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Is a Stenotic Intercondylar Notch a Risk Factor for Failure in Skeletally Immature Athletes Who Undergo ACL Reconstructions?

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Summary:

Radiographic case-control study, were 17 failed ACLR in a cohort of skeletally immature patients were compared to a control group of 27 intact-ACLR in skeletally immature patients who had >2 years follow-up. Notch width index, notch angle and intercondylar roof angle were found to be significant predictors for failure in skeletally immature athletes that undergo ACL reconstructions.

Abstract:

Objective

To determine whether alterations in the intercondylar notch anatomy are associated with failure of anterior cruciate ligament reconstruction (ACLR) in skeletally immature athletes. Previous reports have shown that smaller and narrow notches are associated with a higher risk of ACL tears, yet to our knowledge no study has evaluated if notch size predicts failure following ACLR. Our hypothesis is that a stenotic notch increases risk for failure following ACLR in this population.

Method

Radiographic case-control study, were 17 failed hamstring ACLR were identified in a cohort of skeletally immature patients operated by the same surgical team. Failures were compared to a control group of 27 intact-ACLR in skeletally immature patients who had succeeded returning to athletics and had a minimum of 2 years follow-up. Average skeletal age at the time of surgery was 13.6 years (range 10 - 17). Notch width index (NWI) and notch angle (NA) were measured in coronal and axial proton density weighted MRI studies using

Method

previously validated method. Inclination of the intercondylar notch roof (Blumensaat Line) was measured using sagittal MRI images, as a novel morphological parameter described for the purpose of this study. The Wilcoxon-Rank sum test was used to compare the continuous predictors and Fisher's exact test was used to compare the categorical predictors.

Results

In both coronal and axial planes, NWI was significantly smaller in the failed-ACLR group compared to the intact-ACLR group, with an average of 0.213 versus 0.261 for the coronal plane ($z=4.122$, $p<0.0001$), and of 0.224 versus 0.271 in the axial plane ($z=3.908$, $p<0.0001$). NA was also significantly lower in failed-ACLR knees versus the control group, with an average of 46.8° versus 60.8° in the coronal plane ($z=4.173$, $p<0.0001$), and of 45.4° versus 55.1° in the axial

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plane ($z=3.366$, $p < 0.0008$). Inclination of the notch roof was significantly steeper in the failed-ACLR group compared to the control group, with an average of 135.8° versus 126.5° ($z=-3.503$, $p=0.0005$).

Conclusion

This pilot study demonstrates that notch width index and notch angle are significant predictors for failure in skeletally immature athletes that undergo ACL reconstructions. Interestingly, the inclination of the intercondylar roof was also related to failure following ACLR in this population.