerve and branches. (2) Superior medial genicular artery. (3) Patella (superior medial angle of the patella). (4) Vastus medialis. (5) Quadriceps femoralis tendon. (6) Medial patellofemoral ligament. (7) Fascia (rejected). (8) Medial epicondyle

# Conclusion

- Landmarks for MPFL reconstruction
- Knee position during fixation and tension
  - 30° ? 60° ?
  - Avoid over tension



*“It appears prudent to tension your graft with the knee contained in the groove at the ROM where your graft length is the longest.” E. Arendt.*