Adolescent Differences in Knee Stability Following Computer-Assisted ACL Reconstruction

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Disclosures:

Introduction: Computer navigation offers a unique and reliable way to quantitatively measure intra-operative knee stability during anterior cruciate ligament (ACL) Reconstruction. Although adolescents have unique physiologic differences compared to adults, no study has assessed the amount of rotational or translational correction that can be achieved with computer-assisted ACL reconstruction in an adolescent population. The purpose of this study was to evaluate injury and ACL reconstruction stability measurements in adolescent patients who underwent computer-assisted ACL reconstruction and to compare them to adults.

Methods: This was a retrospective review of all adolescent patients (less than 18 years old) who underwent computer-assisted primary single bundle ACL reconstruction by a single surgeon from 2007 to 2012. All patients had intra-operative pre- and post-reconstruction stability measurements recorded with computer navigation assistance, and anterior translation (AT), external rotation (ER) and internal rotation (IR) were measured at 30 degrees of flexion. Pre- and post-reconstruction stability measurements were analyzed along with patient characteristics (gender, graft type, associated injuries) and surgical details, and adolescent stability data was compared to a larger cohort of adult patients (18 years old or older). Pearson correlation coefficients, T-tests, and ANOVAs were used for statistical analysis with a significance level set at p <0.05 a priori.

Results: Thirty adolescents were identified within a larger cohort that included 113 adult patients. The average age of adolescents was 15.8 years (SD 3.3); 12 (40%) were female and 18 (60%) were male. In addition to ACL tears, 36.7% (11) were found to have at least one additional intra-articular injury (meniscal tear, chondral lesion, capsular tear). 53.3% (16) of adolescents had ACL reconstructions using hamstring autograft, 40% (12) had patellar tendon autograft, and 6.7% (2) had hamstring autograft with allograft augmentation. There were no significant differences in anterior translation or rotational stability among the different graft types. The average pre-reconstruction AT was 14.4mm (SD 3.6) and the average post-reconstruction was 4.7mm (SD 2.5). The average percent correction of AT was 67.5% (SD 11.9) and was significantly higher than the percent correction of IR or ER (25.9% and 17.8% respectively, p<0.0001). Female adolescents were found to have higher IR than male adolescents both pre- (25.6° versus 21.7°, p=.026) and post-reconstruction (20.1° versus 15.1°, p=.005). Compared to adults, adolescents demonstrated higher IR both pre- (23.3° versus 21.5°, p =.047) and post-reconstruction (17.1° versus 14.4°, p=.003). They also had higher total rotation both pre- (40.9° versus 38.4°, p =.02) and post-reconstruction when compared to adults (31.6° versus 28.7°, p=.005).

Discussion: In adolescent patients, anterior translation was corrected more than rotation with a single bundle ACL reconstruction. Female adolescents were found to have higher pre- and residual post-reconstruction internal rotation compared to males. When compared to adults, adolescents had increased internal rotation and total rotation both pre- and post-reconstruction. While the clinical significance of these differences has yet to be elucidated, these results suggest that subtleties exist among ACL injuries, and individual variability related to age and gender should be further evaluated.

Significance: This is the first study to investigate intra-operative knee stability in adolescent patients undergoing computer-assisted ACL reconstruction. Anatomic differences between genders and age-groups may play important roles in optimizing surgical outcomes and should be further studied.

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