The Lateral Patellar Retinaculum is Thicker in Pediatric and Adolescent Patients with Patellofemoral Instability

Danielle E. Chipman, BS

Peter Cirrincione, MD

Emilie Lijesen, BS

Shae K. Simpson, BS

Danielle S. Gorelick, NP

Douglas N. Mintz, MD

Daniel W. Green, MD, MS

Hospital for Special Surgery, New York, NY, USA

ISAKOS CONGRESS 2025 | MUNICH GERMANY June 8–11

Disclosures

Presenting author: Dr. Daniel Green

- Royalties: Arthrex, Inc., Pega Medical, *Current Opinion in Pediatrics*, Wolters Kluwer Health – Lippincott Williams & Wilkins
- Paid consultant: Arthrex, Inc.
- Speakers bureau: AO Trauma International, Arthrex, Inc.
- Editorial board: *Current Opinion in Pediatrics*
- Board of Directors: AAOS, New York County Medical Society, Patellofemoral Foundation, POSNA, PRiSM

Disclosures for all authors can be found on the AAOS Disclosures page.

Background

- Pediatric and adolescent patients who undergo medial patellofemoral ligament (MPFL) reconstruction for surgical treatment of patellofemoral instability (PI) often undergo concomitant release of the lateral patellar retinaculum (LPR)
- LPR release improves patellar alignment and positioning in the trochlear groove
- Few studies have described exact indications for LPR release

Purpose

- To examine the thickness of the LPR in pediatric and adolescent patients who undergo an MPFL reconstruction
- To examine patellar tilt, a radiographic measure commonly used to assess PI, in pediatric and adolescent patients

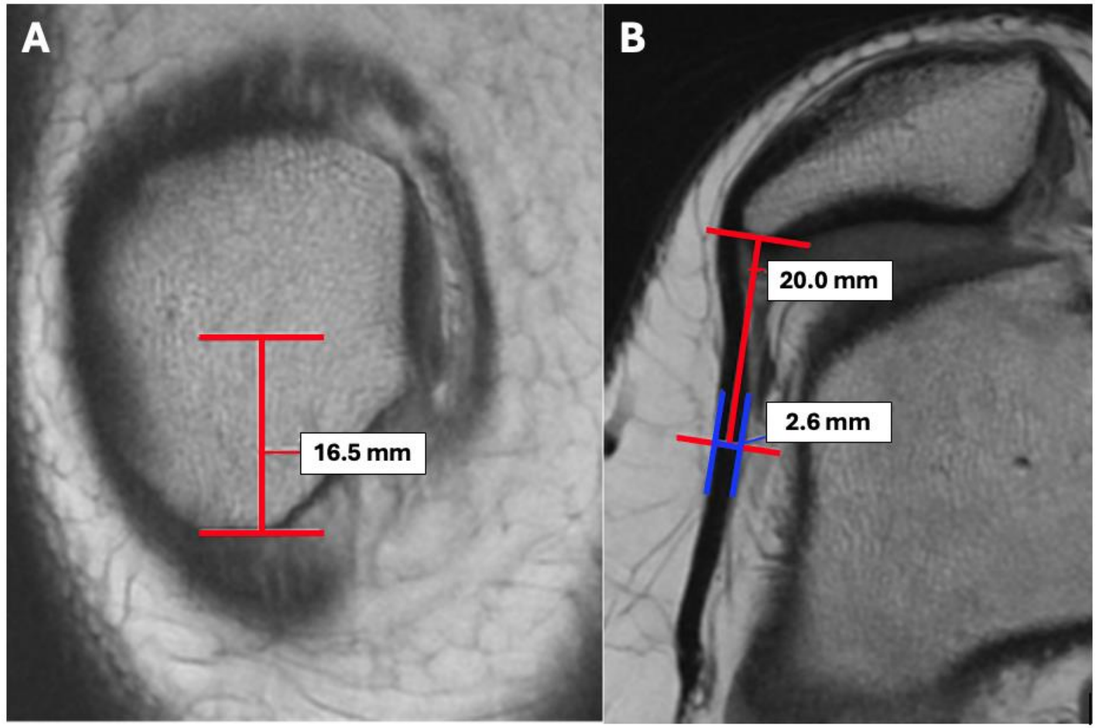


FIGURE 1. LPR measurement on MRI. A) Coronal MRI slice with longest height of patella identified, distance measured and divided by half to identify midpoint. B) Midpoint from coronal view used to identify slice on axial view, 20mm measured from lateral edge of patella to LPR, at this point LPR thickness is measured.

Methods

- Patients ≤18 years who underwent an MPFL reconstruction between 2016-2022 and had a proton density preoperative axial MRI performed at our institution were identified retrospectively

- Patients with a history of ipsilateral knee surgery, syndromic dislocators, and obligatory dislocators were excluded

- Patients were age (± 1.5 years), sex, and laterality matched to a comparison cohort for analysis

Results

TABLE 1. Demographics of patients in MPFL cohort and control cohort

	All Patients (N=290)	MPFL Cohort (N=145)	Control Cohort (N=145)
		Mean ± SD	
Age at Imaging (years)	14.2 ± 2.1	14.4 ± 2.0	14.1 ± 2.1
		N (%)	
Sex			
Female	196 (68)	98 (68)	98 (68)
Male	94 (32)	47 (32)	47 (32)

Results

TABLE 2. LPR thickness and patellar tilt between MPRL and control cohort

	MPFL Cohort	Control Cohort	P-value
	Mean ± SD		
LPR Thickness (mm)	2.3 ± 0.8 (0.5 - 4.8)	1.9 ± 0.6 (0.8 - 3.9)	< 0.001*
Patellar Tilt (degrees)	18.5 ± 9.2 (1.8 - 50.6)	6.9 ± 4.7 (-6.7 – 19.7)	< 0.001*

- **Patients who underwent MPFL reconstruction have a significantly thicker LPR and increased patellar tilt**

Results

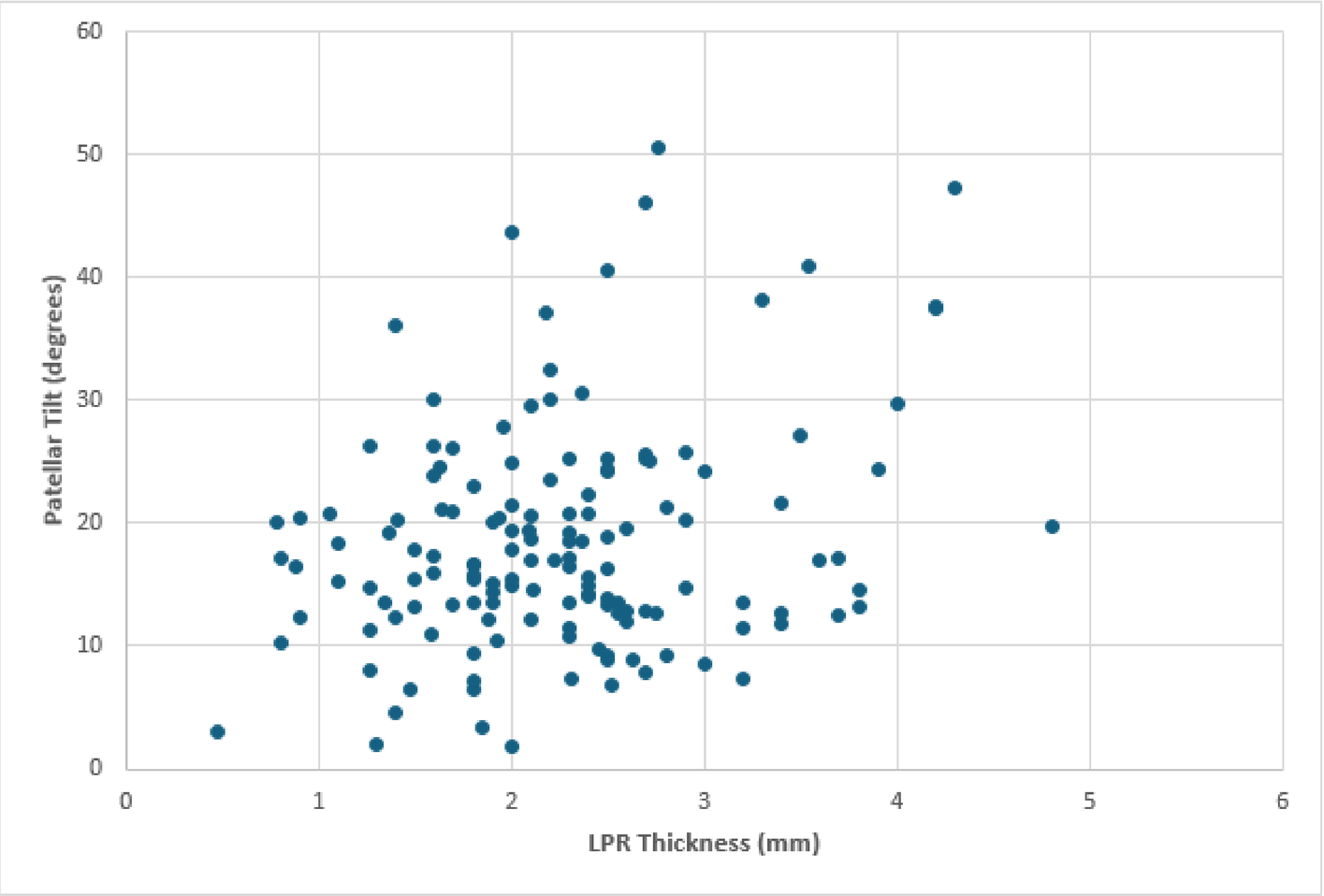


FIGURE 2. Correlation between patellar tilt and LPR thickness for patients in MPFL cohort

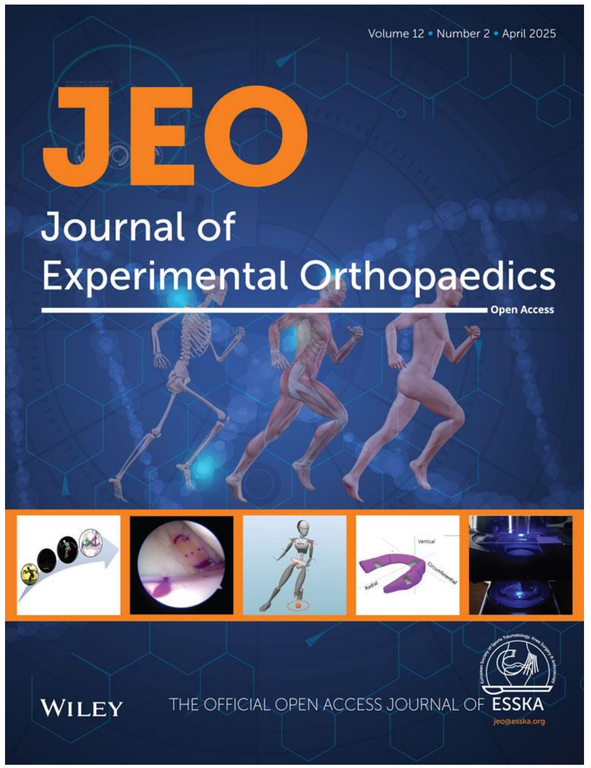
- **LPR thickness and patellar tilt are correlated**

- Axial knee MRI from control patient (left) vs. patient who received an MPFL reconstruction for PI (right)
- LPR significantly thicker in MPFL patient vs. control

Conclusion

- The LPR is significantly thicker in patients undergoing MPFL reconstruction compared to a comparison cohort
- Patellar tilt is directly correlated with increased LPR thickness

- One of the first studies to demonstrate that LPR thickness is associated with pathologic PI on imaging



Published in JEO April 2025

Thank you!

Contact Information: Daniel Green MD, greendw@hss.edu

References

1. Balcarek P, Milinkovic DD, Zimmerer A, Zimmermann F (2022) Mental and physical health-related quality of life in patients with recurrent patellar dislocations-a generic and disease-specific quality of life questionnaire assessment. J Exp Orthop 9(1):60
2. Biz C, Stecco C, Crimì A, Pirri C, Fosser M, Fede C, Fan C, Ruggieri P, De Caro R (2022) Are Patellofemoral Ligaments and Retinacula Distinct Structures of the Knee Joint? An Anatomic, Histological and Magnetic Resonance Imaging Study. Int J Environ Res Public Health 19(3):1110
3. Danielsen O, Poulsen TA, Eysturoy NH, Mortensen ES, Hölmich P, Barfod KW (2023) Trochlea dysplasia, increased TT-TG distance and patella alta are risk factors for developing first-time and recurrent patella dislocation: a systematic review. Knee Surg Sports Traumatol Arthrosc 31(9):3806–3846
4. Dejour H, Walch G, Nove-Josserand L, Guier Ch (1994) Factors of patellar instability: An anatomic radiographic study. Knee Surg Sports Traumatol Arthrosc 2(1):19–26
5. Escala JS, Mellado JM, Olona M, Giné J, Saurí A, Neyret P (2006) Objective patellar instability: MR-based quantitative assessment of potentially associated anatomical features. Knee Surg Sports Traumatol Arthrosc 14(3):264–272
6. Hinckel BB, Baumann CA, Arendt EA, Gobbi RG, Garrone AJ, Voss E, Fithian D, Khan N, Sherman SL (2022) Quadriceps Tendon Lengthening for Obligatory (Habitual) Patellar Dislocation in Flexion. Arthrosc Tech 11(9):e1589–e1595
7. Huddleston HP, Lavoie-Gagne O, Mehta N, Walsh JM, Fu MC, Forsythe B, Verma NN, Cole BJ, Yanke AB (2023) PROMIS physical function and pain perform poorly psychometrically in patients undergoing medial patellofemoral ligament reconstruction. Knee Surg Sports Traumatol Arthrosc 31(11):5067-5076
8. Kim JS, Yun SJ, Jin W, Kim GY, Park SY, Park JS, Ryu KN (2017) A Focal Defect at the Lateral Patellar Retinaculum on Clinical Knee MRI and Cadaveric Study: A Normal Variant or Pathologic Lesion? AJR Am J Roentgenol 208(5):1103–1109
9. Laugharne E, Bali N, Purushothamdas S, Almallah F, Kundra R (2016) Variability of Measurement of Patellofemoral Indices with Knee Flexion and Quadriceps Contraction: An MRI-Based Anatomical Study. Knee Surg Relat Res 28(4):297–301
10. Lewallen L, McIntosh A, Dahm D (2015) First-Time Patellofemoral Dislocation: Risk Factors for Recurrent Instability. J Knee Surg 28(04):303–310
11. Pascual-Leone N, Chipman DE, Meza BC, Mintz DN, Fabricant PD, Green DW (2023) Concomitant anterior medializing osteotomy and MPFL reconstruction improves patellar tilt when compared to MPFL reconstruction alone. Knee Surg Sports Traumatol Arthrosc 31(8):3399–3404
12. Schlichte LM, Sidharthan S, Green DW, Parikh SN (2019) Pediatric Management of Recurrent Patellar Instability. Sports Med Arthrosc Rev 27(4):171–180
13. Starok M, Lenchik L, Trudell D, Resnick D (1997) Normal patellar retinaculum: MR and sonographic imaging with cadaveric correlation. AJR Am J Roentgenol 168(6):1493–1499
14. Tan SHS, Kwan YT, Lee JZJ, Yeo LKP, Lim AKS, Hui JH (2024) Patellar tilt, congruence angle, and tibial tubercle-trochlear groove distance are correlated with positive J-sign in adolescents. Phys Sportsmed 52(5):492–496
15. Thawait SK, Soldatos T, Thawait GK, Cosgarea AJ, Carrino JA, Chhabra A (2012) High resolution magnetic resonance imaging of the patellar retinaculum: normal anatomy, common injury patterns, and pathologies. Skeletal Radiol 41(2):137–148