Concomitant Anterior Medializing Osteotomy and MPFL Reconstruction Improves Patella Tilt When Compared to MPFL Reconstruction Alone: A Retrospective Comparison Cohort Study of Patients with Elevated TT-TG

Nicolas Pascual-Leone, BA
Danielle E. Chipman, BS
Blake C. Meza, MD
Douglas N. Mintz, MD
Peter D. Fabricant, MD, MPH
Daniel W. Green, MD, MS, FAAP, FACS

Hospital for Special Surgery,
New York, NY, USA

Disclosures

NO RELEVANT DISCLOSURES

- **Douglas N. Mintz**

  Board or committee member: American College of Radiology, Society of Skeletal Radiology

- **Peter D. Fabricant**

  Editorial or governing board: Clinical Orthopaedics and Related Research
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- **Daniel W. Green**

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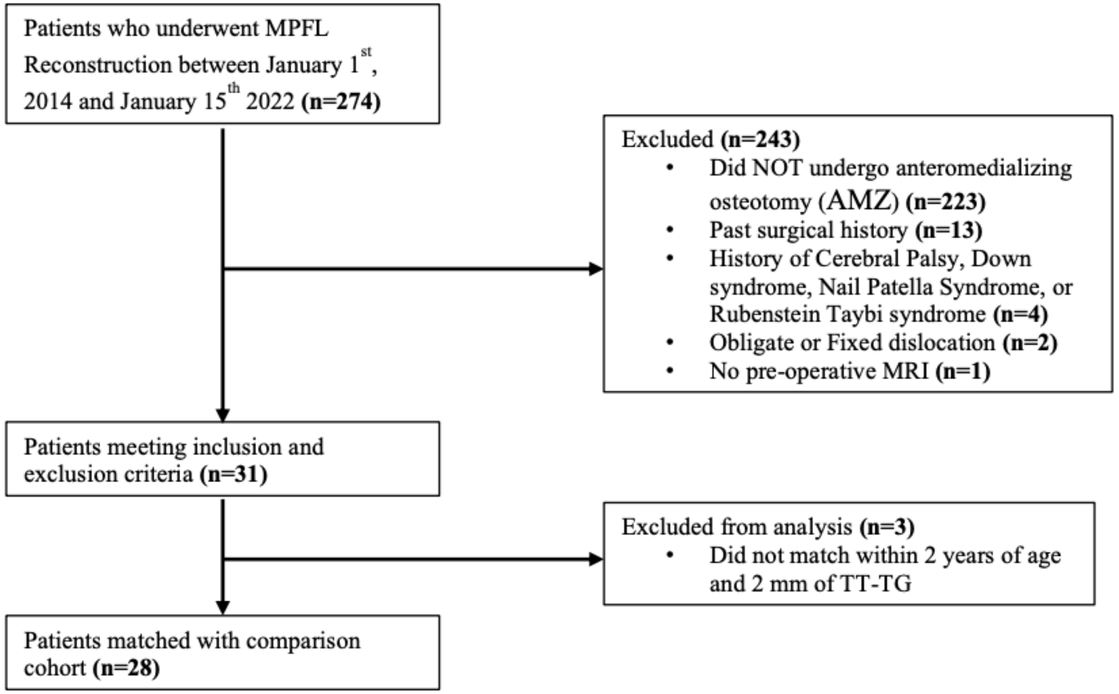
Introduction

- Understanding how surgical procedures influence anatomic factors associated with patellofemoral instability can help guide surgeons when planning treatments for individual patients
- **Purpose**: This study sought to understand how patellar tilt is affected in adolescent patients with elevated pre-operative tibial-tuberosity to trochlear groove (TT-TG) distances undergoing medial patellofemoral ligament reconstruction (MPFLR) with or without an anterior medializing osteotomy (AMZ)
- **Hypothesis**: There would be minimal improvement in tilt following MPFLR, however, with the addition of an AMZ, patellar tilt would improve post-operatively

Methods

- Utilizing a prospective database of 274 patellofemoral instability patients who underwent MPFLR ± AMZ by one of two orthopedic surgeons at a single institution, those who underwent MPFLR + AMZ were identified
- Pre-operative and post-operative MRIs were used to measure TT-TG distance, while radiographs were used to measure patellar tilt (tilt)
- Patients were matched based on age at surgery (within 2 years) and pre-operative TT-TG distance (within 2 mm) to a comparison cohort of patients who underwent isolated MPFLR (iMPFLR) without osseous procedures



Results

- 56 patients were analyzed (28 per group)
- Mean age of cohort = 15.5±2.0 years

	MPFLR + AMZ	iMPFLR	P-value
Total Number	28	28	
Age	15.9 (11.5 – 19.3)	15.1 (11.7 – 19.5)	0.143
Laterality:			
Right	12 (42.9%)	13 (46.4%)	
Left	16 (57.1%)	15 (53.6%)	0.500
Sex:			
Male	5 (17.9%)	9 (32.1%)	
Female	23 (82.1%)	19 (67.9%)	0.178
Proximal Tibial Physis:			
Open	0 (0%)	9 (32.1%)	**0.001***
Closed	28 (100%)	19 (67.9%)	
Lateral Release	9 (32.1%)	4 (14.3%)	0.205
Post-operative Instability:	2 (7.7%)	2 (7.7%)	1.000
Future Surgery:			
Removal of Hardware	7 (25%)	1 (3.6%)	
Tibial ORIF	1 (3.6%)	1 (3.6%)	
Chondroplasty	0 (0%)	2 (7.1%)	0.146
Removal of Loose body	0 (0%)	1 (3.6%)	
ACLR	0 (0%)	1 (3.6%)	
MPFL+AMZ	0 (0%)	1 (3.6%)	

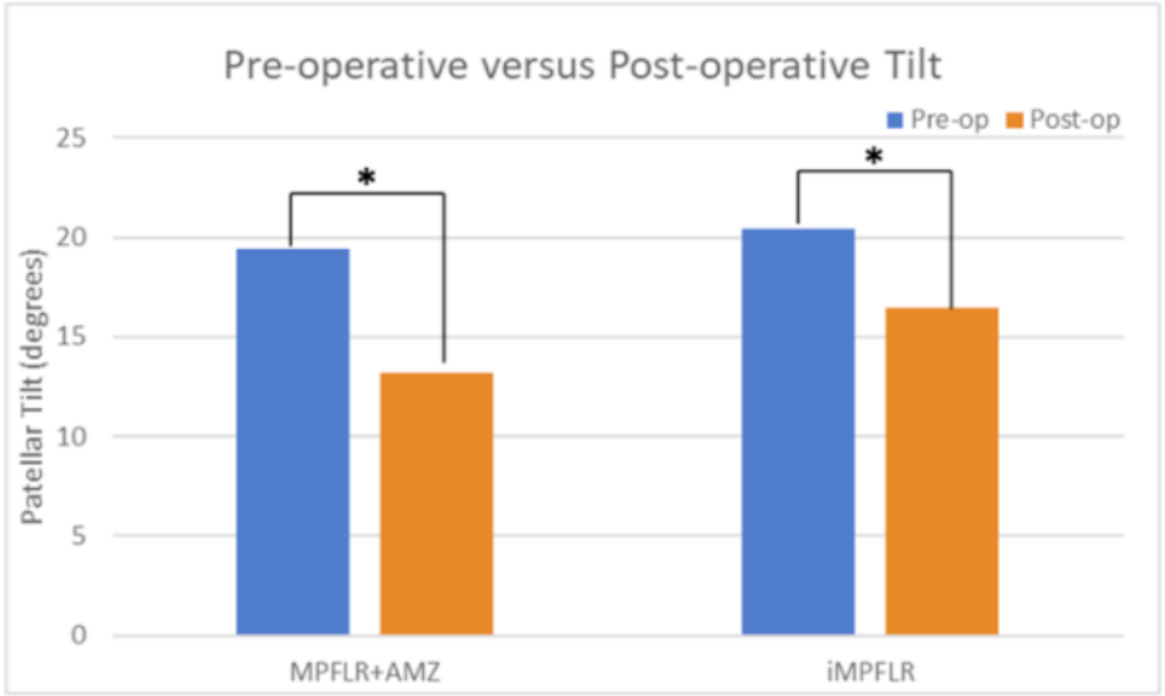
Results

- Significant pre- to post-operative improvements in patellar tilt were noted for both MPFLR+AMZ (6.6 degrees, p<0.001) and iMPFLR (3.9 degrees, p=0.013)
- While there were no differences in pre-operative patellar tilt (21.2±3.5 vs. 21.1±3.4, p=0.91), post-operatively, MPFLR+AMZ had significantly less patellar tilt than isolated MPFLR (13.2±5.5 vs. 16.5±4.4, p=0.017)

	MPFLR + AMZ	iMPFLR	P-value
Number	10	15	
Time between pre-operative and post-operative (months)	22.2 ± 24.7	15.2 ± 12.5	0.36
Pre-operative TT-TG (mm)	21.2 ± 3.5	21.1 ± 3.4	0.91
Post-operative TT-TG (mm)	12.3 ± 4.1	19.8 ± 4.2	**<0.001***
TT-TG Difference (mm)	8.1 ± 4.5	1.1 ± 2.7	**0.001***
Number	27	26	
Time between pre-operative and post-operative (months)	5.0 ± 5.2	4.7 ± 4.2	0.841
Pre-operative Tilt (°)	19.8 ± 6.2	20.4 ± 8.8	0.761
Post-operative Tilt (°)	13.2 ± 5.5	16.5 ± 4.4	**0.017***
Tilt Difference (°)	6.2 ± 5.6	3.9 ± 7.4	0.194

Conclusion

- Patellar tilt significantly improved in participants undergoing either MPFLR+AMZ or iMPFLR
  - 6.2° improvement in patellar tilt following MPFLR+AMZ and 3.9° improvement in patellar tilt following iMPFLR
- MPFLR+AMZ were found to have significantly lower post-operative tilt than iMPFLR
- Suggests that surgeons seeking to correct tilt in pediatric patients with patellar instability might strongly consider MPFLR with AMZ
- Future studies should analyze additional outcomes and patient-reported measures to determine the success of these procedures



Thank you!

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

References

- Cilengir AH, Cetinoglu YK, Kazimoglu C, et al. The relationship between patellar tilt and quadriceps patellar tendon angle with anatomical variations and pathologies of the knee joint. Eur J Radiol. 2021;139(January 2021):109719. doi:10.1016/j.ejrad.2021.109719
- Roger J, Viste A, Cievet-Bonfils M, et al. Axial patellar engagement index and patellar tilt after medial patello-femoral ligament reconstruction in children and adolescents. Orthop Traumatol Surg Res. 2019;105(1):133-138. doi:10.1016/j.otsr.2018.10.002
- Erickson BJ, Nguyen J, Gasik K, et al. Isolated Medial Patellofemoral Ligament Reconstruction for Patellar Instability Regardless of Tibial Tubercle–Trochlear Groove Distance and Patellar Height: Outcomes at 1 and 2 Years. Am J Sports Med. 2019;47:1331–1337
- Zikria B, Rinaldi J, Guermazi A, et al. Lateral patellar tilt and its longitudinal association with patellofemoral osteoarthritis-related structural damage: Analysis of the osteoarthritis initiative data. Knee 2020; 27:1971–1979