their primary ACL reconstruction was 24.1±4.2 years. Additional injuries at the time of ACL rupture included 63 (32%) medial meniscus tears with 42 (67%) repaired, 134 (67%) lateral meniscus tears with 82 (62%) repaired, and 31 (16%) chondral lesions of grade 3 or higher. 194 (97%) athletes returned to play (RTP) at 10.7±3.9 months. Return to play was strictly defined as returning to a professional level. Eighteen (9%) athletes sustained a re-rupture at a median of 11.1 months (IQR 8.6-16.6 months) with 6 occurring pre-RTP and 12 post-RTP, while 52 (26%) sustained a contralateral ACL rupture during their soccer career. At 2 years, performance metrics showed that 59% of athletes were playing in the same or higher-level league, while 15% were in a lower-level league but had more game appearances and minutes played than pre-injury. By 5 years 34% of athletes were playing in the same or higher-level league and 26% were in a lower-level league but had more game appearances and minutes played. At 2 years, there were no significant predictors of performance when evaluating factors such as concomitant injuries, undergoing surgery after ACLR, or mechanism of injury. However, the presence of a grade 3 or 4 chondral lesion at the time of surgery significantly impacted both career length and performance with only 15% of athletes playing at the same or higher league at 5 years and these athletes were 3.5 times more likely to be playing at a lower level league or retired (p=0.029). Meniscus repair lengthened the RTP timeline (11.6 months versus 9.8 months, p=0.001), but no impact was seen at 5 years with league level or performance (all p>0.5). No other injury characteristic predicted performance at 5 years post ACLR. Conclusion: While a high level of return to play, 97%, was achieved in professional soccer players following primary ACLR, their performance decreased with time. Performance metrics show 59% of athletes are at the same league level at 2 years and this decreases to 34% at 5 years post ACLR. Presence of a Grade 3 or 4 chondral lesion significantly decreased performance metrics, while a meniscus repair delayed RTP but did not impact performance metrics at 5 years post ACLR.

Category: Knee - ACL

Knee Extensor Mechanism Complications Following Autograft Harvest In ACL Reconstruction: A Systematic Review and Meta-Analysis

Abstract ID# 23339
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Summary:
Based on current literature, the proportion of extensor mechanism complications after ACL reconstruction using either bone-patellar-tendon-bone or quadriceps tendon autograft is low, indicating that extensor mechanism harvest remains a safe option.

Data:
Background: ACL reconstruction (ACLR) is a widely studied operation in the literature with the goal of optimizing techniques and patient outcomes. Graft choice is an important consideration in ACLR, as previous studies have reported donor site morbidity in the form of kneeling pain and anterior knee pain with bone-patellar-tendon-bone (BTB) or quadriceps tendon (QT) autografts. A less frequent yet substantial source of morbidity using extensor mechanism grafts is the potential for extensor mechanism disruption in the form of post-operative patella fracture or donor site tendon rupture. Existing systematic reviews have sought to characterize the relative donor site morbidity of BTB and QT grafts, but these studies have focused on donor site symptoms without reporting pooled proportions of patella fractures and donor tendon ruptures across the body of literature. Purpose: To estimate the proportion of patella fractures, patellar tendon ruptures, and quadriceps tendon ruptures associated with bone-patellar-tendon-bone (BTB) or quadriceps tendon (QT) autograft harvest during anterior cruciate ligament reconstruction (ACLR) using published data. Methods: A meta-analysis was conducted using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Peer-reviewed articles in English reporting on extensor mechanism complications associated with graft harvest in patients undergoing ACLR were included. Pooled proportions of patellar fractures, patellar tendon ruptures, and quadriceps tendon ruptures were calculated for each graft type (BTB, QT) using a random effects model. Results: Twenty-eight studies were analyzed. Nineteen studies (n = 8424) reported patellar fracture data for BTB autograft, and eight studies (n = 766) reported patellar fracture data for QT autograft. The pooled proportion of patellar fractures was 0.57% (95% CI:0.34%-0.91%) for BTB and 2.03% (95%CI:0.78%-3.89%) for QT. Ten studies (n = 10,890) reported patellar tendon rupture after BTB autograft, while three studies (n = 376) reported quadriceps tendon tears following QT. The proportion of patellar tendon ruptures after BTB harvest was 0.22% (95%CI:0.14%-0.33%) and the proportion of quadriceps tendon ruptures after QT harvest was 0.52% (95%CI: 0.06%-1.91%). Based on the available literature, in 1000 BTB ACLR, one could expect 5.7 patella fractures and 2.2 patellar tendon ruptures; in 1000 QT ACLR, one could expect 20.3 patella fractures and 5.2 quadriceps tendon ruptures. The majority (16/28, 57.1%) of included studies were of level of evidence IV. Conclusion: Based on current literature, the proportion of extensor mechanism complications after ACL reconstruction using either BTB or QT autograft is low, indicating that extensor mechanism harvest remains a safe option. Surgeons can use these data to better inform their patients on the relative morbidity of autograft options in ACL reconstruction.

Category: Knee - ACL

Can We Identify Why Athletes Fail to Return to Sport after Anterior Cruciate Ligament (ACL) Reconstruction? A Systematic Review and Meta-Analysis

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Summary:
This study aims to address this gap in literature and provide the specific reasons for why an athlete fails to return to sport after ACL reconstruction; we estimated the rate of failure to return to sports after ACL reconstruction to be 25.5%, with one-third of athletes citing fear of reinjury as the major deterrent for returning to sports.

Data:
Abstract: Purpose: Anterior cruciate ligament (ACL) injuries are a relatively common orthopedic injury with an estimated incidence rate of 1 in 3000, however this number is believed to be much higher in the young athletic population. While existing literature has investigated outcomes of patients with successful return to sport, the outcomes of those who fail to return have not been characterized. The purpose of this systematic review is to determine the rate of athletes who did not return to sport (RTS) after primary ACL reconstruction. We aimed to identify the specific reasons for failure to RTS following autograft harvest during anterior cruciate ligament reconstruction (ACLR) using published data. Methods: This meta-analysis was conducted following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Eligible studies included those explicitly reporting the rate of failure for RTS following ACL reconstruction and as providing details on reasons for why athletes were unable to return. Data was collected on the number of athletes, average age, average follow up time, type of sport played, failure to RTS rate, and specific reasons for failure to return. A random effects model was employed to conduct the meta-analysis. Results: Thirty-one studies met the inclusion criteria and reported on a collective total of 4762 athletes. Among the athletes included, 2929/4762 (61.4%) were males, and 1839/4762 (38.6%) were females. The weighted rate of failure to return to sport after ACL reconstruction was 25.5% (95% CI, 19.88-31.66%). The estimated proportion of non-knee related reasons cited for failure to RTS was significantly greater than knee related reasons for failure RTS (55.4 % vs. 44.6 %, p-value < 0.0001). The most commonly cited reasons for failure to return was fear of injury (33.0%) followed by other reasons unrelated
to the knee (11.0%) and unspecified or otherwise poor knee function (10.2%). Among knee related reasons for failure to return, the most frequently cited included unspecified knee problems/poor function (28.4%), pain (24.3%), and weakness (11.9%). Evidence for potential publication bias and study heterogeneity was present. Conclusion: Multiple systematic reviews and meta-analyses have reported in detail the rate of return to sport after ACL reconstruction. However, the data reported in these studies often fails to provide insight as to the specific reasons for why an athlete fails to return to sport after this procedure. This study aims to address this gap in literature and provide the specific reasons for why an athlete fails to return to sport after ACL reconstruction. This study estimates the rate of failure to return to sports after ACL reconstruction to be 25.5%, with one-third of athletes citing fear of reinjury as the major deterrent for returning to sports. We highlight how factors independent of direct surgical outcomes may impact an athlete’s ability to return to play given that the predominant reason for not returning to sport after ACL reconstruction was unrelated to the knee.

Category: Knee - ACL

Rates and Levels Of Elite Sport Participation at 5 Years After Revision ACL Reconstruction

Abstract ID# 22370

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Summary:
Elite athletes achieved high initial RTP rates after revision ACL-R with the majority returning to pre-operative levels of competition; however, significant decreases in RTP level were noted at 2 and 5 years post-operatively.

Data:
Introduction The aim of this study was to determine the rate of return to play (RTP) and competition levels at 2 and 5 years post revision ACL-R in elite / professional athletes. The secondary objectives were to assess the association between meniscus and chondral pathologies at the time of revision surgery on RTP and competition level. Methodology A retrospective review of a consecutive series of all revision ACL-R undertaken by the senior author between 2009 and 2019 was carried out. Patients were included if they were elite athletes aged 17 years or older who underwent revision ACL-R a minimum of 2 years previously. Cases of combined-ligament injury and cases which required high tibial osteotomy (HTO), either concurrently or previously were excluded. Outcome measures used were RTP rates, time to return to play and competition level. Statistical Analysis Chi square or Fisher's exact tests were used to determine whether RTP rates and competition level differed or not with age, sport, having a medial or lateral meniscus lesion and the presence and extent of chondral damage at revision ACL surgery. Kaplan–Meier curves were generated to illustrate RTP rates and maintenance of pre-injury competition levels survival at 2 and 5 years after revision ACL-R. Results Forty-nine knees in 48 elite athletes met the inclusion criteria. After revision ACL-R 43 (87.8%) elite athletes achieved RTP, of which 75.5% were at the same level. At 2 years post-surgery, 39 (79.6%) were still playing, 25 (51%) at the same level; and at 5 years post-surgery 20 (44.4%) were still playing, 9 (20%) at the same level. Elite athletes with < 50% thickness or no articular cartilage lesions were more likely to RTP (94.6% versus 66.7%, p = 0.026), as well as maintain the same competition level (83.8% versus 50%, p = 0.047) compared to those with > 50% thickness chondral lesions. Those without medial meniscus pathology were more likely to RTP at the same level after revision surgery (94.4% versus 64.5%, p = 0.036). The median time elite athletes continued to play after revision ACL-R was 73 months(6y1m) (95% CI, 43.4 to 102.6), 23 months at the same level (95% CI, 13.6 to 32.4). The probability of still playing at 5 years post-surgery was 55.9% with 22.5% chance of maintaining pre-injury competition level. Conclusion In elite athletes, RTP rates and competition level decreased over time after revision ACL-R. The presence of > 50% thickness chondral pathology was associated with lower RTP rates and competition level at RTP time, while medial meniscus pathology was associated with lower competition level at RTP.

Category: Knee - ACL

The Impact of Covid-19’s Social Isolation Policies on Functional Outcomes after Anterior Cruciate Ligament Reconstruction: A Retrospective Cohort Study

Abstract ID# 23141

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Summary:
COVID-19 related policy measures were associated with lower quadriceps strength and a lower probability of achieving the threshold for returning to sport-related functional activities after ACLR.

Data:
Introduction The coronavirus 2019 (COVID-19) pandemic resulted in policies that limited access to health care resources, including rehabilitation services following elective surgery. This study aimed to assess the impact of these COVID-19 measures on functional outcomes after anterior cruciate ligament reconstruction (ACLR). Methods Our institution shut down all in-person services in March 2020. Patients who underwent ACLR within the previous nine months (6/11/2019–3/11/2020) were defined as having their rehabilitation interrupted due to COVID-19 (COVID-I). Patients with ACLR done the year prior (6/11/2018–3/11/2019) were the comparative cohort. Multi-ligament reconstruction, physical distancing ACLR, and lack of 1-year follow-up excluded patients. Dependent functional outcomes included: isokinetic quadriceps testing at 60 deg/sec and 240 deg/sec, vertical 4-hop, horizontal hop, and 4-cross-over hop distances. A linear mixed-effects regression model was used to estimate group differences for isokinetic quadriceps testing. A reverse Kaplan-Meier analysis assessed the probability of achieving >90% limb symmetry index (LSI) for all functional outcomes and isokinetic quadriceps strength at 60 deg/sec at 1-year postoperative. Results A total of 176 patients, 80 Non-COVID patients and 96 COVID-I patients, were included. Twenty-nine patients (16.4%) were excluded. Baseline characteristics were similar between groups. The rate of achieving >90% LSI for all functional tests at 1-year postoperative was significantly less for COVID-I patients. Similarly, the rate of achieving an isokinetic strength at 60 deg/sec of >90% LSI at 1-year postoperative was significantly less for COVID-I patients. Controlling for postoperative time, sex, BMI, and age, patients in the Non-COVID group had a 2.96% (95% CI: -1.66 to 7.60) greater isokinetic quadriceps strength LSI at 60 deg/sec compared to the COVID-I group (p-value = 0.215). Similarly, patients in the Non-COVID group had a 4.69% (95% CI: 1.08 to 8.31) greater isokinetic quadriceps strength LSI at 240 deg/sec compared to the COVID-I group (p-value = 0.013). Conclusion COVID-19 related policy measures were associated with lower quadriceps strength and a lower probability of achieving the threshold for returning to sport-related functional activities after ACLR.

Category: Knee - ACL

Nationwide Incidence of ACL-R in Professional Athletes in Sweden

Abstract ID# 21425

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Summary:
The incidence rate of ACL-R per 1000 athlete events is 2 to 5 times higher in male professional athletes compared to male professional athletes in Sweden. Data:Introduction Few studies have looked at the nationwide incidence rate (IR) of anterior cruciate ligament reconstruction (ACLR) in higher level athletes in different sports simultaneously. To better understand the nature of ACL-R within the two highest divisions of soccer, ice hockey, basketball, handball, floorball, and alpine sports. Methods Patient data from the SNKLR, between January 2005 and December 2020, was linked to team rosters and event data of the two highest divisions of soccer, ice hockey, basketball, handball, floorball,