

Anterior cruciate ligament and intercondylar notch growth plateaus prior to cessation of longitudinal growth: an MRI observational study.

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Abstract

PURPOSE: Increasing numbers of children and adolescents are being treated for ACL tears. In order for surgeons to safely optimize treatment during ACL surgery, we must better understand ACL growth and intercondylar notch patterns in the skeletally immature knee. The aim of this study is to measure ACL and intercondylar notch volume in paediatric patients and observe how these volumes change as a function of age and gender.

METHODS: Data were extracted from the picture archiving and communication systems (PACS) computer records. Sample consisted of 137 MRI knee examinations performed between January 2006 and July 2010 in patients aged 3-13. Subjects were grouped into 1-year age intervals. Patients with imaging reports including ACL tears, previous surgeries, congenital structural anomalies, or syndromes were excluded.

RESULTS: Measures of ACL volume significantly increased with age ($P < 0.001$). A linear increase in ACL volume was observed until the age 10, with a mean increase in volume of 148 mm³ per age group. ACL volume plateaued at 10 years, after which minimal increase in ACL volume was observed. Sex was not found to be a significant predictor of ACL volume in the multiple linear regression ($P = 0.57$). Similar to ACL volume, there was a significant increase in intercondylar notch volume with age with a mean increase of 835 mm³ per age group ($P < 0.0001$). Intercondylar notch volume reached a plateau at age 10, after which a minimal increase in notch volume was observed in older groups. Female patients had notch volumes that were on average 892 + 259 mm³ smaller than male patients who were in the same age group ($P = 0.0006$).

CONCLUSION: The plateau in the growth of ACL and notch volume occurs at age 10, prior to the halt in longitudinal growth of boys and girls. Female patients have significantly smaller intercondylar notch volumes than their age-matched male counterparts, while no gender difference was seen in ACL volume. These results suggest that notch volume is an intrinsically sex-specific difference, which may contribute to the higher rate of ACL tears among females. These growth patterns are clinically relevant as it allows surgeons to better understand the anatomy, pathology, and risk factors related to ACL tears and its reconstruction.

LEVEL OF EVIDENCE: Observational Study, Level IV.