Return to Sport After Revision Anterior Cruciate Ligament Reconstruction: A Systematic Review and Meta-Analysis

Varun Gopinatth, Daniel C. Touhey, Edward Metz Barksdale, Derrick Knapik

INTRODUCTION:

Revision anterior cruciate ligament reconstruction (ACLR) is a well-established procedure to restore knee stability and improve function after a failed primary ACLR. Revision ACLR is a technically demanding procedure, with numerous surgical techniques available including staged procedures, various graft options, and use of lateral extra-articular procedures (LEAP), including lateral extra-articular tenodesis (LET) and anterolateral ligament reconstruction (ALLR). In active individuals, patient, injury, and operative variables influencing successful return to sport (RTS) following revision ACLR remain poorly understood. The purpose of this study was to perform a systematic review and meta-analysis to evaluate RTS outcomes in patients undergoing revision ACLR. We hypothesize that athletes undergoing revision ACLR would show favorable RTS rates, with improved outcomes seen with addition of a LEAP and fewer concomitant cartilage and meniscus injuries.

METHODS: A systematic review was conducted in accordance with the 2020 Preferred Reporting Items for Systematic Reviews and Meta Analyses guidelines. A literature search was conducted by querying five databases from inception through January 2025 to identify studies reporting on RTS outcomes on athletes undergoing revision ACLR. Meta-analysis was performed using random-effects models at 95% confidence intervals (CI), with odds ratios (OR) used for comparative studies.

RESULTS:

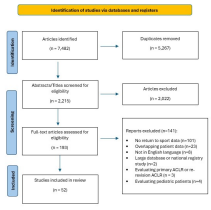
A total of 52 studies, consisting of 3,833 patients, met inclusion criteria. Mean patient age was 27.6 ± 8.4 years with 66.3% (n=2340/3532) of patients being male. Soccer was the most commonly reported sport (24.6%, n=390/1584), followed by basketball (17.6%, n=278/1584) and football (7.8%, n=124/1584). The overall pooled RTS rate was 77.8% (95 CI, .732-.824), with the RTS rate to the previous level of competition being 48.2% (95 CI, .410-.553). The weighted mean time to RTS was 9.3 ± 2.7 months. The RTS rate for patients based on revision ACLR graft type was 67.4% (n=335/497) for BTB autograft, 64.2% (n=77/120) for quadriceps tendon autograft, and 74.6% (n=141/189) for hamstring tendon autograft. The pooled RTS rate was 74.9% (n=998/1333) for autografts and 77.6% (n=550/709) for allografts (p=0.174). Patients undergoing revision ACLR with addition of a LEAP had a greater RTS rate (90.6% vs 74.9%, p<.00001), while the presence of articular cartilage damage was associated with less successful RTS (OR: 0.214, 95 CI: 0.078-0.584). The mean postoperative Anterior Cruciate Ligament Return to Sport after Injury Scale (ACL-RSI) score was 61.5 ± 24.5 (n=554). The most commonly reported reason for failure to RTS or RTS at a lower competition level was fear of reinjury (28.0%, n=142/508), followed by knee pain (12.0%, n=61/508) and persistent instability (7.3%, n=37/508).

DISCUSSION AND CONCLUSION:

The overall RTS rate following revision ACLR was 77.8%, with 48.2% returning to the prior level of competition. Revision ACLR with LET or ALLR has been shown to improve rotational stability and reduce graft failure rates. Our study further corroborates the improved outcomes of revision ACLR with LEAP as patients underwent a LEAP at the time of revision ACLR had a 90.6% RTS rate compared to 74.9% RTS without. Moreover, sports participation has been reported to be an indication for LET during revision ACLR, and this study support the indication for LET in the revision setting to potentially improve successful RTS.

Although no significant difference was seen in RTS between autograft and allograft options, prior studies have demonstrated that autograft can result in lower graft retear rates compared to allograft during revision ACLR. However, further high-level studies are necessary to determine the impact of graft choice on RTS outcomes after revision ACLR.

Fear of reinjury was reported as the most commonly reported barrier to successful RTS. Additionally, the mean post-operative ACL-RSI score was 61.5, which is lower than the 65-point threshold used by many studies that has been predictive of RTS and satisfactory recovery. Although the improvement from preoperative to postoperative ACL-RSI (16.38) exceeded the minimally important change (13.4) for ACL-RSI for primary ACLR, further research is warranted to determine ways to facilitate psychological recovery and RTS readiness after revision ACLR.



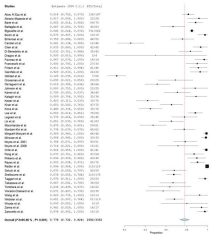


Figure. Forest plot showing the overall proportion of patients returning to sport at any level after revision ACLR by random-effects model

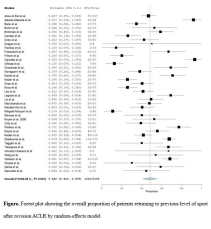


Figure. Forest plot showing the overall proportion of patients returning to previous level of sport after revision ACLR by random-effects model

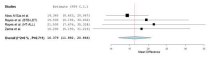


Figure. Forest plot showing mean improvement in ACL-RSI score from preoperative to postoperative levels

Table. Patient Characteristics

Total Patient Population	3833
Patient Age (Mean ± SD), yrs	27.60 ± 8.41
Gender	Male: 66.3% (n=2340/3532) Female: 33.7% (n=1192/3532)
Sports Played	Soccer: 24.6% (n=390/1584) Basketball: 17.6% (n=278/1584) Football: 7.8% (n=124/1584) Skiing: 5.0% (n=79/1584) Baseball/softball: 4.2% (n=67/1584) Volleyball: 4.1% (n=65/1584) Rugby: 1.8% (n=27/1584) Gymnastics: 1.0% (n=16/1584) Other/unspecified: 34.1% (n=540/1584)
Level of Competition	Recreational: 48.5% (n=702/1741) Competitive: 11.8% (n=205/1741) Professional: 3.8% (n=66/1741) Collegiate: 0.5% (n=9/1741) Other/unspecified: 41.0% (n=715/1741)
Revision ACLR Graft	BTB autograft: 35.0% (n=338/3678) Allograft: 26.8% (n=968/3678) HT autograft: 16.1% (n=591/3678) QT autograft: 8.8% (n=213/3678) Other/unspecified autograft: 11.4% (n=272/3678) Other/unspecified graft: 3.8% (n=446/3678)
LEAP Augmentation	No augmentation: 81.8% (n=1700/1542) LET: 14.8% (n=401/1542) ALLR: 3.3% (n=38/1542)