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Upper extremity

Arthroscopy, Volume 37, Issue 9, P 2735-2742

Repair Tension During Arthroscopic Rotator Cuff Repair is Correlated With Preoperative Tendon Retraction and Postoperative Rotator Cuff Integrity

Takeda, Y., Fujii, K., Suzue, N., Miyatake, K., Kawasaki, Y., & Yokoyama, K.

https://doi.org/10.1016/j.arthro.2021.03.069

Purpose
This study aimed to examine the correlation of repair tension during arthroscopic rotator cuff repair (ARCR) with preoperative factors and to evaluate whether measuring tension during ARCR is effective for predicting rotator cuff integrity after ARCR.

Methods
Patients who underwent ARCR from May 2014 to June 2017 were enrolled in this study. Inclusion criteria were patients with medium or larger-sized tears and with a minimum of 6 months' follow-up. Patients with a partial repair were excluded. Intraoperative repair tension was measured according to Davidson's method. Correlation of repair tension with preoperative factors was evaluated with Pearson and Spearman correlation coefficient tests. Logistic regression analysis was performed on intraoperative factors, including repair tension, to identify independent predictors of retear after ARCR. Receiver operating characteristic (ROC) curve was used to determine the cutoff value of repair tension for retear.

Results
One-hundred twenty patients met the inclusion criteria. Mean repair tension was 26.6 ± 12.6 N, and retear was found in 29 shoulders (24.2%). Among the preoperative factors, tear size in the mediolateral ($P < .001$) and anteroposterior ($P < .001$) directions, DeOrio and Cofield's classification ($P < 0.001$), geometric classification ($P < .001$), and fatty infiltration of supraspinatus ($P = .006$) and infraspinatus ($P = .003$) were significantly correlated with repair tension. However, multivariable logistic regression analysis identified only tear size in the mediolateral direction as an independent predictor of repair tension ($P = .036$). Logistic regression analysis showed that repair tension ($P = .02$) and geometric classification ($P < .001$) are significant factors affecting rotator cuff integrity after ARCR. ROC curve analysis showed the cutoff value of repair tension of large to massive tears for retear to be 35.6 N.

Conclusion
This study demonstrated that intraoperative repair tension is strongly correlated with tear size in the mediolateral direction based on preoperative magnetic resonance imaging and that measuring tension during ARCR is effective for predicting rotator cuff integrity after ARCR.

Level of Evidence
Level IV, prognostic study.

BACK

Improved Clinical and Radiologic Outcomes Seen after Superior Capsule Reconstruction using Long Head Biceps Tendon Autograft

Kim, D., Um, J., Lee, J., & Kim, J.

https://doi.org/10.1016/j.arthro.2021.04.006

Purpose
The objective of this study was to investigate the clinical and radiologic outcomes after superior capsule reconstruction (SCR) with biceps tendon (BT) for irreparable rotator cuff tears.

Methods
The retrospective study period was May 2015 through February 2018. The average follow-up was 32 months (24-48 months) after surgery. Study inclusion criteria included an arthroscopic SCR performed using only our technique and minimum 2-year clinical follow-up by office visit and survey. Exclusion criteria included irreparable subscapularis tear and those patients lost to follow-up. This method enabled SCR by using the extraarticular portion and the intraarticular portion and making it 2 to 3 bundles by moving back and forth in the intraarticular area. Physical examination and functional scoring procedures were performed before surgery and at 3, 6, 12, and 24 months after surgery. Radiography and magnetic resonance imaging (MRI) were performed before surgery, after surgery (only radiography), and at 6 and 24 months after surgery.

Results
Fifty-three shoulders involving 45 consecutive patients underwent BT technique for irreparable massive rotator cuff tears. The visual analog scale (VAS), American Shoulder and Elbow Surgeons (ASES), and constant score (CS) showed statistically significant improvement (VAS, 4.1-1.0; ASES, 60.9-82.7; and CS, 64.9-80.0; $P < .0001$). The shoulder active range of motion improved significantly by 23 for forward elevation (125.3-148.4; $P < .0001$) and by 12 for external rotation (38.0-50.9, $P < .0001$). The acromiohumeral distance (AHD) was significantly increased by 2.7 mm (4.4 ± 1.4 mm -> 7.1 ± 1.3 mm). No graft tear was detected in 39 patients (86.7%) during follow-up (24-48 months).

Conclusions
SCR via our technique improved clinical and radiologic outcomes. Thirty-five (77.7%) patients achieved 17-point improvement (the minimally clinically important difference) in the last follow-up of ASES score. Clinical scores and AHD had significantly increased, and good healed rate (86.7%) was observed in MRI.

Level of Evidence
Level IV, retrospective case series.

BACK

Biceps Rerouting for Semirigid Large-to-Massive Rotator Cuff Tears

Rhee, S.-M., Youn, S.-M., Park, J. H., & Rhee, Y. G.

https://doi.org/10.1016/j.arthro.2021.04.008

Purpose
To compare clinical and radiographic results of arthroscopic rotator cuff repair (ARCR) with biceps rerouting (BR) and those of conventional repair for semirigid, large-to-massive rotator cuff tear.

Methods
We prospectively collected data of 111 patients who underwent either ARCR + BR (n = 59, group 1) or only ARCR (n = 52, group 2) for semirigid, large-to-massive rotator cuff tear between January 2016 and December 2018. We comparatively analyzed both groups with respect to preoperative factors including concomitant lesions of the long head of the biceps tendon (LHBT). Univariate logistic regression analysis was performed to identify predictive variables for occurrence of retear after ARCR + BR.

Results
Mean age of groups 1 and 2 were 62.8 and 63.7 years, respectively (P = .484). Mean follow-up period in groups 1 and 2 were 15.1 and 25.1 months, respectively (P = .102). Mean range of motion and functional scores improved significantly (P < .05) and comparably (P > .05) in both groups. In total, 11 (18.6%) and 25 (48.1%) patients from groups 1 and 2, respectively, showed retear of the repaired rotator cuff at final follow-up (P < .01). Of 45 group 1 patients who showed less than 50% partial tearing of the LHBT preoperatively, 6 (13.3%) experienced retear. Comparatively, of 14 patients with partial tearing involving more than 50% of the LHBT, 5 (35.7%) suffered postoperative retear. If the patients had partial tear involving more than 50% of LHBT preoperatively, the odds ratio (OR) to have retear was 4.222 (P = .037). Wider (OR, 1.445, P = .047) and thinner (OR, 0.166, P = .019) LHBT were the prognostic factors to have retear. Three (5.1%) group 1 patients showed the Popeye deformity at final follow-up.

Conclusions
ARCR + BR for semirigid, large-to-massive rotator cuff tears effectively improved clinical and structural outcomes as also shown in the conventional repairs. However, the retear rate was significantly lower in patients who underwent ARCR + BR than those treated conventionally. Partial tearing involving more than 50% of the LHBT and wide and/or thin tendon morphology were significant risk factors for postoperative occurrence of retear.

Level of Evidence
Level III, retrospective therapeutic comparative trial.

BACK

Superior Capsular Reconstruction With Autologous Fascia Lata Using a Single Lateral-Row Technique Is an Effective Option in Massive Irreparable Rotator Cuff Tears: Minimum 2-Year Follow-Up

Alarcon, J. F., Uribe-Echevarria, B., Clares, C., Apablaza, D., Vargas, J. C., Benavente, S., & Rivera, V.

https://doi.org/10.1016/j.arthro.2021.04.009

Purpose
The purpose of this study was to evaluate clinical and radiologic outcomes of arthroscopic superior capsular reconstruction (ASCR) with fascia lata autograft in patients with irreparable rotator cuff tears (IRCTs) performed using a single lateral-row fixation technique.

Methods
We studied a retrospective case series of patients with large or massive IRCTs for ASCR with fascia lata autograft. Clinical outcomes were evaluated using the Visual Analog Scale (VAS) and the Constant score. Healing of the graft was assessed by magntic resonance imaging or ultrasound. Acromiohumeral distance was evaluated by radiographs.

Results
Thirty-one patients with an average age of 61 years and an average follow-up of 35 months (24-51 months) underwent ASCR with fascia lata autograft. There was a significant improvement in VAS (7.7-0.7), Constant score (36.0-78.7), forward elevation (115°-171°), external rotation (33°-50°), strength (0.3 kg-2.3 kg), and acromiohumeral distance (6.1 mm-8.6 mm) ($P < 0.001$). Graft failure was present in 13.8% of patients, as shown by magnetic resonance imaging (26 patients) or ultrasound (3 patients). Patients with failed ASCR showed worse Constant scores (68.5.8 vs 80.2, $P = 0.007$), worse VAS (2.5 vs 0.4, $P = 0.00002$), worse external rotation (20° vs 54°, $P = 0.004$), lower acromiohumeral distance (5mm vs 9mm, $P = 0.007$), and a high association with the presence of os acromiale ($\chi 2$ $P = 0.003$). No revision or subsequent surgical procedures were required.

Conclusions
ASCR, with autologous fascia lata and single lateral row configuration, is an effective option in irreparable rotator cuff tears and results in clinical and radiologic improvement.

Level of Evidence
Level IV, retrospective case series.

BACK

Complications of Superior Capsule Reconstruction for the Treatment of Functionally Irreparable Rotator Cuff Tears: A Systematic Review

Sommer, M. C., Wagner, E., Zhu, S., McRae, S., MacDonald, P. B., Ogborn, D., & Woodmass, J. M.

https://doi.org/10.1016/j.arthro.2021.03.076

Purpose
The purpose of this systematic review is to characterize the complications associated with superior capsule reconstruction (SCR) for the treatment of functionally irreparable rotator cuff tears (FIRCTs).

Methods
This systematic review was completed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses. Two independent reviewers completed a search of PubMed, Embase, and Medline databases. Studies were deemed eligible for inclusion if they reported postoperative outcomes of arthroscopic SCR for FIRCTs and considered at least 1 postoperative complication. Statistical heterogeneity was quantified via the I2 statistic. Due to marked heterogeneity, pooled proportions were not reported. All complications and patient-reported outcomes were described qualitatively.

Results
Fourteen studies met the inclusion/exclusion criteria. The overall complication rate post-SCR ranged from 5.0% to 70.0% (I2 = 84.9%). Image-verified graft retear ranged from 8% to 70%, I2 = 79.4%), with higher rates reported when SCR was performed using allograft (19%-70%, I2 76.6%) compared to autograft (8%-29%, I2 = 66.1%). Reoperation (0%-36%, I2 = 73.4%), revision surgeries (0%-21%, I2 = 81.2%), medical complications (0%-5%, I2 = 0.0%), and infections (0%-5%, I2 = 0.0%) were also calculated.

Conclusions
SCR carries a distinct complication profile when used for the treatment of FIRCTs. The overall rate of complications ranged from 5.0% to 70.0%. The most common complication is graft retear with higher ranges in allografts (19%-70%) compared to autografts (8%-29%). The majority of studies reported at least 1 reoperation (range, 0%-36%), most commonly for revision to reverse shoulder arthroplasty.

Level of Evidence
Level IV, systematic review of Level IV or better investigations.

BACK

Journal of Shoulder and Elbow Surgery (JSES), Volume 30, issue 9, p1990-1997

The effects of nonsteroidal anti-inflammatory medications after rotator cuff surgery: a randomized, double-blind, placebo-controlled trial.

Tangtiphaiboontana, J., Figoni, A.M., Luke A., et al.

DOI: https://doi.org/10.1016/j.jse.2021.05.018

Background
Nonsteroidal anti-inflammatory drugs (NSAIDs) are frequently used for postoperative pain management. However, animal studies have demonstrated negative effects of NSAIDs on bone and tendon healing after commonly performed procedures such as rotator cuff repair. The purpose of this study was to evaluate the effects of postoperative NSAID use on opioid use, pain control, and shoulder outcomes after arthroscopic rotator cuff repair.

Methods
A randomized, double-blind, placebo-controlled trial of postoperative NSAID use was performed in patients undergoing primary arthroscopic rotator cuff surgery at a single institution. Patients were randomized to receive ibuprofen or placebo for 2 weeks postoperatively, in addition to opioid medication. They were instructed to keep a daily pain diary for the first week after surgery, which was returned at their first postoperative visit for analysis. Visual analog scale (VAS) pain scores, shoulder range of motion, and 12-item Short Form Survey, Disabilities of the Arm, Shoulder and Hand, and American Shoulder and Elbow Surgeons (ASES) scores were collected. Assessment of rotator cuff healing was performed using ultrasound at 1 year postoperatively.

Results
A total of 50 patients in the placebo group and 51 patients in the ibuprofen group were included for analysis. There were no differences in age, race, sex, history of preoperative NSAID or opioid use, or operative findings between groups. The amount of mean total morphine milligram equivalents (MMEs) used in the first postoperative week was lower in the ibuprofen group than in the placebo group (168 MMEs vs. 211 MMEs, P = .04). Early VAS scores on postoperative days 3, 4, 5, and 6 were lower in the ibuprofen group, but there was no difference in mean VAS scores between groups by 6 weeks after surgery. At 6 months, mean forward flexion and the mean ASES score were higher in the ibuprofen group than in the placebo group: 162° vs. 153° (P = .03) and 86 vs. 78 (P = .02), respectively. There were no differences in shoulder motion or 12-item Short Form Survey, Disabilities of the Arm, Shoulder and Hand, or ASES scores at 1 year. At 1 year after surgery, 7 patients in the ibuprofen group had evidence of tendon retear diagnosed on ultrasound (5 partial and 2 full thickness) compared with 13 patients in the placebo group (5 partial and 8 full thickness), but this difference was not statistically significant (P = .20).

Conclusion
Postoperative ibuprofen use reduces opioid requirements and decreases patient pain levels in the first week after arthroscopic rotator cuff repair. In addition, ibuprofen use after rotator cuff repair does not lead to an increased risk of tendon retear.

Level of evidence
Level I, Randomized Controlled Trial

BACK

Effect of perioperative acetaminophen on pain management in patients undergoing rotator cuff repair: a prospective randomized study.

Singh, A.M., Kirsch, J.M., Patel, M.S., et al.

DOI: https://doi.org/10.1016/j.jse.2021.03.132

Background
Limiting opioid use in perioperative pain management is currently an important focus in orthopedic surgery. The ability of acetaminophen to reduce postoperative opioid consumption while providing acceptable pain management has not been thoroughly investigated in patients undergoing rotator cuff repair (RCR).

Methods
Patients undergoing primary arthroscopic RCR were prospectively randomized to 1 of 3 treatment groups: Group 1 (control) received both 5 mg of oxycodone every 6 hours as needed and 1000 mg of acetaminophen orally every 6 hours as needed after surgery and had the option to take either medication or both. Group 2 (control) received only 5 mg of oxycodone every 6 hours as needed without any additional acetaminophen after surgery. Group 3 received 1000 mg of acetaminophen orally every 6 hours for 1 day prior to and after surgery, which was subsequently decreased to administration every 8 hours during postoperative days 2-5. Group 3 patients were also allowed to take 5 mg of oxycodone every 6 hours as needed after surgery. All patients received interscalene blocks with liposomal bupivacaine (Exparel). Opioid use, pain scores, side effects, and overall satisfaction were assessed daily for the first week after surgery.

Results
A total of 57 patients (mean age, 57.8 ± 9.55 years) were included in this study. Baseline demographic characteristics including age, sex, and body mass index were similar between the groups ($P > .05$). Patients in group 3 took significantly fewer narcotics overall ($P = .017$) and took significantly fewer pills each day compared with group 2. Group 3 also reported significantly better overall pain control compared with the other groups ($P = .040$). There were no significant differences in overall patient satisfaction between the groups ($P > .05$). Additionally, there were no significant differences between groups regarding postoperative medication-associated side effects ($P > .05$).

Conclusion
Perioperative acetaminophen represents an important component of multimodal analgesia in appropriately selected patients undergoing shoulder surgery. In this study, the use of perioperative acetaminophen significantly decreased opioid consumption and improved overall pain control after primary arthroscopic RCR.

Level of evidence
Level II, Randomized Controlled Trial

BACK

Evaluating the role of graft integrity on outcomes: clinical and imaging results following superior capsular reconstruction.

LaBelle, M.W., Mengers, S., Strony, J., et al.

DOI: https://doi.org/10.1016/j.jse.2020.12.016

Background
Superior capsular reconstruction (SCR) addresses massive, irreparable rotator cuff tears in young patients. The purpose of this study was to retrospectively evaluate clinical outcomes and graft integrity in patients following SCR.

Methods
Thirty-four consecutive patients undergoing SCR by 2 surgeons with minimum 2-year follow-up were identified. Functional outcomes were obtained, including Simple Shoulder Test (SST), American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form (ASES), visual analog scale (VAS), and Single Assessment Numeric Evaluation (SANE) scores. Graft integrity was evaluated on magnetic resonance images (MRIs).

Results
Thirty-five shoulders in 34 patients were identified. Four patients underwent subsequent surgery. The mean preoperative scores were SST 21.6 ± 17.6, ASES 28.3 ± 10.1, SANE 50.6 ± 22.1, and VAS 6.6 ± 1.7. The mean postoperative outcomes were SST 79.1 ± 19.6, ASES 79.9 ± 17.4, SANE 74.3 ± 18.7, and VAS 1.5 ± 2.2. There was statistically significant improvement in SST, ASES, and VAS following SCR. MRI revealed graft failure in 62% (n = 13 of 21) of shoulders. Radiographic evidence of graft healing did not have any effect on SST, ASES, SANE, or VAS scores.

Conclusion
Given the high rate of graft failure without a significant difference in clinical outcomes, graft healing after SCR might not be an independent predictor of success. The improved clinical improvement in patients undergoing SCR may be due to other known beneficial aspects of the procedure, including partial rotator cuff repair, débridement, and biceps management.

Level of Evidence
Level III, Retrospective Cohort Comparison

BACK

Increased perioperative complication rates in patients with solid organ transplants following rotator cuff repair.

Kunkle, B., JaredReid, J., Kothandaraman, V., et al.

DOI: https://doi.org/10.1016/j.jse.2020.12.024

Background
Rotator cuff repair is the second most common soft tissue procedure performed in orthopedics. Additionally, an increasing percentage of the population has received a solid organ transplant (SOT). The chronic use of immunosuppressants as well as a high prevalence of medical comorbidities in this population are both important risk factors when considering surgical intervention. The purpose of this study is to determine the demographic profile, comorbidity profile, and perioperative complication rate of SOT patients undergoing inpatient rotator cuff repair surgery compared to nontransplanted patients.

Methods
The Nationwide Inpatient Sample (NIS) database was queried from years 2002-2017 to identify all patients who underwent inpatient rotator cuff repair (n = 144,528 weighted). This group was further divided into SOT (n = 286 weighted) and nontransplant (n = 144,242 weighted) cohorts. Demographic and comorbidity analyses were performed between these groups. Additionally, a matched cohort of nontransplanted patients controlled for the year of procedure, age, sex, race, income, and hospital region was created in a 1:1 ratio to the SOT group (n = 286 each) for perioperative complication rate analysis.

Results
Compared to nontransplanted patients, SOT patients were more likely to have at least 1 significant medical comorbidity (98% vs. 69%, P < .001), had a higher number of total comorbidities (3.1 vs. 1.4, P < .001), and had a higher Charlson-Deyo Comorbidity Index (2.6 vs. 0.54, P < .001). Compared to the matched cohort, SOT patients experienced longer hospital stays (2.9 vs. 1.8 days, P < .001), higher surgery costs ($12,031 vs. $8476, P < .001), and were more likely to experience a perioperative complication (24% vs. 3%, P < .001) with an odds ratio of 7.7 (95% confidence interval: 3.9-15.1).

Conclusion
Compared with nontransplanted patients, SOT patients undergoing rotator cuff repair had a significantly higher comorbidity index, longer hospital stays, costlier surgeries, and were >7 times more likely to experience a perioperative complication. With nearly a quarter of all SOT patients experiencing a perioperative complication following rotator cuff repair, careful consideration for surgery as well as increased postoperative surveillance should be considered in this unique population.

Level of evidence
Level III, Retrospective Cohort Comparison

BACK

Arthroscopic repair of the medium-size rotator cuff tear with the novel technique of the point union bridge: a minimum 2-year follow-up cohort study.

Peng, L., Yue, J., Ouyang, K., et al.

DOI: https://doi.org/10.1016/j.jse.2020.12.003

Background
Achieving secure fixation and preventing retear have been recognized as fundamental in arthroscopic repair of rotator cuff tears. Moreover, reducing internal implantation can lower medical expenses and minimize the operation time, which is essential for the surgical safety and postoperative rehabilitation of the patients. We have recently proposed the point union bridge (PUB) suture configuration as a novel method for not only providing equivalent fixation but also decreasing the operation time and medical expenses. However, no comparative clinical studies have been performed.

Methods
From March 2014 to September 2016, a total of 88 patients with diagnoses of medium-size rotator cuff tears underwent arthroscopic repair with a randomly assigned technique—either the PUB technique (n = 42) or the double-row suture bridge (DRSB) technique (n = 46). All patients underwent a minimal 2-year follow-up. We used the Constant-Murley score (CMS), American Shoulder and Elbow Surgeons (ASES) score, active and passive range of motion, and visual pain-simulation score (visual analog scale [VAS] score) to assess the functional outcomes. In addition, we recorded the arthroscopic operation time, medical costs, and postoperative complications. All patients received magnetic resonance imaging at the 6-month and 2-year postoperative evaluations to assess structural integrity and tendon healing.

Results
At the 2-year follow-up, all scoring parameters evaluated (CMS, ASES score, and VAS score), as well as active and passive range of motion, improved significantly in both groups as compared with preoperative assessments. The PUB technique significantly decreased the operation time (55.9 ± 14.1 minutes vs. 72.2 ± 14.2 minutes for PUB vs. DRSB, $P < .001$) and medical expenses ($2608.0 ± $391.1 vs. $4056.9 ± $350.9 for PUB vs. DRSB, $P < .001$). However, no significant differences between the 2 techniques were found in any functional assessments of the shoulder (CMS, ASES score, and VAS score), repair integrity, or the retear rate at the 2-year follow-up.

Conclusion
Arthroscopic repair of the medium-size rotator cuff tear with either the PUB or DRSB technique could yield both satisfactory improvements in the shoulder function of patients and equivalent tendon integrity. With less consumption of internal implants, the PUB technique significantly reduced the operation time and decreased medical expenses.

Level of evidence
Level III, Retrospective Cohort Comparison

BACK

American Journal of Sports Medicine (AJSM), Volume 49, Issue 30, P3030–3039

Return to Professional Australian Rules Football After Surgery for Traumatic Anterior Shoulder Instability

Michael Perret, MBBS(Hons), Sarah Warby, PhD¶, Godefroy Brais, MD, Stephanie Hinse, MD, Sophie Hoy, MBBS, Gregory Hoy, MBBS

https://doi.org/10.1177/03635465211029022

Background: The treatment of traumatic anterior shoulder instability in professional Australian Football League (AFL) players is challenging, with an emphasis on early return to play and avoidance of instability recurrence.

Purpose: To investigate return-to-sport (RTS) outcomes and complications after 2 different procedures for traumatic anterior shoulder instability in professional AFL players.

Study Design: Cohort study; Level of evidence, 3.

Methods: We retrospectively reviewed our surgical database for professional AFL players who underwent capsulolabral stabilization or open Latarjet procedure by a single surgeon between 2006 and 2017. Outcomes included RTS, on-field performance, and complications. Between-group analyses for RTS and complications were estimated using Kaplan-Meier survival analyses. Within-group analyses for on-field performance data were performed using paired t tests with significance set at .05.

Results: A total of 58 capsulolabral stabilization procedures in 54 players and 32 Latarjet procedures in 29 players were included in the analysis; 93.1% of capsulolabral patients and 96.9% of Latarjet patients returned to professional AFL. The median RTS time was 6.8 months for the capsulolabral group and 7.3 months for the Latarjet group. There was no significant difference in RTS rates between the 2 groups (P = .270). Of those undergoing surgery early in the season, 75% of the capsulolabral and 71% of Latarjet group were able to RTS within the same season, at a mean time of 16.9 weeks and 18.8 weeks, respectively. There was a significant difference in instability recurrence, with 19% for the capsulolabral group and no recurrence in the Latarjet group (P = .017). There was no significant reduction in player on-field performance in either group (P < .05).

Conclusion: In this study, the median RTS in AFL players was approximately 7 months after capsulolabral and Latarjet surgery with no compromise to on-field performance. Instability-related complications occurred only in the capsulolabral group, and the incidence increased with time

BACK

A Multicenter Randomized Controlled Trial Comparing Single-Row With Double-Row Fixation in Arthroscopic Rotator Cuff Repair: Long-Term Follow-up

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https://doi.org/10.1177/03635465211029029

Background: The long-term outcomes of single- versus double-row fixation in arthroscopic rotator cuff repair are not currently known.

Purpose: To compare the treatment effects of the single- versus double-row suture technique in arthroscopic rotator cuff repair of full-thickness tears at 10-year follow-up.

Study Design: Randomized controlled trial; Level of evidence, 1.

Methods: Patients were evaluated at 10 years postoperatively. The primary outcome measure was the Western Ontario Rotator Cuff Index (WORC). Secondary outcome measures included the American Shoulder and Elbow Surgeons (ASES) score, Constant score, strength, and incidence of revision surgery. Ultrasound was used to evaluate the rotator cuff to determine repair integrity. Statistical analyses consistent with those of the main trial were conducted.

Results: Of the original 90 participants, 77 (85%) returned at a mean follow-up of 10 years. At ten year follow-up, the WORC score was higher in the double row group (79.9 [95% CI, 16.2 to 99.1]) compared with the single row group (72.9, [95% CI, 4.3 to 100]), P = .020. From baseline to 2 years, the mean change in WORC scores for the single-row group was –48.5 compared with −40.6 for the double-row group, with a between-group difference of −7.8 (95% CI, −20.4 to 4.7). From 2 to 10 years, the change in WORC scores for the single-row group was 11.5 compared with −0.2 for the double-row group, with a between-group difference of 11.7 (95% CI, −0.7 to 24.3). From baseline to 10 years, the mean between-group difference was 3.9 (95% CI, −7.8 to 15.6). Similarly, a decrease in ASES scores was observed between 2 and 10 years for the single-row group (9.2 [95% CI, 0.9 to 17.5]; P = .029), with a nonsignificant decrease in ASES scores for the double-row group (6.2 [95% CI, −3.2 to 15.6]; P = .195) as well as a decrease in Constant scores for both the single- (9.5 [95% CI, 1.4 to 17.5]; P = .020) and double-row (14.4 [95% CI, 5.6 to 23.3]; P = .001) groups. Overall, 3 participants developed a full-thickness tear after 2 years: 2 from the double-row group and 1 from the single-row group. One participant from each study group underwent revision surgery after the 2-year time point.

Conclusion: A statistically significant (but likely not clinically important) difference in WORC scores was seen at 10-year follow-up in favor of double-row fixation. Between baseline and 10-year follow-up, a decrease in most outcome scores was observed in both the single- and the double-row groups.

BACK

Prediction of Shoulder Stiffness After Arthroscopic Rotator Cuff Repair

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https://doi.org/10.1177/03635465211028980

Background: Postoperative shoulder stiffness (POSS) is a prevalent adverse event after arthroscopic rotator cuff repair (ARCR) that is associated with major limitations in everyday activities and prolonged rehabilitation.

Purpose/Hypothesis: The purpose was to develop a predictive model for determining the risk of POSS within 6 months after primary ARCR. We hypothesized that sufficient discrimination ability of such a model could be achieved using a local institutional database.

Study Design: Case-control study; Level of evidence, 3.

Methods: Consecutive primary ARCRs documented in a local clinical registry between 2013 and 2017 were included, and patients who experienced POSS before the final clinical 6-month follow-up were identified. A total of 29 prognostic factor candidates were considered, including patient-related factors (n = 7), disease-related factors (n = 9), rotator cuff integrity factors (n = 6), and operative details (n = 7). We used imputed data for the primary analysis, and a sensitivity analysis was conducted using complete case data. Logistic regression was applied to develop a model based on clinical relevance and statistical criteria. To avoid overfitting in the multivariable model, highly correlated predictors were not included together in any model. A final prognostic model with a maximum of 8 prognostic factors was considered. The model's predictive accuracy was assessed by the area under the receiver operating characteristic curve (AUC). Internal validation was performed using bootstrapping.

Results: Of 1330 ARCR cases (N = 1330 patients), 112 (8.4%) patients had POSS. Our final model had a moderate predictive ability with an AUC of 0.67. The predicted risks of POSS ranged from 2.3% to 38.9% and were significantly higher in women; patients with partial tears, low baseline passive shoulder abduction, and lack of tendon degeneration; and when no acromioplasty was performed.

Conclusion: A prognostic model for POSS was developed for patients with ARCR, offering a personalized risk evaluation to support the future decision process for surgery and rehabilitation.

BACK

BACK

Lower Extremity

Arthroscopy, Volume 37, Issue 9, P2809-2816

Salvage Revision Hip Arthroscopy Including Remplissage Improves Patient-Reported Outcomes After Cam Over-Resection

Arner, J. W., Ruzbarsky, J. J., Soares, R., Briggs, K., & Philippon, M. J.

https://doi.org/10.1016/j.arthro.2021.02.020

Purpose
To evaluate outcomes of arthroscopic hip remplissage with folded iliotibial band allograft to treat cam over-resection.

Methods
Patients who underwent arthroscopic iliotibial band hip remplissage from May 2013 to April 2018 were prospectively evaluated. Pre- and postoperative patient-reported outcome scores were compared and included the 12-Item Short Form Survey (SF12) Physical Health Composite Score (PCS), SF12 Mental Health Composite Score (MCS), Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC), modified Harris Hip Score (mHHS), and Hip Outcome Score (HOS) (Activities of Daily Living [ADL] and Sport). Postoperative Tegner Activity Scale and patient satisfaction (1–10) were also evaluated.

Results
Thirteen patients (2 men, 11 women) with an average age of 39.8 ± 9 years underwent arthroscopic hip remplissage with minimum 2-year and mean 3.1-year follow-up (range, 2.1–4.1 years). One hundred percent follow-up was achieved. The average number of previous surgeries was 1.38 (range, 1–3). One patient underwent total hip arthroplasty 2 years after remplissage. All 12 patients who did not undergo total hip arthroplasty had improved patient-reported outcomes after remplissage (mean scores: SF12 PCS 36 vs 42, P = .02; SF12 MCS 45 vs 51, P = .14; mHHS 45 vs 66, P < .001; minimal clinically important difference [MCID] 83%; WOMAC 42 vs 28, P < .001; HOS ADL 52 vs 69, P = .003; MCID, 67%; HOS Sport 27 vs 46, P = .015; MCID, 67%). All improvements met statistical significance, besides the SF12 MCS. Median postoperative Tegner score was 2.9. Median postoperative patient satisfaction was 7 out of 10 (range, 5–10).

Conclusions
Arthroscopic hip remplissage is a successful salvage treatment option for hip instability caused by previous cam over-resection. Care must be taken during primary surgery not to over-resect the cam as patient-reported outcomes after remplissage are inferior to those undergoing primary hip arthroscopy.

Level of Evidence
Level IV, case series.

BACK

Hip Arthroscopy With and Without A Perineal Post: A Comparison of Early Postoperative Pain

Schaver, A. L., Mattingly, N., Glass, N. A., Willey, M. C., & Westermann, R. W.

https://doi.org/10.1016/j.arthro.2021.03.045

Purpose
To compare postoperative pain and early recovery after hip arthroscopy with and without a perineal post for joint distraction.

Methods
We retrospectively reviewed a consecutive series of patients who underwent hip arthroscopy before and after the adoption of a postless technique. Patients who underwent concurrent periacetabular or femoral osteotomy were excluded. Demographic information, procedure variables, and visual analog scale (VAS) pain scores were recorded. Analgesic medications given were converted to morphine milligram equivalents (MME) for comparison. Uni- and multivariate analyses were conducted to compare total MME, postoperative pain, and time to discharge between groups.

Results
One hundred patients were in each group. The overall age (mean ± standard deviation) was 26.5 ± 9.9 years (Post [P]: 57 females; No Post [NP]: 68 females). Total operative time (P 100.4 ± 17.9 minutes vs NP 89.1 ± 25.5 minutes, P = .0004), traction time (P 45.8 ± 10.3 minutes vs NP 40.9 ± 11.1 minutes, P = .0017), and operating room time (P 148.8 ± 19.3 minutes vs NP 137.3 ± 25.8 minutes, P = .0005) were found to be shorter in the NP group. Total MME, and final VAS pain scores in the PACU were similar between both groups (MME, P = .1620; VAS, P = .2139). Time to discharge was significantly shorter in the NP group (P 207.2 ± 58.8 vs NP 167.5 ± 47.9, P < .0001). Patient age (≥25 years) (65.2 ± 18.1 vs 59.8 ± 15.7 [MME], P = .0269) and elevated body mass index (≥25) (65.1 ± 17.1 vs 59.3 ± 16.4 [MME], P = .0164) were factors associated with greater total MME consumption. Female sex was associated with higher postoperative VAS pain scores (FM 4.1 ± 1.6 vs M 3.4 ± 1.8 P = .0027).

Conclusions
Adoption of the postless technique did not result in prolonged operating room or operative time. Overall, both groups had similar postoperative pain, however, the time from surgery to hospital discharge was shorter in the postless group.

Level of Evidence
III, retrospective comparison study.

BACK

Revision Anterior Cruciate Ligament Reconstruction with the All-Soft Tissue Quadriceps Tendon Autograft Has Acceptable Early and Intermediate-Term Outcomes

Hunnicutt, J. L., Haynes, W. B., Slone, H. S., Prince, J. A., Boden, S. A., & Xerogeanes, J. W.

https://doi.org/10.1016/j.arthro.2021.03.035

Purpose
The purposes were to (1) examine early to intermediate-term clinical outcomes and complications of revision anterior cruciate ligament reconstruction (ACLR) using all-soft tissue quadriceps tendon (QT) autografts, and (2) compare quadriceps strength between patients who had hamstring versus patella tendon autografts in their previous reconstruction.

Methods
One hundred patients (52 males/48 females; 22.6 ± 8.0 years) undergoing revision ACLR with all-soft tissue QT autografts were prospectively followed. All revision procedures were performed by a single surgeon, using a minimally invasive graft harvest technique and suspensory fixation. Subjective assessment of knee function was obtained before and after surgery with the International Knee Documentation Committee (IKDC) survey. Postoperative knee laxity and isokinetic quadriceps strength were collected at regular intervals. Strength was reported as limb symmetry index (LSI; surgical side divided by nonsurgical side). Complications including hematomas, postoperative loss of knee extension, and graft failures were recorded. To determine clinical significance ($P \leq .05$), outcomes were compared using analysis of variance or paired samples t-tests.

Results
The mean IKDC scores significantly improved (54.3 ± 13.0 vs 82.8 ± 13.8), with an average follow-up of 42.2 ± 21.2 months. There were no significant changes in knee laxity side-to-side differences: 6 weeks (1.2 ± 1.5 mm), 3 months (1.2 ± 1.8 mm), 6 months (1.4 ± 1.6 mm). Quadriceps LSIs significantly improved from 71.6% ± 19.3% at 6 months to 81.5% ± 19.3% at 12 months for 60°/s isokinetic testing and 76.6% ± 16.4% at 6 months to 83.9% ± 16.9% at 12 months for 180°/s testing. Graft harvest site hematomas developed in 2 patients, postoperative loss of knee extension in 4 patients, and graft failure in 11 patients. No significant differences in quadriceps or hamstrings LSIs were noted between patients with previous hamstring versus patella tendon autografts ($P > .050$).

Conclusion
Revision ACLR with all-soft tissue QT autografts has acceptable early and intermediate-term outcomes with reasonable complication rates (11/80 patients with follow-up). Secondary insult to the extensor mechanism via QT autograft harvest does not adversely affect strength after prior patellar tendon versus hamstring autograft.

Level of Evidence
Level IV, cases series subgroup analysis.

BACK

Corticosteroid Injections 1 Month Before Arthroscopic Meniscectomy Increase the Risk of Surgical-Site Infection

Forsythe, B., Forlenza, E. M., Agarwalla, A., Cohn, M. R., Lavoie-Gagne, O., Lu, Y., & Mascarenhas, R.

https://doi.org/10.1016/j.arthro.2021.02.047

Purpose
To define the incidence of postoperative infections in patients who receive corticosteroid injections prior to arthroscopic meniscectomy, to determine whether there is a temporal relation between injections and the risk of surgical-site infections, and to identify corresponding risk factors.

Methods
The Humana administrative claims database was reviewed for patients undergoing arthroscopic meniscectomy within 1 year of injection and those undergoing arthroscopic meniscectomy without prior injection. Patients with preoperative injections were further stratified by the duration in months between the injection and the surgical procedure. Surgical-site infection within 6 months of surgery was recorded. Univariate analysis and binary logistic regression were performed to determine independent risk factors for surgical-site infection. Statistical significance was defined as $P < .05$.

Results
We identified patients with (n = 11,652) and without (n = 37,261) a history of a knee corticosteroid injection within 1 year of arthroscopic meniscectomy with at least 6 months of database activity from 2007 to 2017. In patients who received knee injections within 1 month prior to surgery, the rate of development of postoperative infections was twice that in patients who did not receive an injection (1.28% vs 0.63%; odds ratio [OR], 1.84; 95% confidence interval [CI], 1.24-2.62; P = .001). Multivariate logistic regression identified male sex (OR, 1.39; 95% CI, 1.14-1.71; P = .001), diabetes (OR, 1.48; 95% CI, 1.19-1.85; P < .001), chronic obstructive pulmonary disease (OR, 1.57; 95% CI, 1.27-1.94; P < .001), obesity (OR, 1.32; 95% CI, 1.07-1.63; P = .010), tobacco use (OR, 1.61; 95% CI, 1.30-1.98; P < .001), and preoperative injections within 1 month of surgery (OR, 1.78; 95% CI, 1.21-2.54; P = .002) as significant predictors, whereas injections administered more than 1 month before surgery were not significantly associated with postoperative surgical-site infection after arthroscopic meniscectomy.

Conclusions
Injections 1 month before arthroscopic meniscectomy significantly increase the risk of surgical-site infection. However, injections can be safely administered more than 1 month prior to surgery because there is no increased risk of postoperative infection at this time point.

Level of Evidence
Level III, retrospective cohort study.

BACK

Anatomical Triple Bundle Anterior Cruciate Ligament Reconstructions With Hamstring Tendon Autografts: Tunnel Locations and 2-Year Clinical Outcomes

Uchida, R., Shino, K., Iuchi, R., Tachibana, Y., Yokoi, H., Nakagawa, S., & Mae, T.

https://doi.org/10.1016/j.arthro.2021.03.070

Purpose
To anatomically clarify the location of the tunnel apertures created using the bony landmark strategy and to elucidate clinical outcomes after anatomic triple-bundle (ATB) anterior cruciate ligament (ACL) reconstruction.

Methods
Thirty-two patients with unilateral ACL injury who had consented to undergo computed tomography (CT) at 3 weeks, as well as 2-year follow-up evaluation, were enrolled. At the time of surgery, remnant tissues were thoroughly cleared to create 2 femoral and 3 tibial tunnels inside the ACL attachment areas bordered by the bony landmarks. Two double-looped semitendinosus tendon autografts were prepared and fixed on the femur with two EndoButton-CLs and secured to the tibia with pullout sutures and plates with 10-20N of tension. The location of the tunnel aperture areas was assessed using 3-dimensional CT images, and 2-year postoperative clinical outcomes were evaluated.

Results
The CT evaluation showed 100% of the femoral tunnel aperture area and at least 79% of the tibial tunnel aperture area were located inside the anatomic attachment areas. Thirty patients were available for clinical evaluation. The International Knee Documentation Committee subjective assessment showed all of the patients were classified as “normal” or “nearly normal.” Lachman and pivot-shift tests were negative in 100% and 93%, respectively. The mean side-to-side difference of anterior laxity at the maximum manual force with a KT-1000 Knee Arthrometer was 0.7 ± 0.7 mm, ranging from 0 to 2 mm.

Conclusion
In ATB ACL reconstructions with hamstring tendon grafts, the tunnels can be created in proper locations using the arthroscopically-identifiable bony landmarks. Moreover, ATB ACL reconstruction with hamstring tendon grafts via the proper tunnels result in consistently satisfactory clinical outcomes.

Level of Evidence
Level IV, case series.

BACK

The Graft Insertion Length in the Femoral Tunnel During Anterior Cruciate Ligament Reconstruction With Suspensory Fixation and Tibialis Anterior Allograft Does Not Affect Surgical Outcomes but Is Negatively Correlated With Tunnel Widening

Moon, H.-S., Choi, C.-H., Yoo, J.-H., Jung, M., Lee, T.-H., Choi, K.-H., & Kim, S.-H.

https://doi.org/10.1016/j.arthro.2021.03.072

Purpose
To investigate the surgical outcomes of anterior cruciate ligament (ACL) reconstruction using a low-dose irradiated tibialis anterior allograft with a fixed-loop cortical suspension device for the femur based on the graft insertion length (GIL) in the femoral tunnel.

Methods
Between January 2010 and January 2018, the medical records of consecutive patients who underwent arthroscopic ACL reconstruction with a tibialis anterior allograft fixed with the EndoButton CL for the femur and who had at least 2 years of follow-up were retrospectively evaluated. Patients were classified into 3 groups based on the GIL in the femoral tunnel (group 1, GIL < 15 mm; group 2, GIL of 15-20 mm; and group 3, GIL > 20 mm), and their functional scores, knee laxity, and radiographic parameters were evaluated.

Results
A total of 91 patients were analyzed. There were no statistically significant differences in the functional scores and knee laxity between the 3 groups at 2 years postoperatively. However, significant differences were observed in tunnel widening at 1 year postoperatively in the femur ($P = .045$ for absolute value and $P = .004$ for relative value) and the tibia ($P = .014$ for absolute value and $P = .012$ for relative value), revealing that both the femoral and tibial tunnels widened as the GIL decreased. Additional linear regression analyses were performed to identify whether the GIL independently affects tunnel widening. Consequently, the femoral tunnel depth, tunnel diameter, and GIL were found to independently influence femoral tunnel widening ($P = .008$, $P = .019$, and $P < .001$, respectively), whereas the tunnel diameter and GIL affected tibial tunnel widening ($P < .001$ and $P = .004$, respectively).

Conclusions
The GIL in the femoral tunnel during ACL reconstruction using a tibialis anterior allograft with a fixed-loop cortical suspension device for the femur has no significant association with the postoperative functional outcomes and knee laxity, but it has a negative correlation with tunnel widening in the femur and the tibia.

Level of Evidence
Level III, retrospective cohort study.

BACK

Capsular Repair May Improve Outcomes in Patients Undergoing Hip Arthroscopy for Femoroacetabular Impingement: A Systematic Review of Comparative Outcome Studies

Owens, J. S., Jimenez, A. E., Shapira, J., Saks, B. R., Glein, R. M., Maldonado, D. R., … Domb, B. G.

https://doi.org/10.1016/j.arthro.2021.03.063

Purpose
To review the existing literature in order to determine the effect of hip capsule repair on outcomes after hip arthroscopy for femoroacetabular impingement syndrome.

Methods
This study used Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines to find articles by using PubMed and Embase. Included studies were Level I through III studies that focused on patient outcomes as a function of hip capsular treatments: capsulotomy repair, partial repair, plication, and unrepaired capsulotomies. The Methodological Index for Non-randomized Studies was used for quality assessment of clinical outcome studies. After applying inclusion and exclusion criteria, a total of 16 comparative outcome studies evaluating 2,996 hips were included; they evaluated the following capsular management techniques: complete repair (n = 1,112, 37.1%), partial repair (n = 32, 1.1%), plication (n = 223, 7.4%), and unrepaired capsulotomy (n = 1629, 54.4%).

Results
Of the 16 studies, 13 included patient-reported outcome scores (PROs), 3 included imaging outcomes data, and 2 reported on reoperation. Of the studies, 10 directly compared patient-reported outcomes between a capsular repair group and an unrepaired group. Of the 10 studies that directly compared PROs between a group with unrepaired capsulotomy and a group with capsular repair, 8 studies demonstrated statistically significantly better PROs in the repaired group compared to the unrepaired group, and 2 studies found no difference between the groups. Reoperation rates demonstrated mixed results between groups, and no difference was found in regard to imaging outcomes.

Conclusions
Midterm outcome studies suggest that capsular repair is safe and effective in patients without arthritis who are undergoing hip arthroscopy, and it may result in superior PROs compared with those found after unrepaired capsulotomy. Studies consistently demonstrate similar or superior outcomes in cohorts after capsular repair compared to unrepaired capsulotomy, and no studies reported superior results in unrepaired capsulotomy patients.

Level of Evidence
Level IV, systematic review of Level I through Level III studies

BACK

Knee Surgery, Sports Traumatology, Arthroscopy (KSSTA), Volume 29, Issue 9 p2799-2818.

There is no definite consensus on the adequate radiographic correction in arthroscopic osteochondroplasty for femoroacetabular impingement: a systematic review and meta-analysis.

Cohen, D., Khan, A., Kay, J. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06645-1.

Purpose
The purpose of this study is to evaluate and define what is considered an adequate radiographic correction in arthroscopic osteochondroplasty for FAI and to secondarily assess how radiographic outcomes relate to patient reported outcomes and complications.

Methods
The databases EMBASE, PubMed, and MEDLINE were searched for relevant literature from database inception until January 2021. Studies were screened by two reviewers independently and in duplicate for studies reporting on post-operative radiographic outcomes in arthroscopic osteochondroplasty for FAI. Data on radiographic outcomes as well as data reporting functional outcomes and complications were recorded. A meta-analysis was used to combine the mean pre- and post-operative radiographic outcomes using a random effects model. A risk of bias assessment was performed for all included studies using the MINORS score.

Results
The most commonly reported radiographic outcome was the alpha angle with a pooled mean post-operative angle of 44° (95% CI 41°–46°), and mean pre- to post-surgical difference of − 19° (− 22 to − 16, I^2 = 96%), followed by the LCEA with a pooled mean post-operative angle of 30° (95% CI 29–31) and mean difference after surgery of − 4° (− 6 to − 1, I^2 = 97%,). Eleven studies reported on the correlation between radiographic and clinical outcomes with no consistent consensus correlation found amongst the included studies. Similarly, six studies correlated radiographic outcomes with conversion to THA with no consistent consensus correlation found amongst the included studies.

Conclusion
Based on this review, the main conclusion is that there is no consensus definition on the optimal radiographic correction for FAI and there was no consistent correlation between radiographic correction and functional outcomes. However, based on the uniform improvement in functional outcomes, this review suggests a post-operative alpha angle target of 44° with a correction target of 19° and LCEA target of 30° with a correction target of 3°.

Level of evidence
IV.

BACK

Clinical outcomes after arthroscopic treatment of calcification with surrounding inflammation in the hip labrum.

Ju, X., Xu, Y., Zhang, X. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06638-0

Purpose
The purpose of this study was to investigate the surgical methods and clinical outcomes of arthroscopic treatment of a special type of calcification with surrounding inflammation in the acetabular labrum of the hip, which was temporarily named “calcifying labrumitis”.

Methods
From April 2015 to November 2019, a total of seven patients with calcifying labrumitis of the hip who underwent arthroscopic excision of calcified lesions and suture or partial resection of the labrum were included in this study. Radiographs were retrospectively evaluated for morphologic characteristics of calcifying labrumitis. Each patient was assessed by the visual analogue scale (VAS), modified Harris hip score (mHHS), nonarthritic hip score (NAHS) and satisfaction rate before surgery and at the final follow-up evaluation.

Results
Seven patients, one male and six females aged 29–48 years, were included in the study; of these patients, three had calcifying labrumitis on the left side and four had calcifying labrumitis on the right side. All patients had hip pain and limited range of motion for a mean of 7.5 ± 3.1 months (range, 3–12 months). The mean follow-up period was 34.9 ± 19.5 months (range, 12–66 months). The lateral central-edge angle (LCEA) was 31.7 ± 3.9° (range, 28.8–36.4°), and the α angle was 41.4 ± 5.3° (range, 33.6–48.2°). None of the patients had cam or pincer lesions. After complete removal of calcified lesions, five patients underwent repair of the labrum with a suture anchor, and two patients underwent partial resection of the labrum. The symptoms of all patients improved significantly at the last follow-up. Mean scores improved from 5.8 ± 1.5 to 1.1 ± 0.3 ($p < 0.01$) for the VAS, from 57.3 ± 10.6 to 90.8 ± 13.4 for the mHHS and from 62.5 ± 10.7 to 84.3 ± 9.6 for the NAHS. The satisfaction rate was 100%.

Conclusion
Calcifying labrumitis of the hip is a special kind of rare disease that is different from calcifications accompanying FAI and os acetabuli. Arthroscopic treatment of calcification with suture or partial resection of the labrum is an effective, safe and minimally invasive method, significantly relieving pain and improving hip joint function.

Level of evidence
Level IV.

BACK

The influence of pain catastrophizing and central sensitization on the reported pain after hip arthroscopy.

Bech, N.H., Sierevelt, I.N., de Rooij, A. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06658-w

Purpose
This study was conducted to investigate whether the pain catastrophizing scale (PCS) and the central sensitization inventory (CSI) are predictive factors for the reported pain after hip arthroscopy.

Methods
A total of 37 patients undergoing hip arthroscopy for femoroacetabular impingement syndrome and labral tears were prospectively enrolled. All patients completed the PCS and CSI before hip arthroscopy. Postoperative pain was measured with the numeric rating scale (NRS) weekly the first 12 weeks after surgery by electronic diary.

Results
At baseline, univariate analyses showed that both the CSI and PCS were significantly associated with the NRS outcome ($p < 0.01$). During 12 weeks follow-up, a significant decrease on the NRS was observed ($p < 0.01$). Univariate analyses showed that both the CSI and PCS were significantly associated with the NRS during follow-up. Multivariate mixed model analysis showed that only the PCS remained significantly associated with the NRS outcome with a ß of 0.07 (95% CI 0.03–0.11, $p < 0.01$).

Conclusion
Results indicate that both the PCS and CSI are associated with the reported postoperative pain after hip arthroscopy. The PCS and CSI may be useful in daily practice to identify patients that possibly benefit from pain catastrophizing reduction therapy (e.g. counseling) prior to surgery.

Level of evidence
IV

BACK

The postoperative shorter meniscal width was the risk factor of lateral meniscal extrusion in the middle portion for juvenile and adolescent knees with discoid lateral meniscus.

Mochizuki, T., Tanifuji, O., Watanabe, S. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06188-x

Purpose
The study aim was to clarify the risk factors for postoperative meniscal extrusion in a middle portion in juvenile and adolescent knees with DLM.

Methods
Forty-six patients with symptomatic DLM who underwent surgery were retrospectively assessed. Inclusion criteria were set as follows: (1) aged ≤ 17 years with an open growth plate, (2) preoperative and postoperative follow-up MRI, and 3) reshaping surgeries comprising of saucerization alone or with meniscal repair. Average (95%CI) age during surgery, body mass index (BMI), and follow-up duration were 12 years (11–13), 19.9 kg/m^2 (18.7–21.0), and 26.4 months (19.5–33.3), respectively. Age, sex, sports activities, BMI, postoperative rehabilitation, preoperative shift of DLM by Ahn's classification, surgical procedures, postoperative meniscal width of all portions, and meniscal healing were analyzed.

Results
Postoperatively, eight knees in the no-extrusion group and 38 knees in the extrusion group were observed. In the univariate logistic regression analysis, shorter meniscal width in a middle portion (OR = 1.580, $p = 0.006$), shorter minimum width of all portions (OR = 1.674, $p = 0.024$), and meniscal healing (OR = 0.160, $p = 0.028$) were the risk factors for meniscal extrusion in a middle portion. Multiple logistic regression analysis demonstrated that shorter meniscal width in a middle portion was the risk factor.

Conclusions
As the clinical relevance, to prevent postoperative meniscal extrusion of the middle portion with DLM, surgeons are necessary to pay attention to maintain the adequate meniscal width for juvenile and adolescent knees.

Level of evidence
III

BACK

Peroneus longus tendon autograft has functional outcomes comparable to hamstring tendon autograft for anterior cruciate ligament reconstruction: a systematic review and meta-analysis.

He, J., Tang, Q., Ernst, S. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06279-9

Purpose
This review aimed to assess whether peroneus longus tendon (PLT) autograft would have comparable functional outcomes and graft survival rates when compared to hamstring tendon (HT) autograft for anterior cruciate ligament (ACL) reconstruction.

Methods
PubMed, Web of Science, Cochrane Library, Ovid (MEDICINE), and EMBASE databases were queried for original articles from clinical studies including the keywords: ACL reconstruction and PLT autograft. Studies comparing PLT autograft versus HT autograft were included in this analysis and the following data were extracted from studies meeting the inclusion criteria: graft diameter, functional outcomes (Tegner activity scale, Lysholm score, and International Knee Documentation Committee (IKDC) subjective score), knee laxity (Lachman test), and complications (donor site pain or paresthesia, graft failure). Besides, the American Orthopaedic Foot and Ankle Society (AOFAS) scale and the Foot and Ankle Disability Index (FADI) pre-operation and at last follow-up were also compared among patients using PLT autograft. Meta-analysis was applied using Review Manager 5.3 and $p < 0.05$ was considered statistically significant.

Results
Twenty-three studies including 925 patients with ACL reconstruction met inclusion criteria. Of these, 5 studies included a direct comparison of PLT autograft (164 patients) versus HT autograft (174 patients). No significant difference was observed between PLT and HT autografts for Tegner activity scale, Lachman test, donor site pain, or graft failure. However, PLT groups demonstrated better Lysholm score (mean difference between PLT and HT groups, 1.55; 95% CI 0.20–2.89; $p = 0.02$) and IKDC subjective score (mean difference between PLT and HT groups, 3.24; 95% CI 0.29–6.19; $p = 0.03$). No difference of FADI was found (n.s.) but AOFAS was slightly decreased at last post-operative follow-up for patients with PLT autograft compared with pre-operative scores (mean difference of 0.31, 95% CI 0.07–0.54, $p = 0.01$).

Conclusion
PLT autograft demonstrated comparable functional outcomes and graft survival rates compared with HT autograft for ACL reconstruction. However, a slight decrease in AOFAS score should be considered during surgical planning. Hence, the PLT is a suitable autograft harvested outside the knee for ACL reconstruction to avoid the complication of quadriceps-hamstring imbalance which can occur when harvesting autografts from the knee.

Level of evidence
Level II.

BACK

The risk of graft impingement still exists in modern ACL surgery and correlates with degenerative MRI signal changes.

Schützenberger, S., Grabner, S., Schallmayer, D. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06300-1

Purpose
Anatomic tunnel placement in ACL reconstruction is crucial to restore knee function. The aims of this study were to (i) evaluate the accuracy of tunnel placement for primary state-of-the-art ACL reconstruction, and (ii) examine the correlation between incorrect tunnel placement, graft appearance, and notch impingement.

Methods
In this retrospective study, all patients underwent primary single-bundle ACL reconstruction with independent drilling of the femoral and tibial tunnels according to anatomical landmarks. The accuracy of tunnel placement and the rate of notch impingement were analysed with MRI. The study cohort was subdivided according to the morphology of the graft: intact, degeneration, and re-rupture. The objective outcome was evaluated with the IKDC objective score, and the subjective outcomes were evaluated with the IKDC subjective score, the Lysholm knee score, the KOOS, and the Tegner activity scale score.

Results
Eighty-seven consecutive patients with a mean follow-up of 3.8 ± 1.4 years were evaluated. There was no significant difference among the groups concerning the baseline characteristics. The re-rupture rate was 9.2%. The position of the femoral tunnel was correct in 92% of the patients, and the position of the tibial tunnel was correct in 93% of the patients. In the intact group, impingement was not found in any of the cases, whereas the rate of impingement in the degeneration (65%) and re-rupture (80%) groups was significantly higher than that in the intact group ($p < 0.001$). The risk of impingement was more likely with femoral (71% vs. 13%, $p < 0.001$) or tibial (100% vs. 11%, $p < 0.001$) malpositioning. The objective IKDC score was A in 52 patients (60%), B in 26 patients (30%), and C in 9 patients (10%). The average subjective IKDC score, Lysholm score, and KOOS were comparable in the intact and degeneration groups but significantly lower in the patient group with newly diagnosed re-ruptures ($p = 0.05$). The Tegner activity scale score was comparable in all three groups.

Conclusion
Even though the accuracy of femoral tunnel placement in modern single-bundle ACL reconstruction is greater, the risk of malpositioning and graft impingement remains. In our patient cohort, there was a clear correlation between ACL graft impingement, degenerative changes in MRI, and incorrect tunnel positioning. The surgeon must focus on accurate tunnel placement specific to individual patient anatomy.

Level of evidence
Level III.

BACK

Effects of unloader bracing on clinical outcomes and articular cartilage regeneration following microfracture of isolated chondral defects: a randomized trial.

Konopka, J.A., Finlay, A.K., Eckstein, F. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06228-6

Purpose
To determine whether the use of an unloading brace can increase the thickness of cartilage regenerate after microfracture surgery.

Methods
This is a randomized (1:1) controlled clinical trial. Twenty-four patients who underwent microfracture between 2012 and 2015 were identified and were randomly assigned to an unloading brace group or a no-brace group. All patients were kept non-weight bearing for the first eight weeks after surgery and then patients in the intervention group began using an unloading brace for an average of 63.9 (SD = 41.6) days to protect clot stability by exerting a varus or valgus force on the knee to decrease the force on the knee's lateral or medial compartment, respectively. Quality of the cartilage repair was assessed with knee magnetic resonance imaging to determine repair tissue thickness (primary outcome), repair tissue volume, and T2 relaxation times at 12 and 24 months after surgery. Clinical outcomes were evaluated with KOOS, Tegner, SF12, and Lysholm questionnaires at six, 12 and 24 months after surgery.

Results
Three patients were lost to follow-up, resulting in 21 patients ultimately analyzed. The unloading brace repair tissue was greater than the no-brace group in volume (26.8 ± 23.7 mm3 vs − 8.4 ± 22.7 mm3, p = 0.005) and thickness (0.2 ± 0.2 mm versus − 0.4 ± 0.3 mm, p = 0.001) at 12 months and in cartilage thickness in the unloading brace group at 24 months (0.4 ± 0.4 mm versus − 0.1 ± 0.3 mm, p = 0.029). There was a positive correlation between wearing the brace longer and improved 6-month KOOS symptom scores (r = 0.82, p = 0.013), 6-month KOOS QOL scores (r = 0.80, p = 0.017), 6-month Tegner scores (r = 0.94, p = 0.002), and Tegner score changes from baseline to 6 months (r = 0.80, p = 0.032).

Conclusion
This study found a significant mid-term increase in cartilage repair tissue thickness following unloading bracing in patients recovering from microfracture for isolated chondral defects.

Level of evidence
II.

BACK

Patient-reported outcomes of meniscal repair and meniscectomy in patients 40 years of age and older show similar good results.

Engler, I.D., Moradian, J.R., Pockros, B.M. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06299-5

Purpose
The purpose of this study is to evaluate patient-reported outcome measures (PROMs) in patients aged 40 years and older who underwent meniscal repair or meniscectomy.

Methods
All patients aged 40 and older who underwent a meniscal repair at a single institution from 2006 to 2017 were included. Meniscal repair cases were matched with a meniscectomy control group in a 1:3 ratio, selected for an equal proportion of concomitant ACL reconstruction in each group. PROMs, collected at a minimum follow-up of 24 months, included International Knee Documentation Committee Subjective Knee Evaluation Form (IKDC), Marx activity scale, and a patient satisfaction scale. The primary outcome was IKDC score, which was compared between groups using a Mann–Whitney U test. Rate of failure, defined as repeat ipsilateral knee surgery or surgeon report of failure, was reported.

Results
Thirty-five meniscal repair patients and 131 meniscectomy patients were identified; 28 (80.0%) and 67 (51.1%) completed all PROMs with mean follow-up of 4.9 and 5.2 years, respectively. The mean age was 48.5 ± 7.0 years in the meniscal repair cohort and 52.8 ± 7.1 years in the meniscectomy cohort ($p = 0.009$). Concomitant ACL reconstruction was present in 46.4% and 49.3% of the meniscal repair and meniscectomy cohorts, respectively (n.s.). The median IKDC score was 78 (IQR 66, 87) in the repair cohort and 77 (IQR 56, 86) in the meniscectomy cohort (n.s.). The median Marx activity scale was 3.5 (IQR 0, 8) in the repair cohort and 3.0 (IQR 0, 9) in the meniscectomy cohort (n.s.). Over 85% of both groups were satisfied or very satisfied with no between-group differences (n.s.).

Conclusion
In patients aged 40 years and older, patient-reported outcomes at an average of 5 years postoperatively were satisfactory and similar in patients undergoing meniscal repair and meniscectomy, indicating that age alone should not be a contraindication to meniscal repair.

Level of evidence
Level III.

BACK

Knee muscle strength after quadriceps tendon autograft anterior cruciate ligament reconstruction: systematic review and meta-analysis.

Johnston, P.T., McClelland, J.A., Feller, J.A. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06311-y

Purpose
Restoration of knee muscle strength is associated with better outcomes following anterior cruciate ligament (ACL) reconstruction, but little is known about the outcome of strength following quadriceps tendon autograft (QT) ACL reconstruction in relation to other graft types. The aim of this review was to evaluate strength outcomes of the knee extensors and knee flexors following QT ACL reconstruction compared to (1) the non-reconstructed contralateral limb and (2) alternative ACL graft types.

Methods
Four electronic databases were searched up until 21st February 2020. Summary meta-analyses were performed comparing knee strength outcomes following QT ACL reconstruction to the contralateral limb by way of limb symmetry index (LSI). Comparative meta-analyses were performed comparing QT ACL reconstruction to alternative ACL grafts for the two most frequently reported strength outcome measures which were peak knee extensor torque LSI, and peak knee flexor torque LSI at the following post-operative periods: 3, 5–8, 9–15, 24, 36–60 months.

Results
In total, 18 studies met the inclusion criteria. Knee strength outcomes of 952 QT ACL reconstructions were included and compared to either the contralateral limb or 1 of 4 alternative ACL graft types; 245 hamstring tendon autograft (HT), 143 patellar tendon autograft (PT), 45 quadriceps tendon allograft, and 21 tibialis anterior allograft. Knee extensor strength LSI following QT ACL reconstruction did not reach 90% even at 24 months post-operatively. Conversely, knee flexor strength LSI following QT ACL reconstruction exceeded 90% at the 9–15 months post-operative period. Knee extensor strength at 5–8 months following QT ACL reconstruction appears similar to PT but weaker than HT ACL reconstruction. In addition, peak knee flexor LSI was significantly greater at 5–8 months in QT ACL reconstruction patients compared to HT patients.

Conclusion
The decision to utilize a QT graft for ACL reconstruction should include consideration of strength outcomes. Knee extensor strength recovery following QT ACL reconstruction appears not to be restored before 24 months.

Level of evidence
Level IV.

BACK

Five- and six-strand hamstring grafts consistently produce appropriate graft diameters for anterior cruciate ligament reconstruction.

Nazari, G., Barton, K.I., Bryant, D. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06313-w

Purpose
Hamstring tendon graft diameter less than 8 mm has been correlated with an increased risk of anterior cruciate ligament reconstruction (ACLR) graft failure. The purpose of this study was to measure and compare the diameter of 3-, 4-, 5-, and 6-strand gracilis and semitendinosus (ST) hamstring tendon (HT) ACLR grafts, and to determine if there is a correlation between anthropometric data, HT length, and diameter of the HT ACLR graft.

Methods
Male patients (n = 78) undergoing primary or revision ACLR with a HT autograft between July 2018 and March 2020 were recruited. Pre-operative anthropometric data was collected. Gracilis and ST tendons were harvested and the length and diameter measured. The following HT graft configurations were prepared in each patient: triple ST; double gracilis + double ST; double gracilis + triple ST; triple gracilis + triple ST. Paired t-tests and Pearson's correlation coefficients were used to assess demographics, anthropometrics, graft diameter, and tendon length. A non-parametric test was used to compare femoral and tibial ACL graft diameters of the 3-, 4-, 5-, and 6-strand HT graft configurations.

Results
For the femoral end, 10%, 19%, 69% and 86% of the patients achieved graft diameters of equal to or greater than 8 mm in 3-, 4-, 5- and 6-strand HT graft configurations respectively. For the tibial end, 27%, 10%, 83%, and 92% of the patients achieved graft diameters of equal to or greater than 8 mm in 3-, 4-, 5-, and 6-strand HT graft configurations respectively. The largest increases in HT graft diameters were noted between the femoral end of 6- vs. 3-strand grafts (mean difference 1.7 ± 0.5 mm; $p < 0.001$) and between the tibial end of 6- vs. 4-strand grafts (mean difference 2.0 ± 0.5 mm; $p < 0.001$). Height and leg length were moderately positively correlated with ST tendon length ($r = 0.54–0.51$) and gracilis tendon length ($r = 0.52–0.45$), and thigh and shank lengths were moderately positively correlated with ST tendon length ($r = 0.43$ and 0.40, respectively).

Conclusion
Traditional 4-strand HT ACL autografts in male patients undergoing ACLR in the United Arab Emirates result in graft diameters less than 8 mm in the majority of patients.

Level of evidence
III.

BACK

Machine learning can reliably identify patients at risk of overnight hospital admission following anterior cruciate ligament reconstruction.

Lu, Y., Forlenza, E., Cohn, M.R. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06321-w

Purpose
Overnight admission following anterior cruciate ligament reconstruction has implications on clinical outcomes as well as cost benefit, yet there are few validated risk calculators for reliable identification of appropriate candidates. The purpose of this study is to develop and validate a machine learning algorithm that can effectively identify patients requiring admission following elective anterior cruciate ligament (ACL) reconstruction.

Methods
A retrospective review of a national surgical outcomes database was performed to identify patients who underwent elective ACL reconstruction from 2006 to 2018. Patients admitted overnight postoperatively were identified as those with length of stay of 1 or more days. Models were generated using random forest (RF), extreme gradient boosting (XGBoost), linear discriminant classifier (LDA), and adaptive boosting algorithms (AdaBoost), and an additional model was produced as a weighted ensemble of the four final algorithms.

Results
Overall, of the 4,709 patients included, 531 patients (11.3%) required at least one overnight stay following ACL reconstruction. The factors determined most important for identification of candidates for inpatient admission were operative time, anesthesia type, age, gender, and BMI. Smoking history, history of COPD, and history of coagulopathy were identified as less important variables. The following factors supported overnight admission: operative time > 200 min, age < 35.8 or > 53.5 years, male gender, BMI < 25 or > 31.2 kg/m2, positive smoking history, history of COPD and the presence of preoperative coagulopathy. The ensemble model achieved the best performance based on discrimination assessed via internal validation (AUC = 0.76), calibration, and decision curve analysis. The model was integrated into a web-based open-access application able to provide both predictions and explanations.

Conclusion
Modifiable risk factors identified by the model such as increased BMI, operative time, anesthesia type, and comorbidities can help clinicians optimize preoperative status to prevent costs associated with unnecessary admissions. If externally validated in independent populations, this algorithm could use these inputs to guide preoperative screening and risk stratification to identify patients requiring overnight admission for observation following ACL reconstruction.

Level of evidence
IV.

BACK

Distal remnant length can be measured reliably and predicts primary repair of proximal anterior cruciate ligament tears.

Vermeijden, H.D., Cerniglia, B., Mintz, D.N. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06312-x

Purpose
To assess the reliability and predictive value of quantifying anterior cruciate ligament (ACL) tear location on magnetic resonance imaging (MRI) and assess the predictive value of tear location on the eligibility for arthroscopic primary repair of proximal ACL tears.

Methods
In this case–control study, all adult patients undergoing acute ACL surgery between 2008 and 2020 were retrospectively reviewed. All patients were treated with the treatment algorithm of undergoing primary repair when proximal tears with sufficient tissue quality were present intraoperatively, and otherwise underwent single-bundle ACL reconstruction. Sagittal MRI images were reviewed to measure proximal and distal remnant lengths along the anterior aspect of the torn ligament, and tear location was calculated as distal remnant divided by total remnant length. Interobserver and intraobserver reliability for remnant measurements were calculated. Then, receiver operating curve analysis (ROC) was performed to calculate the optimal cut-off for the possibility of primary repair with the different measurements.

Results
Two hundred and forty-eight patients were included, of which 151 underwent repair (61%). Inter- and intraobserver reliability ranged between 0.92 and 0.96 [95% confidence interval (CI) 0.55–0.98] and 0.91–0.97 (95% CI 0.78–0.98, respectively). All patients with a tear location of ≥ 80% on MRI could undergo repair, whereas all patients with tear location of < 60% required reconstruction. The positive predictive value of a proximal quarter tear (≥ 75%) on primary repair was 94%. Older age was correlated with more proximal tear location ($p < 0.001$), but there was no correlation between tear location and gender, BMI, or timing of surgery (all n.s).

Conclusion
This study showed that tear location could reliably be quantified on MRI by assessing distal and proximal remnant lengths. Tear location in the proximal quarter of the ACL was found to have a positive predictive value for repairability of 94%. These findings may assist orthopaedic surgeons in evaluating which patients are eligible for primary ACL repair preoperatively.

Level of evidence
III.

BACK

Female gender and medial meniscal lesions are associated with increased pain and symptoms following anterior cruciate ligament reconstruction in patients aged over 50 years.

Dejour, D., de Lavigne, C., Panisset, JC. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06318-5

Purpose
Several studies report satisfactory clinical outcomes following ACLR in older patients, but none evaluated the effects of meniscal and cartilage lesions. The aim was to evaluate the influence of meniscal and cartilage lesions on outcomes of ACLR in patients aged over 50 years.

Methods
The authors prospectively collected records of 228 patients that underwent primary ACLR, including demographics, time from injury to surgery, whether injuries were work related, and sports level (competitive, recreational, or none). At a minimum follow-up of 6 months, knee injury and osteoarthritis outcome scores (KOOS), International Knee Documentation Committee (IKDC) score and Tegner activity level were recorded, and differential laxity was measured as the side-to-side difference in anterior tibial translation (ATT) using instrumented laximetry devices. Regression analyses were performed to determine associations between outcomes and meniscal and cartilage lesions as well as nine independent variables.

Results
A total of 228 patients aged 54.8 ± 4.3 years at index ACLR were assessed at a follow-up of 14.3 ± 3.8 months. KOOS subcomponents were 85 ± 13 for symptoms, 91 ± 10 for pain, 75 ± 18 for daily activities, 76 ± 18 for sport, and 88 ± 12 for quality of life (QoL). The IKDC score was A for 84 (37%) knees, B for 96 (42%) knees, C for 29 (13%) knees, and D for 8 (4%) knees. Tegner scores showed a decrease (median 0, range −4 to 4) and differential laxity also decreased (median − 4, range − 23.5 to 6.0). KOOS symptoms worsened with higher BMI ($p = 0.038$), for women ($p = 0.007$) and for knees that had medial meniscectomy ($p = 0.029$). KOOS pain worsened with higher BMI ($p \leq 0.001$), for women ($p = 0.002$) and for knees with untreated ($p = 0.047$) or sutured ($p = 0.041$) medial meniscal lesions. Differential laxity increased with follow-up ($p = 0.024$) and in knees with lateral cartilage lesions ($p = 0.031$).

Conclusion
In primary ACLR for patients aged over 50 years, female gender and medial meniscal lesions significantly compromised KOOS symptoms and pain, while lateral cartilage lesions significantly increased differential laxity. Compared to knees with an intact medial meniscus, those with sutured or untreated medial meniscal lesions had worse pain, while those in which the medial meniscus was resected had worse symptoms. These findings are clinically relevant as they could help surgeons with patient selection and adjusting expectations according to their functional demands.

Level of evidence
III.

BACK

Transtibial pullout repair of medial meniscus posterior root tears: effects on the meniscus healing score and ICRS grade among patients with mild osteoarthritis of the knee.

Kodama, Y., Furumatsu, T., Okazaki, Y. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06332-7

Purpose
To assess the effects of transtibial pullout repair for medial meniscus posterior root tears (MMPRTs) among patients with early osteoarthritis of the knee as measured by the meniscus healing score and to determine whether the meniscus healing score correlates with the International Cartilage Repair Society (ICRS) grade progression.

Methods
Forty-seven patients with mild osteoarthritic knees (Kellgren–Lawrence grade ≤ 2 and varus alignment < 5°) who underwent transtibial pullout repair less than 3 months after MMPRT onset were assessed. The association between meniscus healing scores at 1 year postoperatively and cartilage damage of the medial compartment (medial femoral condyle [MFC] and medial tibial plateau [MTP]) were evaluated. The MFC was divided into six zones (A to F) and the MTP into two zones (G and H). The mean ICRS grade for each zone was compared between the primary surgery and second-look arthroscopy. The correlation between cartilage damage and meniscus healing status at the time of second-look arthroscopy in each zone was analysed.

Results
The mean time interval from injury to surgery was 63 days, and all clinical scores showed significant improvement. There were no significant differences in the extent of cartilage damage in areas B, C, E, or F (n.s.) for MFC or in areas G and H (n.s.) for MTP. The meniscus healing score and cartilage damage were correlated in the loading areas (B, C, E, and H; − 0.53, − 0.45, − 0.33, and − 0.38, respectively; $p < 0.05$).

Conclusion
Transtibial pullout repair of MMPRTs among patients with mild osteoarthritic knees improved the clinical outcomes and showed a negative correlation between high meniscus healing scores and ICRS grades in the medial compartment loading area. This study suggests that early surgery should be undertaken for patients with mild osteoarthritic knee who develop MMPRTs.

Level of evidence
Level IV.

BACK

Tegner level is predictive for successful return to sport 2 years after anterior cruciate ligament reconstruction.

Klasan, A., Putnis, S.E., Grasso, S. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06335-4

Purpose
For a successful return to sport (RTS) after an anterior cruciate ligament reconstruction (ACLR), patients are recommended to attend a comprehensive rehabilitation program, followed by an RTS assessment, that is a combination of tests. The purpose of this study was to predict a successful return to sport using the results of the RTS assessment and self-reported questionnaires at minimum 2 years after ACLR.

Methods
A total of 123 consecutive ACLR patients undertook an intensive rehabilitation program followed by a comprehensive RTS assessment that included an established combination of balance and strength tests, the ACL-return to sport after Injury scale (ACL-RSI) questionnaire and a KT1000 laximetry test. Preinjury and expected Tegner and Lysholm were collected at baseline, at RTS and prospectively collected at minimum 2-year follow-up. The patients were asked if they returned to their previous sport and at which level. All variables were included in a regression analysis predicting a successful return to previous sport, return to the same level of sport as well as the Tegner level at 2 years.

Results
Sixty-two patients (50%) returned to their previous sport by the 2-year follow-up, without a difference in preinjury Tegner between these two groups (n.s.). Expected preoperative Tegner was the only significant predictor of a successful return to previous sport ($p = 0.042$; OR 1.300, 95% CI 1.010–1.672). Out of the 62 patients returning to their previous sport, 38 (61%) reported to be on the same or higher level. The only predictive variable for returning to the same level was the higher preinjury Tegner level ($p = 0.048$; OR 1.522). Multivariate regression analysis of Tegner level at 2 years found younger age to be the only predictive value. From the RTS assessment tests, the ACL-RSI questionnaire and the posterolateral balance test were predictive variables for Tegner at 2-year follow-up, albeit in the univariate regression analysis.

Conclusions
Preoperative Tegner and expected Tegner level collected prior to an ACL reconstruction can aid in the objective prediction of patients' return to sport after 2 years. High-level athletes are more likely to return to their previous sport and to the previous level. Younger patients achieve a higher Tegner level at 2 years.

Level of evidence
Level III study.

BACK

Autograft type affects muscle strength and hop performance after ACL reconstruction. A randomised controlled trial comparing patellar tendon and hamstring tendon autografts with standard or accelerated rehabilitation.

Cristiani, R., Mikkelsen, C., Wange, P. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06334-5

Purpose
To evaluate and compare changes in quadriceps and hamstring strength and single-leg-hop (SLH) test performance over the first 24 postoperative months in patients who underwent anterior cruciate ligament reconstruction (ACLR) with bone-patellar tendon-bone (BPTB) or hamstring tendon (HT) autografts and followed either a standard or an accelerated rehabilitation protocol.

Methods
A total of 160 patients undergoing ACLR were randomised in four groups depending on the graft that was used and the rehabilitation protocol (40 BPTB/standard rehab, 40 BPTB/accelerated rehab, 40 HT/standard rehab, 40 HT/accelerated rehab). Isokinetic concentric quadriceps and hamstring strength at 90°/s and the SLH test performance were assessed preoperatively and 4,6,8,12 and 24 months postoperatively. The results were reported as the limb symmetry index (LSI) at the same time point. Linear mixed models were used to compare the groups at the different time points.

Results
An average quadriceps strength LSI of 78.4% was found preoperatively. After ACLR, the LSI first decreased at 4 months and then increased from 6 to 24 months, reaching an overall value of 92.7% at the latest follow-up. The BPTB group showed a significantly decreased LSI at 4, 6, 8 and 12 months compared with the HT group. No significant differences between the graft groups were found at 24 months.

An average hamstring strength LSI of 84.6% was found preoperatively. After ACLR, the LSI increased from 4 to 24 months in the BTPB group. In the HT group, the LSI first decreased at 4 months and then increased from 6 to 24 months. An LSI of 97.1% and 89.1% was found at the latest follow-up for the BPTB and the HT group, respectively. The HT group showed a significantly decreased LSI at all follow-ups compared with the BPTB group.

An average SLH test LSI of 81% was found preoperatively. After ACLR, the LSI increased from 4 to 24 months, reaching 97.6% overall at the latest follow-up. The BPTB group showed a significantly decreased LSI only at 4 months postoperatively compared with the HT group. No significant differences in any of the three tests were found between the standard and accelerated rehabilitation groups for either of the graft groups at any time point.

Conclusion
Muscle strength and SLH test performance recovered progressively after ACLR overall, but they did not all fully recover, as the injured leg performed on average less than 100% compared with the uninjured leg even 24 months postoperatively. After ACLR, inferior quadriceps strength and a poorer SLH test performance were found at 4, 6, 8 and 12 months and at 4 months, respectively, for the BTPB group compared with the HT group. Persistent, inferior hamstring strength was found at all postoperative follow-ups in the HT group. Rehabilitation, standard or accelerated, had no significant impact on the recovery of muscle strength and SLH test performance after ACLR in any of the graft groups.

Level of Evidence
Level I.

BACK

Diagnostic and therapeutic approach to meniscal ossification: a systematic review.

Ververidis, A.N., Keskinis, A., Paraskevopoulos, K. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06338-1

Purpose
The purpose of this study was to systematically review case reports and case series about meniscal ossicle, to summarize existing evidence. Specifically, to identify the etiology, demographic characteristics, localization, clinical features, diagnostic procedures and treatment options of this rare entity. Although, case reports/ series are of low level of evidence, a systematic review of such studies can provide and help us to gain a better understanding and awareness of meniscal ossicle.

Methods
Two authors searched three online databases (MEDLINE, SCOPUS and GOOGLE SCHOLAR) from inception until March 2020 for the literature on meniscal ossicle. Inclusion criteria included case series, case reports and case-based reviews, available in full-text version, in English and that concern humans. Reports published in languages other than English were excluded, as well as articles with no electronic full text availability. Case reports using the term “meniscal ossicle” to describe an acute avulsion fracture of the tibial root of the meniscus, were also excluded.

Results
Of 453 initial studies, 38 studies satisfied inclusion criteria. In total 169 patients were included of whom 107 (63%) were males and 62 (37%) were females. Mean age was 44 years (range 12–87). According to Magnetic resonance imaging findings, in 144 knees (86%) the ossicle was localized at the posterior root or horn of the medial meniscus. 60% of the patients had a history of trauma. The predominant symptom in 87% of patients was knee pain. In all patients was detected an intra-articular density structure in computed radiography. 76% had associated meniscal tear, 61% had intraarticular cartilage loss, 34% meniscal extrusion and 28% anterior cruciate ligament injury. Treatment modalities included conservative regimen in 40 patients, while 59 patients underwent surgical excision.

Conclusion
The most possible etiology of meniscal ossicle is posttraumatic heterotopic ossification and small occult bony avulsion fracture. It is commonly observed in individuals complaining about knee pain with history of antecedent trauma. The presence of a meniscal ossicle should alert the physician to the high likelihood of the patient having an associated meniscal tear, articular cartilage loss, ACL injury or meniscal extrusion. Along with the meniscal ossicle, the associated meniscal tear should be treated as well.

BACK

PRP does not improve the objective outcomes of anterior cruciate ligament reconstruction: a systematic review and meta-analysis.

de Andrade, A.L.L., Sardeli, A.V., Garcia, T.A. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06348-z

Purpose
Platelet rich plasma (PRP) has been used in association with anterior cruciate ligament resconstruction (ACLR) to improve rehabilitation. The purpose was to systematically review the literature to compare the effects of PRP on ACLR in its objective and subjective outcomes.

Methods
A systematic review of the MEDLINE, Web of Science, Embase, Scopus, and Cochrane databases was performed. Two independent reviewers included all the English language literature of patients undergoing primary ACLR with autograft combined with PRP. The outcomes analyzed were graft ligamentization (MRI), tibial and femoral tunnel widening (MRI), knee laxity, IKDC, Lysholm, Tegner activity scale and visual analog scale.

Results
Nine studies were included with a total of 525 patients. PRP did not improve ligamentization of graft (standardized mean difference (SMD): 0.01 [95% CI: − 0.37; 0.39]), did not lead to lesser tunnel widening (SMD: 0.71 [95% CI: − 0.12; 1.54]), or lead to lesser knee laxity (raw mean difference: 0.33 [95% CI: − 0.84; 0.19]). Although there was statistical significance for PRP effects on Lysholm score and VAS ($p < 0.01$), their magnitude was limited.

Conclusion
PRP showed no improvement in objective outcomes like ligamentization and less tunnel widening, while it showed just small improvements in terms of Lysholm, VAS and knee laxity. Therefore, there is not enough evidence to support a recommendation in favor of PRP and more research is needed.

Level of evidence
I.

BACK

Medial meniscus ramp and lateral meniscus posterior root lesions are present in more than a third of primary and revision ACL reconstructions.

Magosch, A., Mouton, C., Nührenbörger, C. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06352-3

Purpose
The purpose of this study was (1) to describe the meniscus tear pattern in anterior cruciate ligament (ACL)-injured patients, with a special focus on medial meniscus (MM) ramp lesions and lateral meniscus (LM) root tears and (2) to determine whether patient and injury characteristics were associated with meniscus tear patterns.

Methods
Data from 358 cases of ACL primary and revision reconstruction surgeries were extracted from a center-based registry. During arthroscopy, the presence of associated meniscus lesions was documented by systematically inspecting the anterior and posterior tibiofemoral compartments. With a special focus on MM ramp lesions and LM root tears, groups of different injury tear patterns were formed. Chi-square tests were used to determine whether these groups differed with respect to various patient and injury characteristics, including gender, previous ipsilateral ACL injuries, the injury's relation to sport, person contact during injury and the type of ACL tear. Median age at surgery and body mass index were compared between groups using the Kruskal–Wallis test. Significance was set at $p < 0.05$.

Results
Two hundred and thirty-nine ACL injuries (67%) showed additional meniscal injuries, of which 125 (52%) involved the MM ramp and/or the LM root. Ramp lesions were more frequent in males (23% vs 12% in females, $p < 0.01$), in contact injuries (28% vs 16% in non-contact, $p < 0.05$) and in complete ACL tears (21% vs 5% in partial, $p < 0.05$). Combined injuries of the MM ramp and the LM root showed a higher percentage of contact injuries compared to non-contact injuries (10% vs 4%, $p < 0.05$).

Conclusion
Two-thirds of all ACL injuries showed a concomitant meniscus injury, of which half involved the biomechanically relevant, but previously often undiagnosed RLMM or the PRLM. These findings provide evidence that until recently about half of ACL-associated meniscus injuries were not properly identified. Ramp lesions were more frequent in males, contact injuries and in complete ACL tears. These findings stress the need for a systematic assessment and a better understanding of the pathomechanism of these specific injuries which may have an important impact on knee biomechanics and the outcome of ACL reconstruction.

Level of evidence
III.

BACK

Increased lateral femoral condyle ratio is associated with greater risk of ALC injury in non-contact anterior cruciate ligament injury.

Li, K., Zheng, X., Li, J. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06347-0

Purpose
To examine whether increased lateral femoral condyle ratio (LFCR) correlates with increased risk of Anterior cruciate ligament (ACL) injury (1) and to evaluate the relationship between the LFCR and anterolateral complex (ALC) injury in non-contact ACL torn knees (2).

Methods
Six hundred and seventy-two patients who underwent ACL reconstruction surgery between 2013 and 2019 were retrospectively reviewed, and 120 patients were finally included in the study. Forty patients (ACL + ALC injury) were included in the study group, while forty patients with isolated ACL injury (isolated ACL injury group) and 40 patients who suffered from meniscal tear without ACL or ALC injury were matched in a 1:1 fashion by age, sex, and BMI to the study group (ACL + ALC injury). The LFCR was measured on standard lateral radiographs in a blinded fashion. The differences between the three groups were analyzed by ANOVA. A ROC (Receiver Operating Characteristic) curve was produced to determine risk of ACL injury and risk of concomitant ALC injury in non-contact ACL injury.

Results
The mean LFCR was 71.9% ± 3.1% in the ACL + ALC injury group, 68.4% ± 3.2% in the isolated ACL injury group, and 66.8% ± 2.6% in the control group (patients who suffered from meniscal tear without ACL or ALC injury). Significantly greater LFCR was found in the ACL + ALC injury group than that in the isolated ACL injury group ($p < 0.017$). Greater LFCR was additionally confirmed in the ACL injury group as compared to the control group ($p < 0.05$). ROC curve analysis demonstrated that LFCR > 68.3% was predictive for an increased risk of ACL injury in the entire cohort. LFCR > 69.4% was predictive for an increased risk of ALC injury in non-contact ACL ruptured patients.

Conclusion
Increased LFCR was found to be associated with greater risk of ALC injury in non-contact ACL ruptured patients. Additionally, increased LFCR was further confirmed to be correlated with increased risk of ACL injury in an Asian population. The data from this study may help recognize patients undergoing ACL reconstruction that could benefit from additional extra-articular tenodesis.

Level of evidence
III.

BACK

Terminal knee extension deficit and female sex predict poorer quadriceps strength following ACL reconstruction using all-soft tissue quadriceps tendon autografts.

Hunnicutt, J.L., Xerogeanes, J.W., Tsai, LC. et al.

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Purpose
The all-soft tissue quadriceps tendon (QT) autograft is becoming increasingly popular for ACL reconstruction (ACLR); however, studies reporting strength recovery and early outcomes after QT autograft are limited with patient samples composed of predominantly males. The primary purpose was to characterize early, sex-specific recovery of strength, range of motion (ROM), and knee laxity in a large cohort of patients undergoing primary ACLR with standardized harvest technique of the all-soft tissue QT autograft. The secondary purpose was to examine the influence of demographic factors and clinical measures on 6-month quadriceps strength.

Methods
Patients 14–25 years who underwent primary, unilateral ACLR with all-soft tissue QT autografts were prospectively followed. Knee laxity and ROM were collected at 6 weeks, 3 and 6 months; while, quadriceps normalized torques and limb symmetry indices (LSI) were collected at 3 and 6 months using isokinetic dynamometry at 60°/s. Two-way ANOVAs with repeated measures were conducted to determine recovery over time and between sexes. Stepwise linear multiple regressions were conducted to determine predictors of 6-month quadriceps strength.

Results
Three-hundred and twenty patients were included (18 ± 3 years; 156 males:164 females; BMI = 24 ± 4 kg/m2) with no early graft failures within the study period. For strength, there were significant main effects of time ($p < 0.001$) and sex ($p < 0.001$), indicating similar improvement from 3 to 6 months with males demonstrating greater quadriceps LSI (6 months: 72.1 vs 63.3%) and normalized strength (6 months: 2.0 vs 1.6 Nm/kg). A significantly higher proportion of females had knee extension ROM deficits ≥ 5° compared to males at 6 weeks (61 vs 39%; $p = 0.002$). Female sex and 3-month extension ROM deficits were identified as significant predictors of 6-month quadriceps LSI ($R2 = 0.083$; $p < 0.001$). Female sex, BMI, and 6-week extension ROM deficits were identified as significant predictors of 6-month normalized quadriceps strength ($R2 = 0.190$; $p < 0.001$).

Conclusions
Females had decreased quadriceps strength and greater extension ROM deficits at 3 and 6 months following ACLR using all-soft tissue QT autografts. Female sex, higher BMI, and loss of extension ROM were independent predictors of poorer quadriceps strength at 6 months. There were no early graft failures, and laxity remained within normal ranges for both males and females. Surgeons and rehabilitation clinicians should be aware of the increased risk of postoperative loss of extension ROM in females and its implications on quadriceps strength recovery.

Level of evidence
III.

BACK

Double-bundle anterior cruciate ligament reconstruction technique has advantages in chondroprotection and knee laxity control compared with single-bundle technique.

Mao, Z., Wang, J., Wang, Y. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06350-5

Purpose
To compare the long-term clinical outcomes of single-bundle anterior cruciate ligament reconstruction (SBR) and double-bundle anterior cruciate ligament reconstruction (DBR) in patients with isolated anterior cruciate ligament (ACL) rupture, presenting no meniscus injury and no obvious preoperative cartilage degeneration.

Methods
One hundred and three patients (38.6 ± 9.5 years) with a median follow-up of 151.6 months (range, 144–189 months) completed the retrospective study (SBR group: n = 51; DBR group: n = 52). Clinical outcomes were evaluated with physical examinations, KT-2000 anterior and posterior stability measurement with the knee in 30º of flexion, International Knee Documentation Committee (IKDC) subjective score, Tegner score, Lysholm score; magnetic resonance imaging (MRI) (3.0 T) was performed, and International Cartilage Repair Society (ICRS) cartilage degeneration grades were determined. Multivariate analysis was performed to identify factors associated with cartilage degeneration.

Results
There were significant differences in the pre- and postoperative IKDC, Lysholm and Tegner scores between the SBR and DBR groups. The SBR group had over double the rate of positive pressure/rub patellar test results (SBR vs DBR, 43.1% vs. 19.2%, $p < 0.011$). The KT-2000, pivot-shift and Lachman test results were stratified and analyzed, and significant differences between the SBR and DBR groups were found ($p < 0.05$, respectively). The distribution of ICRS grades differed significantly between the groups at the last follow-up ($p = 0.013$). A multivariate analysis found that age and operation procedures were significant predictors of 0 and non-0 ICRS grades (odds ratio, 6.077 [95% CI 2.117–17.447] and 0.210 [95% CI 0.068–0.654], respectively) ($p < 0.05$).

Conclusion
Both SBR and DBR achieved overall good long-term results. DBR had advantages in objective outcome measures and was superior in preventing the occurrence of cartilage degeneration. Age was identified as a preoperative risk factor for significant postoperative cartilage degeneration.

Level of evidence
III.

BACK

Clinical presentation, MRI and clinical outcome scores do not accurately predict an important meniscal tear in a symptomatic discoid meniscus.

Hampton, M., Hancock, G., Christou, A. et al.

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Purpose
Discoid menisci can be symptomatic from instability or a tear. A torn discoid meniscus is likely to require repair to preserve meniscal function and should not be missed. This is the first study to evaluate a range of pre-operative methods to predict the likelihood of a torn discoid meniscus.

Methods
A retrospective analysis of prospectively collected data was performed. Clinical, radiographic and operative data were reviewed. Patients were grouped based on the presence of a tear or not during surgery. All patients underwent MRI scans pre-operatively which were validated with arthroscopy findings to calculate sensitivity. All patients completed Pedi-KOOS and Pedi-IKDC pre-operative scores.

Results
There were 32 discoid menisci in 27 patients. Mean age at surgery was 10.4 years (6–16). Nineteen patients were female. Seventeen menisci were identified as torn at time of arthroscopy (53%), 15 were unstable but not torn. Clinical findings did not differentiate between the torn or unstable menisci. MRI was only 75% sensitive and 50% specific at identifying a torn discoid meniscus. There was no statistical difference between KOOS-child (n.s.) and Pedi-IKDC (n.s.) scores between the groups.

Conclusion
MRI is neither sensitive nor specific at identifying tears in discoid menisci. There is no difference in pre-operative outcome scores for patients with a torn or unstable discoid meniscus; pre-operative PROMs are a poor predictor of a meniscal tear. This study emphasises that pre-operative tests and clinical findings are not conclusive for identifying a meniscal tear and the operating surgeon should be vigilant in identifying and repairing tears at the time of surgery. Pre-operative findings poorly correlate to arthroscopic findings and potential surgical interventions required. Patients and parents/carers should, therefore, be appropriately counselled prior to surgery that post-operative measures are dependent on intra-operative findings and not pre-operative findings in patients.

Level of evidence
III.

BACK

American Journal of Sports Medicine (AJSM), Volume 49, Issue 11, pp. 2878–2888

Articular Cartilage and Meniscus Predictors of Patient-Reported Outcomes 10 Years After Anterior Cruciate Ligament Reconstruction: A Multicenter Cohort Study

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Background: Articular cartilage and meniscal damage are commonly encountered and often treated at the time of anterior cruciate ligament reconstruction (ACLR). Our understanding of how these injuries and their treatment relate to outcomes of ACLR is still evolving.

Hypothesis/Purpose: The purpose of this study was to assess whether articular cartilage and meniscal variables are predictive of 10-year outcomes after ACLR. We hypothesized that articular cartilage lesions and meniscal tears and treatment would be predictors of the International Knee Documentation Committee (IKDC), Knee injury and Osteoarthritis Outcome Score (KOOS) (all 5 subscales), and Marx activity level outcomes at 10-year follow-up after ACLR.

Study Design: Cohort study (prognosis); Level of evidence, 1.

Methods: Between 2002 and 2008, individuals with ACLR were prospectively enrolled and followed longitudinally using the IKDC, KOOS, and Marx activity score completed at entry, 2, 6, and 10 years. A proportional odds logistic regression model was built incorporating variables from patient characteristics, surgical technique, articular cartilage injuries, and meniscal tears and treatment to determine the predictors (risk factors) of IKDC, KOOS, and Marx outcomes at 10 years.

Results: A total of 3273 patients were enrolled (56% male; median age, 23 years at time of enrollment). Ten-year follow-up was obtained on 79% (2575/3273) of the cohort. Incidence of concomitant pathology at the time of surgery consisted of the following: articular cartilage (medial femoral condyle [MFC], 22%; lateral femoral condyle [LFC], 15%; medial tibial plateau [MTP], 4%; lateral tibial plateau [LTP], 11%; patella, 18%; trochlea, 8%) and meniscal pathology (medial, 37%; lateral, 46%). Variables that were predictive of poorer 10-year outcomes included articular cartilage damage in the patellofemoral ($P < .01$) and medial ($P < .05$) compartments and previous medial meniscal surgery (7% of knees; $P < .04$). Compared with no meniscal tear, a meniscal injury was not associated with 10-year outcomes. Medial meniscal repair at the time of ACLR was associated with worse 10-year outcomes for 2 of 5 KOOS subscales, while a medial meniscal repair in knees with grade 2 MFC chondrosis was associated with better outcomes on 2 KOOS subscales.

Conclusion: Articular cartilage injury in the patellofemoral and medial compartments at the time of ACLR and a history of medial meniscal surgery before ACLR were associated with poorer 10-year ACLR patient-reported outcomes, but meniscal injury present at the time of ACLR was not. There was limited and conflicting association of medial meniscal repair with these outcomes.

BACK

Long-term Graft Rupture Rates After Combined ACL and Anterolateral Ligament Reconstruction Versus Isolated ACL Reconstruction: A Matched-Pair Analysis From the SANTI Study Group

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Background: Clinical studies have demonstrated significant advantages of combined anterior cruciate ligament and anterolateral ligament reconstruction (ACL+ALLR) over isolated ACL reconstruction (ACLR) with respect to reduced graft rupture rates, a lower risk of reoperation for secondary meniscectomy, improved knee stability, and higher rates of return to sports. However, no long-term studies exist.

Purpose/Hypothesis: The purpose of this study was to compare the outcomes of isolated ACLR versus ACL+ALLR at long-term follow-up. The hypothesis was that patients who underwent combined procedures would experience significantly lower rates of graft rupture.

Study Design: Cohort study; Level of evidence, 3.

Methods: Patients undergoing primary ACL+ALLR between January 2011 and March 2012 were propensity matched in a 1:1 ratio to patients who underwent isolated ACLR during the same period. A combination of face-to-face and telemedicine postoperative follow-up was undertaken. At the end of the study period (March 2020), medical notes and a final telemedicine interview were used to determine whether patients had experienced any complications or reoperations. The Knee injury and Osteoarthritis Outcome Score, International Knee Documentation Committee score, Lysholm score, and Tegner score were collected for all patients. Graft survivorship was assessed using Kaplan-Meier analysis. Logistic regression was performed to account for the potential effect of activity level on graft rupture rates.

Results: A total of 86 matched pairs were included in the study. The mean ± SD age was 32.2 ± 8.8 years (range, 22-67 years) in the ACL+ALLR group and 34.7 ± 8.5 years (range, 21-61 years) in the isolated ACLR group. The mean duration of follow-up was 104.33 ± 3.74 months (range, 97-111 months). Patients who underwent combined ACL+ALLR versus isolated ACLR experienced significantly better ACL graft survivorship (96.5% vs 82.6%, respectively; $P = .0027$), lower overall rates of reoperation (15.3% vs 32.6%; $P < .05$), and lower rates of revision ACLR (3.5% vs 17.4%; $P < .05$). Patients undergoing isolated ACLR were at >5-fold greater risk of graft rupture (odds ratio, 5.549; 95% CI, 1.431-21.511; $P = .0132$), regardless of their preinjury activity level. There were no significant differences between groups with respect to other complications or any clinically important differences in patient-reported outcome measures.

Conclusion: Patients who underwent combined ACL+ALLR experienced significantly better long-term ACL graft survivorship, lower overall rates of reoperation, and no increase in complications compared with patients who underwent isolated ACLR. Further, patients who underwent isolated ACLR had a >5-fold increased risk of undergoing revision surgery at a mean follow-up of 104.3 months.

BACK

Contribution of Multimodal Analgesia to Postoperative Pain Outcomes Immediately After Primary Anterior Cruciate Ligament Reconstruction: A Systematic Review and Meta-analysis of Level 1 Randomized Clinical Trials

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Background: Anterior cruciate ligament reconstruction (ACLR) is associated with moderate to severe pain in the immediate postoperative period. The optimal individual preemptive or intraoperative anesthetic modality on postoperative pain control is not well-known.

Purpose: To systematically review and perform a meta-analysis comparing postoperative pain scores (visual analog scale [VAS]), opioid consumption, and incidence of complications during the first 24 hours after primary ACLR in patients receiving spinal anesthetic, adjunct regional nerve blocks, or local analgesics.

Study Design: Systematic review and meta-analysis.

Methods: PubMed, Embase, MEDLINE, Biosis Previews, SPORTDiscus, Ovid, PEDRO, and the Cochrane Library databases were systematically searched from inception to March 2020 for human studies, using a PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) checklist. Inclusion criteria consisted of (1) level 1 studies reporting on the use of spinal anesthesia, adjunct regional anesthesia (femoral nerve block [FNB] or adductor canal block [ACB]), or local analgesia in patients undergoing primary ACLR and (2) studies reporting on patient-reported VAS, opioid consumption, and incidence of complications related to anesthesia within the first 24 hours after surgery. Non–level 1 studies, studies utilizing a combination of anesthetic modalities, and those not reporting outcomes during the first 24 hours were excluded. Data were synthesized, and a random effects meta-analysis was performed to determine postoperative pain, opioid use, and complications based on anesthetic modality at multiple time points (0-4, 4-8, 8-12, 12-24 hours).

Results: A total of 263 studies were screened, of which 27 level 1 studies (n = 16 regional blocks; n = 12 local; n = 4 spinal) met the inclusion criteria and were included in the meta-analysis. VAS scores were significantly lower in patients receiving a regional block as compared with spinal anesthesia 8 to 12 hours after surgery ($P < .01$), patients receiving an FNB versus ACB at 12 to 24 hours ($P < .01$), and those treated with a continuous FNB rather than single-shot regional blocks (FNB, ACB) at 12 to 24 hours ($P < .01$). No significant difference in VAS was appreciated when spinal, regional, and local anesthesia groups were compared.

Conclusion: Based on evidence from level 1 studies, pain control after primary ACLR based on VAS was significantly improved at 8 to 12 hours in patients receiving regional anesthesia as compared with spinal anesthesia. Pain scores were significantly lower at 12 to 24 hours in patients receiving FNB versus ACB and those treated with continuous FNB rather than single-shot regional anesthetic.

BACK

Multicenter Outcomes After Revision Hip Arthroscopy: Comparative Analysis of 2-Year Outcomes After Labral Repair Versus Labral Reconstruction

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Background: There is a paucity of literature evaluating patient outcomes in patients undergoing revision labral repair and labral reconstruction.

Purpose: To compare outcomes in patients undergoing revision hip arthroscopy for treatment of labral tears by labral repair or labral reconstruction.

Study Design: Cohort study; Level of evidence, 3.

Methods: A retrospective review of a prospectively maintained multicenter database of patients undergoing hip arthroscopy was performed. An a priori power analysis determined that a total of 62 patients were required. Patients undergoing revision hip arthroscopy for labral tears with completed 2-year outcome scores were included. Patients undergoing primary hip arthroscopy, labral debridement, concomitant gluteal repair, and patients with hip dysplasia (lateral center-edge angle <20°) were excluded. Patients were grouped into revision labral repair and labral reconstruction groups. Patient demographics and patient-reported outcomes (PROs) including Hip Outcome Score – Activities of Daily Living, Hip Outcome Score – Sport Subscale, modified Harris Hip Score, international Hip Outcome Tool-12, visual analog scale for pain and satisfaction, and achievement of minimal clinically important difference (MCID) and Patient Acceptable Symptom State (PASS) were analyzed.

Results: A total of 40 patients underwent revision labral repair and 55 patients underwent labral reconstruction. Patients undergoing revision labral repair were younger (mean age, 30.0 ± 10.7 years vs 34.4 ± 9.7 years; P = .048), had lower rates of labral degeneration (25.0% vs 62.7%; P = .004), and had lower rates of severe complexity of tears (21.1% vs 66.0%; P = .003). However, the labral repair group had higher rates of articular cartilage damage (62.5% vs 33.3%; P = .009). There were no differences in any preoperative or 2-year postoperative PROs. Furthermore, no differences were seen in achievement of MCID or PASS in any PRO.

Conclusion: In this multicenter study on revision hip arthroscopy, patients undergoing revision labral repair were younger and had better labral characteristics but greater cartilage damage compared with patients undergoing labral reconstructions. Despite these differences, patients who underwent labral repair reported similar outcomes to those undergoing labral reconstruction.

BACK

Miscellaneous

BACK