Is Asymmetry of the Medial and Lateral Posterior Femoral Condyles Associated with ACL Rupture? A Case-Control Study of Pediatric Patients

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Disclosures

NO RELEVANT DISCLOSURES

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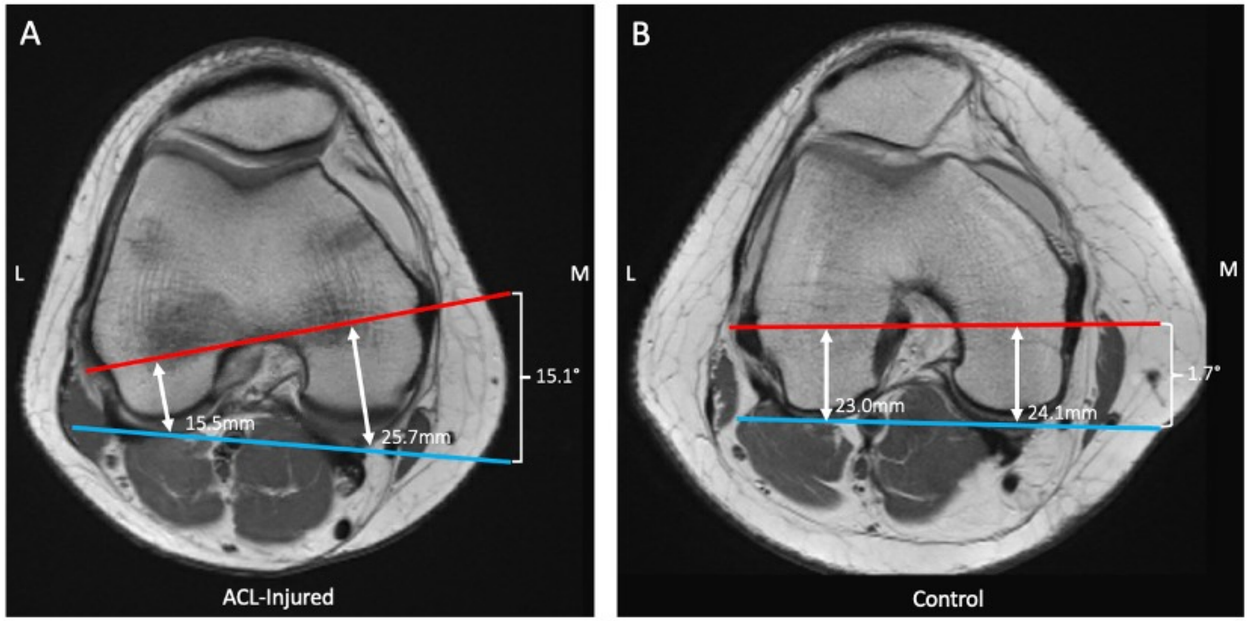
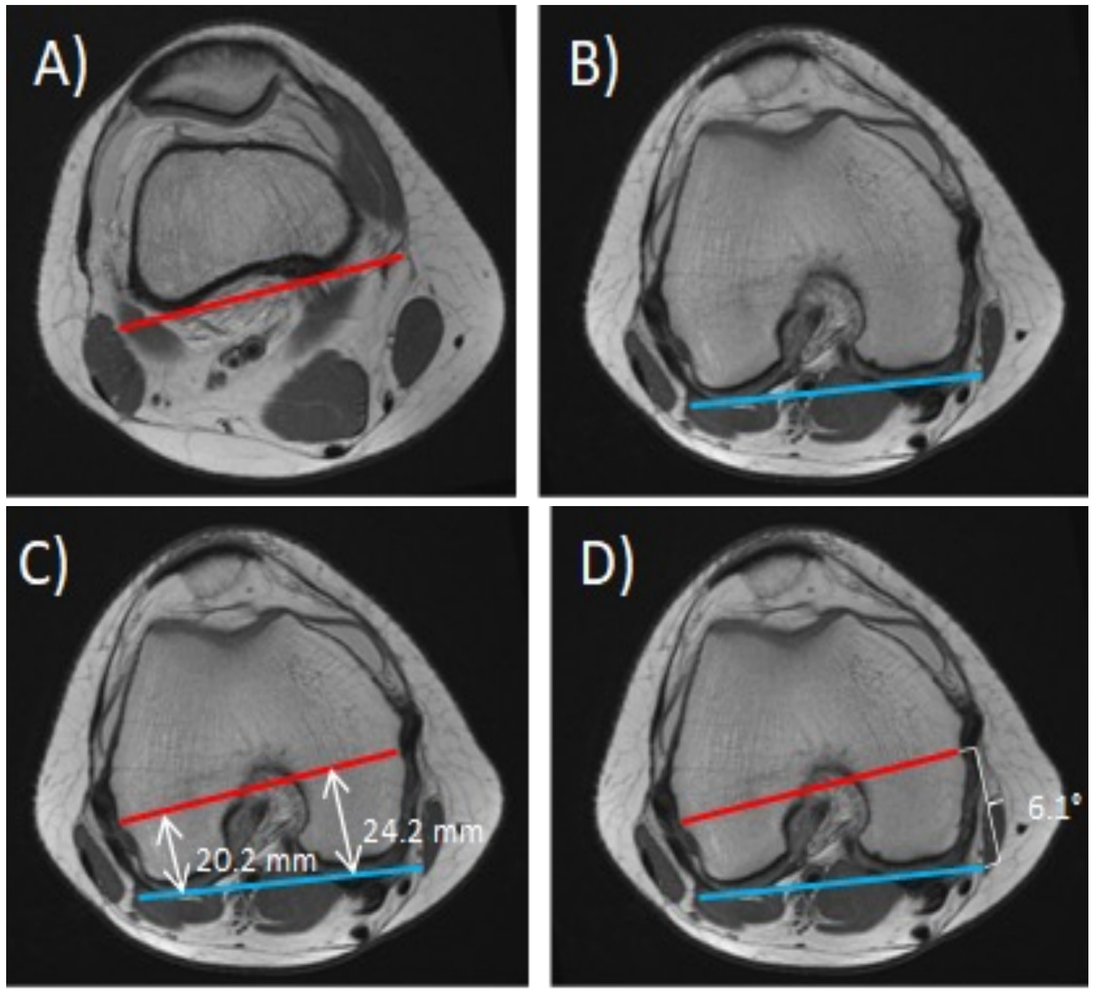
Introduction/Aim

- Investigate posterior condyle morphology differences between pediatric patients with an ACL rupture versus a comparison cohort



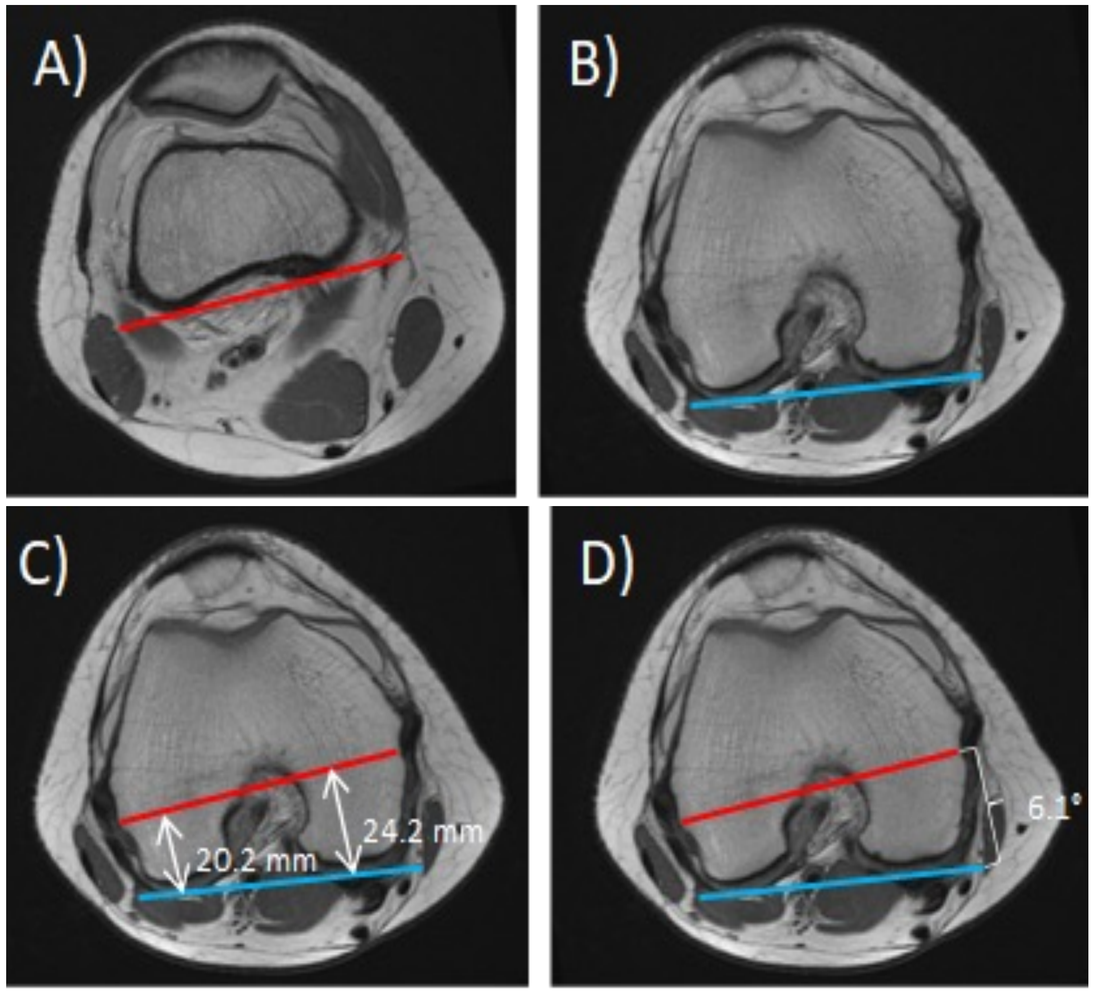
Methods

- Patients (ages 6-18 years) with a pre-operative knee MRI who underwent ACLR were reviewed
- Cases were matched to the comparison cohort based on sex, laterality, and age at imaging
  - Comparison cohort included patients with knee MRIs that did not have any ligament tears, patellar dislocations, fractures, or meniscal tears



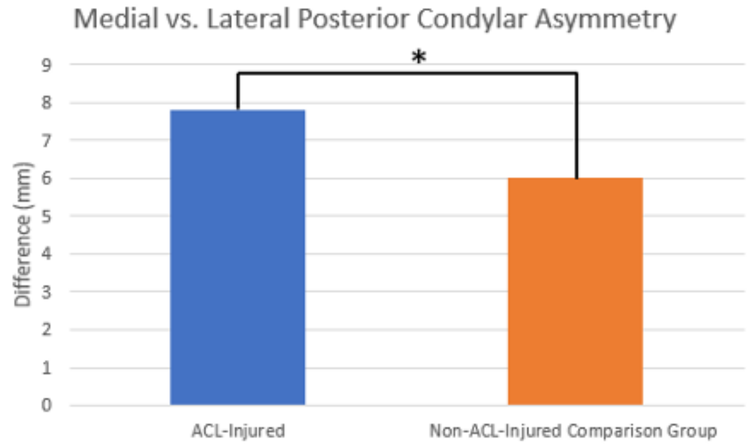
Methods

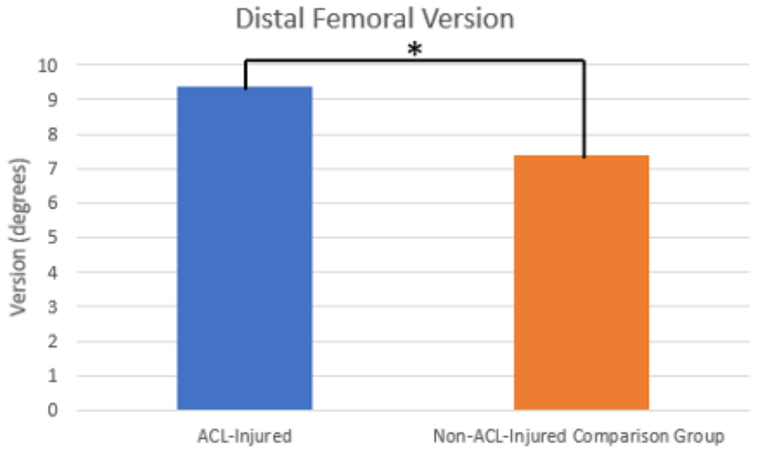
- **Medial and lateral anterior-posterior (AP) condylar height was measured for each participant**
- Condylar difference was calculated as medial AP condylar height minus lateral AP condylar height
- **Distal femoral version was calculated as the angle between the femoral posterior cortical axis of the distal metaphyseal femur and the posterior condylar axis**



Results

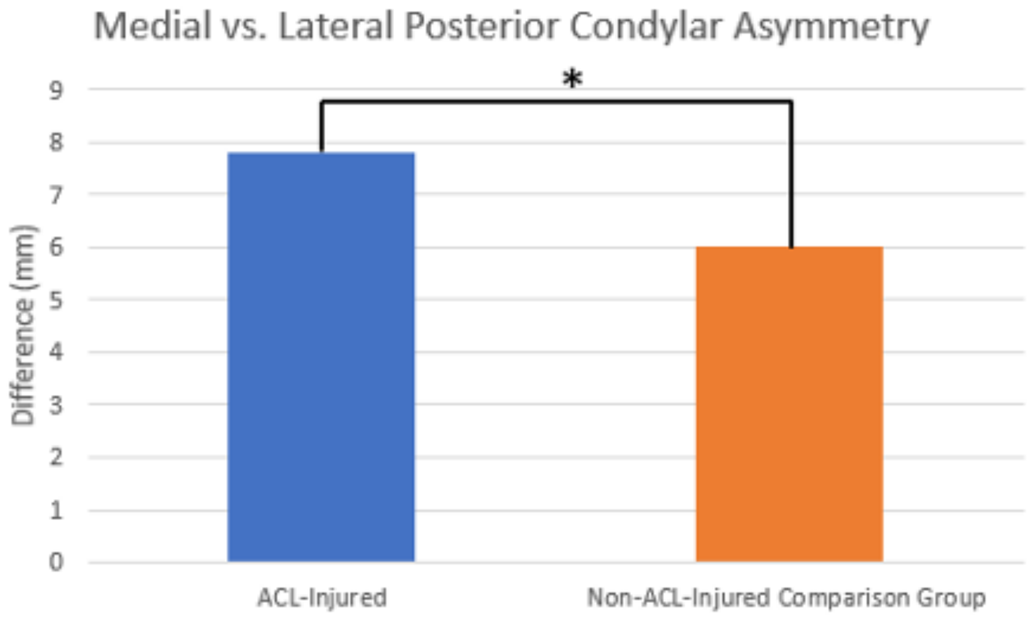
- 72 participants included:
  - 36 ACL-injured patients
  - 36 matched controls
- Median age = 13.5 years





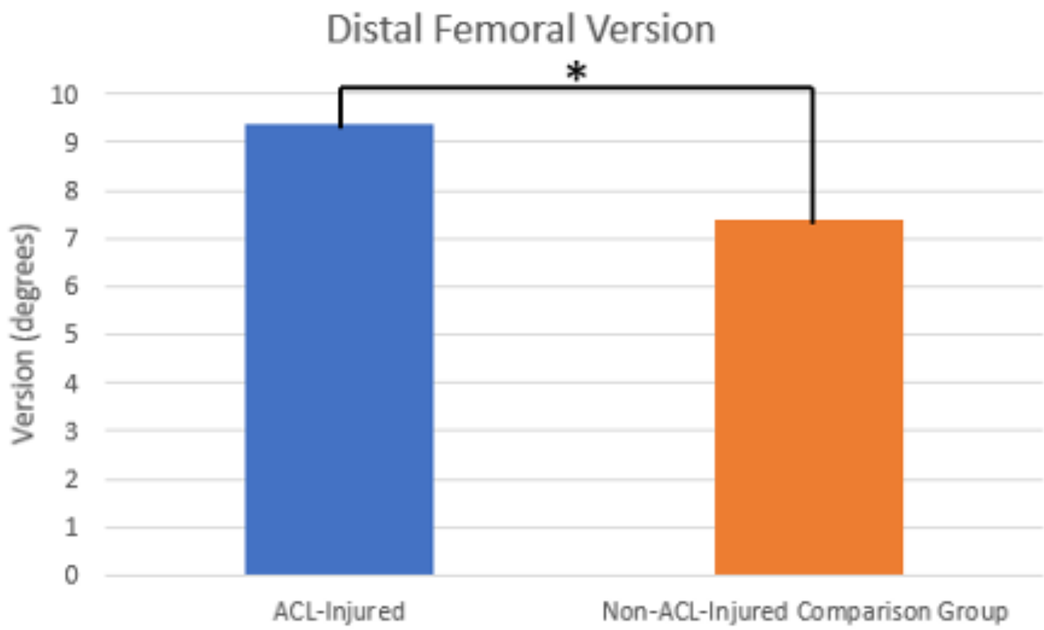
Results

- Anterior-posterior (AP) medial condylar height was greater than lateral condylar height in both cohorts
- Condylar difference was noted to be 1.8 mm greater in ACL cases than controls (p=0.04)



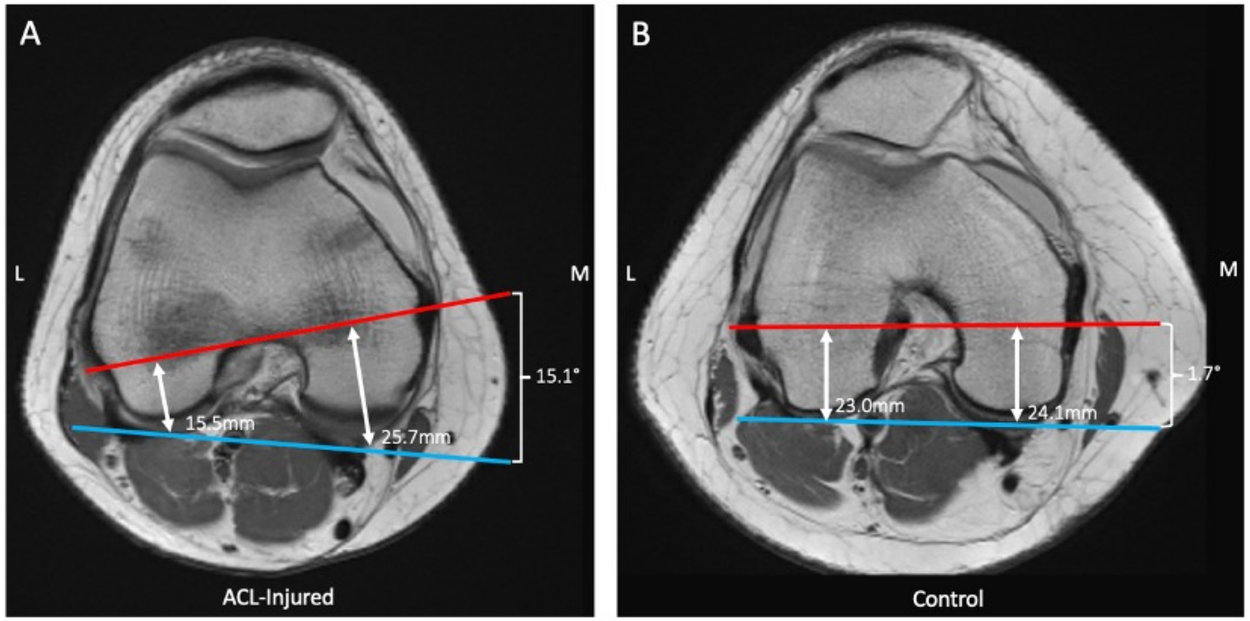
Results

- External distal femoral version was noted to be 2.0° greater in ACL cases than controls (p=0.03)



Conclusion

- **Increased asymmetry of the medial and lateral posterior femoral condyles is associated with pediatric ACL tears**
- We believe this may be an important anatomic risk factor for ACL injury



Thank you!

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References

- Bayer S, Meredith SJ, Wilson K, et al. Knee Morphological Risk Factors for Anterior Cruciate Ligament Injury: A Systematic Review. J Bone Jt Surg - Am Vol. 2020;102(8):703-718. doi:10.2106/JBJS.19.00535
- Kaneko M, Sakuraba K. Association between femoral anteversion and lower extremity posture upon single-leg landing: Implications for anterior cruciate ligament injury. J Phys Ther Sci. 2013;25(10):1213-1217. doi:10.1589/jpts.25.1213
- Pfeiffer TR, Burnham JM, Hughes JD, et al. An increased lateral femoral condyle ratio is a risk factor for anterior cruciate ligament injury. J Bone Jt Surg - Am Vol. 2018;100(10):857-864. doi:10.2106/JBJS.17.01011
- Matziolis D, Meiser M, Sieber N, Teichgräber U, Matziolis G. Posterior cortical axis: A new landmark to control femoral component rotation in total knee arthroplasty. Orthopedics. 2017;40(3):188-190. doi:10.3928/01477447-20170117-01