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Rotator Cuff Delamination Is Associated With Increased Tendon Retraction and Higher Fatty Muscle Infiltration: A Comparative Study on Arthroscopy and Magnetic Resonance Imaging

J.E.Schanda, M. Eigenschink, et al.

DOI: <https://doi.org/10.1016/j.arthro.2021.12.028>

Purpose

To investigate (1) tendon delamination according to different rotator cuff tear patterns as well as (2) the association of tendon retraction and fatty muscle infiltration with delamination of the rotator cuff. Furthermore, we aimed to establish the accuracy of magnetic resonance imaging for the detection of rotator cuff delamination.

Methods

Magnetic resonance imaging scans of patients who underwent arthroscopic rotator cuff repair from 2013 to 2015 were retrospectively compared to intraoperative findings. Prevalences of tendon delamination, tendon retraction, and fatty muscle infiltration were categorized according to different rotator cuff tear patterns. For comparability of the amount of tendon retraction of delaminated and non-delaminated rotator cuff tears, we introduced the global retraction index, a description individually assessing tendon retraction in magnetic resonance imaging scans of all visible layers.

Results

Of 349 shoulders, tendon delamination was observed in 231 patients (66.2%). Of these, rotator cuff delamination was most commonly seen in posterosuperior rotator cuff tears (84.6%). Delaminated rotator cuff tears presented with a significantly higher global retraction index ($P < .001$) as well as higher fatty muscle infiltration of the supraspinatus ($P = .001$) and infraspinatus ($P = .001$). Magnetic resonance imaging had only moderate accuracy (57.3%) to detect rotator cuff delamination, with a positive predictive value of 100% (95% confidence interval [CI] 95.6% to 100.0%) and a negative predictive value of 44.2% (95% CI 38.1% to 50.4%).

Conclusions

Tendon delamination was most commonly observed in posterosuperior rotator cuff tears. Delaminated rotator cuff tears showed a significantly greater tendon retraction as well as a higher amount of fatty muscle infiltration of the supraspinatus and infraspinatus. Magnetic resonance imaging has only moderate accuracy for detection of rotator cuff delamination.

Level of Evidence

III, retrospective cohort study.

Clinical and Radiologic Outcomes of All-Arthroscopic Latarjet Procedure With Modified Suture Button Fixation: Excellent Bone Healing With a Low Complication Rate

Z. Shao, Y. Zhao, et al.

DOI: <https://doi.org/10.1016/j.arthro.2022.01.020>

Purpose

To investigate the clinical outcomes and radiologic evaluation of an all-arthroscopic Latarjet procedure with modified button fixation.

Methods

Patients who received all-arthroscopic Latarjet procedure with modified suture button fixation between September 2015 to September 2016 were retrospectively reviewed. Indications for surgery were recurrent anterior shoulder dislocation with any 1 of these 3 conditions: glenoid defect >15%, contact-sport athlete, or failure after Bankart repair. Inclusion criteria included cases who received this surgery. Clinical outcomes were evaluated by University of California Los Angeles, ASES and Rowe score with a minimal follow-up of 3 years. Radiologic assessment on 3D computed tomography scan was performed preoperatively and postoperatively at different time points. Complications were also recorded.

Results

A total of 30 patients were eventually included in this study. The mean follow-up time was 38.0 ± 2.5 months. There were 25 patients who performed contact sports. Of them, 10 patients were without glenoid defect >15% or failed Bankart repair. The remaining 20 patients had glenoid defect >15%, including 2 failed Bankart cases. Ten patients had glenoid defect < 13.5%, and the rest 20 patients had > 13.5%. UCLA, American Shoulder and Elbow Surgeons, and Rowe score significantly improved during follow-up, and the improvement exceeded MCID for all patients. No severe complications were noted. In total, 86.7% of the graft positioning was measured as flush and 13.3% as medial. The bone union rate was 96.7% at 3 months postoperatively and at final follow-up. The remodeling process for the restoration of the normal anatomy of the lower part of glenoid was noted.

Conclusions

All-arthroscopic Latarjet with modified suture button fixation can achieve stable fixation of the coracoid, good clinical outcomes (all patients with improvement exceeding MCID), low complications rate. Furthermore, the bone remodeling process contributes to the recovery of the normal anatomy of anteroinferior glenoid.

Study Design

Case series; Level of evidence, 4.

Rotator Cuff Repair with Graft Augmentation Improves Function, Decreases Revisions, and Is Cost-Effective

R.Quigley, N.Verma, et al.

DOI: <https://doi.org/10.1016/j.arthro.2022.01.011>

Purpose

The purpose of this study is to evaluate the cost effectiveness of the use of extracellular matrix (ECM) augment at the time of primary rotator cuff repair utilizing a decision tree analysis.

Methods

A decision tree model was created utilizing the existing literature for retear rates with and without dermal graft augmentation. Costs for rotator cuff repair (hospital and surgeon fees) were based on published studies and the cost for graft augmentation was based on institutional data. Utility measures were based upon EQ-5D (European Quality of Life 5 Dimension) scores to assess for improvement in quality adjusted life years (QALY) over a 10-year postoperative period with and without graft augmentation. Cost effectiveness was assessed using the incremental cost effectiveness ratio (ICER), or the incremental cost for per QALY with graft augmentation. Cost effectiveness is based on previous literature whereby an intervention is considered cost effective if the ICER is less than \$50,000/QALY.

Results

On the basis of our decision tree analysis, total cost for rotator cuff tear without augmentation was \$12,763, while the cost increased to \$16,039 with ECM augmentation. With graft augmentation there was an improvement in 2.29 QALY, while there was an improvement of 2.05 without graft augmentation. The ICER of graft augmentation is \$14,000/QALY, well below the cost effectiveness cut-off of \$50,000/QALY. Sensitivity analysis showed the maximum cost of the ECM augment to be cost effective is \$11,921.

Conclusion

Graft augmentation does come with a significant upfront cost; however, on the basis of our decision-tree analysis, it may represent a cost-effective procedure. There is evidence to potentially consider more routine use in rotator cuff repairs, while being cost effective.

Level of Evidence

Economic: Level IV: computer simulation model (Monte Carlo simulation, Markov model) with inputs derived from Level IV studies.

High Rate of Satisfaction and Return to Play at 5-Year Follow-Up After Arthroscopic Superior-Labrum Anterior-Posterior Repairs

E.T. Hurley, E.S. Mojica, et al.

DOI: <https://doi.org/10.1016/j.arthro.2022.01.039>

Purpose

The purpose of this study was to evaluate the outcomes of patients 5 years postoperatively following arthroscopic SLAP repair, and to evaluate factors associated with satisfaction.

Methods

A retrospective review of patients who underwent SLAP repair with a minimum of 5-year follow-up was performed. Recurrence, visual analog scale (VAS) score, Subjective Shoulder Value (SSV), American Shoulder & Elbow Surgeons (ASES) score, satisfaction, whether they would undergo the same surgery again, and the rate, level and timing of return to play (RTP) were evaluated. Multilinear regression models were used to evaluate factors affecting postoperative satisfaction.

Results

Overall, 122 patients who underwent SLAP repair were included, with a mean age of 33.4 years. 81% were males, and 58.2% were participating in sport preoperatively. The mean follow-up was 86.4 ± 14.4 months. At final follow up, the mean satisfaction was 87.7%, and the mean SSV was 82.9. Overall, the rate of RTP was 85.9%, with 64.8% returning at the same level at a mean of 10.5 ± 8 months. Ultimately, 13 (10.7%) patients had a further surgery, including 10 (8.2%) patients that had a biceps tenodesis. VAS during sport ($P = .025$), SSV ($P < .001$), and time to RTP ($P = .0056$), were associated with higher satisfaction.

Conclusion

There was a high rate of satisfaction at 5-year follow-up, with excellent patient-reported outcomes but with one-tenth of patients requiring revision surgeries. Additionally, while there was an overall high rate of RTP, there was only a modest rate of RTP at their preinjury level, and overhead athletes took longer to RTP.

Level of Evidence

IV, case series.

The effect of single-dose, preoperative intravenous tranexamic acid on early postoperative pain scores after rotator cuff repair: a double-blind, randomized controlled trial

Mackenzie, S.P., Spasojevic, M. et al.

DOI: <https://doi.org/10.1016/j.jse.2022.02.023>

Background

Tranexamic acid (TXA) is commonly used in upper and lower limb arthroplasty to limit blood loss and postoperative hematoma formation. The role of TXA in rotator cuff repair (RCR) surgery is less defined. This trial assessed the effect of preoperative TXA on early postoperative pain scores.

Methods

A randomized double-blind trial was conducted in 89 patients undergoing RCR. Patients were randomized to either 2 g of intravenous TXA or placebo at induction. The primary outcome was visual analog scale (VAS)-pain score at day 3 postoperation, with secondary outcomes including VAS-pain, American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form (ASES), and Constant scores at 2, 8, 24, and 52 weeks.

Results

There was no significant difference in VAS-pain scores between groups at day 3 postoperation. Pain scores were significantly better in the TXA group at 8 weeks. There was no difference between groups at any time point in the ASES or Constant score. The TXA group had improved motion at 6 months with a reduced rate of secondary adhesive capsulitis.

Conclusion

TXA did not improve postoperative pain scores after RCR, however, patients who received the intervention demonstrated greater range of motion at 6 months with lower rates of secondary adhesive capsulitis.

Level of evidence

Level I, Randomized Controlled Trial, Treatment Study

Risk factors for failure to achieve minimal clinically important difference and significant clinical benefit in PROMIS computer adaptive test domains in patients undergoing rotator cuff repair

Tramer, J.S., Yedulla, N.R. et al.

DOI: <https://doi.org/10.1016/j.jse.2022.01.125>

Background

The Patient-Reported Outcomes Measurement Information System (PROMIS) has emerged as a valid and efficient means of collecting outcomes in patients with rotator cuff tears. The purpose of this study was to establish threshold score changes to determine minimal clinically important difference (MCID) and substantial clinical benefit (SCB) in PROMIS computer adaptive test (CAT) scores following rotator cuff repair (RCR). Additionally, we sought to identify potential risk factors for failing to achieve MCID and SCB.

Methods

Patients undergoing arthroscopic RCR were identified over a 24-month period. Only patients who completed both preoperative and postoperative PROMIS CAT assessments were included in this cohort. PROMIS CAT forms for upper extremity physical function (PROMIS-UE), pain interference (PROMIS-PI), and depression (PROMIS-D) were used with a minimum of 1.5-year follow-up. Statistical analysis was performed to determine threshold score changes to determine anchor-based MCID and SCB, as well as risk factors for failure to achieve significant clinical improvement following surgery.

Results

Of 198 eligible patients, 168 (84.8%) were included in analysis. Δ PROMIS-UE values of 5.8 and 9.7 (area under the curve [AUC] = 0.906 and 0.949, respectively) and Δ PROMIS-PI values of -11.4 and -12.9 (AUC = 0.875 and 0.938, respectively) were identified as threshold predictors of MCID and SCB achievement. On average, 81%, 65%, and 55% of patients achieved MCID for PROMIS-UE, PROMIS-PI, and PROMIS-D whereas 71%, 61%, and 38% of patients in the cohort, respectively, achieved SCB. MCID achievement in PROMIS-UE significantly differed according to risk factors, including smoking status (likelihood ratio [LR]: 9.8, $P = .037$), tear size (LR: 10.4, $P < .001$), distal clavicle excision (LR: 6.1, $P = .005$), and prior shoulder surgery (LR: 19.2, $P < .001$). Factors influencing SCB achievement for PROMIS-UE were smoking status (LR: 9.3, $P = .022$), tear size (LR: 8.0, $P = .039$), and prior shoulder surgery (11.9, $P < .001$). Significantly different rates of MCID and SCB achievement in PROMIS-PI for smoking status (LR: 7.0, $P = .030$, and LR: 5.2, $P = .045$) and prior shoulder surgery (LR: 9.1, $P = .002$, and LR: 7.4, $P = .006$) were also identified.

Discussion and Conclusion

The majority of patients showed clinically significant improvements that exceeded the established MCID for PROMIS-UE and PROMIS-PI following RCR. Patients with larger tear sizes, a history of prior shoulder surgery, tobacco users, and those who received concomitant distal clavicle excision were at risk for failing to achieve MCID in PROMIS-UE. Additionally, smokers and patients who underwent prior shoulder surgery demonstrated significantly lower improvements in pain scores following surgery.

Level of evidence

Level III, Retrospective Cohort Comparison, Prognosis Study

Tensioning device increases coracoid bone block healing rates in arthroscopic Latarjet procedure with suture-button fixation

Boileau, P., Gendreau, P. et al.

DOI: <https://doi.org/10.1016/j.jse.2022.01.126>

Background

There is growing interest in using suture buttons for coracoid fixation to avoid the complications associated with screws during the Latarjet procedure. However, achieving bone block healing is critical for successful shoulder stabilization and return to sport. The purpose of this study was to assess and compare the healing rates and positioning of the coracoid bone block fixed with cortical suture buttons that were either manually tensioned (using a knot pusher) or mechanically tensioned (using a tensioning device) during arthroscopic Latarjet procedures.

Methods

This prospective, nonrandomized, comparative study enrolled 69 consecutive patients (mean age, 27 years) who underwent an arthroscopic guided Latarjet procedure with suture-button fixation. Hand tensioning was performed in the first 34 shoulders, whereas the next 35 shoulders underwent mechanical tensioning. Twelve patients (17%) had a history of failed Bankart stabilization. The characteristics of the patients in each group in terms of age, sex, type of sport, bone loss, number of previous failed surgical procedures, smoking, and length of follow-up were comparable. Intraoperatively, the tensioning device was set at 100 N successively 3 times until complete immobilization of the bone block was confirmed, as assessed with a probe. The primary outcome measure was coracoid bone block union and position on computed tomography scan images at 6 months' follow-up. Secondary outcome measures included functional outcome scores, shoulder stability, return to sports, and complications at last follow-up.

Results

Overall, the rate of bone block healing was 74% (25 of 34 patients) in the hand-tensioning group and 94% (33 of 35 patients) in the mechanical tensioning group ($P = .043$). Smoking was an independent risk factor associated with nonunion ($P < .001$) in each group. Patient age, size of the preoperative glenoid bone defect ($<20\%$ or $>20\%$), and a history of surgery were not found to have any influence. The tensioning modality did not affect the bone block position, which was subequatorial in 92% of the cases and flush with the glenoid rim in 92%. At a mean of 34 months of follow-up (range, 24-62 months), 96% of the patients (65 of 69) had a stable shoulder and 87% returned to sports. At final follow-up, no significant difference in clinical scores was noted between the groups; no neurologic or hardware complications were observed.

Conclusion

Mechanical tensioning achieves significantly higher healing rates than hand tensioning during the arthroscopic Latarjet procedure with suture-button fixation. The use of a suture-tensioning device is a key step to the suture-button fixation technique during arthroscopic Latarjet procedures. By making the suture-button construct rigid, the tensioning device transforms the initially flexible suture into a "rigid fixation", similar to a bolt (or a rivet).

Level of evidence

Level III, Retrospective Cohort Comparison, Treatment Study

Acromial and humeral head osteolysis following superior capsular reconstruction using autologous tensor fascia lata graft

Takayama, K., Shiode, H. et al.

DOI: <https://doi.org/10.1016/j.jse.2021.12.019>

Background

Graft tear is a critical complication following superior capsular reconstruction (SCR) as it directly links with clinical outcomes. No previous reports have described acromial and humeral head osteolysis following SCR. Acromial and humeral head osteolysis may incidentally occur after SCR using autologous tensor fascia lata graft. This study aimed to demonstrate the incidence of osteolysis following SCR using autologous tensor fascia lata graft and investigate the factors that affect osteolysis.

Methods

This retrospective cohort study included patients who underwent SCR for irreparable rotator cuff tears between June 2014 and June 2019. The patients were divided into 2 groups—those with no osteolysis and those with osteolysis—and were compared. For subanalysis, patients in the osteolysis group were further divided into 3 groups according to the location of the osteolysis—acromial osteolysis, humeral head osteolysis, and acromial and humeral head osteolysis—to clarify the factors determining the location of osteolyses. The shoulder range of motion was evaluated preoperatively and 24 months postoperatively. Additionally, the following items were evaluated: condition of the subscapularis tendon, Hamada classification (grade 2 or 3), critical shoulder angle, acromiohumeral distance measured preoperatively and 24 months postoperatively, graft size, and graft thickness. In addition, the graft condition was evaluated using magnetic resonance imaging 12 months postoperatively.

Results

In total, 57 patients were enrolled and followed up for a minimum of 2 years (follow-up rate, 92% [57 of 62 cases]). Overall, the incidence of osteolysis following SCR was 35.1% (20 of 57 cases; acromial osteolysis in 7, humeral head osteolysis in 3, and acromial and humeral head osteolysis in 10). Compared with the group with no osteolysis, the osteolysis group had no inferior clinical outcomes or higher graft tear rates. The proportions of Hamada grade 3 ($P = .041$) and involvement of the subscapularis tendon ($P = .020$) were significantly higher in the osteolysis group. The relative risks of subscapularis involvement and Hamada grade 3 for osteolysis were 2.9 and 5.1, respectively. In the subanalysis, the factors determining the location of the osteolysis could not be clarified.

Conclusions

This study suggested that the progression of the Hamada classification and condition of the subscapularis tendon affect the occurrence of osteolyses. However, these osteolyses were not associated with clinical outcomes, including graft tear rate and shoulder range of motion.

Level of evidence

Level III, Retrospective Cohort Comparison, Prognosis Study

Knee Surgery, Sports Traumatology, Arthroscopy, July 2022, volume 30, issue 7, pages: 2528 - 2534

Low healing rates and moderate functional outcome after arthroscopic superior capsular reconstruction using a porcine xenograft

Cromheecke, M., Garret, J. et al.

DOI: <https://doi.org/10.1007/s00167-022-06916-5>

Purpose

In the absence of arthropathy, symptomatic massive irreparable rotator cuff tears contribute to a therapeutic challenge for orthopedic surgeons. The concept of superior capsular reconstruction (SCR) was introduced as an option for these challenging cases. The purposes of this study were to evaluate the clinical outcome scores when using a decellularized porcine xenograft and to evaluate the graft healing and incorporation.

Methods

A multicentric retrospective study of consecutive SCR's performed between 2016 and 2019 by four surgeons in four centers. Preoperative and postoperative Constant score, Subjective shoulder value (SSV) and Visual analog scale for pain (VAS) were recorded. Graft healing was evaluated by ultrasound or magnetic resonance imaging (MRI).

Results

A total of 28 shoulders were retrospectively analyzed with an average follow-up of 24 ± 9 months. One infection and four revisions (14%) to reversed shoulder arthroplasty (RSA) were reported at the final follow-up. The absolute Constant score showed a moderate, but significant improvement from 40 ± 12 to 57 ± 20 ($P = 0.001$). A significant improvement in pain scores was observed ($P < 0.001$). For patients undergoing SCR as a primary surgery, an average postoperative Constant score of 62 ± 16 was observed. This was in contrast to 43 ± 22 for patients who underwent SCR after failed rotator cuff repair. Although a strong trend in absolute differences was observed in regard to the Constant score, they did not reach statistical significance. For all other recorded outcome scores, a significant difference was reported between these groups. Graft healing was observed in (7/22) 30% of the patients. In the case of graft incorporation, an absolute constant score of 70 ± 9 was observed compared to 48 ± 21 in the graft failure group ($P = 0.003$). All cases with graft healing were considered to have a successful clinical outcome. This compared to only (7/15) 47% in the case of graft failure.

Conclusions

In these series, SCR with a dermal xenograft successfully alleviated pain, but provided only a moderate improvement in functional outcome. In the case of graft healing, satisfactory clinical outcomes and patient satisfaction were observed. The present study indicates the benefit of performing SCR as a primary surgery, yet warns against using SCR as a salvage option for failed rotator cuff repair. In this group, the use of dermal xenografts is limited by the low healing rates and high complication rate.

Level of evidence

IV. Retrospective case series, treatment study.

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Rates of Return to Manual Labor After Arthroscopic Rotator Cuff Repair

Clare K. Green, BS*, John P. Scanaliato, MD, John C. Dunn, MD, Rachel S. Rosner, Nata Parnes, MD

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Background:

Rotator cuff tears represent a significant cause of shoulder pain and dysfunction in the United States. The development of these injuries is associated with older patient age and higher levels of physical activity; however, data regarding the rate of return to work after arthroscopic rotator cuff repair in patients older than 50 years of age who have physically strenuous jobs is inconclusive.

Purpose/Hypothesis:

The purpose of this study was to report short term outcomes and return to work rates after arthroscopic rotator cuff repair in a cohort of patients aged 50 to 60 years working in manual labor jobs. It was hypothesized that arthroscopic rotator cuff repair would result in good functional outcomes for these patients and allow for return to work rates in excess of 80%.

Study Design:

Case series; Level of evidence, 4.

Methods:

Preoperative and final evaluations including the pain visual analog scale (VAS), the Single Assessment Numeric Evaluation (SANE), and the American Shoulder and Elbow Surgeons (ASES) Shoulder Score were collected. A total of 73 patients were screened for inclusion. Nineteen patients were outside of the inclusion age range, 2 underwent exclusionary concomitant procedures, and 4 patients were lost to follow up, leaving a total of 48 patients with a mean follow up of 34.02 months (range, 24-67 months) available for analysis. None of the patients were involved in a workers' compensation claim. Subgroup analysis was performed to determine if arm dominance or tear size affected surgical outcomes or return to work rates.

Results:

After arthroscopic rotator cuff repair, 43 of 48 patients (89.6%) were able to return to manual labor positions. Tears were classified using the Southern California Orthopaedic Institute Classification at the time of repair as massive (C4) in 9 patients (18.75%), large (C3) in 13 patients (27.08%), medium (C2) in 21 patients (43.75%), and small (C1) in 5 patients (10.42%). At latest follow up, the mean VAS decreased from 8.0 ± 1.81 to 0.46 ± 1.20 , the average SANE increased from 47.50 ± 18.59 to 91.88 ± 12.30 , and the average ASES score improved from 39.58 ± 10.71 to 93.44 ± 11.97 ($P < .0001$). Outcomes did not differ between patients who underwent surgery on their dominant shoulder and those who underwent surgery on their nondominant shoulder. The overall postoperative complication rate was 8.33%.

Conclusion:

Arthroscopic rotator cuff repair portended favorable outcomes and high rates of return to work in this cohort of manual laborers, with 89.6% of patients able to return to work.

Beach-Chair Versus Lateral Decubitus Positioning for Arthroscopic Posterior Shoulder Labral Repair: A Retrospective Comparison of Clinical and Patient-Reported Outcomes

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Background:

Both beach-chair and lateral decubitus patient positioning are often utilized for shoulder arthroscopy, with each offering its unique advantages and disadvantages. The surgical position is often selected according to each surgeon's preference, with no clear superiority of one position over the other.

Purpose/Hypothesis:

The purpose was to compare clinical and patient-reported outcomes between patients who underwent arthroscopic posterior labral repair in the beach-chair versus the lateral decubitus position. We hypothesized that patient positioning would not affect clinical and patient-reported outcomes.

Study Design:

Cohort study; Level of evidence, 3.

Methods:

A list of all patients diagnosed with the Current Procedural Terminology codes 29806 and 29807 between 2015 and 2019 was obtained from the medical records. Patients were only included if arthroscopic posterior labral repair with or without concomitant superior labral anterior to posterior repair was confirmed. Data collected for eligible patients included the number of anchors used, perioperative and postoperative complications, redislocations, subjective instability, reoperation, and revision. Patients were also contacted to complete several patient-reported outcome surveys. Preoperative data, perioperative data, and postoperative outcomes were compared between patients who underwent surgery in the beach-chair versus lateral decubitus position.

Results:

Overall, 126 patients were included—69 patients underwent surgery in the lateral decubitus position and 57 in the beach-chair position—with a mean follow-up of 2.6 ± 1.7 years. There were no significant pre- or perioperative differences between groups. Rates of postoperative dislocations, subjective instability, reoperations, revisions, all complications, and return to sports rates also did not differ between groups (all, $P > .05$). Finally, there was no difference between groups regarding postoperative pain, function, and subjective instability scores (all, $P > .05$). Results of the multivariate regression analysis showed that increased age was a weak independent risk factor for subjective recurrent posterior shoulder instability (odds ratio, 1.04; $P = .036$).

Conclusion:

Surgical positioning for arthroscopic posterior shoulder labral repair did not affect postoperative clinical and patient-reported outcomes. Both beach-chair and lateral decubitus position provided good outcomes for posterior shoulder labral repair, with an overall recurrence rate of 8.7%. Increased age was a weak independent risk factor for subjective recurrent instability.

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Results of Arthroscopic Revision Rotator Cuff Repair for Failed Open or Arthroscopic Repair: A Prospective Multicenter Study on 100 Cases

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Background:

Retears after rotator cuff repair (RCR) have been associated with poor clinical results. Meaningful data regarding the role of arthroscopic revision RCR are sparse thus far.

Purpose/Hypothesis:

To investigate results after arthroscopic revision RCR. We hypothesized that (1) arthroscopic revision RCR would lead to improved outcomes, (2) the clinical results would be dependent on tendon integrity and (3) tear pattern, tendon involvement, and repair technique would influence clinical and structural results.

Study Design:

Case series; Level of evidence 4.

Methods:

During a 40-month period, 100 patients who underwent arthroscopic revision RCR were prospectively enrolled in this multicenter study. Outcomes were evaluated preoperatively, at 6 months (6M), and at 24 months (24M) using the Constant score (CS), the Oxford Shoulder Score (OSS), and the Subjective Shoulder Value (SSV). Tendon integrity at 2 years was analyzed using magnetic resonance imaging. A total of 13 patients (13%) were lost to follow-up, and 14 patients (14%) had a symptomatic re-tear before the 24M follow-up.

Results:

All clinical scores improved significantly during the study period (CS: preoperative, 44 ± 16 ; 6M, 58 ± 22 ; 24M, 69 ± 19 points; OSS: preoperative, 27 ± 8 ; 6M, 36 ± 11 ; 24M, 40 ± 9 points; SSV: preoperative, $43\% \pm 18\%$; 6M, $66\% \pm 24\%$; 24M, $75\% \pm 22\%$) ($P < .01$). At 2 years, a re-tear rate of 51.8% (43/83) and a surgical revision rate of 12.6% (11/87) were observed. Mean full-thickness tear size decreased from 5.00 ± 1.61 cm² to 3.25 ± 1.92 cm² ($P = .041$). Although the Sugaya score improved from 4.5 ± 0.9 to 3.7 ± 1.4 ($P = .043$), tendon integrity did not correlate with better outcome scores. Previous open RCR, involvement of the subscapularis, chondral lesions of Outerbridge grade ≥ 2 , and medial cuff failure were correlated with poorer SSV scores at 2 years ($P \leq .047$). Patients with traumatic re-tears had better CS and OSS scores at 2 years ($P \leq .039$).

Conclusion:

Although arthroscopic revision RCR improved shoulder function, re-tears were frequent but usually smaller. Patients with re-tears, however, did not necessarily have poorer shoulder function. Patient satisfaction at 2 years was lower when primary open RCR was performed, when a subscapularis tear or osteoarthritis was present, and when the rotator cuff re-tear was located at the

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musculotendinous junction. Patients with traumatic retears showed better functional improvement after revision.

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Histologic Differences in Human Rotator Cuff Muscle Based on Tear Characteristics

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Background: Fatty accumulation in the rotator cuff is associated with shoulder dysfunction and a risk of failure of rotator cuff repair. The aims of this study were to (1) describe cellular findings in rotator cuff muscles in patients presenting with varying degrees of rotator cuff tendon pathology by examining fat content and myofiber cross-sectional area of rotator cuff muscles and (2) correlate histologic features to magnetic resonance imaging (MRI) grades derived with the Goutallier classification.

Methods: Rotator cuff muscle biopsies were performed in a consecutive series of patients undergoing arthroscopic shoulder surgery. Rotator cuffs were graded according to the Goutallier classification and labeled as either partial-thickness or full-thickness. Patients without a rotator cuff tear undergoing arthroscopic surgery served as controls. The biopsy specimens were examined using LipidTOX to visualize lipid accumulation. Laminin was used to quantify myofiber cross-sectional area.

Results: Twenty-seven patients with a rotator cuff tear and 12 without a tear (controls) were included. There were 24 males (62%). The mean age was 55 years. Patients in the control cohort were younger (mean, 46 years) than those in the treatment group (mean, 60 years, $p < 0.01$). Within the treatment group, 12 and 15 patients were recorded as having partial and full-thickness rotator cuff tears, respectively. Lipid accumulation visualized at the cellular level was fairly-to-moderately correlated with the Goutallier classification on MRI ($R_s = 0.705$, 95% confidence interval [CI] = 0.513, 0.829). Muscle biopsy specimens with a Goutallier grade of 2+ had significantly more lipid accumulation than those with grade-0 ($p < 0.01$) or grade-1 ($p < 0.01$) fatty accumulation. Muscle biopsies at the sites of full-thickness tears showed significantly greater lipid accumulation than those associated with either partial ($p < 0.01$) or no ($p < 0.01$) tears. Partial-thickness rotator cuff tears had no difference in lipid accumulation in comparison to the control group. Muscle biopsy specimens from full-thickness tears had significantly smaller myofiber cross-sectional area when compared with partial-thickness tears ($p = 0.02$) and controls ($p < 0.01$).

Conclusions: Cellular lipid accumulation correlates with the MRI Goutallier grade of fatty accumulation, thus verifying the Goutallier classification at the cellular level. Muscle biopsy specimens from partial-thickness tears are more similar to controls than to those from full-thickness tears, whereas full-thickness tears of all sizes showed significantly greater lipid content and smaller myofiber cross-sectional area compared with partial-thickness tears and controls.

Clinical Relevance: Our research confirms the utility of using the Goutallier classification to predict rotator cuff muscle quality and shows that tendon attachment, even if partially torn, protects the muscle from fatty accumulation.

InSpace Implant Compared with Partial Repair for the Treatment of Full-Thickness Massive Rotator Cuff Tears: A Multicenter, Single-Blinded, Randomized Controlled Trial

Verma, Nikhil; Srikumaran, Uma; Roden, Colleen M.; Rogusky, Edwin J.; Lapner, Peter; Neill, Heather; Abboud, Joseph A.; on behalf of the SPACE GROUP

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Background: The purpose of this study was to prospectively evaluate the efficacy and safety of a subacromial balloon spacer (InSpace implant; Stryker) compared with arthroscopic partial repair in patients with irreparable, posterosuperior massive rotator cuff tears.

Methods: Patients ≥ 40 years of age with symptomatic, irreparable, posterosuperior, massive rotator cuff tears and an intact subscapularis who underwent failed nonoperative management were included in this randomized controlled trial comparing the InSpace implant with partial repair. Clinical outcome data were collected at baseline through a 24-month follow-up. The primary outcome was improvement in the American Shoulder and Elbow Surgeons (ASES) scores. The secondary outcomes included change from baseline in the Western Ontario Rotator Cuff (WORC) score, the visual analog scale (VAS) pain score, the Constant-Murley shoulder score, the EuroQol-5 Dimensions-5-Level (EQ-5D-5L) score, active range of motion, and operative time. Complications and reoperations for each group were also recorded.

Results: Twenty sites randomized 184 patients: 93 in the InSpace group and 91 in the partial repair group. Significant and clinically relevant improvements in the ASES score from baseline were noted in both groups at Month 12 and were maintained at Month 24. Overall, 83% of patients in the InSpace group and 81% of patients in the partial repair group achieved the ASES minimally clinically important difference threshold, and 82% of patients in the InSpace group and 79% of patients in the partial repair group achieved the substantial clinical benefit threshold. Forward elevation was significantly greater in the InSpace group compared with the partial repair group at Day 10 ($p = 0.04$), Week 6 ($p = 0.0001$), Month 12 ($p = 0.005$), and Month 24 ($p = 0.003$). The operative time was significantly shorter in the InSpace group ($p < 0.0001$). No device-related surgical complications were noted, and 4 reoperations after InSpace implantation and 3 reoperations after partial repair were required.

Conclusions: The InSpace implant is an appropriate alternative to partial repair in patients with irreparable posterosuperior massive rotator cuff tears and an intact subscapularis. Notable benefits include early functional recovery and pain relief combined with a shorter operative time.

Level of Evidence: Therapeutic Level I. See Instructions for Authors for a complete description of levels of evidence.

Lower Extremity

Journal of Arthroscopy, Volume 38, Issue 7

Earlier Treatment Yields Superior Outcomes in Competitive Athletes Undergoing Primary Hip Arthroscopy

A.E. Jimenze, P.F. Monahan, et al.

DOI: <https://doi.org/10.1016/j.arthro.2021.11.053>

Purpose

To report minimum 2-year patient-reported outcome scores (PROs) and return to sport (RTS) for competitive athletes undergoing primary hip arthroscopy for femoroacetabular impingement syndrome within 1 year of symptom onset and to compare these results with a propensity-matched control group of competitive athletes with symptoms for over 1 year.

Methods

Data on professional, collegiate, high-school, and organized amateur athletes who underwent primary hip arthroscopy within 1 year of symptom onset between April 2008 and November 2017 were collected. RTS and minimum 2-year PROs were collected for the modified Harris Hip Score (mHHS), Non-arthritic Hip Score (NAHS), Hip Outcome Score-Sport Specific Subscale (HOS-SSS), International Hip Outcome Tool (iHOT-12), and visual analog pain scale (VAS). Rates of achieving minimal clinically important difference (MCID) were also evaluated. These patients were propensity-matched to a control group of competitive athletes with symptoms for over one year for comparison.

Results

Fifty competitive athletes (51 hips, 54.9% female) were included in the study group with a mean follow-up of 70.9 ± 29.1 months and age of 23.6 ± 11.3 years. They demonstrated significant improvement from preoperative to latest follow-up for all recorded PROs ($P < .001$) and RTS at a rate of 72.9%. When outcomes were compared to the control group, the study group demonstrated similar preoperative scores for all PROs but significantly better minimum 2-year postoperative scores for NAHS (93.8 vs 85.1, $P = .0001$), HOS-SSS (89.1 vs 77.2, $P = .001$), iHOT-12 (87.7 vs 76.4, $P = 0.011$), and VAS (1.5 vs 2.4, $P = 0.027$). Rates of achieving MCID for HOS-SSS and mHHS were comparable between groups. Further, RTS rates were similar between groups ($P = .301$).

Conclusion

Competitive athletes undergoing primary hip arthroscopy with symptoms for less than 1 year demonstrated superior 2-year PROs compared to a propensity-matched control group with symptoms for over 1 year, but the rates achieving MCID and RTS were similar between groups.

Level of Evidence

Level III, retrospective comparative study.

[BACK](#)

Younger Age, Capsular Repair, and Larger Preoperative Alpha Angles Are Associated With Earlier Achievement of Clinically Meaningful Improvement After Hip Arthroscopy for Femoroacetabular Impingement Syndrome

V.W. Ouyang, B.R. Saks, et al.

DOI: <https://doi.org/10.1016/j.arthro.2021.12.007>

Purpose

The purpose of the study was to analyze demographic, radiographic, and intraoperative factors that influence the time to achieve the minimal clinically important difference (MCID) and maximum outcome improvement satisfaction threshold (MOIT) after primary hip arthroscopy for femoroacetabular impingement syndrome (FAIS) and labral tear.

Methods

Included patients had undergone hip arthroscopy with labral repair or reconstruction for FAIS with labral tear between February 2008 and October 2018. Patients were excluded if they had a prior ipsilateral hip surgery, prior hip conditions, a Tonnis grade > 1, or were unwilling to participate. Multiple demographic, radiographic, and intraoperative variables were collected. The modified Harris Hip Score (mHHS) and Non-Arthritic Hip Score (NAHS) were collected before surgery and at 3 months, 1 year, and 2 years after surgery. The MCID and MOIT for the mHHS and NAHS were either calculated or determined through previously published values. A time-to-event analysis was performed to determine variables predictive of early or delayed achievement of MCID or MOIT. Early achievement was defined as achieving MCID or MOIT at the 3-month timepoint.

Results

Six hundred thirty-two hips (632 patients) were included. Of those that achieved MCID and MOIT, 428 (73.0%) and 414 (73.0%) patients achieved MCID and 253 (47.9%) and 264 (52.5%) patients achieved MOIT by 3 months after surgery for mHHS and NAHS, respectively. Younger age, capsular repair, and increasing alpha angle were associated with earlier achievement for either MCID or MOIT. Increasing age, worker's compensation claims, and higher baseline patient-reported outcome measure scores were associated with delayed achievement for either MCID or MOIT.

Conclusions

Most of the patients who achieved MCID and MOIT for mHHS and NAHS did so by 3 months after surgery. Younger age, capsular repair, and increasing alpha angle were associated with earlier achievement of MCID and MOIT after hip arthroscopy.

Level of Evidence

Level IV, case series.

Duration of Care and Operative Time Are the Primary Drivers of Total Charges After Ambulatory Hip Arthroscopy: A Machine Learning Analysis
Y. Lu, O. Lavoie-Gagne, et al.

DOI: <https://doi.org/10.1016/j.arthro.2021.12.012>

Purpose

To develop a machine learning algorithm to predict total charges after ambulatory hip arthroscopy and create a risk-adjusted payment model based on patient comorbidities.

Methods

A retrospective review of the New York State Ambulatory Surgery and Services database was performed to identify patients who underwent elective hip arthroscopy between 2015 and 2016. Features included in initial models consisted of patient characteristics, medical comorbidities, and procedure-specific variables. Models were generated to predict total charges using 5 algorithms. Model performance was assessed by the root-mean-square error, root-mean-square logarithmic error, and coefficient of determination. Global variable importance and partial dependence curves were constructed to show the impact of each input feature on total charges. For performance benchmarking, the best candidate model was compared with a multivariate linear regression using the same input features.

Results

A total of 5,121 patients were included. The median cost after hip arthroscopy was \$19,720 (interquartile range, \$12,399-\$26,439). The gradient-boosted ensemble model showed the best performance (root-mean-square error, \$3,800 [95% confidence interval, \$3,700-\$3,900]; logarithmic root-mean-square error, 0.249 [95% confidence interval, 0.24-0.26]; $R^2 = 0.73$). Major cost drivers included total hours in facility less than 12 or more than 15, longer procedure time, performance of a labral repair, age younger than 30 years, Elixhauser Comorbidity Index (ECI) of 1 or greater, African American race, residence in extreme urban and rural areas, and higher household and neighborhood income.

Conclusions

The gradient-boosted ensemble model effectively predicted total charges after hip arthroscopy. Few modifiable variables were identified other than anesthesia type; nonmodifiable drivers of total charges included duration of care less than 12 hours or more than 15 hours, operating room time more than 100 minutes, age younger than 30 years, performance of a labral repair, and ECI greater than 0. Stratification of patients based on the ECI highlighted the increased financial risk borne by physicians via flat reimbursement schedules given variable degrees of comorbidities.

Level of Evidence

Level III, retrospective cohort study.

Arthroscopic Hip Capsular Reconstruction Using Iliotibial Band Allograft as a Salvage Option for Unreparable Capsular Defects Demonstrates Good Survivorship and Improved Patient-Reported Outcomes

J.J. Ruzbarsky, M.N. Seiter, et al.

DOI: <https://doi.org/10.1016/j.arthro.2021.12.035>

Purpose

To describe patient outcomes 3 to 5 years after arthroscopic hip capsule reconstruction.

Methods

Between January 2007 and December 2016, patients aged 18 to 50 years who underwent arthroscopic hip capsular reconstruction using an Iliotibial band allograft by the senior author and had minimum of 3-year follow-up were identified. Patients were excluded if they had previous open hip surgery, advanced osteoarthritis (Tönnis grade >2), significant acetabular dysplasia (lateral center edge angle <20°), avascular necrosis, or Legg–Calve–Perthes disease. Outcome scores including the Hip Outcome Score (HOS)-Activities of Daily Living scale, modified Harris Hip Score, HOS-Sports scale, SF-12, and Western Ontario & McMaster Universities Osteoarthritis Index were compared in addition to failure rate, revision rate, and patient satisfaction rate with the outcome (range, 1-10). All patients were assessed by the senior author pre- and postoperatively.

Results

Thirty-nine patients met the inclusion criteria. The mean age of the cohort was 32 ± 10 years, with 6 male and 33 female patients. The average number of previous hip arthroscopy surgeries was 2 ± 1 . Six patients (15%) converted to total hip arthroplasty at an average of 2.1 years (range 7 months to 6 years) following capsular reconstruction. Four patients required revision hip arthroscopy after the arthroscopic capsular reconstruction. All arthroscopic revisions occurred in female patients with the primary intraoperative finding of capsulolabral adhesions at the time of revision. At mean follow-up of 4.3 years (range 3-6.8 years), the 29 patients who did not require subsequent surgery had significant improvements from preoperatively to postoperatively in HOS-Activities of Daily Living and HOS-Sport with 90% reaching minimal clinically important difference. All other scores showed significant improvement. Survival for patients not requiring total hip arthroplasty was 86% at 3 years, with a mean survival of 5.7 years (95% confidence interval 4.97-6.4).

Conclusions

Arthroscopic hip capsular reconstruction with iliotibial band allograft is a successful treatment option for patients with symptomatic capsular defects, demonstrating improved patient-reported outcomes maintained at mean follow-up time of 4 years. This technique offers restoration of the anatomic structure and function of the capsular ligaments to improve pain and instability.

Level of Evidence

IV, case series.

Self-Reported Cannabis Use Is Not Associated With Increased Opioid Use or Costs After Hip Arthroscopy

J.T. Wood, S. Sambandam, et al.

DOI: <https://doi.org/10.1016/j.arthro.2021.12.040>

Purpose

Our purpose is to determine the difference in cost, opioid use, and complication rates following hip arthroscopy with or without perioperative cannabis use.

Methods

Data were collected from a large commercial insurance database (PearlDiver) between the years 2010 and 2019. Patients who underwent hip arthroscopy with reported cannabis use were identified using Common Procedural Terminology codes and the appropriate International Classification of Diseases codes. This group was then matched by age, procedure, gender, Charleston Comorbidity Index, Elixhauser Comorbidity Index), obesity, tobacco use, diabetes to a group of similar patients without self-reported cannabis use. Opioid use over the episode of care, evaluated by morphine milligram equivalents (MME), and 30-day cost were compared between groups using unequal variance t-test.

Results

Of queried patients, 360 (.71%) had a diagnosis of preoperative cannabis use, abuse, or dependence within 5 years prior to their hip arthroscopy. A total of 300 patients (172 female, 128 male) were matched into each hip arthroscopy group, with and without cannabis. Of those patients, 171 without cannabis use and 174 with cannabis use had full financial and opioid use data for analysis. Prescription opioid use was not significantly different over the episode of care in patients with reported cannabis use ($1,840 \pm 2,743$ MME) than those without reported cannabis use ($2,129 \pm 3,383$ MME) ($P = .3848$). Additionally, episode of care reimbursement cost following hip arthroscopy did not differ significantly between patients with cannabis use ($\$2,957 \pm \$4,428$) and those without reported cannabis use ($\$2,651 \pm \$3,762$) ($P = .3620$).

Conclusions

Following hip arthroscopy, patients with reported cannabis use do not appear to have significantly different postoperative opioid use or cost of hip arthroscopy episode of care compared with patients without reported cannabis use.

Level of Evidence

III, cohort study.

Tibiofemoral Relationship 3 Weeks After Anatomic Triple-Bundle Anterior Cruciate Ligament Reconstruction With 10 N of Initial Tension Is Closer to Normal Knee Versus That With 20 N of Initial Tension

Y. Tachibana, T. Mae, et al.

DOI: <https://doi.org/10.1016/j.arthro.2021.12.027>

Purpose

This study aimed to clarify the effect of initial graft tension on the ensuing tibiofemoral relationship and on 2-year clinical outcomes after anatomic triple-bundle anterior cruciate ligament (ACL) reconstruction.

Methods

A total of 31 patients with primary unilateral ACL rupture (mean age, 25.1 years) were enrolled. Anatomic triple-bundle ACL reconstruction was performed using semitendinosus tendon autografts, and patients were grouped according to the total initial tension at graft fixation: 20 N for 16 patients between January 2012 and December 2012 and 10 N for 15 patients between January 2013 and December 2013. Three-dimensional computed tomography scans were performed preoperatively and at 3 weeks and 6 months postoperatively. The side-to-side difference of the 3-dimensional tibial position relative to the femur was compared at each time point. The side-to-side difference in anterior laxity was sequentially compared preoperatively, immediately after surgery, and at 6 months and 2 years postoperatively. Clinical outcomes at 2 years were likewise compared.

Results

One patient in each group was excluded because of secondary ACL injury. At 3 weeks postoperatively, 2.5 ± 1.3 and 1.0 ± 1.3 mm of posterior tibial displacement and $3.8^\circ \pm 2.4^\circ$ and $2.0^\circ \pm 1.7^\circ$ of external rotation were observed in the 20- and 10-N initial tension groups, respectively, with significant differences ($P = .006$ and $.033$). At 6 months postoperatively, anterior displacement was 0.1/0.1 mm and external rotation was $0.8^\circ/0.4^\circ$ in both groups, without any significant differences. The 2-year clinical outcomes were satisfactory, including mean side-to-side difference in anterior knee laxity of 0.5 mm in both groups.

Conclusion

The tibiofemoral relationship 3 weeks after anatomic triple-bundle ACL reconstruction with 10 N of initial tension is less constrained than that with 20 N. Six-month tibiofemoral relationship and 2-year clinical outcomes are satisfactory in both groups.

Level of Evidence

III, retrospective comparative trial

Bone Marrow Aspirate Concentrate Augmentation May Accelerate Allograft Ligamentization in Anterior Cruciate Ligament Reconstruction: A Double-Blinded Randomized Controlled Trial

B. Forsythe, J. Chahla, et al.

DOI: <https://doi.org/10.1016/j.arthro.2022.01.010>

Purpose

To assess the effect of bone marrow aspiration concentrate (BMAC) augmentation on clinical outcomes and magnetic resonance imaging (MRI) findings in anterior cruciate ligament (ACL) reconstruction (ACLR) with bone–patellar tendon–bone (BTB) allografts.

Methods

A double-blinded, randomized controlled trial was conducted on 80 patients undergoing ACL reconstruction using BTB allografts. Patients were randomized to 2 groups: (1) bone marrow aspirate was collected from the iliac crest, concentrated, and approximately 2.5 mL was injected into the BTB allograft, or (2) a small sham incision was made at the iliac crest (control). MRI was performed at 3 months and 9 months postoperatively to determine the signal intensity ratio of the ACL graft.

Results

Seventy-three patients were available for follow-up at 1-year postoperatively (36 BMAC, 37 control). International Knee Documentation Committee (IKDC) scores were significantly greater in the BMAC group versus the control at the 9-month postoperative period (81.6 ± 10.5 vs 74.6 ± 14.2 , $P = .048$). There was no significant difference in the proportion of patients who met the minimal clinically important difference for IKDC between the BMAC and control groups at 9 months (89% vs 85%; $P = .7$). Three months postoperatively, signal intensity ratio of the inferior third of the ACL graft was significantly greater in the BMAC group versus the control group (3.2 ± 2.2 vs 2.1 ± 1.5 ; $P = .02$).

Conclusions

Patients who received BMAC augmentation of the BTB allograft during ACL reconstruction demonstrated greater signal intensity scores on MRI at 3 months, suggesting increased metabolic activity and remodeling, and potentially accelerated ligamentization. Additionally, patients in the BMAC group had greater patient-reported outcomes (IKDC) at 9 months postoperatively when compared with those who underwent a standard surgical procedure. There was no significant difference in the proportion of patients who met the minimal clinically important difference for IKDC between the BMAC and control groups at 9 months, suggesting limited clinical significance at this time point.

Level of Evidence

I, randomized control trial.

Modified Pulvertaft on Weave Technique Restores Full Active Knee Extension in Patients With Large Chronic Quadriceps Tendon Rupture: A Case Series

J.L. Rocha de Faria, C.T. Laett, et al.

DOI: <https://doi.org/10.1016/j.arthro.2022.01.023>

Purpose

We aimed to investigate the clinical and functional outcomes, including maximal and explosive strength, after chronic quadriceps tendon rupture repair with Modified Pulvertaft on Weave (MPW) technique

Methods

Knee joint range of motion (ROM), patella height, thigh circumference, and Lysholm and International Knee Documentation Committee (IKDC) scores were assessed preoperatively and postoperatively. The knee extensors maximal (isokinetic peak torque and isometric maximal voluntary contraction (MVC) torque) and explosive strength—rate of torque development (RTD) early [RTD50 and RTD100] and late [RTD250]—were performed. We assessed the thigh circumference and vastus lateralis muscle thickness (MT) as indicators of quadriceps muscle mass, and the voluntary quadriceps activation using surface electromyography (EMG50).

Results

Nine patients (mean age: 53 ± 11 years) took part in the study. We observed a significant increase in the knee active ROM and a decreased extension deficit (both, $P < .001$), but not for pain ($P = .07$), IKDC ($P = .07$), and Lysholm ($P = .21$) after the surgery. We did not observe a difference between involved ($n = 8$) and uninvolved ($n = 10$) limbs for ROM, thigh circumference, and MT. We observed differences for extensors peak torque, MVC torque, and late RTD (all, $P < .05$). However, we did not observe differences for early RTD and EMG50. Significant positive correlations were observed for RTD50 ($\rho = .80$) and RTD100 ($\rho = .81$) vs EMG50. Both the IKDC and Lysholm were better correlated with the early than with later RTD.

Conclusions

The MPW reestablished the active knee extension. The same level of quadriceps muscle mass was observed in both limbs, suggesting a lack of hypotrophy due to the injury. Although the involved limb had demonstrated lower knee extensors maximal strength, they demonstrate an equivalent early RTD when compared to the uninvolved limb. The early RTD seems to be better correlated with the patient's functionality than the later RTD and maximal strength.

Level of Evidence

IV, case series.

Early Identification of Arthrofibrosis in Adolescents Following Anterior Cruciate Ligament Reconstruction Is Associated With the Need for Subsequent Surgery: A Matched Case–Control Study

S. Baghdadi, T.J. Ganley, et al.

DOI: <https://doi.org/10.1016/j.arthro.2022.01.043>

Purpose

To identify the postoperative characteristics associated with the need for subsequent surgical intervention in pediatric anterior cruciate ligament reconstruction (ACLR).

Methods

Patients ≤ 18 years old who received operative treatment for arthrofibrosis following ACLR versus age- and sex-matched controls with a satisfactory postoperative course were retrospectively reviewed. The range of knee motion preoperatively and at each postoperative visit was recorded. Based on the typical post-operative protocols, visits were categorized into 3 groups: first (first 4 weeks), second (weeks 5-8), and third (weeks 9-16) visits. The deficit in the total arc of range of motion (ROM) in the operative knee relative to the nonoperative knee and the change in ROM between visits were compared. Receiver operating characteristic analysis was performed to determine the time point in which a diagnosis of arthrofibrosis could be predicted with the greatest accuracy.

Results

In total, 18 patients with arthrofibrosis (mean age 14.2 ± 2.7 years, 9 male) and 36 control patients were included in the final analysis. Arthrofibrosis patients had significantly larger ROM deficits at all visits, 93° vs 69° for the first, 69° vs 24° for the second, and 56° vs 2° for the third, compared with controls ($P < .001$ for all). Pairwise comparisons showed that in arthrofibrosis cases, the total ROM did not change significantly between the second and third visits ($P = .77$), contrary to the controls. Receiver operating characteristic analysis revealed that the total ROM deficit of 50.7° at the second postoperative visit is 89% sensitive and 92.5% specific for development of arthrofibrosis.

Conclusions

We found that patients who go on to need manipulation of the knee under anesthesia/arthroscopic lysis of adhesions do not experience a significant improvement in ROM after the first 5-8 weeks, and that a ROM deficit of $>50^\circ$ at the 5- to 8-week mark postoperatively, is associated with ultimately needing operative intervention for arthrofibrosis. Based on these findings, it may be appropriate to intervene earlier if a patient still has a ROM deficit exceeding 50° by the second postoperative month.

Level of Evidence

Level III, retrospective comparative prognostic trial.

Radiofrequency Ablation in Cooled Monopolar or Conventional Bipolar Modality Yields More Beneficial Short-Term Clinical Outcomes Versus Other Treatments for Knee Osteoarthritis: A Systematic Review and Network Meta-Analysis of Randomized Controlled Trials

L. Wu, Y. Li, et al.

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Purpose

To evaluate various radiofrequency ablation (RFA) treatments for knee osteoarthritis (OA) and determine the best modality, target, number of electrodes, and image guidance for improving knee pain and function.

Methods

Electronic databases were searched for randomized controlled trials (RCTs) comparing the efficacy of RFA treatments for knee OA from inception up to September 30, 2021. The primary outcome was the visual analog scale (VAS), and the secondary outcome was the Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC). Bayesian network meta-analysis was performed to synthesize the mean difference (MD) and rank the comparative effectiveness of treatments.

Results

A total of 21 eligible RCTs (from 2011 to 2021, involving 1,818 patients) with 8 RFA treatments, 6 intra-articular injections, NSAIDs, exercise, and placebo were assessed. Conventional bipolar genicular nerve RFA (GNRFA) had the greatest net benefit on the VAS at 6 months (MD, -5.5; 95% confidence interval [CI], -4.3 to -6.7; SUCRA, .98). And cooled monopolar GNRFA had the greatest net benefit on the WOMAC at 6 months (MD, -33; 95% CI, -37 to -29; SUCRA, .99). In conventional and pulsed modalities, bipolar RFA was associated with a significant decrease in VAS and WOMAC than monopolar RFA. Combining pulsed intra-articular RFA and platelet-rich plasma injection had no additional positive effects on VAS or WOMAC at 3 months.

Conclusions

RFA is effective in improving both knee pain and function in patients with OA, at least in the short term (6 months). Patients respond better to the cooled modality than the conventional and pulsed modalities. Bipolar is more effective than monopolar for improving pain and function in conventional and pulsed modalities. Fluoroscopy and ultrasound guidance showed no differences in improving pain and function. The effectiveness of RFA in cooled modality using bipolar or in combination with various intra-articular injections remains to be compared.

Level of Evidence

II, systematic review and meta-analysis of Level I and II studies.

Inconclusive and Contradictory Evidence for Outcomes After Hip Arthroscopy in Patients With Femoroacetabular Impingement and Osteoarthritis of Tönnis Grade 2 or Greater: A Systematic Review

Aa Andronic, L. S. Claydon-Mueller, et al.

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Purpose

To investigate whether hip arthroscopy (HA) is effective in patients with femoroacetabular impingement and concomitant hip osteoarthritis (OA) of Tönnis grade 2 or greater.

Methods

This review was registered in the International Prospective Register for Systematic Reviews and Meta-analysis (PROSPERO, CRD42020210936). It followed the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) guidelines and included multiple databases: MEDLINE, Embase, Web of Science Core Collection, and Cochrane Library. All studies in English or German from database inception to December 1, 2020, that investigated outcomes of HA in patients with OA of Tönnis grade 2 or greater were considered eligible. The risk of bias was assessed using the MINORS (Methodological Index for Non-randomized Studies) tool. Data heterogeneity was explored using the I² test in a random-effects model.

Results

Eleven studies met the eligibility criteria. The MINORS (Methodological Index for Non-randomized Studies) score averaged 68% (range, 46%-81%). A total of 616 hips, consisting of 247 hips of interest (Tönnis grade 2 or greater) and 369 controls, were included. The weighted estimated follow-up averaged 29.1 months (range, 12-84 months). Data on patient-reported outcome measures (PROMs) could be extracted for 6 of 11 studies, and data on conversion to total hip arthroplasty were available for 8 of 11. Four studies reported an overall improvement in PROMs after HA, and 2 highlighted a failure of improvement in PROMs. Failure of HA with conversion to total hip arthroplasty was observed at a rate of 0% to 9% in 4 studies, as opposed to proportions as high as 35% to 70% in the other 4 studies. There was a high level of heterogeneity, with a calculated I² value of 89%.

Conclusions

There is currently contradictory and insufficient evidence regarding the efficacy of HA for hips with femoroacetabular impingement and concomitant OA of Tönnis grade 2 or greater. This is in the context of data with low levels of evidence, mainly consisting of retrospective case series (Level IV) with a high risk of bias and high heterogeneity (I² of approximately 90%).

Level of Evidence

Level IV, systematic review of Level III and IV studies.

Smaller Gap Formation With Suture Anchor Fixation Than Traditional Transpatellar Sutures in Patella and Quadriceps Tendon Rupture: A Systematic Review

J. R. Onggo, S. Babazadeh, et al.

DOI: <https://doi.org/10.1016/j.arthro.2022.01.012>

Purpose

The purpose of this study is to compare the biomechanical properties between traditional transosseous tunnel and suture anchor technique repair for extensor mechanism ruptures and assess for differences in the mechanism of failure of both techniques.

Methods

A multi-database search (PubMed, EMBASE, and Medline) was performed according to PRISMA guidelines on November 14, 2021. All articles comparing biomechanical properties of transpatellar and suture anchor technique for extensor mechanism ruptures were included. Abstracts, reviews, case reports, studies without biomechanical analysis, conference proceedings, and non-English language studies were excluded. Outcomes pursued included gap formation, load to failure, and mechanism of failure. Relevant data from studies meeting inclusion criteria were extracted and analyzed. Study methodology was assessed using the Methodological Index for Non-Randomized Studies score.

Results

A total of 212 knees were biomechanically assessed, including 98 patella and 114 quadriceps tendon ruptures. Five patellar tendon studies were included, and all of them reported significantly smaller gap formation in suture anchor group. Gap formation for suture anchors ranged from .9 mm to 4.1 mm, while that of transpatellar group ranged from 2.9 mm to 10.3 mm. One study reported a significantly higher load to failure in the suture anchor group, while the remaining four studies reported no significant difference. Load to failure for suture anchor ranged from 259 N to 779 N, while that of the transpatellar group ranged from 287 N to 763 N. The most common mechanism of failure was anchor pullout in suture anchor and knot failure in the transpatellar group. Five quadriceps tendon studies were included, and three studies reported statistically significant smaller gap formation in the suture anchor group. Gap formation for suture anchor ranged from 1.5 mm to 5.0 mm, while that of transpatellar group ranged from 3.1 mm to 33.3 mm. Two studies reported a significantly higher load to failure in the suture anchor group, while one study reported a higher load to failure in the transpatellar repair group. Load to failure for suture anchor ranged from 286 N to 740 N, while that of transpatellar group ranged from 251 N to 691 N. The most common mechanism of failure was suture failure in the suture anchor and knot failure in the transpatellar group.

Conclusion

Suture anchor fixation displays a better biomechanical profile than traditional transpatellar techniques in terms of smaller gap formations in the repair of both patella and quadriceps tendon injuries. Anchor pullout in suture anchor fixation was present mainly with the use of titanium anchors.

Clinical Relevance

These findings above may result in better retention of tendon approximation in patella and quadriceps tendon fixation postoperatively, which may result in earlier recovery. Further randomized controlled clinical trials to compare these techniques are required.

[BACK](#)

Increased Posterior Tibial Slope and Meniscal Slope Could Be Risk Factors for Meniscal Injuries: A Systematic Review

J. Jiang, Z. Liu, et al.

DOI: <https://doi.org/10.1016/j.arthro.2022.01.013>

Purpose

The purpose of this systematic review was to summarize the available evidence and examine the relation between the posterior tibial slope (PTS) and meniscal slope (MS) and the incidence of meniscal injury.

Methods

PubMed, Embase, the Cochrane Central Register of Controlled Trials, and Web of Science were searched from inception to February 23, 2021. Cohort studies investigating the association between PTS or MS and the risk of meniscal injury were included. Two authors independently conducted the literature search, data extraction, and quality assessment.

Results

Sixteen studies with a total of 2,670 patients were included. For meniscal injury with an anterior cruciate ligament tear, the lateral PTS in the lateral meniscal root tear group (range, 8.0°-12.6°) was significantly higher than that in the control group (range, 4.0°-10.7°). Furthermore, there appeared to be a relation between a greater medial MS and the presence of a ramp lesion (range, 2.6°-6.7° for ramp lesion vs 2.0°-5.1° for control). For degenerative meniscal injury, the medial PTS in the medial meniscal posterior root tear group (range, 6.15°-10.4°) was significantly greater than that in the control group (range, 4.0°-9.8°).

Conclusions

On the basis of the available evidence, for meniscal injury with an anterior cruciate ligament tear, an increased lateral PTS was associated with a higher risk of lateral meniscal tears and lateral meniscal posterior root tears. Furthermore, there appeared to be a relation between an increased medial MS and a higher risk of ramp lesions. For degenerative meniscal injury, most of the included studies showed that a larger medial PTS could increase the risk of medial meniscal tears and medial meniscal posterior root tears.

Level of Evidence

Level III, systematic review of Level III studies.

Knee Surgery, Sports Traumatology, Arthroscopy, July 2022, volume 30, issue 7, pages: 2200 - 2208

Factors affecting return to play and graft re-rupture after primary ACL reconstruction in professional footballers

Balendra, G., Jones, M. et al.

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Purpose

Modern ACL reconstruction (ACL-R) techniques have led to improved outcomes in professional footballers. The aim of this study was to identify and assess patient, surgical and post-operative factors that affected rates and time to return to play (RTP) as well as ACL re-rupture rates.

Methods

A retrospective review of consecutive ACL-R undertaken in professional footballers between 2005 and 2018.

Results

Two-hundred and thirty-two knees in 215 professional footballers (17 bilateral) were included. 205 (88.9%) were male and average age at surgery was 23.3 ± 4.4 years. Two-hundred and twenty-two (96.1%) returned to professional football, with 209 (90.1%) returning to the same or higher Tegner level. Subgroup analysis revealed three factors that independently affected RTP rate: (1) Players under 25 years had a higher rate of RTP (99.3% vs 90.2%. $p = 0.001$); (2) a subsequent operation prior to RTP decreased RTP rate from 98.2 to 89.7% ($p = 0.009$); (3) undergoing meniscal surgery at ACL-R decreased RTP rate ($p = 0.002$). The mean time to RTP from surgery was 10.5 ± 3.6 months. Factors found to increase RTP time included age under 25 (11.0 vs 9.7 months, $p = 0.005$), recurrent effusions (11.4 vs 10.2 months, $p = 0.035$), and medial meniscal repair at ACL-R compared to meniscectomy (12.5 vs 9.6 months, $p = 0.022$). The surgical technique varied over the study period in relation to graft type, femoral tunnel position and addition of lateral extra-articular tenodesis (LET). Overall, the re-rupture rate was 8.2% at 2 years. Patella tendon autograft in an anteromedial bundle femoral tunnel position with addition of LET has the lowest re-rupture rate (2.0%).

Conclusion

Primary ACL-R in professional footballers yields high rates of RTP (96.1%), with 90.1% at the same level or higher, at a mean 10.5 months. Patients under 25 years not only had a significantly higher RTP rate, but also had a lengthier period of rehabilitation.

Level of evidence

Level IV.

[BACK](#)

Long-term follow-up of bucket-handle meniscal repairs: chondroprotective effect outweighs high failure risk

Kalifis, G., Raoulis, V. et al.

DOI: <https://doi.org/10.1007/s00167-021-06787-2>

Purpose

Outcomes after repair of bucket-handle meniscal tears tend to be satisfying in the short-term follow-up. However, the literature is scarce regarding long-term data following repair of bucket-handle meniscal tears. The aim of this study was to assess long-term follow-up outcomes, focusing on knee osteoarthritis (OA) development and failure rate, and determine risk factors associated with failure.

Methods

This is a retrospective cohort study, including all patients with bucket-handle tears within 4 mm of the menisco-synovial junction, who underwent meniscal repair, either isolated or combined with anterior cruciate ligament reconstruction (ACLR) between 2004 and 2015. A combination of all-inside, outside-in, and inside-out repair technique was used in all patients. Patients over 40 years old, concomitant multi-ligamentous injuries, and severe cartilage lesions documented intraoperatively were excluded. During the follow-up, a meniscus was considered healed using Barrett's criteria, while knee OA evaluation was performed according to Kellgren–Lawrence (KL) classification using standing knee radiographs. Patients were assessed preoperatively as well as postoperatively in terms of knee function using International Knee Documentation Committee (IKDC) score, Lysholm score, and Knee injury and Osteoarthritis Outcome Score (KOOS).

Results

In total, the inclusion criteria were met by 66 patients. Median age at the time of operation was 21.9 years (13–39). Median follow-up was 114 (62–176) months. Total failure rate was approximately 33% at median time of 19 (6–39) months. Osteoarthritis was statistically significantly more prevalent in patients with failed repairs (mean KL score: 2.09) in comparison to patients with successful repairs (mean KL score: 0.54) $p = 0.001$. In addition, successful repairs were associated with higher KOOS score as compared with failed repairs (mean \pm SD, 89.6 ± 4.6 vs 77.8 ± 4.9 $p < 0.001$), higher IKDC score (mean \pm SD, 88.2 ± 5.1 vs 79.2 ± 5.2 $p < 0.001$), and Lysholm score (mean \pm SD, 90.3 ± 5.3 vs 78.4 ± 7.8 $p < 0.001$). Patients with medial meniscus repair had 4.8 higher relative likelihood of failure compared to lateral meniscus [$p = 0.014$, OR = 4.8 (95% CI 1.2, 18.6)]. Patients over 16 years old had 5.7 higher relative likelihood of failure [$p = 0.016$, OR = 5.7 (95% CI 0.04, 0.85)]. Concurrent ACLR did not have a significant effect on the postoperative outcomes.

Conclusion

A high rate of clinical failure was observed after meniscal repair of bucket-handle tears. However, successful treatment led to lower rates of knee OA development and better knee function, approximately 10 years postoperatively. Meniscal repair of bucket-handle tears is recommended to improve knee function and prevent knee OA in young patients.

Level of evidence

III.

[BACK](#)

ICRS scores worsen between 2-year short term and 5-year mid-term follow-up after transtibial medial meniscus root repair despite maintained functional outcomes

Kaplan, D.J., Bloom, D. et al.

DOI: <https://doi.org/10.1007/s00167-021-06747-w>

Purpose

The purpose of this study was to evaluate the mid-term results of posterior medial meniscal root tear (PMMRT) repair through assessment of functional outcome scores and magnetic resonance imaging (MRI).

Methods

This was a single-center, retrospective study evaluating patients that had undergone a PMMRT. This was a follow-up to a previously published 2-year outcome study (all original patients were invited to participate). Clinical outcomes included pre- and postoperative International Knee Documentation Committee (IKDC) and Lysholm scores. Root healing, meniscal extrusion, and cartilage degeneration via International Cartilage Repair Society Scale (ICRS) grades were assessed on MRI by two musculoskeletal fellowship-trained radiologists.

Results

10 of the original study's 18 patients were able to participate. Mean age and BMI was 48.4 ± 12.0 years and 29.5 ± 4.5 , respectively, with mean follow-up 65.5 ± 8.3 months (range 52.0–75.8) (60% female).

The IKDC significantly increased from 43 ± 13 preoperatively to 75 ± 16 at 5-year follow-up ($p < 0.001$). There was no significant change in IKDC score between 2-year and 5-year follow-up [75 ± 16 vs 73 ± 20 , (n.s)]. The Lysholm also significantly increased between preoperative and 5-year follow-up (49 ± 7 vs 84 ± 11 , $p < 0.001$). There was no significant change between Lysholm score at 2-year and 5-year follow-up [84.0 ± 11 vs 82 ± 13 , (n.s)]. Mean extrusion did not significantly change from the preoperative state to 5-year follow-up [$4.80 \text{ mm} \pm 1.9$ vs $5.0 \text{ mm} \pm 2.5$, (n.s)]. Extrusion also did not significantly change between 2- and 5-year follow-up [$6.1 \pm 3.2 \text{ mm}$ vs $5.0 \text{ mm} \pm 2.5$, (n.s)]. No patients with $> 3 \text{ mm}$ of extrusion on preoperative MRI had $< 3 \text{ mm}$ of extrusion on postoperative MRI. Both medial femoral condyle and medial tibial plateau ICRS grades significantly increased from preoperative to 2-year follow-up ($p = 0.038$, $p = 0.023$, respectively). Medial femoral condyle and medial tibial plateau ICRS grades again significantly increased between 2-year and 5-year follow-up ($p = 0.014$, $p = 0.034$).

Conclusion

Patients treated with the transtibial suture pullout technique with two locking cinch sutures had maintenance of clinical outcome improvements at 5-year follow-up. However, extrusion was widely prevalent, with worsening progression of femoral and tibial chondral disease.

Level of Evidence

Level 4.

[BACK](#)

Arthroscopic confirmation of femoral button deployment prevents soft tissue interposition in ACL reconstruction

Guy, S., Carrozzo, A. et al.

DOI: <https://doi.org/10.1007/s00167-021-06758-7>

Purpose

The purpose of this study was to determine whether direct arthroscopic control of femoral buttons can prevent improper deployment and soft tissue interposition in anterior cruciate ligament (ACL) reconstruction.

Methods

A retrospective analysis of prospectively collected data from the SANTI study group database was performed. All patients who underwent ACL reconstruction using suspensive femoral fixation between 01/01/2017 and 31/12/2019 were included. Patient assessment included demographics, sports metrics, reoperations performed and femoral button-related specific complications such as iliotibial band (ITB) irritation and/or septic arthritis. Proper deployment of the button and soft tissue interposition were assessed on postoperative radiographs.

Results

A total of 307 patients underwent ACL reconstruction using adjustable femoral button fixation and were analyzed after a mean follow-up of 35.2 ± 11.0 months (14.3–50.2). The mean age was 39.5 ± 10.9 -years old (range 13.3–70.6). Postoperative radiographs showed a correctly deployed femoral button without soft tissue interposition for all patients. No septic arthritis was reported. Nine patients (2.9%) suffered from lateral pain related to ITB irritation due to the button. Five of them had their symptoms resolve during rehabilitation. Ultrasound-guided corticosteroid infiltration was necessary for four patients after an average delay of 14.5 ± 4.8 months (11.7–21.7). Three patients were then symptom-free, but one required surgical removal of the implant 27.5 months after the surgery. Regarding unrelated femoral button complications, 15 patients (4.9%) underwent secondary arthroscopic procedures, including meniscectomy (1.6%), surgery for cyclops syndrome (2.6%) and revision ACLR (0.7%).

Conclusion

Arthroscopic confirmation of femoral button deployment prevents soft tissue interposition without specific complications.

Level of evidence

Level IV.

Nineteen percent of meniscus repairs are being revised and failures frequently occur after the second postoperative year: a systematic review and meta-analysis with a minimum follow-up of 5 years

Schweizer, C., Hanreich, C. et al.

DOI: <https://doi.org/10.1007/s00167-021-06770-x>

Purpose

Meniscus repair has gained increasing interest over the last two decades as loss of meniscus tissue predisposes to early onset knee arthritis. Although there are many reports of meniscus repair outcome in short-term studies, data on the long-term outcome of meniscus repair are still scarce. The purpose of this meta-analysis was to evaluate the overall failure rate of meniscus repair with a minimum follow-up of 5 years. Additionally, possible factors influencing meniscus repair outcome were assessed.

Methods

PubMed and Scopus were searched for studies of the last 20 years reporting on meniscus repair outcome with a minimum follow-up of 5 years. The study was performed following the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. The search terms used for this study were ([meniscus OR meniscal] AND repair). Titles and abstracts were evaluated by two authors independently. Using meta package of R (version 3.6.2), random-effect models were performed to pool failure rates. Subgroup analyses were performed and effect estimates in form of an odds ratio with 95% CIs were established.

Results

In total, 12 studies with 864 patients were included. Degenerative tears were excluded in two studies and one study only included traumatic meniscus tears. Other studies did not state whether the cause of meniscus tear was degenerative or traumatic. Studies reporting meniscus repair outcome on root repairs, revision anterior cruciate ligament reconstruction, discoid menisci or ramp lesions were excluded. Revision surgery was used as failure definition in all included studies. The overall failure rate of meniscal repair at a mean follow-up of 86 months was 19.1%. There was no significant difference in meniscus repair outcome when performed in combination with anterior cruciate ligament reconstruction compared to isolated meniscus repair (18.7% vs. 28%; n.s.) or when performed on the lateral meniscus compared to the medial meniscus (19.5% vs. 24.4%; n.s.). There was no significant difference of meniscus repair outcome between vertical/longitudinal tears and bucket-handle tears (n.s.). Thirty-six percent of meniscus repair failures occur after the second postoperative year. The only significant finding was that inside-out repair results in a lower failure rate compared to all-inside repair (5.6% vs. 22.3%; $p = 0.009$) at 5 years.

Conclusion

The overall meniscus repair failure rate remains nineteen percent in long-term studies. The cause of failure is poorly documented, and it remains unclear whether failure of the meniscus repair itself or additional adjacent tears lead to revision surgery. Despite the given technical advantages of all-inside repair devices, this meta-analysis cannot demonstrate superior outcomes compared to inside-out or outside-in repair at 5 years.

Level of evidence

IV.

[BACK](#)

Different timing in allograft and autograft maturation after primary anterior cruciate ligament reconstruction does not influence the clinical outcome at mid-long-term follow-up

Cusumano, A., Capitani, P. et al.

DOI: <https://doi.org/10.1007/s00167-021-06785-4>

Purpose

The use of allografts in primary anterior cruciate ligament reconstruction (ACLR) is increasing although they are still supposed to be associated to greater risk of re-rupture due to a slower and less efficient graft maturation. The aim of this prospective randomized controlled study was to compare the graft maturation after ACLR with allograft and autograft by MRI at 6- and 12-month follow-up and integrate these data with the functional and clinical results observed at 6-, 12- and 60-month follow-up.

Methods

Fifty patients with indication to primary ACLR were randomly and equally divided into hamstring autograft or allograft tendon groups. The graft maturation was measured at 6- and 12-month follow-up by the SNQ score and other radiological parameters on MRI scans. Clinical and functional recovery was evaluated by Lysholm score, Visual Analogues Scale, Tegner activity scale and modified Cincinnati knee rating system at 6, 12 and 60 months after surgery to estimate the predictive value of the radiological parameters for clinical outcomes. Return-to-sport (ACL-RSI) was measured 60 months after surgery.

Results

Three patients had re-tear of the neo-ligament (two from Auto group and one from Allo group). All the clinical/functional parameters significantly improved over time, with no statistically significant difference between the groups. At 6 months, the SNQ value was significantly higher in the Auto than in the Allo group (12.9 vs 7.9, $p = 0.038$), but at 12 months they were comparable (9.8 vs 10.4). The 6-month SNQ values did not correlate with the clinical scores, whereas the 12-month SNQ values significantly correlated with the Cincinnati score, Lysholm score and Tegner activity scale collected at 60-month follow-up.

Conclusion

No clinical or functional differences have been found between the two treatment groups, supporting the suitability of using allograft in primary ACLR, when available. The results at MRI scans showed a different graft maturation trend in the two groups, with allografts being more reactive in the first 6 months. MRI together with the subjective evaluation allows to evaluate objectively the status of the neo-ligamentization process and therefore helps the surgeon to dictate the individual time for return-to-sport.

Level of evidence

Level I.

Long sports career and satisfactory clinical outcomes after Meniscal Allograft Transplantation (MAT) in young professional athletes involved in strenuous sports

Bonanzinga, T., Grassi, A. et al.

DOI: <https://doi.org/10.1007/s00167-021-06779-2>

Purpose

To assess the return to sport rate of young professional athletes, to analyze their careers in terms of matches played and league participation over a minimum period of 6 years after Meniscal Allograft Transplantation (MAT), as well as to assess the long-term clinical subjective outcomes and satisfaction.

Methods

Thirteen professional athletes (ten soccer and one basketball players, one fencer and one wrestler) with a mean age at surgery of 23.4 ± 4.0 underwent MAT (six medial, seven lateral). The time required to return to sport, post-operative performance level and the number of reoperations were evaluated. At an average follow-up of 9.0 ± 2.8 years, Lysholm, KOOS and Cincinnati scores were administered and collected.

Results

Thirteen patients (100%) returned to sports practice after an average period of 11.8 ± 3.8 months. Nine athletes (69%) returned to sports at the same pre-injury level. Overall, 93%, 85%, 62% and 55% were active until the 3rd, the 5th, the 7th and the 9th season after MAT, respectively. Seven patients (54%) underwent a reoperation after MAT, where only two of them (15%) were related to graft problems (one meniscectomy and one graft suture). Of the ten athletes that completed subjective evaluation, the mean Lysholm score was 72 ± 15 (0% "Excellent", 10% "Good", 60% "Fair", 30% "Poor"). Of the athletes with lower scores, one suffered from patellar tendon rupture, one from post-operative infection and one from a previous femoral fracture. The mean Cincinnati knee score was 77 ± 18 , while the average KOOS values were 60 ± 34 for sports.

Conclusion

Meniscal Allograft Transplantation (MAT) in young professional athletes involved in strenuous activities allowed all patients to return to pre-injury sport and in nearly 70% of cases at their pre-injury level. After five seasons following MAT, 85% of patients were still active or playing more than 20–30 matches per season. On the other hand, nearly 50% underwent at least one reoperation and only 70% of patients were rated as "Good", or "Fair" using the Lysholm score.

Level of evidence

IV.

Double-bundle anterior cruciate ligament reconstruction using autologous hamstrings with LARS augmentation demonstrates comparable outcomes to hamstrings alone, without evidence of synovitis or early osteoarthritis

Ebert, J., Nairn, R. et al.

DOI: <https://doi.org/10.1007/s00167-021-06801-7>

Purpose

To compare the clinical and radiological outcomes in patients undergoing anterior cruciate ligament reconstruction (ACLR) with, or without, LARS augmentation.

Methods

One-hundred and thirty-six patients that underwent double-bundle ACLR with (DB Hams/LARS, n = 67), or without (DB Hams, n = 69), LARS augmentation, were assessed clinically and with Magnetic Resonance Imaging (MRI) at a minimum of 7-years post-surgery. Patients were assessed via patient-reported outcome measures (PROMs), KT-1000 (laxity), isokinetic knee extensor and flexor strength and a 4-hop test battery. Limb symmetry indices (LSIs) were calculated. The Whole-Organ Magnetic Resonance Imaging Score (WORMS) evaluated knee status via MRI. Sport participation, secondary operations, ACL re-tears and contralateral ACL tears were reported.

Results

No differences (n.s.) were observed in demographics, PROMs, KT-1000 scores or strength and hop LSIs. Normal (< 3 mm side-to-side differences) KT-1000 scores were observed in 64 (92.8%) and 59 (88.1%) of DB Hams and DB Hams/LARS patients, respectively. Comparative rates of satisfaction were reported. Knee flexor strength and hop test LSIs were all >95% in both groups, which was 94.2% and 96.7% for knee extensor strength in the DB Hams and DB Hams/LARS cohorts, respectively. While 53 (76.8%) and 52 (77.6%) of the DB Hams and DB Hams/LARS patients had returned to pivoting sports, 42 (60.9%) and 41 (61.2%) were participating in pivoting sports at the minimum 7-year review. No difference (n.s.) was observed in the WORMS (12.3 DB Hams, 16.7 DB Hams/LARS). Of the cohort assessed, 8 (11%) DB Hams and 11 (16%) DB Hams/LARS patients had undergone secondary surgery. In addition to one patient in each group that demonstrated ACL rupture on MRI, an additional cohort of patients were excluded from the current analysis due to prior re-tear (DB Hams n = 6, DB Hams/LARS n = 8) or contralateral ACL tear (DB Hams n = 4, DB Hams/LARS n = 4).

Conclusions

Comparable outcomes were observed after double-bundle ACLR using autologous hamstrings with, or without, LARS augmentation. Therefore, while these outcomes do not justify the additional use of synthetic augmentation given the lack of further benefit and additional cost, higher rates of graft failure, synovitis and early osteoarthritic change previously reported were not observed.

Level of Evidence

III.

The aspiration test reveals an instability of the posterior horn of the lateral meniscus in almost one-third of ACL-injured patients

Jacquet, C., Mouton, C. et al.

DOI: <https://doi.org/10.1007/s00167-021-06806-2>

Purpose

Anterior cruciate ligament (ACL) injuries often lead to associated injuries of the posterior horn of the lateral meniscus (PHLM). Arthroscopic assessment of PHLM instability may be difficult in the absence of a visible meniscus damage. The main objective of this prospective multi-center study was to compare the ability of the probing and aspiration tests to identify PHLM instability in a population of patients undergoing ACL reconstruction (ACLR) and a control group of patients with an intact ACL undergoing knee arthroscopy.

Methods

A prospective case-control analysis was performed in three sports medicine centers. One-hundred and three consecutive patients operated for a primary isolated ACLR without structural lateral meniscus damage other than a root tear were included. They were compared to a control group of 29 consecutive patients who had a knee arthroscopy with an intact ACL and no structural lateral meniscus lesion. The probing and aspiration tests were consecutively executed according to previously published methods.

Results

In the control group, no lateral meniscus lesions were visualized during arthroscopy, and both probing and aspiration tests were negative in all patients. In the group of ACL-injured patients, a Forkel type I-III posterolateral meniscus root tear (PLMRT) was found in 12 patients (12%). In this subgroup, the probing test was positive in 4/12 patients (33%) and the aspiration test in 5 additional patients (75%). In 15 patients (15%), an elongation of the posterior root of the lateral meniscus (defined as type IV PLMRT as an addendum to the Forkel classification) could be observed during arthroscopy. In this subgroup, only 1 patient displayed a PHLM instability with the probing test (7%), whereas the aspiration test was positive in 13/15 patients (87%). In the remaining 76 patients (74%), no structural lesion of the PHLM could be identified. Nevertheless, an instability of the PHLM could be identified in 8 of them (11%) with the probing test, and the aspiration test was positive in 2 additional knees (13%) of this apparently normal subgroup. Altogether, in the entire ACL injury cohort, a positive probing test was observed in 13/103 patients (13%) and a positive aspiration test in 32/103 knees (31%) ($p < 0.01$).

Conclusion

Careful observation and examination of the PHLM with the aspiration test revealed a substantial amount of previously undiagnosed lateral meniscus instabilities in ACL-injured knees. The prevalence of PHLM instability as evaluated by the aspiration test was high (31%). The aspiration test was superior to the probing test in detecting an instability of the PHLM in a population of ACL-injured patients.

Level of evidence

II.

[BACK](#)

Anterior cruciate ligament reconstruction using quadriceps tendon autograft is a viable option for small-statured female patients

Goto, K., Buthon, V.B. et al.

DOI: <https://doi.org/10.1007/s00167-021-06845-9>

Purpose

The choice of graft for anterior cruciate ligament (ACL) reconstruction remains controversial. The quadriceps tendon (QT) autograft is a good alternative for ACL reconstruction. However, concerns regarding its use in short-statured patients, related to donor site morbidity, anterior knee pain, or loss of muscle strength remain. This study aimed to compare muscle strength and morbidity between patients with short and normal statures following ACL reconstruction with a QT autograft.

Methods

A total of 73 female patients (mean age, 33.8 ± 11.5 years) who underwent primary ACL reconstruction between 2016 and 2019 were included. Patients were categorized into two groups: group S, with a height ≤ 163 cm, and group L, with a height > 163 cm. Muscle strength, harvesting site morbidity, and ACL-return to sport after injury scale (ACL-RSI) were evaluated, with a mean timing of the follow-up of 9.0 ± 2.3 months.

Results

The mean quadriceps strength for the isokinetic measurements at 60° and 240° was 65.0% and 74.0% in group S, respectively, and 70.0% and 75.7% in group L, respectively. There was no significant difference in the postoperative muscle strength or mean ACL-RSI (group S, 70.0; group L, 65.9) between the groups. No donor site morbidity was observed in either group.

Conclusion

Muscle strength recovery, morbidity, and readiness to return to sports were similar in both groups, which supports the possibility of QT autografts for patients with a small stature. The results of this study may provide useful information for surgeons who are hesitant to perform QT autografts because of patient physique.

Level of Evidence

IV.

Thromboprophylaxis after knee arthroscopy does not decrease the risk of deep vein thrombosis: a network meta-analysis

Lameire, D.L., Khalik, H.A. et al.

DOI: <https://doi.org/10.1007/s00167-021-06857-5>

Purpose

The primary aim of this network meta-analysis (NMA) is to compare the incidence of venous thromboembolisms (VTE) and bleeding risk following the use of pharmacological and non-pharmacological thromboprophylaxis for arthroscopic knee surgery (AKS). This study assumed the null hypothesis which was that there will be no difference in the incidence of VTE and bleeding risk when comparing no treatment, pharmacological treatment, and non-pharmacological treatment for preventing VTE events following AKS.

Methods

A systematic electronic search of CENTRAL, Medline, Embase, and ClinicalTrials.gov was carried out. All English language prospective randomized clinical trials published from date of database inception to November 21, 2021 were eligible for inclusion. All papers addressing arthroscopic knee surgery were eligible for inclusion regardless of timing of surgery, operation, surgical technique, or rehabilitation. Multiple random effects NMAs were conducted to compare all treatments for each outcome. The primary outcome was the incidence of pulmonary embolism (PE) and secondary outcomes consisted of overall deep vein thrombosis (DVT), symptomatic DVT, asymptomatic DVT, and all-cause mortality. Adverse outcomes consisted of major and minor bleeding, as well as adverse events.

Results

A total of nine studies with 4526 patients were included for analysis. There were 1054 patients in the no treatment/placebo group (NT/Placebo), 1646 patients in the graduated compression stockings, 810 patients in the extended-duration (> 10 days) low molecular weight heparin (Ext-LMWH) group, 650 patients in the short-duration (< 10 days) LMWH group (Short-LMWH), and 356 patients in the rivaroxaban group. GCS, Ext-LMWH, Short-LMWH and rivaroxaban all demonstrated low risks of PE, symptomatic DVT, asymptomatic DVT, combined DVT and all-cause mortality. Similarly, all interventions demonstrated a low risk of major bleeding.

Conclusion

There is no significant difference in the risk reduction of PEs, symptomatic DVTs, major/minor bleeding, and/or all-cause mortality when using LMWH (including short or extended regimens), rivaroxaban, graduated compression stockings or no treatment following arthroscopic knee surgery. Future primary research on the efficacy of thromboprophylaxis following arthroscopic knee surgery should stratify outcomes based on key patient (i.e., age, sex, comorbidities) and surgical (i.e., major vs. minor surgery) characteristics and should include acetylsalicylic acid as an intervention.

Level of evidence

I, network meta-analysis of Level I studies.

[BACK](#)

An increased posterior tibial slope is associated with a higher risk of graft failure following ACL reconstruction: a systematic review

Lui, Z., Jiang, J. et al.

DOI: <https://doi.org/10.1007/s00167-022-06888-6>

Purpose

The posterior tibial slope (PTS) is considered a risk factor for anterior cruciate ligament (ACL) injury. However, the influence of PTS on graft failure following ACL reconstruction remains relatively unknown. Therefore, this systematic review was conducted to investigate whether PTS could be a potential risk factor for graft failure after ACL reconstruction.

Methods

PubMed, EMBASE, Cochrane Library, Web of Science, China National Knowledge Infrastructure Database, and Wanfang Database were comprehensively searched from inception to March 31, 2021. Observational studies reporting the associations of medial tibial plateau slope (MTPS) or lateral tibial plateau slope (LTPS) with graft failure after ACL reconstruction were evaluated.

Results

Twenty studies involving 12 case-control studies, 4 retrospective studies and 4 cross-sectional studies including 5326 patients met the final inclusion criteria. The high heterogeneity and the characteristics of nonrandomized controlled trials limited data synthesis. Fifteen of the 20 included studies detected a significant association between increased PTS and ACL graft failure, while 5 studies concluded that increased PTS was not associated with ACL graft failure. Ten studies suggested that MTPS is associated with ACL graft failure, and six studies suggested that LTPS is associated with ACL graft failure. The mean MTPS values for nonfailure group ranged from $3.5^{\circ} \pm 2.5^{\circ}$ to $14.4^{\circ} \pm 2.8^{\circ}$. For the graft failure group, MTPS ranged from $4.71^{\circ} \pm 2.41^{\circ}$ to $17.2^{\circ} \pm 2.2^{\circ}$. The mean LTPS values for nonfailure group ranged from $2.9^{\circ} \pm 2.1^{\circ}$ to $11.9^{\circ} \pm 3.0^{\circ}$. For the graft failure group, LTPS ranged from $5.5^{\circ} \pm 3.0^{\circ}$ to $13.3^{\circ} \pm 3.0^{\circ}$. The reported PTS values that caused ACL graft failure was greater than 7.4° to 17° .

Conclusion

Based on the current clinical evidence, increased PTS is associated with a higher risk of ACL graft failure after ACL reconstruction. Despite various methods of measuring PTS have high reliability, there is still vast disagreement in the actual value of PTS.

Level of evidence

IV.

Single and double bundle posterior cruciate ligament reconstruction yield comparable clinical and functional outcomes: a systematic review and meta-analysis

Krott, N.L., Wengle, L. et al.

DOI: <https://doi.org/10.1007/s00167-022-06907-6>

Purpose

To perform a systematic review and compare the functional and objective outcomes after single-bundle (SB) vs. double-bundle (DB) posterior cruciate ligament reconstruction (PCLR). Where possible to pool outcomes and arrive at summary estimates of treatment effect for DB PCLR vs. SB PCLR via an embedded meta-analysis.

Methods

A comprehensive PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) literature search identified 13 eligible studies evaluating clinical outcomes of both techniques for PCLR. Clinical outcome measures included in the meta-analysis were functional outcomes (Lysholm Score, Tegner Activity Scale) and objective measurements of posterior laxity of the operated knee (arthrometer and stress radiographs).

Results

The meta-analysis included 603 patients. Three hundred and fifteen patients were treated with SB and two hundred and eighty-eight patients with DB PCLR. There were no significant differences between SB and DB PCLR in postoperative functional Lysholm Scores (CI [- 0.18, 0.17]), Tegner Activity Scales (CI [- 0.32, 0.12]) and IKDC objective grades (CI [- 0.13, 1.17]). Regarding posterior stability using KT-1000 and Kneelax III arthrometer measurements, there were no differences between the SB and DB group. However, double-bundle reconstruction provided better objective outcome of measurement of posterior laxity (CI [0.02, 0.46]) when measured with Telos stress radiography.

Conclusion

A systematic review was conducted to identify current best evidence pertaining to DB and SB PCLR. An embedded meta-analysis arrived at similar summary estimates of treatment effect for motion, stability and overall function for both techniques. There is no demonstrable clinically relevant difference between techniques based on the currently available evidence.

Level of evidence

III.

Demographics and surgery-related complications lead to 30-day readmission rates among knee arthroscopic procedures

Williams, C., Bagwell, M.T. et al.

DOI: <https://doi.org/10.1007/s00167-022-06919-2>

Purpose

The study objectives were (1) to evaluate risk factors related to 30-day hospital readmissions after arthroscopic knee surgeries and (2) to determine the complications that may arise from surgery.

Methods

The American College of Surgeons National Surgical Quality Improvement Program database data from 2012 to 2017 were researched. Patients were identified using Current Procedural Terminology codes for knee arthroscopic procedures. Ordinal logistic fit regression and decision tree analysis were used to examine study objectives.

Results

There were 83,083 knee arthroscopic procedures between 2012 and 2017 obtained from the National Surgical Quality Improvement Program database. The overall readmission rate was 0.87%. The complication rates were highest for synovectomy and cartilage procedures, 1.6% and 1.3% respectively. A majority of readmissions were related to the procedure (71.1%) with wound complications being the primary reason (28.2%) followed by pulmonary embolism and deep vein thrombosis, 12.7% and 10.6%, respectively. Gender and body mass index were not significant factors and age over 65 years was an independent risk factor. Wound infection, deep vein thrombosis, and pulmonary embolism were the most prevalent complications.

Conclusion

Healthcare professionals have a unique opportunity to modify treatment plans based on patient risk factors. For patients who are at higher risk of inferior surgical outcomes, clinicians should carefully weigh risk factors when considering surgical and non-surgical approaches.

Level of evidence

III.

The minimal clinically important difference for the nonarthritic hip score at 2-years following hip arthroscopy

Bloom, D.A., Kaplan, D.J. et al.

DOI: <https://doi.org/10.1007/s00167-021-06756-9>

Purpose

The purpose of this study was to determine and establish the MCID for the NAHS at 2 years in patients undergoing hip arthroscopy for femoroacetabular impingement syndrome (FAIS).

Methods

Patients that underwent primary hip arthroscopy for FAIS between 2010 and 2016 were analyzed for eligibility. Data were collected from a single surgeon's hip arthroscopy database. MCID was calculated for the NAHS utilizing a distribution-based method.

Results

The study included 298 patients (184 females) with an average age of 40.4 ± 13.0 years and average body mass index (BMI) of 25.7 ± 4.2 kg/m². At baseline, the cohort's average NAHS score was 48.7 ± 13.6 and demonstrated an improvement of 36.5 ± 17.0 for NAHS at follow-up. This resulted in MCID values of + 8.5 for NAHS.

Conclusion

This is the first study to report the MCID (+ 8.5) for NAHS following primary hip arthroscopy, and as such, is a valuable contribution to future hip arthroscopy research.

Level of evidence

IV.

A higher proportion of patients may reach the MCID with capsular closure in patients undergoing arthroscopic surgery for femoroacetabular impingement: a systematic review and meta-analysis

Cohen, D., Comeau-Gauthier, M. et al.

DOI: <https://doi.org/10.1007/s00167-022-06877-9>

Purpose

The purpose of this review is to provide a summary of the techniques and outcomes of various capsular management strategies in patients undergoing hip arthroscopy for femoroacetabular impingement (FAI). The information this review provides on capsular management strategies will provide surgeons with operative guidance and decision-making when managing patients with FAI lesions arthroscopically.

Methods

Three databases MEDLINE, EMBASE, and PubMed were searched from database inception to November 2nd 2021, for literature addressing capsular management of patients undergoing hip arthroscopy for FAI. All level I–IV data on capsular management strategy as well as postoperative functional outcomes were recorded. A meta-analysis was used to combine the mean postoperative functional outcomes using a random-effects model.

Results

Overall, there were a total of 36 studies and 4744 patients included in this review. The mean MINORS score was 10.7 (range 8–13) for non-comparative studies and 17.6 (range 15–20) for comparative studies. Three comparative studies in 1302 patients examining the proportion of patients reaching the MCID for the mHHS score in patients undergoing interportal capsulotomy with either capsular repair or no repair found that the capsular repair group had a higher odds ratio of reaching the MCID at 1.46 (95% CI 0.61–3.45, I² = 67%, Fig. 2, Table 3); however, this difference was not significant with a p value of 0.39. When looking at only level 1 and 2 studies, four studies in 1308 patients reporting on the mHHS score in patients undergoing capsular closure regardless of capsulotomy type, found a pooled standardized mean difference in the mHHS score of 2.1 (95% CI 1.7–2.55, I² = 70%, Fig. 3), while four studies in 402 patients reporting on the mHHS score in patients not undergoing capsular closure regardless of capsulotomy type found a pooled standardized mean difference in the mHHS score of 1.46 (95% CI 1.2–1.7, I² = 30%, Fig. 4).

Conclusion

This review may demonstrate improved postoperative outcomes in patients undergoing complete capsular closure regardless of capsulotomy type based on postoperative mHHS score. Furthermore, this review may suggest improved postoperative outcomes after closure of an interportal capsulotomy. There are limited published outcome data regarding T-type capsulotomy without closure. This review provides surgeons with operative guidance on capsular management strategies when treating patients with FAI lesions arthroscopically.

Level of evidence

IV.

[BACK](#)

Endoscopically assisted reconstruction of chronic Achilles tendon ruptures and re-ruptures using a semitendinosus autograft is a viable alternative to pre-existing techniques

Nilsson, N., Gunnarsson, B. et al.

DOI: <https://doi.org/10.1007/s00167-022-06943-2>

Purpose

Achilles tendon ruptures are termed chronic after a delay in treatment for more than 4 weeks. The literature advocates surgical treatment with reconstruction to regain ankle push-off strength. The preferred technique is, however, still unknown and is often individualized. This study aims to present the technique and clinical outcome of an endoscopically assisted free semitendinosus reconstruction of chronic Achilles tendon rupture and Achilles tendon re-ruptures with delayed representation. It is hypothesized that the presented technique is a viable and safe alternative for distal Achilles tendon ruptures and ruptures with large tendon gaps.

Method

Twenty-two patients (13 males and 9 females) with a median (range) age of 64 (34–73) treated surgically with endoscopically assisted Achilles tendon reconstruction using a semitendinosus autograft were included. The patients were evaluated at 12 months post-operatively for Achilles tendon Total Rupture Score (ATRS), calf circumference, Achilles Tendon Resting Angle (ATRA), heel-rise height and repetitions together with tendon length determined by ultrasonography, concentric heel-rise power and heel-rise work.

Results

The patients reported a median (range) ATRS of 76 (45–99) out of 100. The median (range) ATRA on the injured side was 60° (49°–75°) compared with 49.5° (40–61°), $p < 0.001$, on the non-injured side. Eighteen out of 22 patients were able to perform a single-leg heel-rise on the non-injured side. Sixteen patients out of those 18 (89%) were also able to perform a single heel-rise on the injured side. They did, however, perform significantly lower number of repetitions compared with the non-injured side with a median (range) heel-rise repetitions of 11 (2–22) compared with 26 (2–27), ($p < 0.001$), and a median (range) heel-rise height of 5.5 cm (1.0–11.0 cm) compared with 9.0 cm (5.0–11.5 cm), ($p < 0.001$). The median calf circumference was 1.5 cm smaller on the injured side, 37.5 cm compared with 39 cm, when medians were compared. The median (range) tendon length of the injured side was 24.8 cm (20–28.2 cm) compared with 22 cm (18.4–24.2 cm), ($p < 0.001$), on the non-injured side.

Conclusion

The study shows that endoscopically assisted reconstruction using a semitendinosus graft to treat chronic Achilles tendon ruptures and re-ruptures with delayed representation produces a satisfactory outcome. The technique can restore heel-rise height in patients with more distal ruptures or large tendon defects and is therefore a viable technique for Achilles tendon reconstruction.

Level of evidence

IV.

American Journal of Sports Medicine (AJSM), Volume 50, Issue 9

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Surgical Outcomes After Bucket-Handle Meniscal Repairs: Analysis of a Large Contained Cohort

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Background:

Representing approximately 10% of all meniscal tears, bucket-handle meniscal tears (BHMTs) are large longitudinal vertical tears that have an attached fragment flipped into the intercondylar notch. Meniscectomy often results in significant meniscal loss and increased joint loading. Alternatively, meniscal repair attempts to restore the function of the meniscus and aims to preserve joint mechanics.

Purpose:

To evaluate the long-term risk of subsequent ipsilateral knee surgery in patients who underwent a bucket-handle meniscal repair (BHMR), and to assess risk factors associated with subsequent knee surgical intervention.

Study Design:

Case series; Level of evidence, 4.

Methods:

We performed an electronic health record search for all patients aged 12 to 65 years who underwent arthroscopic knee meniscal repairs for BHMT (2011-2018). We excluded patients who had a previous BHMR, did not have magnetic resonance imaging of the knee within 60 days before BHMR, lacked active membership in Kaiser insurance in the year before and after BHMR, or underwent meniscectomy before BHMR. All patients were followed until December 31, 2019, with censoring at death or membership disenrollment. Primary outcomes included ipsilateral knee procedures overall and by type (ie, repeat meniscal repair and meniscectomy); secondary outcomes included other surgical interventions of the same knee, any contralateral knee surgery, deep surgical-site infection, and deep venous thrombosis or pulmonary embolism.

Results:

The final cohort included 1359 patients with a median age of 24 years (interquartile range [IQR], 17-34) who underwent BHMR for a BHMT. During the follow-up period (median, 50.2 months [IQR, 32.3-60.6]), 495 subsequent ipsilateral procedures were performed in 274 (20.2%) patients, and the median time to the first procedure was 10.6 months (IQR, 4.1-23.5). An overall 59 (4.3%) patients underwent repeat meniscal repair, and 165 (12.1%) had a subsequent meniscectomy of the same knee. Significant risk factors for subsequent ipsilateral procedures included younger age, 12 to 18 years (adjusted odds ratio [aOR], 5.77 [95% CI, 1.84-18.08]) and 19 to 30 years (aOR, 3.65 [95% CI, 1.17-11.36]), as well as normal and overweight body mass index (aOR, 2.84 [95% CI, 1.29-6.23] and 2.34 [95% CI, 1.06-5.17], respectively). Patients undergoing concomitant anterior cruciate ligament reconstruction (ACLR) at the initial BHMR had a lower risk of undergoing subsequent surgery (aOR, 0.66 [95% CI, 0.49-0.87]) than those without concomitant ACLR.

Conclusion:

This is the largest reported study on outcomes after BHMR in a contained cohort. One-fifth of patients underwent subsequent ipsilateral surgery during follow-up, with 4.3% receiving a repeat meniscal repair and 12.1% experiencing a meniscectomy. Risk factors for subsequent surgery of the same knee included younger age and normal or overweight body mass index. Concomitant ACLR at time of BHMR reduced the risk of subsequent reoperation.

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Increased Joint Space Narrowing After Arthroscopic Partial Meniscectomy: Data From the Osteoarthritis Initiative

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Background:

Arthroscopic partial meniscectomy (APM) is widely performed and remains an important therapeutic option for patients with a meniscal tear. However, it is debated whether or not APM accelerates the progression of osteoarthritis (OA) in the long term.

Purpose/Hypothesis:

The purpose was to compare the progression of OA measured by the change in tibiofemoral joint space width (JSW)—a quantitative measure of OA radiographic severity—across 3 groups with a midterm follow-up: (1) patients undergoing APM; (2) those with a meniscal tear treated nonoperatively; and (3) those without a tear. We hypothesized that the reduction in JSW would be greatest in patients undergoing APM and least in those patients without a tear.

Study Design:

Cohort study; Level of evidence, 3.

Methods:

Using the Osteoarthritis Initiative cohort, a total of 144 patients were identified that underwent APM with at least 12 months of follow up and without previous knee surgery. Those with a meniscal tear who did not have APM ($n = 144$) and those without a tear ($n = 144$) were matched to patients who had APM by sex, age, Kellgren-Lawrence (KL) grade, and follow up time. Participants underwent magnetic resonance imaging at baseline. Knee radiographs to assess JSW were collected annually or biannually. The change in minimum medial compartment JSW was calculated using a validated automated method. A piecewise linear mixed effects model was constructed to examine the relationship between JSW decline over time and treatment group—adjusting for age, body mass index, smoking status, KL grade, and baseline JSW.

Results:

All groups had comparable baseline JSW—ranging from 4.33 mm to 4.38 mm. The APM group had a rate of JSW decline of -0.083 mm/mo in the first 12 months and -0.014 mm/mo between 12 and 72 months. The rate of JSW decline in the APM group was approximately 27 times greater in the first 12 months than that in the nonsurgical group (-0.003 mm/mo) and 5 times greater than that in the no tear group (-0.015 mm/mo); however, there was no significant difference between groups for 12 to 72 months (nonsurgical group: -0.009 mm/mo; no tear group: -0.010 mm/mo). The adjusted JSW in the APM group was 4.38 mm at baseline and decreased to 2.57 mm at 72 months; the JSW in the nonsurgical group declined from 4.31 mm to 3.73 mm, and in the no tear group it declined from 4.33 mm to 3.54 mm. There was a statistically significant difference in JSW change between baseline and 72 months for the APM group compared with the other groups ($P < .001$), but not between the nonsurgical and no tear groups ($P = .12$).

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Conclusion:

In the first postoperative year, APM results in a faster rate of joint space narrowing compared with knees undergoing nonsurgical management of meniscal tears. Thereafter, there are comparable rates of OA progression regardless of the chosen management. APM results in a persistent decrease in JSW over at least 72 months. An untreated meniscal tear does not contribute to radiographic progression—assessed by JSW—as compared with an intact meniscus.

Nonanatomic All-Inside Arthroscopic Anterior Talofibular Ligament Repair With a High-Position Anchor versus Anatomic Repair: An Analysis Based on 3D CT

Sung Hyun Lee, MD, PhD*, Je Heon Yang, MD, Isac Kim, MD

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Background:

In patients with chronic ankle instability, it is important to repair the anterior talofibular ligament (ATFL) at the anatomic origin site. However, there are limited reports on the clinical outcomes according to anatomic ATFL repair.

Purpose:

To compare the clinical outcomes after arthroscopic ATFL repair according to whether the anchor is fixed at an anatomic position.

Study Design:

Cohort study; Level of evidence, 3.

Methods:

We performed a retrospective review of consecutive patients who underwent arthroscopic ATFL repair for chronic ankle instability and were available for a minimum 2-year follow-up. The patients were divided into 3 groups according to the anchor position at the distal fibula on 3-dimensional computed tomography: anatomic arthroscopic ATFL repair (anatomic group), subanatomic arthroscopic ATFL repair (subanatomic group), and nonanatomic arthroscopic ATFL repair (nonanatomic group). The visual analog scale for pain, Foot and Ankle Outcome Score (FAOS), and Karlsson ankle functional score were measured as subjective outcomes. Posturographic analysis and radiologic evaluation using stress radiographs and axial view magnetic resonance imaging were performed as objective outcomes.

Results:

Of 96 patients, 16 were excluded per the exclusion criteria, and 80 were evaluated (anatomic group, $n = 24$; subanatomic group, $n = 42$; nonanatomic group, $n = 14$). The mean age of the patients was 34.5 years, and the mean follow-up period was 27.4 months. A between-group comparison revealed significant differences in FAOS, Karlsson score, and fall risk evaluated by posturography at the final follow-up. Post hoc analysis revealed that the anatomic group had better clinical scores on the FAOS than did the nonanatomic group in all 5 domains (all $P < .017$). Patients in the anatomic and subanatomic groups had better Karlsson scores and fall risk than those in the nonanatomic group ($P = .004$ and $P = .013$, respectively). In terms of objective outcomes, patients in the anatomic and subanatomic groups had better outcomes in fall risk than did those in the nonanatomic group (both $P = .001$). There were no differences in clinical scores and objective outcomes between the anatomic and subanatomic groups.

Conclusion:

Nonanatomic ATFL repair showed inferior outcomes when compared with anatomic ATFL repair. When arthroscopic ATFL repair is performed, the anchor should be fixed in the anatomic position to improve prognosis.

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Outcomes for the Arthroscopic Treatment of Femoroacetabular Impingement Syndrome With Acetabular Retroversion: A 3D Computed Tomography Analysis

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Background:

Increased attention has been directed toward the acetabular morphology in the management of patients with femoroacetabular impingement syndrome (FAIS). Whether acetabular version influences patient-reported outcomes remains poorly understood.

Purpose:

To use computed tomography (CT)–based 3-dimensional (3D) bone models to (1) quantify acetabular version in patients with FAIS, (2) compare acetabular version on 3D bone models with current plain radiographic parameters, and (3) explore the relationship between the magnitude of acetabular version and minimum 2-year clinical outcomes after hip arthroscopy.

Study Design:

Cohort study; Level of evidence, 3.

Methods:

Three-dimensional models of the pelvis and femur were generated by semiautomated segmentation and aligned to a standard coordinate system. Acetabular version was quantified at the 3-o'clock position, and 3 groups were identified: acetabular retroversion (AR; $<15^\circ$), normal acetabular version (NV; 15° – 25°), and acetabular anteversion (AA; $>25^\circ$). Patient demographic characteristics, plain radiographic parameters, and clinical outcomes were analyzed, including the Hip Outcome Score–Activities of Daily Living, Hip Outcome Score–Sports Subscale, modified Harris Hip Score (mHHS), International Hip Outcome Tool (iHOT-12), and visual analog scale (VAS) for pain and satisfaction.

Results:

Preoperative CT scans were acquired in 105 consecutive patients before hip arthroscopy for FAIS, of which 84 (80.0%) completed minimum 2-year patient-reported outcomes. The mean \pm SD age and body mass index of patients were 33.9 ± 12.6 years and 26.0 ± 5.4 , respectively; 70.2% were female. The number of patients and the mean central acetabular version within each group were as follows: AR ($n = 12$; $11.3^\circ \pm 2.7^\circ$), NV ($n = 56$; $20.7^\circ \pm 2.9^\circ$), and AA ($n = 16$; $28.5^\circ \pm 2.7^\circ$). Posterior wall sign was the only plain radiographic parameter that was significantly more observed in the AR group than in the other 2 groups. At minimum 2-year follow-up, significant between-group differences in the mHHS, iHOT-12, and VAS for pain and satisfaction ($P < .05$) were appreciated, while post hoc analysis with Bonferroni correction ($P < .0167$) found lower scores on the mHHS, iHOT-12, and VAS for pain and satisfaction in patients with AR as compared with NV. Lower scores on the VAS for satisfaction were reported in patients with AR when compared with AA ($P = .006$) but not on the mHHS ($P = .023$), iHOT-12 ($P = .032$), or VAS for pain ($P = .072$).

Conclusion:

Traditional plain radiographic indices to describe AR, including crossover sign and ischial spine sign, were not reliable in defining AR according to 3D models derived from CT scans. Only the posterior wall sign was observed in a higher proportion in the AR group. Patients with AR

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demonstrated inferior outcomes when compared with patients with NV and AA after hip arthroscopy for FAIS.

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Intra-articular Damage and Patient Outcome Comparison Between Athletes and Nonathletes After Hip Arthroscopy

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Background:

The body of literature comparing hip arthroscopy between athletes and nonathletes is relatively scarce. Analyzing these groups can help to shed light on the severity of intra-articular damage and end-stage osteoarthritis that may result from participation in strenuous activities.

Purpose:

(1) To compare the intra-articular damage at the time of hip arthroscopy between athletes and nonathletes, and (2) to compare the pre- and postoperative outcomes between the groups.

Study Design:

Cohort study; Level of evidence, 3.

Methods:

Patients were considered eligible for analysis if they had received a primary hip arthroscopy between August 2008 and June 2018, were participating in competitive athletics, and had preoperative baseline scores and minimum 2-year follow-up for the following patient-reported outcomes: modified Harris Hip Score, Nonarthritic Hip Score (NAHS), Hip Outcome Score–Sports Specific Subscale, and visual analog scale. Propensity score matching was used to match eligible patients in a 1:1 ratio to patients who were not participating in any sports greater than a recreational level before surgery.

Results:

A total of 234 patients were included. There were no significant differences in the severity of labral tears, ligamentum teres tears, or cartilage damage ($P > .05$). The procedures performed between cohorts were similar ($P > .05$). The athlete population had higher preoperative means scores for the modified Harris Hip Score and NAHS (each $P < .001$). Likewise, the athlete population had higher postoperative means scores for the NAHS, Hip Outcome Score–Sports Specific Subscale, and visual analog scale ($P = .031$, $P = .030$, and $P = .032$, respectively). Additionally, the athlete cohort reported higher minimum 2-year outcomes than the nonathlete cohort for the 12-Item Short Form Health Survey (mental component; $P = .003$) and Veterans RAND 12-Item Health Survey (mental component, $P = .032$; physical component, $P = .005$).

Conclusion:

At the time of hip arthroscopy, athletes demonstrate similar intra-articular damage to their nonathlete counterparts. Given their higher preoperative scores, it is possible that athletes better tolerate the damage to the hip joint. Despite their strenuous activities and potentially higher tolerance to pain, athletes should not necessarily be expected to have greater severity of intra-articular pathology.

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Predictors of Achieving the Maximal Outcome Improvement Threshold for Willingness to Undergo Revision Hip Arthroscopy

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Background:

The maximal outcome improvement threshold for willingness to undergo revision hip arthroscopy (MOWT) has not been defined yet.

Purpose:

To determine the percentage MOWT in patients who underwent revision hip arthroscopy and to identify predictors of achieving the MOWT.

Study Design:

Case-control study; Level of evidence, 3.

Methods:

An anchor question was provided to patients who underwent revision hip arthroscopy between April 2008 and June 2020 who returned for follow-up between August 2019 and June 2021 at one institution. Patients were included if they underwent revision hip arthroscopy, had answered the anchor question, and had baseline and postoperative minimum 1-year follow-up scores for the modified Harris Hip Score (mHHS), Nonarthritic Hip Score (NAHS), and the visual analog scale (VAS) for pain. Exclusion criteria were Tönnis grade >1, hip dysplasia, previous hip conditions, or unwillingness to participate. Receiver operating characteristic analysis was used to determine the MOWT. Multivariate logistic regression was used to determine intraoperative predictors of achieving the MOWT.

Results:

In total, 153 patients (163 hips) were included, with 117 female hips (71.8%), a mean patient age of 34.3 ± 12.4 years, and an average follow-up time of 61.6 ± 42.7 months. It was determined that 77.3% of the patients reported that they would choose to undergo the revision hip arthroscopy again. The MOWT for the mHHS, NAHS, and VAS was 43.1%, 53%, and 33.4%, respectively. The probability of choosing to undergo revision surgery if the MOWT was achieved was 77.5%, 77.6%, and 79.2%, for the mHHS, NAHS, and VAS, respectively. Patients with residual cam-type morphology, which was addressed during the revision, were 2.3 times more likely to achieve the MOWT for the VAS ($P = .014$).

Conclusion:

Patients who improved 43.1%, 53%, and 33.4% of their MOWT for the mHHS, NAHS, and VAS, respectively, were likely to be willing to undergo revision hip arthroscopy again. Moreover, the presence of residual cam-type femoroacetabular impingement morphology before their revision surgery was identified as a predictor to achieve the MOWT for the VAS.

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Outcomes After Primary Hip Arthroscopy in Athletes Older Than 40 Years Compared With Nonathletes

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Background:

Master athletes (MAs), or athletes older than 40 years, make up a patient population whose outcomes after primary arthroscopic hip surgery are largely unknown.

Purpose:

To report minimum 2-year outcomes of MAs after primary hip arthroscopy and compare their results to a propensity-matched nonathlete (NA) control group.

Study Design:

Cohort study; Level of evidence, 3.

Methods:

Data were prospectively collected between February 2008 and April 2019 and retrospectively reviewed for all patients who underwent primary hip arthroscopy. Patients were included if they were older than 40 years and had preoperative data for the modified Harris Hip Score, Nonarthritic Hip Score, Hip Outcome Score–Sports Specific Subscale, and visual analog scale score for pain. MAs reported participating in organized sports competition within 1 year before surgery and were propensity matched to a control group of patients who did not report participating in organized sports competition (NAs). Patient characteristics, radiographic and intraoperative findings, surgical procedures performed, and patient-reported outcome measures (PROMs) were reported and compared between the groups. The rates of achieving the minimal clinically important difference and maximum outcome improvement satisfaction threshold were recorded.

Results:

A total of 366 hips were eligible; 328 (89.6%) had adequate follow-up data. 328 patients met inclusion criteria but 88 were not included due to the restrictions of the propensity score match ratio. Of these, 80 hips (76 patients) were classified as MAs (mean age, 48.9 ± 6.2 years) and were propensity matched 1:2 to an NA control group. Groups were comparable for baseline demographic and radiographic parameters, intraoperative findings, and procedures performed. MAs had significantly better baseline and minimum 2-year PROM scores ($P < .05$), higher satisfaction ($P = .01$), and higher rates of achieving clinically meaningful improvement across all the outcome tools used ($P < .05$). MAs, when compared with NAs, had lower rates of secondary arthroscopy (0% vs 7.5%, respectively; $P = .001$) and conversion to total hip arthroplasty (12.5% vs 26.9%, respectively; $P = .011$).

Conclusion:

MAs demonstrated favorable outcomes after primary hip arthroscopy. When compared with a propensity score-matched control group of NA patients, MAs demonstrated better preoperative and postoperative PROMs, higher rates of clinically meaningful improvement, and lower rates of secondary arthroscopy and conversion to total hip arthroplasty. Absolute improvements in PROM scores were similar between the groups.

[BACK](#)

Arthroscopic Versus Open Ankle Arthrodesis: A 5-Year Follow Up

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Background: End-stage ankle arthritis has long been managed surgically with open ankle arthrodesis (OAA). Since the first published report in 1983, arthroscopic ankle arthrodesis (AAA) has been thought to be associated with improved patient-reported outcome measures (PROMs) and fewer complications. The purpose of the present study was to compare the long-term PROMs, major complications, and reoperations for these 2 approaches at up to 15 years of follow-up.

Methods: This longitudinal cohort study included patients at our institution who underwent primary ankle arthrodesis for the treatment of end-stage arthritis. Demographic data and preoperative COFAS (Canadian Orthopaedic Foot and Ankle Society) ankle arthritis type were collected for all patients. PROMs were completed preoperatively, at 6 months, and annually thereafter to 5 years. PROMs were compared at all time points with use of a mixed-effects regression model that adjusted for preoperative variables and scores. Major complications and reoperations at the site of the ankle arthrodesis were also compared.

Results: Of 1,294 patients who were screened for inclusion, 351 who had undergone ankle arthrodesis between 2003 and 2019 were eligible for the study. Of those, 223 had undergone AAA and 128 had undergone OAA. The 2 groups were similar preoperatively with respect to demographics, but COFAS Type-4 arthritis was relatively more common in the OAA group and Type-1 arthritis was relatively more common in the AAA group. In addition, the Ankle Osteoarthritis Scale (AOS) score and Ankle Arthritis Score (AAS) were better in the AAA group. In the mixed-effects model analysis, the differences in postoperative outcome scores between the groups were not significant. The risk of revision due to malunion or nonunion was similar in both groups (6% in the AAA group, compared with 4% in the OAA group). Deep infection and wound complications did not occur in the arthroscopic group but occurred in 4% of the patients in the OAA group.

Conclusions: After adjustment for baseline patient characteristics, there were no differences in PROMs between the 2 techniques. Ankle arthrodeses done arthroscopically had a similar revision rate but lower infection rate compared with those done with the open technique.

Level of Evidence: Therapeutic Level III. See Instructions for Authors for a complete description of levels of evidence.