Summary:
Of three short form versions of the KOOS that are currently available (KOOS-12, KOOS-Global and KOOS-ACL) KOOS-Global is the preferred measure to detect changes beyond the initial return to sport phase following ACL reconstruction.

Data:
Background: The Knee injury and Osteoarthritis Outcome Score (KOOS) is a commonly used patient reported outcome measure following anterior cruciate ligament (ACL) reconstruction surgery. To minimize responder burden various short forms of the KOOS are now available, however they have not been extensively used following ACL reconstruction. Purpose: To compare a variety of KOOS short forms with each other and determine their responsiveness in patients who have undergone ACL reconstruction surgery. Methods: In part A, the KOOS was administered between 2 and 6 years (mean 3 years) following ACL reconstruction surgery to a cohort of 832 (489M, 343F) patients. From the full KOOS the following three short form versions were calculated: KOOS-12 Short form, KOOS-Global and KOOS-ACL. Descriptive statistics were calculated for all three measures and associations between them were explored using nonparametric (Spearman rho) correlations. Floor or ceiling effects were considered present if >15% of patients reported the worst (floor effect) or best (ceiling effect) possible score. In part B, the KOOS and a measure of overall knee function were administered at both 2- and 5-years following ACL reconstruction surgery to a cohort of 276 (149M, 127F) patients. The same 3 short forms were derived, and responsiveness was assessed using several distribution and anchor-based methods. From distribution statistics, the standardized response mean (SRM) and smallest detectable change (SDC) score was calculated. Using the anchor-based method, the minimally important change (MIC) score that was associated with an improvement in knee function was determined using receiver operating characteristic (ROC) analysis. Results: Ceiling effects were present for all KOOS short form versions. They were only marginally above threshold for the KOOS-12 and KOOS-Global (both 16%) but clearly above for the KOOS-ACL (26%). KOOS-12 and KOOS-Global were very highly correlated (rho = 0.98). The correlation between both these short forms and KOOS-ACL was also substantial (rho = 0.9). Only KOOS-Global scores significantly increased over time, whereas KOOS-12 and KOOS-ACL did not change. The increase in KOOS-Global was associated with a small (0.2–0.3) SRM. MIC scores ranged from 3.2 to 5.2 points, and for all measures MIC scores were larger than the SDC score at a group level. KOOS-Global was the only measure for which the mean difference between the two assessments exceeded both the SDC (group level) and MIC. Conclusion: Of the three short form versions of the KOOS that are currently available there was little to differentiate between KOOS-Global and KOOS-12, and both had superior psychometric properties compared to KOOS-ACL when used at a single timepoint 2-6 years following ACL reconstruction surgery. However, KOOS-Global had the greatest responsiveness to change between 2- and 5-years post ACL reconstruction surgery. It would therefore be the preferred measure to detect changes beyond the initial return to sport phase following ACL reconstruction.

Category: Knee - ACL Post-Surgery
A Matched-Pair Analysis Evaluating Clinically Meaningful Outcome Improvement and Return to Sport After Anterior Cruciate Ligament Reconstruction With Quadriceps Versus Hamstring Tendon Autograft

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Summary:
This study investigates the performance of QT vs HT autografts with respect to achieving clinically meaningful outcomes and return to sport.

Data:
Purpose: To investigate the potential association between performing ACL reconstruction with HT or QT autograft, propensity for achievement of clinically meaningful outcomes, and return to sport (RTS). Methods: Thirty patients undergoing ACL reconstruction with QT autograft were matched by age, sex and body mass index to 62 patients undergoing ACL reconstruction with HT autograft. Clinical outcomes including the International Knee Documentation Committee (IKDC) score, Marx scale, Single Assessment Numeric Evaluation (SANE), and Patient-Reported Outcomes Measurement Information System (PROMIS) Pain Interference (PI) and Mobility scores, and metrics concerning RTS were collected. The minimal clinically important difference was calculated for each outcome measure using the distribution-based method equivalent to one-half the standard deviation of the change in outcome score at a minimum of one-year follow-up. Appropriate parametric or non-parametric testing was applied to compare the outcome measures, MCID rates and RTS metrics between the two cohorts. Results: Fifty-four patients (60.0%) were male and the mean age was 22.5 ± 6.8 years. No statistically significant differences were observed between preoperative or postoperative clinical outcome scores, nor the net change in these scores. Furthermore, no significant differences were observed in rates of MCID achievement for the IKDC (QT:90%, HT:93.5%), SANE (QT:90%, HT:98.7%), Marx (QT:93.3%, HT:90.3%), PROMIS PI (QT:96.6%, HT:95.2%), and PROMIS Mobility (QT:79.3%, HT:90.3%). The mean time to RTS was 9.1 ± 2.2 months. Mean time to RTS did not significantly differ between cohorts (QT:9.2 ± 2.4, HT:9.0 ± 2.9, p=0.75). The most common reason for failing to RTS in the HT cohort was not being given clearance (34.5%), while the most common reason in the QT cohort was other reasons outside of their health not related to their knee (38.5%). Notably, satisfaction with overall outcome (QT:96.6%, HT:95.1%, p=0.59) and kinesiophobia RTS after injury scores (QT:64.2 ± 27.6 vs. HT:59.4 ± 24.6, p=0.40) did not differ between the cohorts. Conclusion: The use of QT autograft in ACL reconstruction is a reasonable alternative to HT autograft as it confers similar rates of clinically meaningful improvement and RTS at short-term follow-up.

Category: Knee - ACL Post-Surgery
Blood Flow Restriction After ACL Reconstruction Does Not Accelerate Quadriceps Strengthening

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Summary:
Blood Flow Restriction After ACL Reconstruction Does Not Accelerate Quadriceps Strengthening

Data:
INTRODUCTION: The use of blood flow restriction (BFR) therapy has gained popularity as an adjunct rehabilitation technique following anterior cruciate ligament reconstruction (ACLR). The purpose of this study was to longitudinally evaluate the impact that BFR has on quadriceps strength following ACLR with quadriceps tendon (QT) autograft in comparison to traditional rehabilitation protocols. METHODS: Patients undergoing primary ACLR with QT autograft at a single institution were retrospectively reviewed. Included patients had a minimum of two isometric strength testing sessions via electromagnetic dynamometer (Biodesx). Obtained strength measures included peak knee extension torque of the operative extremity and knee extension ratio (KER), in which the ratio of peak knee extension torque of the operative extremity to nonoperative extremity were compared. Strength measures were compared between patients that received BFR during postoperative rehabilitation and patients that underwent traditional rehabilitation without BFR for up to three strength measurement sessions. Demographic and surgical factors including patient age at surgery, sex, BMI, level of competition, time from injury to surgery, time from surgery to strength measurement session, use of regional anesthesia, tourniquet time, and concomitant surgery were collected. Two group comparisons of continuous and categorical variables were analyzed by using Mann-Whitney U and chi-squared test, respectively. Statistical significance was set at 0.05. RESULTS: A total of 45 patients (26 female) in the BFR group and 36 patients (13 female) in the traditional rehabilitation group met inclusion criteria. Mean age of the entire cohort was 19.5 years. There were no statistically significant differences among demographic or surgical factors between BFR and traditional cohorts. Of patients receiving BFR therapy, the mean number of BFR treatments was 18 from surgery to first strength
measurement, 8 between first and second strength measurements, and 9 between the second and third strength measurements. Peak knee extension torque was lower for the BFR (96 Nm) group than traditional (111 Nm) group at the first strength measurement session (p=0.03) but was similar between groups at the second (118 Nm vs 194 Nm, p>0.1) and third (138 Nm vs 190 Nm, p =0.39) strength measurement sessions. There was no difference among BFR and traditional groups in the change of knee extension peak torque or change in KER between testing sessions. KER was lower at the second strength measurement in the BFR group (0.81) compared to the traditional group (0.90, p=0.02), though no differences existed at the first or third strength measurements.

CONCLUSION: Sequential knee extension strength measurements following ACLR in a young patient cohort demonstrated improvements irrespective of BFR use. There were no differences in the change of strength measures between testing sessions when comparing BFR and traditional rehabilitation groups. Both groups demonstrated similar strength improvements over time, and BFR did not accelerate strength gains compared to traditional rehabilitation. However, as the BFR cohort had lower starting yet similar final strength measurements compared to the traditional rehabilitation cohort, a role for BFR over the long term in at risk patients cannot be excluded.

Category: Knee - ACL Post-Surgery

Strength Index Indicates Muscle Fibre Spectrum Change 5 Years After Cruciate Ligament Rupture

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Summary:
The cross-sectional study determined long-term deficits in lower limb muscle strength and performance after ACL surgery.

Data:
Athletes often complain about persistent instability after anterior cruciate ligament (ACL) reconstruction and rarely reach their previous level of performance. There is an increased risk of re-rupture or injury on the contralateral side, probably due to proprioception deficits and inadequate muscle function. For this study, we hypothesized that athletes would have long-term deficits in lower limb muscle strength and performance after ACL surgery. Maximal strength deficits during isometric and isokinetic exercises were investigated. In addition, an isoinertial single-leg jump and a strength endurance test were performed to identify the nature of the deficits. In a cross-sectional study, 17 judokas (26±3.9 years old) were examined at a mean time of 5.1±1.1 years after ACL rupture (group A) and 27 judokas (27±2.4 years old) without knee injury (group B). All judokas were currently training at the national or international competition level. Single-leg countermovement jumps, isokinetic (0.2 and 0.6m/s) and isometric test procedures (6s in 30° knee flexion) for maximum strength and a strength endurance test with 30 repetitions at 0.2m/s in the closed chain were performed. A piezolectric force plate and a Contrex leg press were used. The individual force parameters were recorded in a performance index to determine the direction of these. Subjects in group A showed significantly lower maximum strength values in all isokinetic (87.3% at 0.6m/s, 92.5% at 0.2m/s concentric, 89.7% at 0.2m/s eccentric), isometric (80.6%) and isoinertial strength tests (83.8%) after 5 years compared to the unaffected lower extremity (p<0.01). The judo-specific strength index also showed serious deficits. The stronger leg of the athletes in group B had a higher index than the weaker one with a 95%CI of (1.04-1.08). The uninjured leg achieved a value of 1.18 with a 95%CI of (1.12-1.24) compared to the formerly injured leg. The athletes showed lower maximum forces but significantly less fatigue in a logarithmic regression coefficient of strength endurance on the ACL rupture side (32.7±1 x 1604N) compared to the contralateral side (y=30.98x+1828N)(p<0.05). Thus, 5 years after ACL rupture, athletes showed significant deficits in all relevant maximal strength tests. These findings could explain the poor performance of these athletes and the higher risk of a new ACL rupture without deficits in strength endurance. Changes in the composition of muscle fibres from type II to type I thus seem likely. Further studies are needed to assess the impact of this phenomenon on athletes’ performance, especially with regard to sport-specific tasks and injury potential.

Category: Knee - ACL Post-Surgery

Return to Sport and Psychological Readiness to Return to Sport in Individuals who Have Undergone Bilateral vs Unilateral ACL Surgeries

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Summary:
Our study shows no significant differences in return to sport and psychological readiness to return to sport between individuals who underwent bilateral vs unilateral ACL surgeries.

Data:
Purpose: To compare psychological readiness to return to sport (RTS) and RTS rates between patients undergoing bilateral versus unilateral anterior cruciate ligament reconstruction (ACLR). Methods: A retrospective review of patients who underwent ACLR with a minimum 2-year follow-up was conducted. Bilateral ACLR were matched 1:3 to unilateral reconstructions based on age, sex, and body mass index (BMI). Psychological readiness to RTS was assessed using the validated ACL Return to Sport after Injury Scale (ACL-RSI). This along with time and level of RTS were compared between the two cohorts. Statistical analysis was conducted with chi-square for categorical variables and two-sided t-test for continuous variables. Results: One hundred seventy patients, 44 who underwent bilateral ACLR and 132 who underwent unilateral ACLR were included. At the time of first surgery, patients were 28.8 ± 9.4 years old in the unilateral cohort and 25.7 ± 9.8 years old in the bilateral cohort (p=0.06). Patients were equally comprised of males and females (50%). There was no difference in psychological readiness to RTS (bilateral: 50.5 vs unilateral 48.1, p=0.66), RTS rates (unilateral: 78.0% vs bilateral: 65.9%, p=0.16), percentage of return to preinjury sport level (unilateral: 61.2% vs bilateral: 69.0%, p=0.21) or time to return (unilateral: 41.2 ± 29.3 weeks vs bilateral: 35.2 ± 23.7 weeks, p=0.31) between the two cohorts. Differences existed among patients within the bilateral ACLR cohort that were not found in the unilateral ACLR cohort: patients aged 30 and older had significantly lower ACL-RSI scores (age <30: 59.0 vs =30: 39.5, p=0.01), as did females (male: 60.2 vs female: 42.1, p=0.02). Conclusion: Compared to patients who undergo unilateral ACL reconstructions, patients who undergo bilateral ACL reconstructions are equally as psychologically ready to return to sport, demonstrating equal rates of return to sport, time to return, and level of return.