Knee anteromedial compartment dissection: Final results and Anterior Oblique Ligament description

Pedro Baches Jorge
Diego Escudeiro de Oliveira
Aires Duarte Jr
Luiz Gabriel B. Guglielmetti
Marcos Vaz de Lima

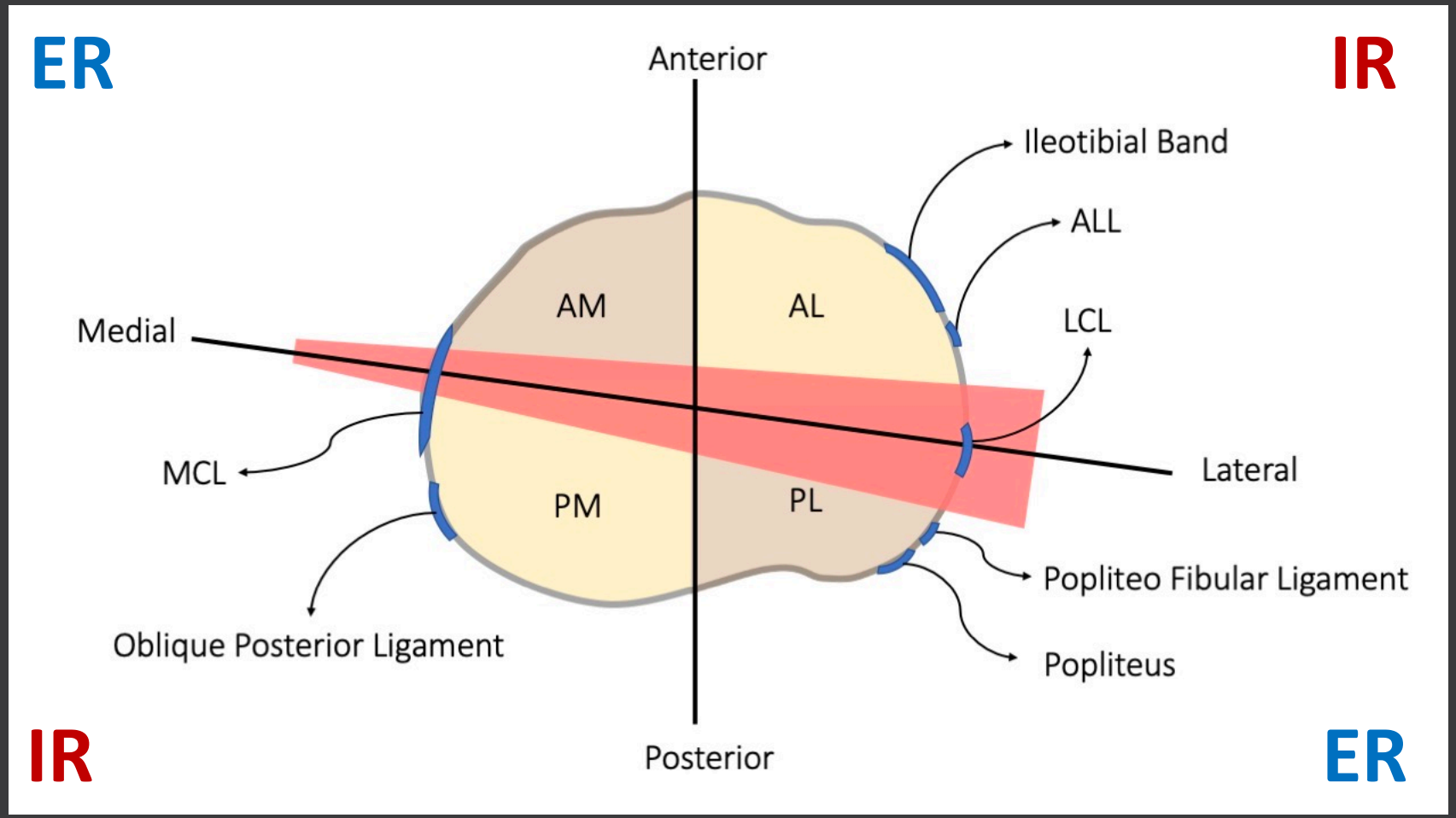
ISAKOS CONGRESS 2023
Boston Massachusetts June 18–June 21

Pavilhão Fernandinho Simonsen
Ortopedia e Traumatologia
Santa Casa de São Paulo

- The authors declare no conflits of interest

Theory of Tibial Quadrants

Valgus control



Varus control

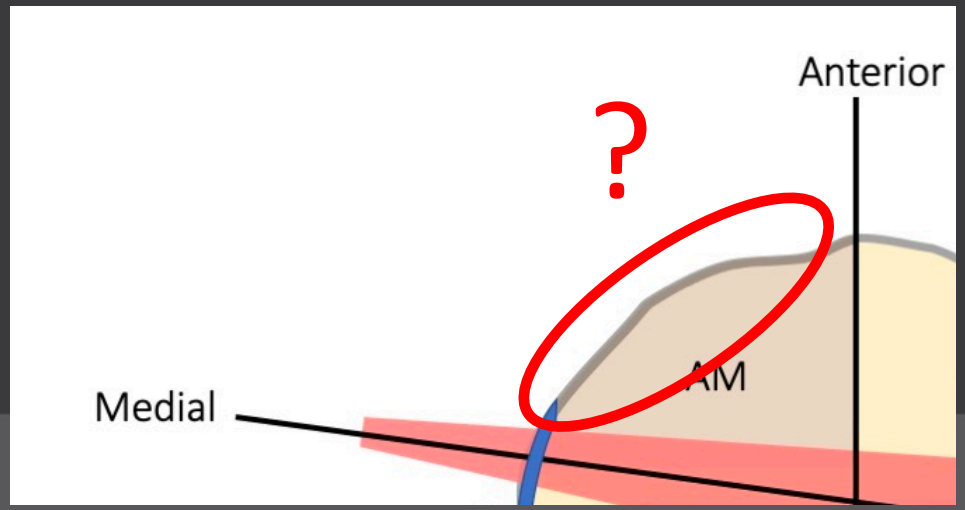
Angular and rotational control provided by periferical ligaments

Ligamentar fibers inside the transepicondilar axis control varus and valgus only (red belt)

Diagonally opposite quadrants are rotationally sinergistic

AOL description in the knee anteromedial compartment

- Purpose: To describe a ligamentous structure in the anteromedial region of the knee identified in a series of anatomical dissections of cadaveric specimens.



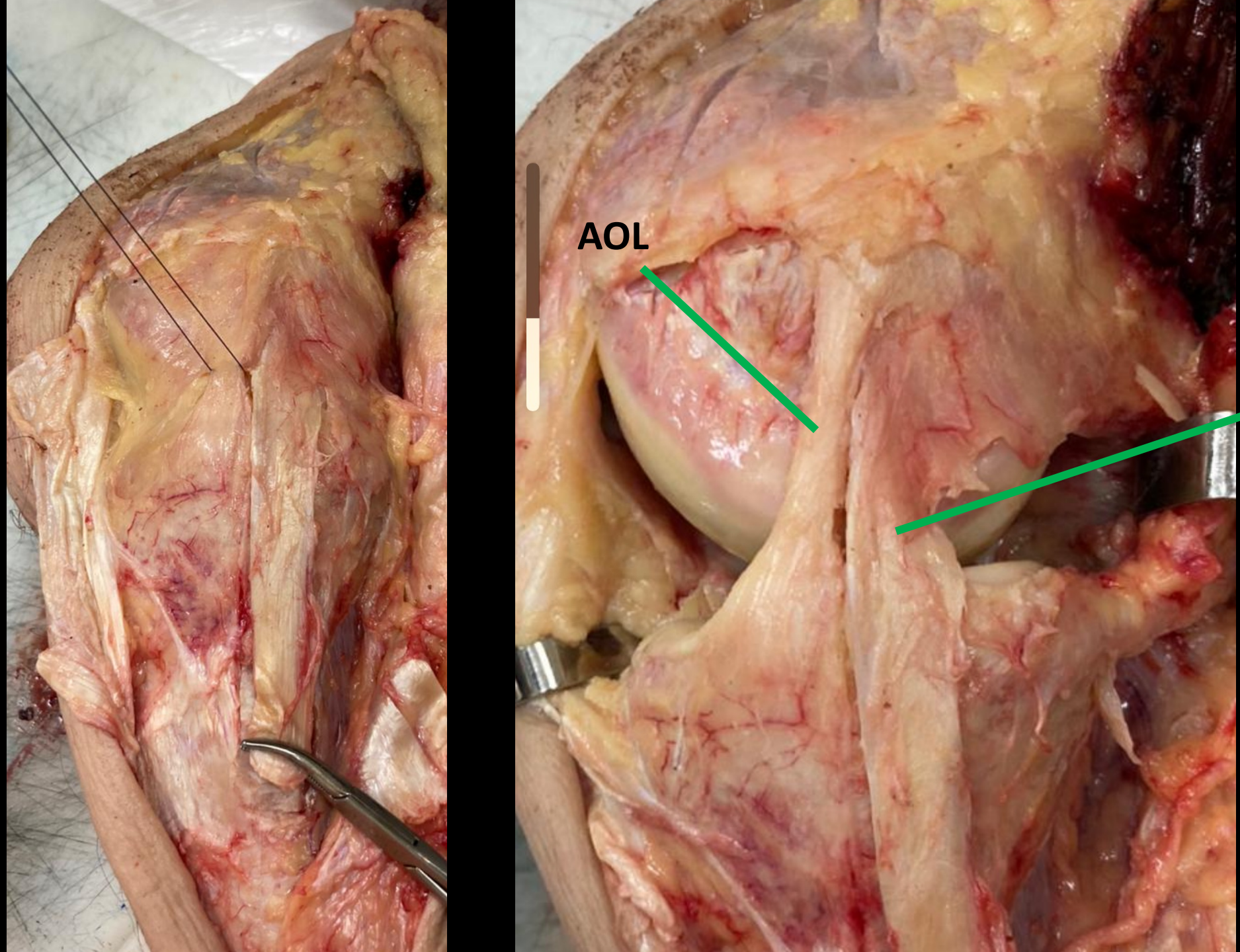
AOL description in the knee anteromedial compartment

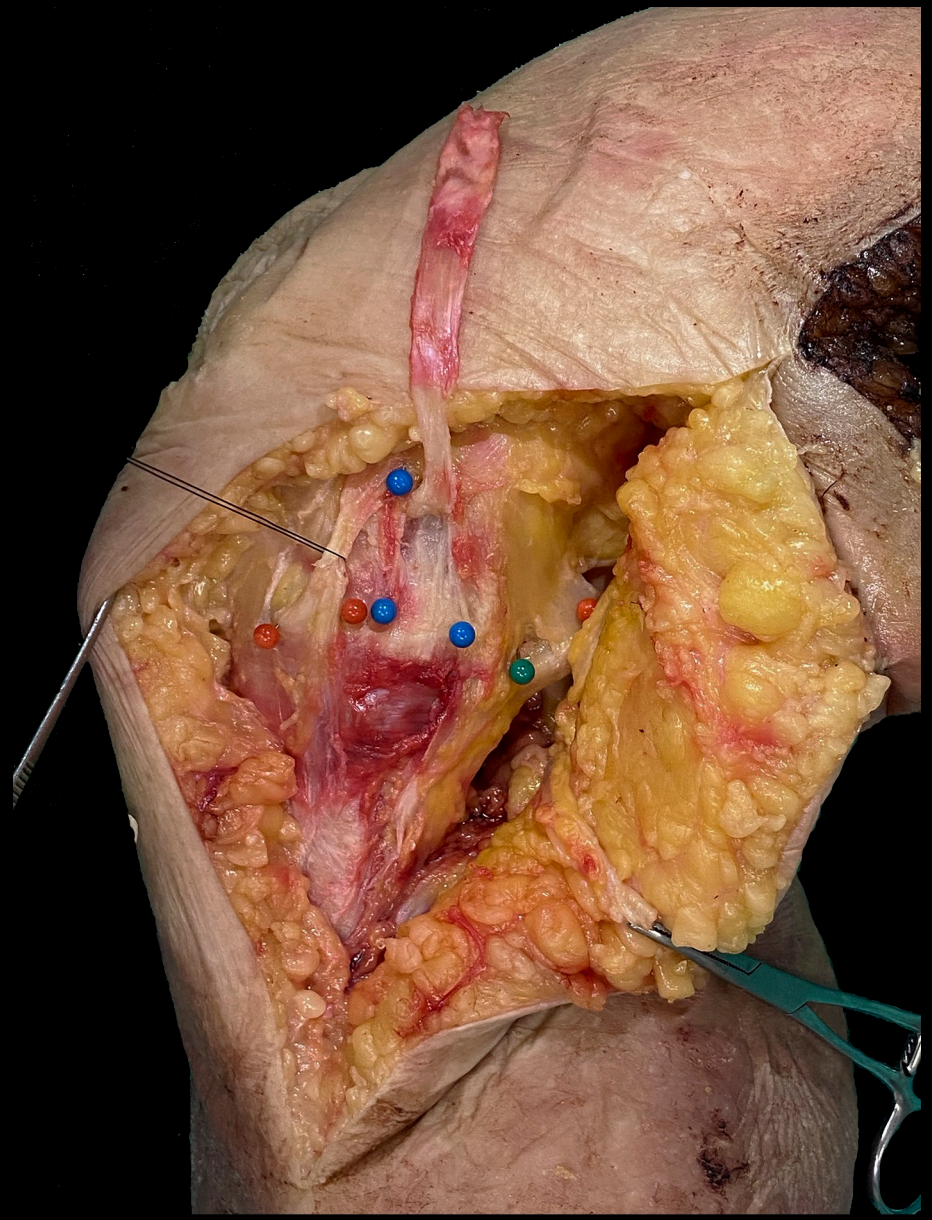
- 22 knees
- 1 discarded

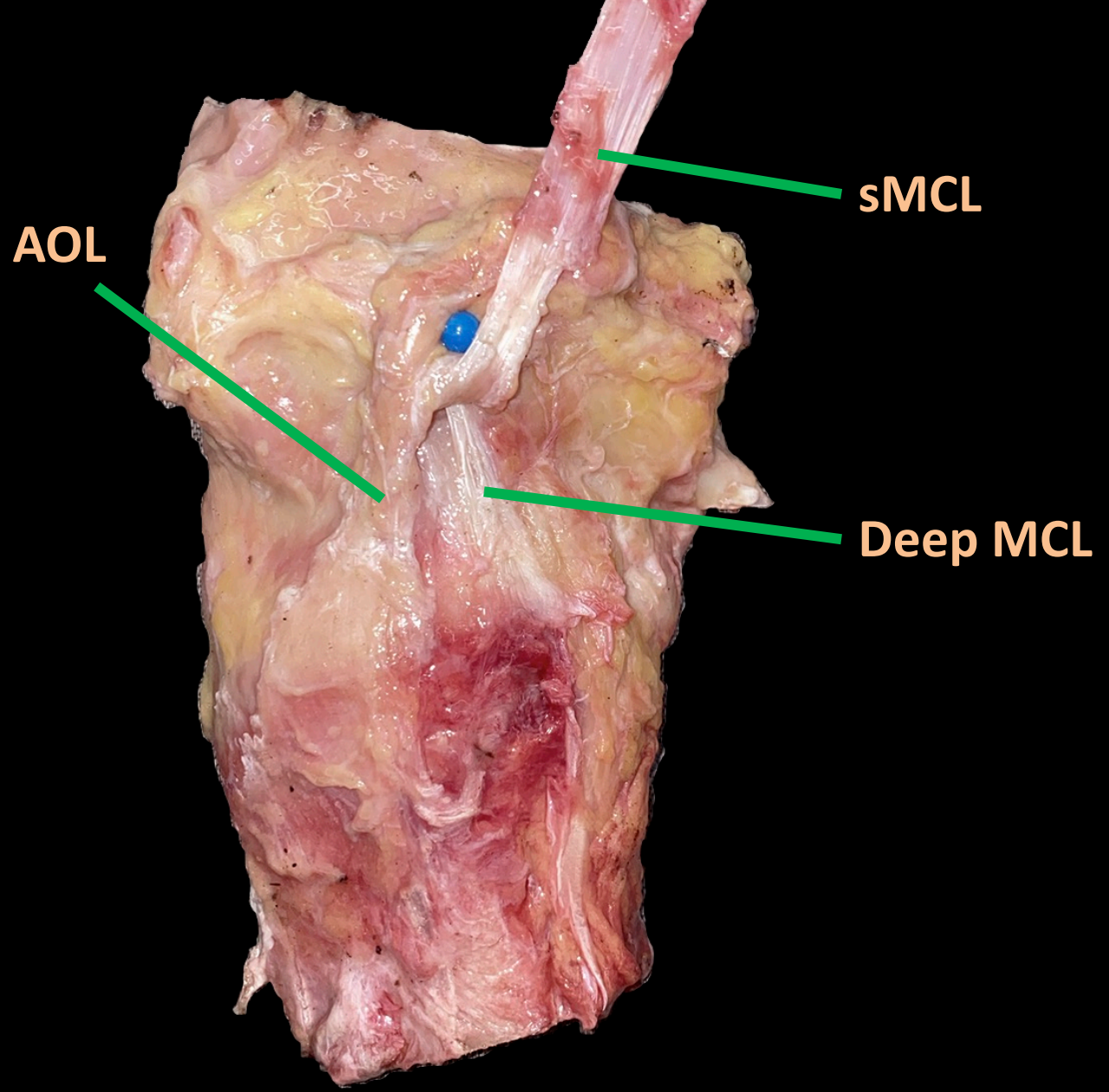
- Visualization of the structure (AOL) in 100% of the time
  - Thick origin in the epicondyle, fanning out for insertion 1 cm from the articular surface in the tibia..

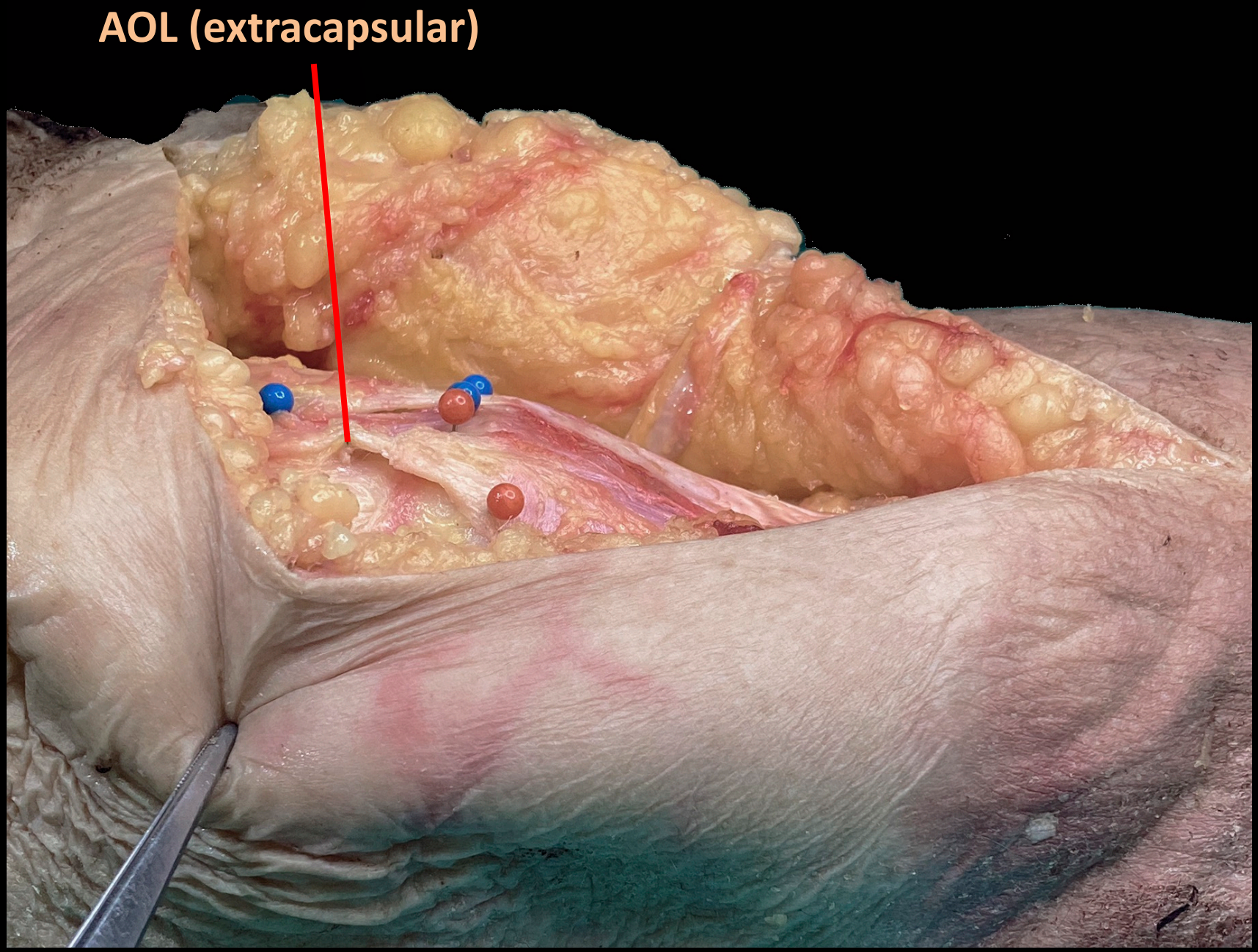
- Size in full extension: 35,27mm
- 90 degrees of flexion: 27,89mm
  - p: 0,0009

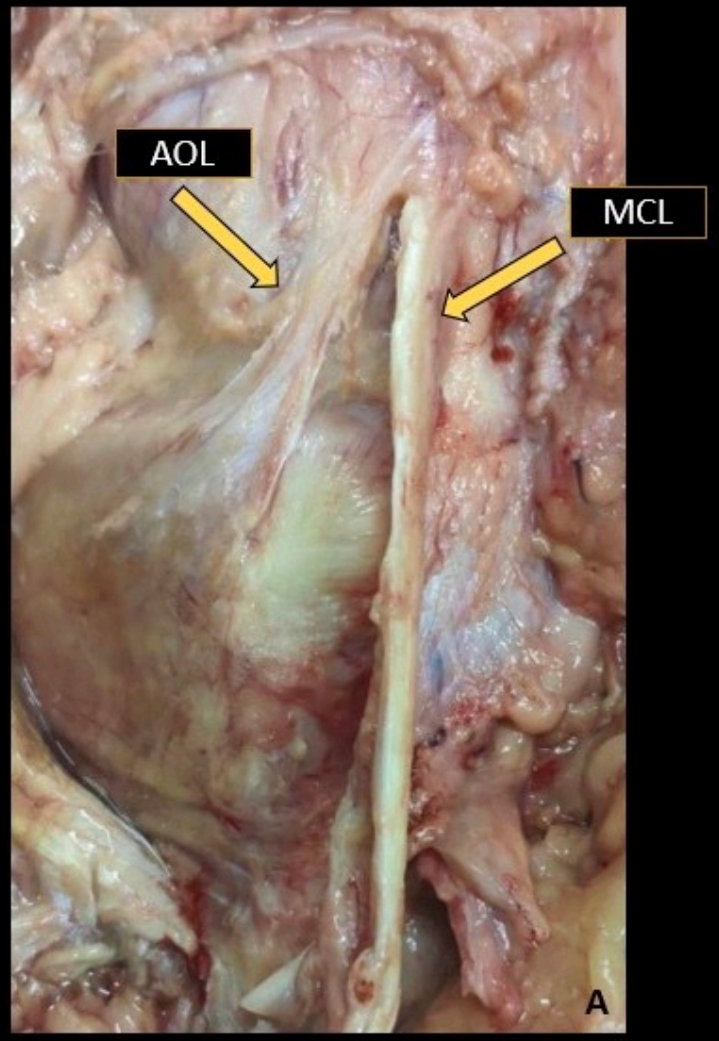
- Insertion takes place anteriorly to the MCL at 8,51mm from it

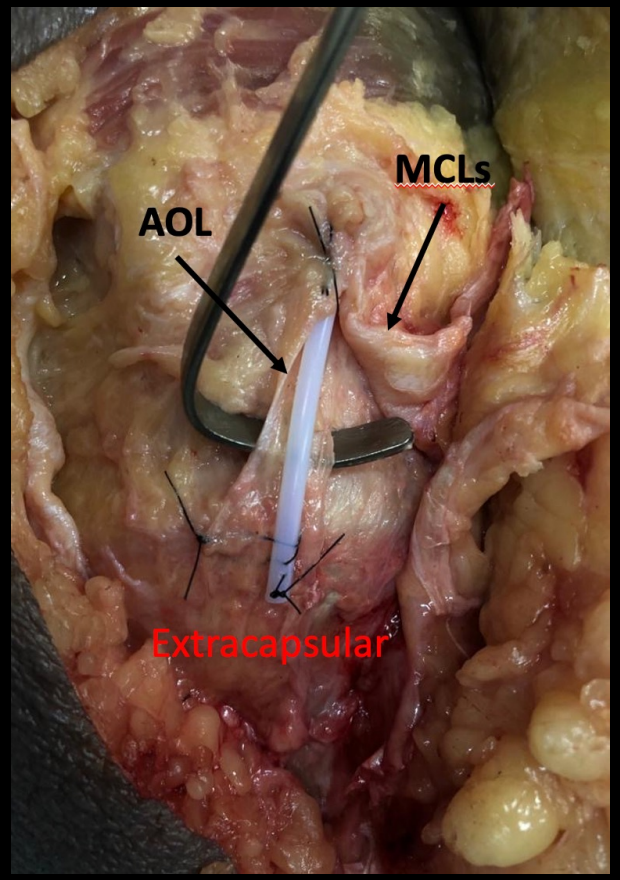

AOL
sMCL




sMCL
AOL
Deep MCL


AOL (extracapsular)





Cadaveric dissection of the medial aspect of the knee, showing the Anterior Oblique Ligament (AOL, Fig. A) and Medial Collateral Ligament (MCL, Fig. A). A polytetrafluoroethylene (PTFE, Fig. B) tube was attached to the ligament for better visualization in MRI scans.

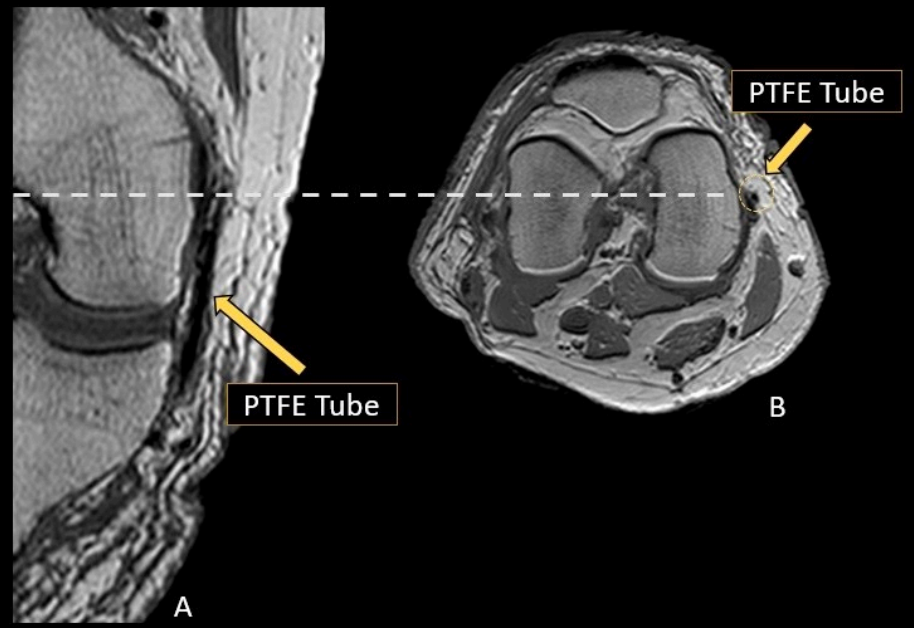
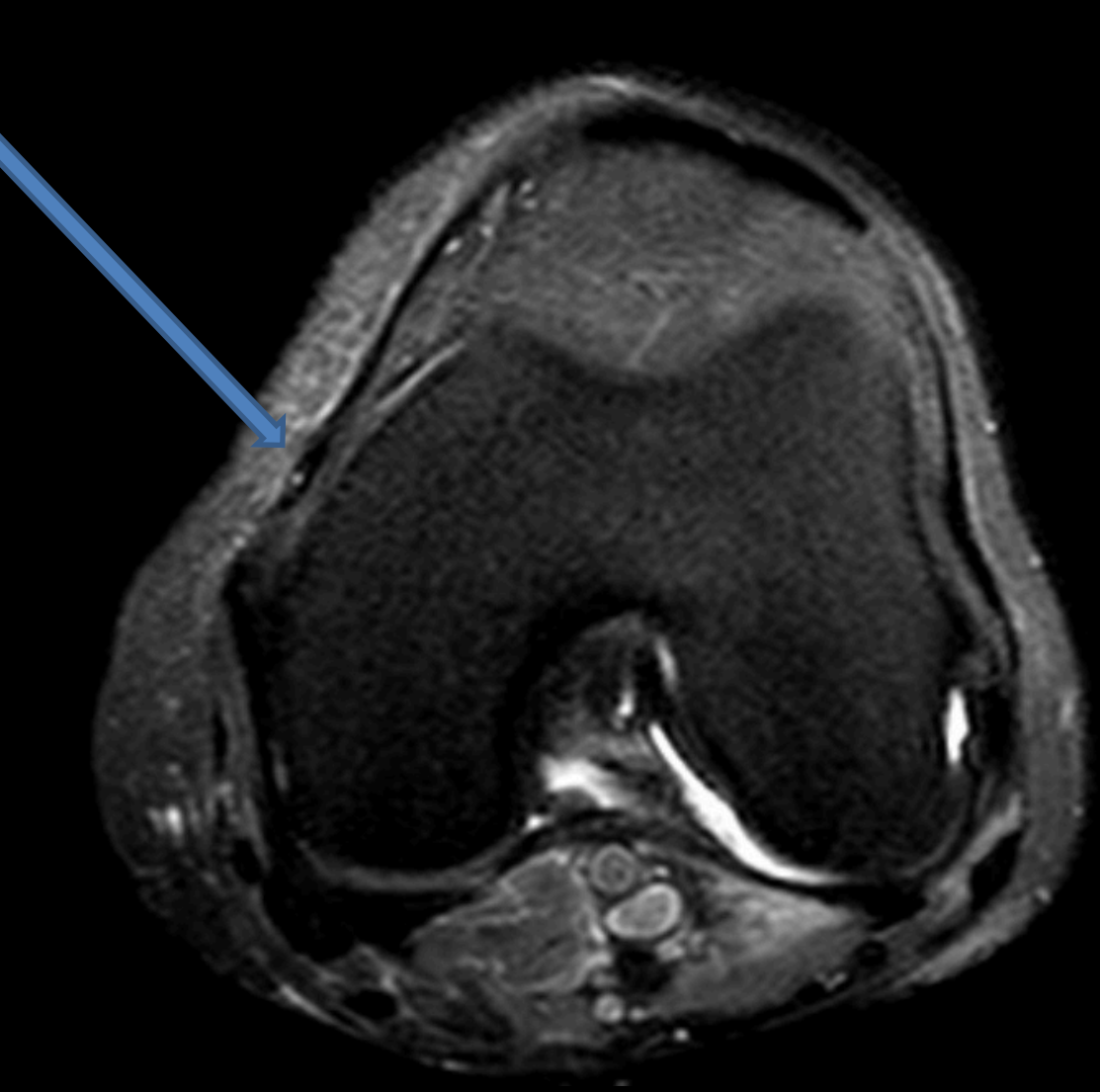
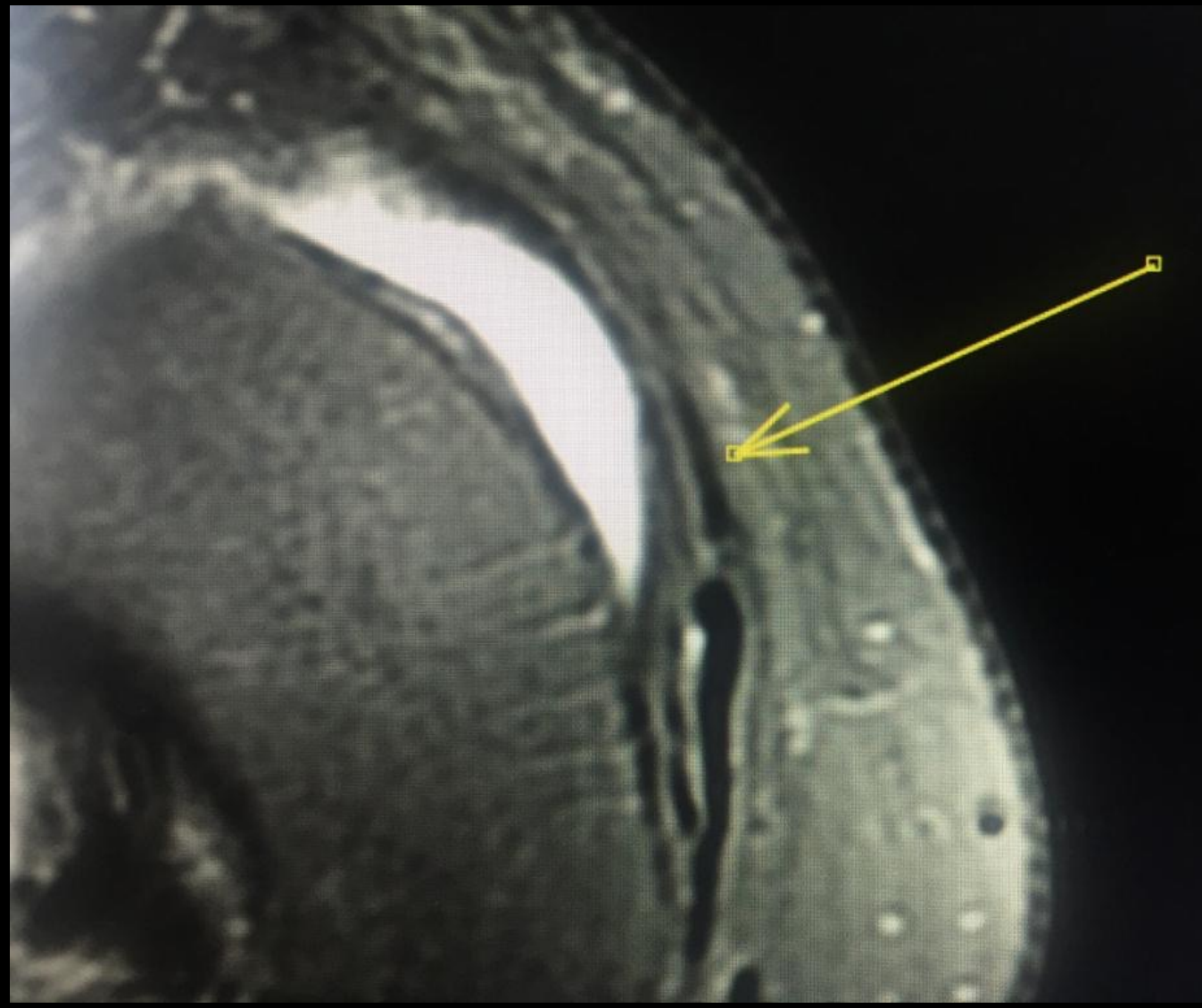


Figure 1. Coronal (A) and axial (B) T1-weighted MRI of cadaveric knee specimen with PTFE tube, showing the origin of the AOL in the medial epicondyle of the femur.

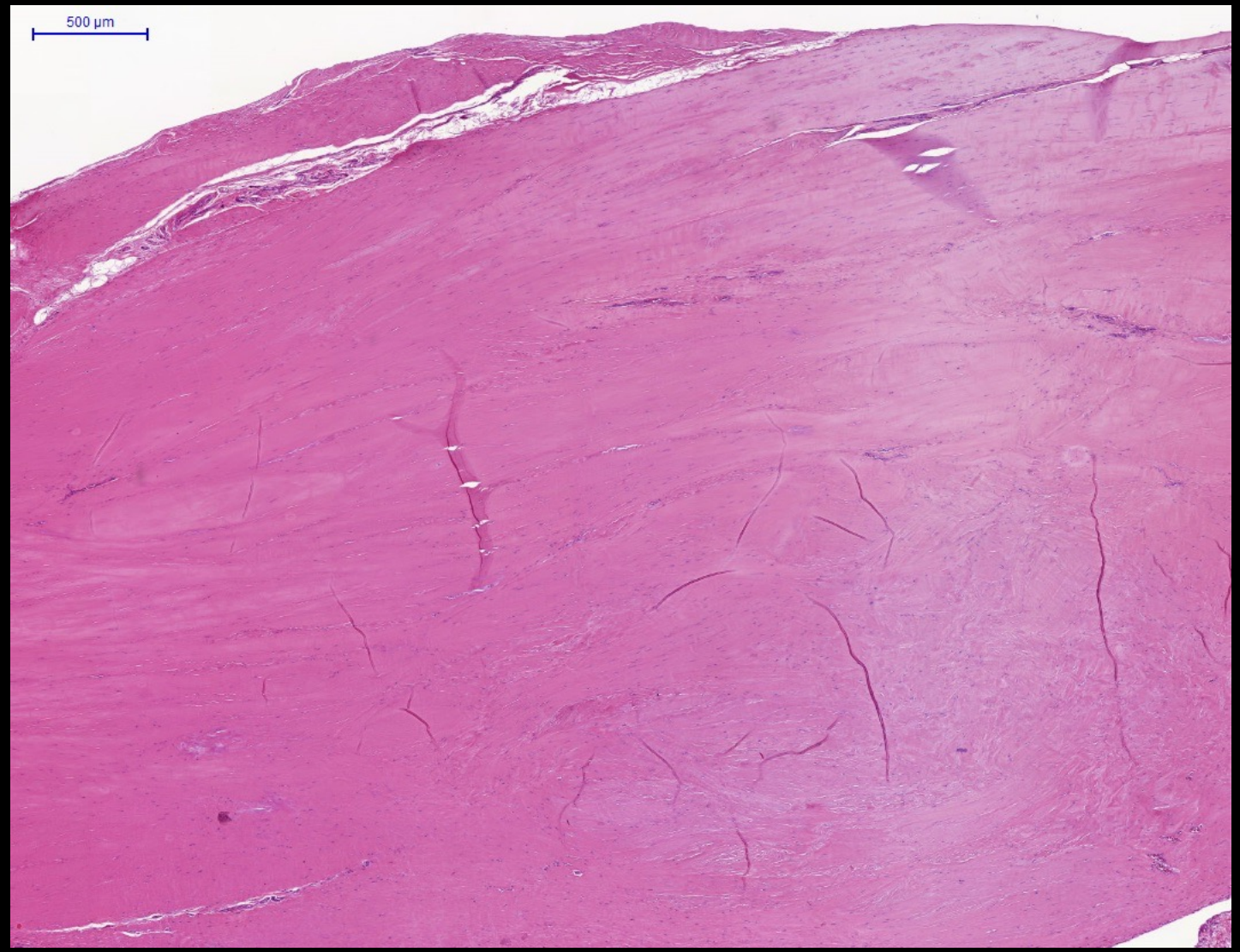
Rafael Baches Jorge, M.D.

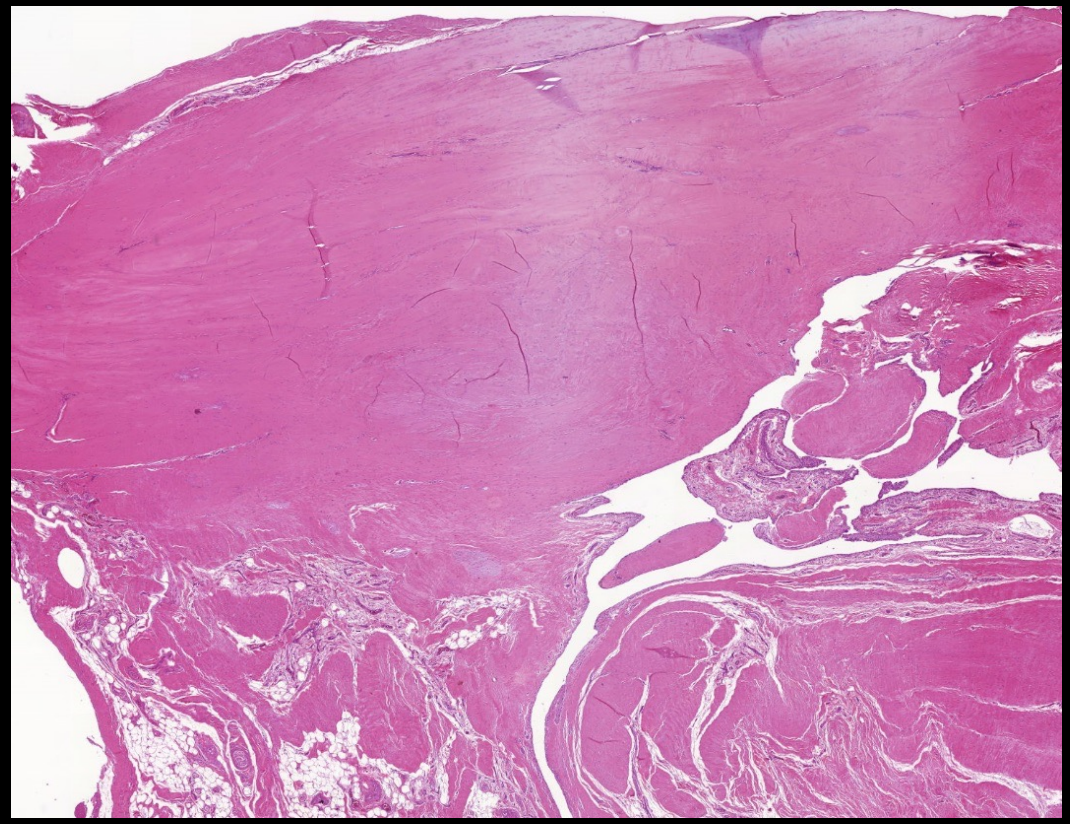
Can be identified on MRI





Histology compatible with ligament tissue



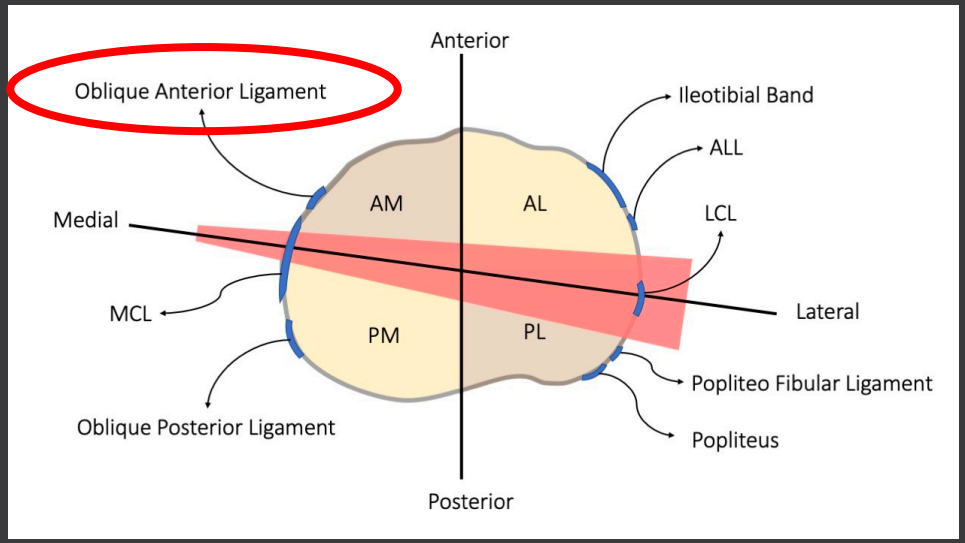


Geanete Pozzan, M.D.

Conclusion

A structure was identified in the knee anteromedial compartment . Has a ligamentous appearance, originating in the medial femoral epicondyle and with tibial insertion anterior to the sMCL.

It’s name is Anterior Oblique Ligament (AOL) and can be important in valgus and external rotational control.



DOI: 10.1002/jor.25169

RESEARCH ARTICLE

Journal of Orthopaedic Research®

Knee anteromedial compartment dissection: Final results and anterior oblique ligament description

REFERENCES

1. Slocum DB, Larson RL. Rotatory instability of the knee. Its pathogenesis and a clinical test to demonstrate its presence. *J Bone Joint Surg Am*. 1968;50(2):211-225.
2. Engebretsen L, Lind M. Anteromedial rotatory laxity. *Knee Surg Sports Traumatol Arthrosc*. 2016;23:2797-2804.
3. Alentorn-Geli E, Myer GD, Silvers HJ, et al. Prevention of non-contact anterior cruciate ligament injuries in soccer players. Part 1: mechanisms of injury and underlying risk factors. *Knee Surg Sports Traumatol Arthrosc*. 2009;17(7):705-729.
4. Elkin JL, Zamora E, Gallo RA. Combined anterior cruciate ligament and medial collateral ligament knee injuries: anatomy, diagnosis, management recommendations, and return to sport. *Curr Rev Musculoskelet Med*. 2019;12(2):239-244.
5. Schafer KA, Tucker S, Griffith T, et al. Distribution of force in the medial collateral ligament complex during simulated clinical tests of knee stability. *Am J Sports Med*. 2016;44(5):1203-1208.
6. Sims WF, Jacobson KE. The posteromedial corner of the knee: medial-sided injury patterns revisited. *Am J Sports Med*. 2004;32(2):337-345.
7. Wierer G, Milinkovic D, Robinson JR, et al. The superficial medial collateral ligament is the major restraint to anteromedial instability of the knee. *Knee Surg Sports Traumatol Arthrosc*. 2020;29:405-416. https://doi.org/10.1007/s00167-020-05947-0
8. Battaglia MJ 2nd, Lenhoff MW, Ehteshami JR, et al. Medial collateral ligament injuries and subsequent load on the anterior cruciate ligament: a biomechanical evaluation in a cadaveric model. *Am J Sports Med*. 2009;37(2):305-311.
9. LaPrade RF, Engebretsen AH, Ly TV, Johansen S, Wentorf FA, Engebretsen L. The anatomy of the medial part of the knee. *J Bone Joint Surg Am*. 2007;89(9):2000-2010.
10. Robinson JR, Bull AM, Thomas RR, Amis AA. The role of the medial collateral ligament and posteromedial capsule in controlling knee laxity. *Am J Sports Med*. 2006;34(11):1815-1823.
11. Robinson JR, Sanchez-Ballester J, Bull AM, Thomas Rde W, Amis AA. The posteromedial corner revisited. An anatomical description of the passive restraining structures of the medial aspect of the human knee. *J Bone Joint Surg Br*. 2004;86(5):674-681.
12. Warren LF, Marshall JL. The supporting structures and layers on the medial side of the knee: an anatomical analysis. *J Bone Joint Surg Am*. 1979;61(1):56-62.
13. Yoon KH, Yoo JH, Kim KI. Bone contusion and associated meniscal and medial collateral ligament injury in patients with anterior cruciate ligament rupture. *J Bone Joint Surg Am*. 2011;93(16):1510-1518.
14. Griffith CJ, Wijdicks CA, LaPrade RF, Armitage BM, Johansen S, Engebretsen L. Force measurements on the posterior oblique ligament and superficial medial collateral ligament proximal and distal divisions to applied loads. *Am J Sports Med*. 2009;37(1):140-148.
15. Mancini EJ, Kohen R, Esquivel AO, Cracchiolo AM, Lemos SE. Comparison of ACL strain in the MCL-deficient and MCL-reconstructed knee during simulated landing in a cadaveric model. *Am J Sports Med*. 2017;45(5):1090-1094.
16. Mehl JT, Kia C, Murphy M, et al. Posteromedial ligament repair of the knee with suture tape augmentation: a biomechanical study. *Am J Sports Med*. 2019;47(12):2952-2959.
17. Ahn JH, Lee SH. Risk factors for knee instability after anterior cruciate ligament reconstruction. *Knee Surg Sports Traumatol Arthrosc*. 2016;24(9):2936-2942.
18. Alm L, Krause M, Frosch KH, Akoto R. Preoperative medial knee instability is an underestimated risk factor for failure of revision ACL reconstruction. *Knee Surg Sports Traumatol Arthrosc*. 2020;28:2458-2467. https://doi.org/10.1007/s00167-020-06133-y
19. Funchal LFZ, Astur DC, Ortiz R, Cohen M. The presence of the arthroscopic "Floating Meniscus" sign as an indicator for surgical intervention in patients with combined anterior cruciate ligament and grade II medial collateral ligament injury. *Arthroscopy*. 2019;35(3):930-937.
20. DePhillipo NN, Moatshe G, Brady A, et al. Effect of meniscocapsular and meniscotibial lesions in ACL-deficient and ACL-reconstructed knees: a biomechanical study. *Am J Sports Med*. 2018;46(10):2422-2431.
21. Vaudreuil NJ, Rothrauff BB, de Sa D, Musahl V. The pivot shift: current experimental methodology and clinical utility for anterior cruciate ligament rupture and associated injury. *Curr Rev Musculoskelet Med*. 2019;12(1):41-49.
22. Churchill DL, Incavo SJ, Johnson CC, Beynnon BD. The transepicondylar axis approximates the optimal flexion axis of the knee. *Clin Orthop Relat Res*. 1998;356:111-118.
23. Krosshaug T, Andersen TE, Olsen OE, Myklebust G, Bahr R. Research approaches to describe the mechanisms of injuries in sport: limitations and possibilities. *Br J Sports Med*. 2005;39(6):330-339.

Pedro Baches Jorge, M.D.
pbj1980@Hotmail.com