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Is Functional Movement Recovery Nine Months After Anterior Cruciate Ligament Reconstruction in Adolescent Patients Adequate for a Safe Return to Sport?

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Summary:
Adolescent patients undergoing primary ACL reconstruction do not consistently recover adequate functional movement by nine months postoperatively to permit a safe return to sport; unique functional movement deficits in skeletally immature and skeletally mature adolescents highlight the need for maturity-specific rehabilitation strategies for adolescent patients undergoing ACL reconstruction.

Abstract:
INTRODCUTION
Clinical failure following anterior cruciate ligament (ACL) reconstruction in adolescent patients is disappointingly frequent. One factor contributing to this may be inadequate recovery of basic movement patterns prior to returning to sport participation. The Functional Movement Screen (FMS) and Lower Quarter Y-Balance Test (LQYBT) can be used to objectively assess functional movement recovery after ACL reconstruction; a low FMS score (=14 out of 21) or >4 cm of anterior asymmetry during the LQYBT have been shown to correlate with an increased risk of lower extremity injury. The aims of this study were to assess whether functional movement recovery nine months postoperatively was adequate to permit a safe return to sport in adolescents undergoing primary ACL reconstruction, and to assess for any maturity-specific differences in this recovery between skeletally immature adolescents, skeletally mature adolescents, and an adult reference group.

METHODS
A group of 39 adolescent patients who underwent primary, anatomic, transphyseal ACL reconstruction using hamstrings autograft from October 2009 to January 2013 were identified from an ACL research database; 17 skeletally immature (SI) patients (mean age 14.2 years (9.9 - 15.3 years)), and 22 skeletally mature (SM) patients (mean age 17.1 years (15.1 - 19.3 years)). An adult reference population of 16 eligible patients (mean age 27.8 years ((20.4 - 34.5 years)) who had undergone primary anterior cruciate ligament reconstruction using hamstrings autograft was also identified. All patients followed a standardized operative and rehabilitation protocol. The three patient groups were compared at nine months postoperatively using the FMS to assess basic movement competency and the LQYBT to assess for asymmetry during single-limb balance.

RESULTS
Nine months postoperatively, the FMS scores for all groups indicated an increased risk for lower extremity injury. The adolescent groups displayed total FMS scores superior to the adult group (mean 13.4 (SI) vs. 14.1 (SM) vs. 11.4 (adult), p=0.014), largely due to higher in-line lunge (p=0.041) and rotatory stability (p=0.033) scores. With respect to specific movement patterns, the SI group displayed inferior straight leg raise (p=0.006) and deep squat (p=0.069) scores despite a lower incidence of pain with these movements. There was no significant difference in hurdle step (p=0.354), shoulder mobility (p=0.210), or trunk stability push-up (p=0.171) scores between the three groups. With respect to LQYBT, there was no significant difference in mean anterior (2.8 cm vs. 2.8 cm vs. 2.9 cm, p=0.987),

posterolateral (4.1 cm vs. 2.9 cm vs. 4.3 cm, p=0.349), or posteromedial (3.1 cm vs. 3.0 cm vs. 2.9 cm, p=0.870) asymmetry between the two groups, however there was wider range of anterior asymmetry in the SI (0-11.5 cm) and SM (0-14.5 cm) groups compared to the adult group (0.5-7 cm).

CONCLUSIONS

We found that adolescent patients undergoing primary ACL reconstruction do not consistently recover adequate functional movement by nine months postoperatively to permit a safe return to sport. We have identified unique functional movement deficits in skeletally immature and skeletally mature adolescents, which highlight the need for maturity-specific rehabilitation strategies for adolescent patients undergoing ACL reconstruction.