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BACK

# Upper extremity

Arthroscopy, Volume 36, Issue 12, p 2954-2961

## Outcomes of Arthroscopic Rotator Cuff Repair in Stiff Shoulders are Comparable to Non-Stiff Shoulders When Combined With Manipulation Under Anesthesia

**Zhang, J., Boon, T. Y., & Tjiauw Tjoen, D. L.**

doi:10.1016/j.arthro.2020.06.025

**Purpose**

The purpose of this study was to compare the outcomes of arthroscopic rotator cuff repair (ARCR) in patients with preoperative stiffness to those without.

**Methods**

A total of 135 patients were prospectively evaluated for 2 years after ARCR for small to medium sized rotator cuff tears at our institution. Patients were divided into stiff (<100° of passive forward flexion) and non-stiff cohorts. The stiff group underwent manipulation under anesthesia (MUA) before ARCR was performed. Outcomes were measured using visual analog scale (VAS), Constant Shoulder Score (CSS), and Oxford Shoulder Score (OSS) recorded at the preoperative, 6- , 12-, and 24-month time points. The results of ARCR between the cohorts were then compared.

**Results**

A total of 123 out of 135 patients (91.1%) completed the follow-up (stiff n = 46, non-stiff n = 77). There were significant improvements in the mean CSS scores at 6 (mean, 59.87; P < .001) and 12 months (mean, 65.88; P = .021) in the stiff group. There were no significant differences detectable in the CSS and OSS scores between the stiff and non-stiff groups at 6, 12, and 24 months. However, the percentage of patients achieving minimal clinically important difference was significantly higher in the stiff group (97.8%) compared with the non-stiff group (75.3%; P = .001). The VAS scores, forward flexion, and strength in both groups were found to be comparable.

**Conclusions**

The results of our study showed no significant differences in outcomes scores in patients with stiff shoulders who underwent MUA combined with ARCR compared with patients with non-stiff shoulders who underwent ARCR alone. Therefore, early surgical repair should be considered in patients with rotator cuff tears and concomitant shoulder stiffness.

**Level of Evidence**

Level II, prospective cohort study.

BACK

**Prognosis after Arthroscopic Superior Medial Scapuloplasty for Snapping Scapula Syndrome Improves following a Transient Beneficial Response with an Ultrasound Guided Subscapular Cortisone Injection**

Tytherleigh-Strong, G., Gill, J., Griffiths, E., & Al-Hadithy, N.

https://doi.org/10.1016/j.arthro.2020.07.024

**Purpose**

To evaluate the prognostic value of an ultrasound-guided subscapular local anesthetic and cortisone injection in a consecutive series of patients who underwent an arthroscopic superior medial scapuloplasty for snapping scapula syndrome (SSS) and had been refractory to conservative treatment.

**Methods**

We undertook an arthroscopic superior medial scapuloplasty on patients with a clinical diagnosis of SSS who had failed a structured physiotherapy program and had either gained a good response or no to minimal response to preoperative ultrasound-guided subscapular local anesthetic and cortisone injection. The patients were assessed preoperatively and at final follow-up with the QuickDASH and Constant scores, and their pain was assessed with a visual analog scale (VAS).

**Results**

Between January 2009 and December 2016, 47 patients were included in the study, with a minimal follow-up of 2 years. There were 29 female and 18 male patients, and the mean age at the time of surgery was 27.4 years (range 15 to 61). Forty-two patients were available at final follow-up. There were 31 patients in the good response group and 11 patients in the no to minimal response group. For all patients, the mean time to follow-up was 41.8 months (range 24 to 108). There was a significant improvement after surgery in the mean QuickDASH score (from 39 to 20, $P < .001$) (minimal clinically important difference [MCID] 15.91) , Constant score (from 57 to 87, $P < .001$) (MCID 10.4), and VAS (from 6 to 2, $P < .001$) (MCID 3). For the good response group, there was a significant improvement after surgery in the mean QuickDASH score (from 38 to 18, $P < .001$) (MCID 15.91), the Constant score (from 57 to 89) (MCID 10.4), and the VAS (from 6 to 2, $P < .001$) (MCID 3). For the no to minimal response group, there was a significant improvement after surgery in the mean QuickDASH score (from 42 to 24, $P < .01$) (MCID 15.91), the Constant score (from 58 to 80, $P < .002$) (MCID 10.4), and the VAS (from 6 to 2, $P < .01$) (MCID 3). The difference in postoperative improvement of the QuickDASH and Constant scores between the good response and the no to minimal response groups was statistically significant ( $P < .05$).

**Conclusion**

The results of this study suggest that arthroscopic scapuloplasty can lead to a significant improvement in pain and function in all patients with a clinical diagnosis of snapping scapula syndrome refractory to conservative treatment. Patients who gained a good transient response to a preoperative ultrasound-guided subscapular cortisone injection obtained a significantly better recovery than those who did not. A preoperative ultrasound-guided subscapular cortisone injection appeared to be of prognostic value.

BACK

**Conversion of Failed Proximal Long Head of the Biceps Tenodesis to Distal Subpectoral Tenodesis: Outcomes in an Active Population**

Peebles, L. A., Midtgaard, K. S., Aman, Z. S., Douglass, B. W., Nolte, P.-C., Millett, P. J., & Provencher, C. M. T.

https://doi.org/10.1016/j.arthro.2020.07.019

**Purpose**

To assess failure rates and patient reported outcomes following revision of failed proximal long head of the biceps (LHB) tenodesis.

**Methods**

Patients from an active-military population who underwent revision proximal (suprapectoral) to distal (subpectoral) LHB tenodesis were prospectively enrolled. Patients were included if they were between the ages of 16 and 60 years presenting after a previous biceps tenodesis with mechanical failure and clinical failure, defined as Single Assessment Numeric Evaluation (SANE) or American Shoulder and Elbow Surgeons (ASES) <70. Exclusion criteria were concomitant rotator cuff repair or debridement, full-thickness rotator cuff tear, extensive labral tears, or any evidence of glenohumeral arthritis. Pre- and postoperative SANE and ASES were documented and analyzed.

**Results**

From 2004 to 2010, a total of 12 patients (all male) with a mean age of 39.9 years (range, 30-54 years) were assessed at a mean follow-up time of 29 months (range, 24-38 months). Nine patients presented with a failed tenodesis construct located at the top of the bicipital groove and 9 patients had LHB tendons originally affixed with an interference screw. Diagnostic arthroscopy revealed that the majority of patients (10/12) had excessive scarring at the site of previous fixation. Mean preoperative assessments of SANE (70.4) and ASES (59.9) improved postoperatively to SANE (90.3; $P < .01$) and ASES (89.8; $P < .01$). No patients were lost due to follow-up, and there were no reported complications or failures. All patients returned to full active duty and were able to perform all required physical tests before returning to their vocation.

**Conclusions**

Patients presenting with symptoms following a proximal LHB tenodesis can be successfully converted to a distal (subpectoral) LHB tenodesis with favorable outcomes. Although in a small sample, there was excessive scarring and synovitis in a majority, which improved significantly when treated with a revision subpectoral tenodesis with minimal complication risk and no reported failures.

**Level of Evidence**

IV (Therapeutic case series)

BACK

Journal of Shoulder and Elbow Surgery (JSES), Volume 29, issue 12, pages 2459-2478

# Management of irreparable massive rotator cuff tears: a systematic review and meta-analysis of patient-reported outcomes, reoperation rates, and treatment response.

Kovacevic D., SurianiJr, R.J., Grawe, B.M., et al.

DOI: https://doi.org/10.1016/j.jse.2020.07.030

**Background**
There is no consensus on the treatment of irreparable massive rotator cuff tears. The goal of this systematic review and meta-analysis was to (1) compare patient-reported outcome scores, (2) define failure and reoperation rates, and (3) quantify the magnitude of patient response across treatment strategies.

**Methods**
The MEDLINE, Embase, CENTRAL (Cochrane Central Register of Controlled Trials), and Scopus databases were searched for studies including physical therapy and operative treatment of massive rotator cuff tears. The criteria of the Methodological Index for Non-randomized Studies were used to assess study quality. Primary outcome measures were patient-reported outcome scores as well as failure, complication, and reoperation rates. To quantify patient response to treatment, we compared changes in the Constant-Murley score and American Shoulder and Elbow Surgeons (ASES) score with previously reported minimal clinically important difference (MCID) thresholds.

**Results**
No level I or II studies that met the inclusion and exclusion criteria were found. Physical therapy was associated with a 30% failure rate among the included patients, and another 30% went on to undergo surgery. Partial repair was associated with a 45% retear rate and 10% reoperation rate. Only graft interposition was associated with a weighted average change that exceeded the MCID for both the Constant-Murley score and ASES score. Latissimus tendon transfer techniques using humeral bone tunnel fixation were associated with a 77% failure rate. Superior capsular reconstruction with fascia lata autograft was associated with a weighted average change that exceeded the MCID for the ASES score. Reverse arthroplasty was associated with a 10% prosthesis failure rate and 8% reoperation rate.

**Conclusion**
There is a lack of high-quality comparative studies to guide treatment recommendations. Compared with surgery, physical therapy is associated with less improvement in perceived functional outcomes and a higher clinical failure rate.

**Level of evidence**
Level IV, Systematic Review

BACK

**Remplissage for anterior shoulder instability with Hill-Sachs lesions: a systematic review and meta-analysis.**

Hurley, E.T., Toale, J.P., Davey, M.S., et al.

**DOI:** https://doi.org/10.1016/j.jse.2020.06.021

**Background**
The purpose of this study was to perform a systematic review and meta-analysis of the current evidence in the literature to determine how arthroscopic Bankart repair (ABR) and remplissage compare with ABR alone and the open Latarjet procedure for anterior shoulder instability in patients with concomitant Hill-Sachs lesions.

**Methods**
A literature search was performed based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) guidelines. Studies comparing ABR and remplissage vs. ABR alone or the Latarjet procedure for anterior shoulder instability in patients with Hill-Sachs lesions were included. Clinical outcomes were compared, with all statistical analysis performed using Review Manager (version 5.3). $P < .05$ was considered statistically significant.

**Results**
Twelve clinical trials were included. There was a significant difference between ABR plus remplissage and ABR alone in total recurrence rate (3.2% vs. 16.8%, $P < .05$) but not the rate of revision due to recurrence (1.7% vs. 8.5%, $P = .06$). There was no significant difference between the Latarjet procedure and ABR plus remplissage in total recurrence rate (7.0% vs. 9.8%, $P = .39$), total revision rate (3.7% vs. 5.7%, $P = .41$), and rate of revision due to recurrence (1.6% vs. 2.1%, $P = .79$). There was a significantly lower rate of complications with ABR and remplissage compared with the Latarjet procedure (0.5% vs. 8.6%, $P = .003$).

**Conclusion**
In patients with Hill-Sachs lesions and subcritical glenoid bone loss, ABR with remplissage resulted in lower rates of recurrent instability compared with ABR alone while resulting in similar recurrence rates, as well as similar patient-reported outcomes, with lower morbidity and fewer complications, compared with the Latarjet procedure.

**Level of evidence**
Level III; Systematic Review

BACK

**The presence of gastroesophageal reflux disease increases the risk of developing postoperative shoulder stiffness after arthroscopic rotator cuff repair.**

Cucchi, D., Menon, A., Feroldi, F.M., et al.

**DOI:** https://doi.org/10.1016/j.jse.2020.07.002

**Background**
Postoperative shoulder stiffness (SS) after arthroscopic rotator cuff (RC) repair has been reported with a variable incidence, and numerous preoperative risk factors have been described. This prospective study aimed to document the incidence of postoperative SS and to evaluate the role of preoperative risk factors in the development of this complication, with a special focus on the role of gastroesophageal reflux disease (GERD).

**Methods**
Preoperative risk factors for SS were prospectively evaluated in 237 consecutive patients undergoing arthroscopic single-row RC repair. The presence of GERD was evaluated with the GerdQ diagnostic tool. Postoperative SS was diagnosed according to the criteria described by Brislin et al in 2007.

**Results**
The incidence of postoperative SS was 8.02%. The presence of GERD was significantly associated with the development of postoperative SS (odds ratio [OR], 5.265; 95% confidence interval [CI], 1.657-1.731; $P = .005$). Older age (OR, 0.896; 95% CI, 0.847-0.949; $P < .001$), male sex (OR, 0.126; 95% CI, 0.0252-0.632; $P = .012$), and number of pregnancies (OR, 0.47; 95% CI, 0.228-0.967; $P = .040$) emerged as protective factors.

**Conclusions**
The presence of GERD significantly influences the development of postoperative SS after arthroscopic single-row RC repair. An underlying aspecific proinflammatory condition, characterized by increased expression of tumor necrosis factor α and transforming growth factor β, and disorders in retinoid metabolism are hypotheses that could explain this previously unknown association. The documented incidence of postoperative SS falls within previously reported ranges, with women being significantly more affected than men.

**Level of evidence**
Level II, Prospective Cohort Design

BACK

# Does a subscapularis tear combined with a posterosuperior rotator cuff tear affect postoperative functional outcomes?

Malavolta, E.A., Chang, V.Y.P., Montechi, J.M.N., et al.

**DOI:** https://doi.org/10.1016/j.jse.2020.03.044

**Background**
The subscapularis is biomechanically important for the shoulder. However, few studies have clinically assessed its importance using a comparative design. Our objective was to compare the functional outcomes in patients who underwent isolated repair of posterosuperior rotator cuff tears and those with repair of combined tears involving the subscapularis.

**Methods**
We performed a retrospective cohort study evaluating patients who underwent arthroscopic full-thickness rotator cuff repair between January 2013 and May 2017. The patients were divided into 2 groups: isolated repair of posterosuperior tears and repair of combined tears involving the subscapularis. The primary outcome was to evaluate the American Shoulder and Elbow Surgeons (ASES) and University of California, Los Angeles (UCLA) scales at 24 months' follow-up.

**Result**
A total of 326 patients were evaluated: 194 with isolated posterosuperior repairs and 132 with combined subscapularis repairs. Both groups showed significant improvement with the procedure ($P < .001$). The ASES score at 24 months showed no significant difference ($P = .426$) between the group without subscapularis repair (median, 90.0; interquartile range [IQR], 24.8) and the group with subscapularis repair (median, 86.3; IQR, 33.2). Similarly, the UCLA score showed no difference between the groups (median, 33.0 [IQR, 6.0] and 32.5 [IQR, 8.8], respectively; $P = .190$). The preoperative functional evaluation also showed no significant differences between the groups.

**Conclusion**
The functional results did not differ between patients who underwent isolated repair of posterosuperior tears and those with repair of combined tears involving the subscapularis, according to the ASES and UCLA scales at 24 months.

**Level of evidence**
Level III, Retrospective Cohort Comparison

BACK

**Influence of workers' compensation status on postoperative outcomes in patients following biceps tenodesis: a matched-pair cohort analysis.**

Lu, Y., Agarwalla, A., Patel, B.H., et al.

**DOI:** https://doi.org/10.1016/j.jse.2020.03.048

**Background and hypothesis**
Although the literature on the association of workers' compensation (WC) status with negative outcomes after orthopedic surgery is extensive, there is a paucity of evidence on outcomes in WC recipients undergoing biceps tenodesis. We hypothesized that WC patients would report significantly worse outcomes postoperatively on patient-reported outcome measures (PROMs).
**Methods**

Functional and health-related quality-of-life PROMs and a visual analog scale score for pain were administered preoperatively and at 12 months postoperatively to consecutive patients undergoing isolated biceps tenodesis between 2014 and 2018 at our institution. Thirty-eight WC patients were matched 1:2 to non-WC patients by age, body mass index, and operative limb. The minimal clinically important difference, substantial clinical benefit, and patient acceptable symptom state were calculated for all patients via anchor- and distribution-based methods. Rates of achievement and the likelihood of achievement were determined.

**Results**
All patients showed significant improvements in all outcome measures ($P < .001$). WC patients reported inferior postoperative scores on all PROMs examined. WC status significantly predicted a reduced likelihood of achieving substantial clinical benefit for the American Shoulder and Elbow Surgeons score (odds ratio [OR], 0.38; 95% confidence interval [CI], 0.17-0.81; $P = .01$) and the patient acceptable symptom state (OR, 0.28; 95% CI, 0.12-0.65; $P = .003$) for the American Shoulder and Elbow Surgeons score, Single Assessment Numeric Evaluation score (OR, 0.24; 95% CI, 0.10-0.61; $P = .003$), Constant-Murley Subjective Assessment (OR, 0.25; 95% CI, 0.08-0.77; $P = .016$), and visual analog scale pain score (OR, 0.27; 95% CI, 0.16-0.47; $P < .001$).

**Conclusion**
WC patients reported inferior scores on all postoperative PROMs and demonstrated lower odds of achieving substantial benefit and satisfaction regarding improvements in both function and pain compared with non-WC patients.

**Level of evidence**
Level III, Retrospective Cohort Comparison

BACK

**Accuracy of arthroscopic fluid pump systems in shoulder surgery: a comparison of 3 different pump systems.**

Taha, M.E., Schneider, K., Smith, M.M., et al.

**DOI:** https://doi.org/10.1016/j.jse.2020.03.039

**Background**
Extra-articular fluid extravasation is a known complication during shoulder arthroscopy. The risk and amount of extravasation to a large degree is dependent on the fluid pressure delivered to the surgical site. Accurate measurement, knowledge, and control of the pressure delivered is thus important to surgeons, anesthetists, and the patient. The purpose of this study was to compare the pressure measurement accuracy of 3 arthroscopic fluid pumps, with 2 of them having 2 different settings.

**Methods**
Twenty-five patients (n = 5 per group) undergoing shoulder arthroscopy were selected. Three different arthroscopic fluid pumps (ConMed 24K, Stryker Crossflow, Arthrex Dual Wave) were tested in 5 different operational settings (Stryker, standard and dynamic mode; ConMed, with and without TIPS; Arthrex Dual Wave). In each operation, the set pump pressures and the subsequently delivered intra-articular surgical site fluid pressures were measured by a spinal needle connected to an anesthetic standard pressure transducer attached to the anesthetic machine. Independent measures of the surgical site pressures were obtained before multiple portals were created or extravasation had occurred. Measurements were taken at the beginning of surgery.

**Results**
Measurements of the mean intra-articular pressure were found to not be significantly different from the set pressure for the ConMed 24K with TIPS (0.98 ± 0.02-fold) and Stryker Crossflow in standard mode (0.98 ± 0.02-fold). However, actual pressure was significantly greater than the set pressure for the ConMed 24K without TIPS (by 1.30 ± 0.13-fold), Stryker Crossflow in dynamic mode (by 1.82 ± 0.08-fold), and Arthrex Dual Wave (by 2.19 ± 0.06-fold).

**Conclusion**
Independently measured intra-articular pressure can be more than double the set pressure for some arthroscopic pumps. Measuring intra-articular pressure can thus aid in adjusting the set pressure. This could minimize the risk of intraoperative complications.

**Level of evidence**
Basic Science Study, Other

BACK

**Clinical outcomes of a combined arthroscopic and mini-open Outerbridge-Kashiwagi procedure for elbow osteoarthritis.**

Liao, W., Zhang, B., Fu, Y. et al.

**DOI:** https://doi.org/10.1016/j.jse.2020.05.007

**Background**
To evaluate the short-term clinical outcomes of a modified Outerbridge-Kashiwagi (O-K) procedure in the treatment of elbow osteoarthritis.

**Methods**
Between January 2012 and December 2016, 27 patients with elbow osteoarthritis were treated with a modified O-K procedure combining mini-open and arthroscopic technique in our institution. All patients with primary osteoarthritis and post-traumatic degenerative osteoarthritis of the elbow were included in the study if they had undergone the modified O-K procedure. Clinical outcomes were assessed using the visual analog scale (VAS), degree of flexion, extension loss, arc of motion, Mayo Elbow Performance Score (MEPS), and radiographs.

**Results**
Twenty-five patients with a mean age of 47.2 years (range, 21-69 years) at surgery were followed up for a mean of 54.5 months (range, 27-86 months). The VAS improved from 8.0 ± 1.4 (range, 6-10) preoperatively to 1.3 ± 1.1 (range, 0-3) at the final follow-up ($P < .001$), degree of flexion from 115.2° ± 12.0° (range, 90°-135°) to 130.6° ± 6.3° (range, 120°-140°) ($P < .001$), extension loss from 31.2° ± 15.0° (range, 10°-60°) to 10.2° ± 7.7° (range, 0°-30°) ($P < .001$), arc of motion from 84.0° ± 18.8° (range, 55°-120°) to 120.4° ± 9.3° (range, 105°-135°) ($P < .001$), and MEPS from 55.8 ± 8.1 (range, 40-70) to 88.4 ± 7.2 (range, 70-100) ($P < .001$). Radiographs at the final follow-up showed that 9 patients (36%) had significant recurrence of bone formation within the fenestration of the olecranon fossa. One patient developed delayed-onset ulnar neuropathy, with only slight numbness in the ulnar nerve distribution 6 months after surgery.

**Conclusions**
The modified O-K procedure is safe and effective in pain relief and function restoration in patients with elbow osteoarthritis.

**Level of evidence**
Level IV ,Case Series

BACK

**The impact of age on 30-day complications following shoulder instability surgery.**

Padaki, A.S., Boddapati, V., Lynch S., et al.

**DOI:** https://doi.org/10.1016/j.jse.2020.05.024

**Hypothesis**
The purpose of this study was to evaluate short-term outcomes including medical complications, overnight admission, and 30-day readmission with regard to patient age at the time of shoulder instability surgery.

**Methods**
Patients undergoing surgery for glenohumeral instability were collected from the National Surgical Quality Improvement Program between the years of 2005 and 2016. These patients were separated into cohorts of younger than 25 years, 25-34 years, and older than 34 years. Medical complications, hospital admission, and 30-day readmission were compared using multivariate analysis.

**Results**
Of the 5449 patients included, there were 2035 (37.0%) patients younger than 25 years, 1815 (33.0%) between 25 and 34 years, and 1649 (30.0%) 35 and older. Overall, 81.7% of patients underwent an arthroscopic Bankart repair, 12.6% of patients underwent an open Bankart repair, and 5.7% of patients underwent a Latarjet-Bristow procedure. The risk of 30-day readmission increased with age, ranging from 0.24% for <25 years old to 0.92% for 35 years and older ($P$ = .040). Operative duration greater than 60 minutes (odds ratio [OR] 1.76; $P$ = .001), duration greater than 90 minutes (OR 3.58; $P$ < .001), and American Society of Anesthesiologists class III and IV (OR 1.80; $P$ = .001) were associated with increased risk of overnight hospital stay. Compared with arthroscopic Bankart repair, the Latarjet-Bristow procedure was associated with increased total complications (OR 3.30; $P$ = .021), overnight hospital stay (OR 4.64; $P$ < .001), and 30-day readmission (OR 3.39; $P$ = .013).

**Conclusion**
This study demonstrates that even in the relatively young and healthy shoulder instability patient cohort, patients older than 25 years are almost 4 times more likely to experience a complication. Additionally, Latarjet-Bristow procedures are 3-4 times more likely to experience a complication or readmission than other shoulder instability procedures.

**Level of evidence**
Level III, Retrospective Cohort , Treatment Study

BACK

American Journal of Sports Medicine (AJSM), Volume 48, Issue 14, pp. 3439–3446

# Establishing the Minimal Clinically Important Difference, Patient Acceptable Symptomatic State, and Substantial Clinical Benefit of the PROMIS Upper Extremity Questionnaire After Rotator Cuff Repair

Eric D. Haunschild, BS, Ron Gilat, MD, Michael C. Fu, MD, Tracy Tauro, BS, Hailey P. Huddleston, BS, Adam B. Yanke, MD, Brian Forsythe, MD, Nikhil N. Verma, MD, Brian J. Cole, MD, MBA†

https://doi.org/10.1177/0363546520964957

**Background:**
The Patient-Reported Outcome Measurement Information System Upper Extremity (PROMIS UE) questionnaire has been validated as an effective and efficient outcome measure after rotator cuff repair (RCR). However, definitions of clinically significant outcomes used in interpreting this outcome measure have yet to be defined.

**Purpose:**
To define clinically significant outcomes of the PROMIS UE questionnaire in patients undergoing arthroscopic RCR.

**Study Design:**
Cohort study (diagnosis); Level of evidence, 3.

**Methods:**
We reviewed charts of consecutive patients undergoing RCR in our institution between 2017 and 2018 and included patients who were administered the PROMIS UE before surgery and 12 months after surgery. At 12 months postoperatively, patients were asked domain-specific anchor questions regarding their function and satisfaction after surgery, which were then used to determine the minimal clinically important difference (MCID), Patient Acceptable Symptomatic State (PASS), and substantial clinical benefit (SCB) using receiver operating characteristic and area under the curve (AUC) analysis. Univariate and multivariate logistic regression analysis was utilized to identify patient factors associated with clinically significant outcomes.

**Results:**
A total of 105 patients with RCR and minimum 12-month postoperative PROMIS UE were included in the analysis. The defined clinically significant outcomes were 4.87 for the MCID using a distribution-based method, 7.95 for the SCB (sensitivity, 0.708; specificity, 0.833; AUC, 0.760), and 39.00 for the PASS (sensitivity, 0.789; specificity, 0.720; AUC, 0.815). Among respondents, 79.0%, 62.9%, and 64.8% achieved the MCID, SCB, and PASS score thresholds, respectively. Workers' compensation was negatively associated with achievement of the PASS. Lower preoperative PROMIS UE scores were associated with obtaining the MCID (odds ratio [OR], 0.871; P = .001) and the SCB (OR, 0.900; P = .040), whereas higher preoperative scores were predictive of achieving the PASS (OR, 1.111; P = .020).

**Conclusion:**
This study defines the clinically significant outcomes for the PROMIS UE after RCR, of which the majority of patients achieved the MCID, PASS, and SCB at 12 months after surgery. These thresholds should be considered in future study design and interpretation of PROMIS UE in patients with RCR.

BACK

# Clinical Outcomes of Patients With Anterior Shoulder Instability and Glenolabral Articular Disruption Lesions: A Retrospective Comparative Study

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https://doi.org/10.1177/0363546520964479

**Background:**
Anterior shoulder instability is a common clinical condition that often requires surgical stabilization. Glenoid labral tears are often associated with instability, with glenolabral articular disruption (GLAD) lesions occasionally being identified arthroscopically during repair, particularly in collision athletes.

**Purpose:**
To evaluate the clinical outcomes and recurrence rates in patients who had GLAD lesions and underwent arthroscopic Bankart repair (ABR) and compare them with a control group without GLAD lesions.

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

**Methods:**
A retrospective review of patients who underwent ABR with GLAD lesions, by a single surgeon between July 2012 and March 2017, was performed. Additionally, these were pair matched in a 2:1 ratio for age, sex, sport, and level of play with a control group who underwent ABR without GLAD lesions. Return to sport, the level of return, and the timing of return were assessed. The visual analog scale (VAS) for pain score, Rowe score, Shoulder Instability–Return to Sport after Injury (SIRSI) score, and Subjective Shoulder Value (SSV) were evaluated.

**Results:**
The study included a total of 66 patients (22 and 44 patients for the GLAD and control groups, respectively), with a mean age of 25.8 years and a mean follow-up of 66 months. Overall, there was no significant difference in any of the clinical outcome scores (VAS, Rowe, SIRSI, and SSV) utilized for the GLAD and control groups ($P > .05$ for all). Similarly, there was no significant difference in the total rate of return to play (90.9% vs 88.6%; $P > .99$) or return at the same/higher level (68.2% vs 72.7%; $P = .78$). There was no significant difference in timing of return to play (6.3 ± 6.6 months vs 6.4 ± 2.5 months; $P = .98$). There were 3 cases (13.6%) requiring further surgery (1 revision stabilization, 1 arthroscopic release, and 1 rotator cuff repair) in the GLAD group and 2 cases (4.5%) requiring further surgery (both revision stabilization) in the control group; the difference was not statistically significant ($P = .32$).

**Conclusion:**
After arthroscopic repair, patients with GLAD lesions had similar midterm outcomes when compared with a control group without GLAD lesions

BACK

**Arthroscopic Superior Capsule Reconstruction for Irreparable Rotator Cuff Tears: Comparison of Clinical Outcomes With and Without Subscapularis Tear**

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https://doi.org/10.1177/0363546520965993

**Background:**
Arthroscopic superior capsule reconstruction (SCR) was developed to restore shoulder superior stability, muscle balance, and function in patients with irreparable posterior-superior rotator cuff tears.

**Purpose:**
To assess the effects of concomitant subscapularis tendon tear, which may reduce glenohumeral stability and force coupling, on clinical outcomes of SCR for irreparable posterior-superior rotator cuff tears.

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

**Methods:**
In total, 193 patients with irreparable posterior-superior rotator cuff tears underwent arthroscopic SCR using fascia lata autograft between 2007 and 2015. They were allocated to 3 groups: group 1, no subscapularis tear (160 patients); group 2, reparable subscapularis tear, which underwent arthroscopic repair (26 patients); and group 3, irreparable subscapularis tear (7 patients). American Shoulder and Elbow Surgeons (ASES) and Japanese Orthopaedic Association (JOA) scores, visual analog scale (VAS) score for pain, active shoulder range of motion (ROM), muscle strength (manual muscle test), and acromiohumeral distance were evaluated before surgery and at final follow-up (mean, 3 years, 7 months; range, 2-11 years). Postoperative complications were assessed.

**Results:**
In groups 1 and 2, ASES, JOA, and VAS scores and shoulder ROM and muscle strength improved significantly after SCR with subscapularis repair ($P < .001$). SCR in group 3 significantly improved ASES, JOA, and VAS scores ($P < .001$), whereas shoulder ROM and muscle strength did not increase significantly. Postoperative acromiohumeral distance was significantly smaller in group 3 (5.7 ± 2.9 mm [mean ± SD]) than group 2 (9.1 ± 2.3 mm) ($P = .002$). Group 3 had a significantly higher rate of graft tear ($P < .001$) and postoperative infection ($P < .001$) than group 1.

**Conclusion:**
The presence of subscapularis tendon tear affects clinical outcomes and complication rates after SCR. The reparability of the subscapularis affects superior glenohumeral stability; therefore, an intact subscapularis or reparable subscapularis tendon tear is the best indication for arthroscopic SCR in patients with irreparable posterior-superior rotator cuff tendon tears.

BACK

# Time Required to Achieve Clinically Significant Outcomes After Arthroscopic Rotator Cuff Repair

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https://doi.org/10.1177/0363546520962512

**Background:** Recent literature has focused on correlating statistically significant changes in outcome measures with clinically significant outcomes (CSOs). CSO benchmarks are being established for arthroscopic rotator cuff repair (RCR), but more remains to be defined about them.

**Purpose:** To define the time-dependent nature of the minimal clinically important difference (MCID), substantial clinical benefit (SCB), and Patient Acceptable Symptomatic State (PASS) after RCR and to define what factors affect this time to CSO achievement.

**Study Design:** Case series; Level of evidence, 4.

**Methods:** An institutional registry was queried for patients who underwent arthroscopic RCR between 2014 and 2016 and completed preoperative, 6-month, 1-year, and 2-year patient-reported outcome measures (PROMs). Threshold values for MCID, SCB, and PASS were obtained from previous literature for the American Shoulder and Elbow Surgeons score (ASES), Single Assessment Numeric Evaluation (SANE), and subjective Constant score. The time in which patients achieved MCID, SCB, and PASS was calculated using Kaplan-Meier analysis. A Cox multivariate regression model was used to identify variables correlated with earlier or later achievement of CSOs.

**Results:** A total of 203 patients with an average age of 56.19 ± 9.96 years and average body mass index was 30.29 ± 6.49 were included. The time of mean achievement of MCID, SCB, and PASS for ASES was 5.77 ± 1.79 months, 6.22 ± 2.85 months, and 7.23 ± 3.81 months, respectively. The time of mean achievement of MCID, SCB, and PASS for SANE was 6.25 ± 2.42 months, 7.05 ± 4.10 months, and 9.26 ± 5.89 months, respectively. The time of mean achievement of MCID, SCB, and PASS for Constant was 6.94 ± 3.85 months, 7.13 ± 4.13 months, and 8.66 ± 5.46 months, respectively. Patients with dominant-sided surgery (hazard ratio [HR], 1.363; 95% CI, 1.065-1.745; P = .014) achieved CSOs earlier on ASES, while patients with workers' compensation status (HR, 0.752; 95% CI, 0.592-0.955; P = .019), who were current smokers (HR, 0.323; 95% CI, 0.119-0.882; P = .028), and with concomitant biceps tenodesis (HR, 0.763; 95% CI, 0.607-0.959; P = .021) achieved CSOs on ASES at later timepoints. Patients with distal clavicle excision (HR, 1.484; 95% CI, 1.028-2.143; P = .035) achieved CSOs earlier on SANE. Patients with distal clavicle excision (HR, 1.689; 95% CI, 1.183-2.411, P = .004) achieved CSOs earlier on Constant, while patients with workers' compensation insurance status (HR, 0.671; 95% CI, 0.506-0.891; P = .006) and partial-thickness tears (HR, 0.410; 95% CI, 0.250-0.671; P < .001) achieved CSOs later on Constant. Greater preoperative score was associated with delayed achievement of CSOs for ASES, SANE (HR, 0.993; 95% CI, 0.987-0.999; P = .020), and Constant (HR, 0.941; 95% CI, 0.928-0.962; P < .001).

**Conclusion:**
A majority of patients achieved MCID by 6 months after surgery. Dominant-sided surgery and concomitant distal clavicle excision resulted in faster CSO achievement, while workers' compensation status, concomitant biceps tenodesis, current smoking, partial-thickness rotator cuff tears, and higher preoperative PROMs resulted in delayed CSO achievement.

BACK

## Lower Extremity

Arthroscopy, Volume 36, Issue 12, P2992-2997

# Patient-Reported Outcomes Measurement Information System Physical Function Has a Lower Effect Size and is Less Responsive Than Legacy Hip Specific Patient Reported Outcome Measures Following Arthroscopic Hip Surgery

Nwachuwu, B. U., Rasio, J., Beck, E. C., Okoroha, K. R., Sullivan, S. W., Makhni, E. C., & Nho, S. J.

doi:10.1016/j.arthro.2020.07.008

**Purpose**
To compare the use and responsiveness of Patient Reported Outcomes Measurement Information System (PROMIS) to legacy patient-reported outcome measures (PROMs) in patients undergoing hip arthroscopy for femoroacetabular impingement syndrome (FAIS) at 6-month follow-up.

**Methods**
Data from patients who underwent primary hip arthroscopy with routine capsular closure between August 2018 and January 2019 for the treatment of FAIS were analyzed. Preoperative outcomes, 6-month postoperative outcomes, and demographics were recorded. Primary outcome measures included PROMIS Physical Function (PROMIS-PF), PROMIS Pain Interference (PROMIS-PI), and PROMIS Depression. The legacy PROMs included Hip Outcome Score Activities of Daily Living (HOS-ADL), Hip Outcome Score Sport Subscale (HOS-SS), and the international hip outcome tool 12 questions (iHOT-12). Floor and ceiling effects along with the responsiveness and Cohen's d effect size of each PROM tool were calculated.

**Results**
Ninety-six patients with an average age and body mass index of 32.4 ± 11.9 years and 25.9 ± 6.1 kg/m 2, respectively, were included in the final analysis. All outcomes were significantly higher at 6 months compared with the preoperative level ( $P < .001$) except for PROMIS Depression ( $P = .873$). PROMIS-PF demonstrated excellent correlation with HOS-SS ( $r = 0.81$; $P < .001$), very good correlation with HOS-ADL ( $r = 0.73$; $P < .001$), and good correlation with iHOT-12 ( $r = 0.68$; $P < .001$). No floor was observed for any measure. The effect size was large for all outcomes, except PROMIS Depression ( $d = 0.04$), but largest for iHOT12 ( $d = 1.87$) followed by HOS-ADL ( $d = 1.29$). The iHOT-12 was more responsive than PROMIS-PI (relative efficiency [RE] = 3.95), PROMIS-PF (RE = 4.13), HOS-ADL (RE = 2.26), and HOS-SS (RE = 3.84). HOS-SS was similarly responsive to PROMIS-PI (RE=1.03) and PROMIS-PF (RE=1.08). However, PROMIS-PF was overall the least responsive.

**Conclusions**
In patients at 6 months postoperatively from hip arthroscopy for FAIS, iHOT-12 was the most responsive and had the largest effect size. In contrast, PROMIS-PF had a lower effect size compared with legacy hip-specific PROMs. Additionally, PROMIS-PF did not correlate as well with iHOT-12 compared with HOS-SS.

**Level of Evidence**
Level IV, case series.

BACK

# Trochlear Dysplasia Does Not Affect the Outcomes of Patellofemoral Autologous Chondrocyte Implantation

Mestriner, A. B., Ackermann, J., Morlin Ambra, L. F., Franciozi, C. E., Faloppa, F., & Gomoll, A. H.

https://doi.org/10.1016/j.arthro.2020.07.012

**Purpose**
To evaluate the influence of trochlear dysplasia on clinical outcomes after autologous chondrocyte implantation (ACI) for the treatment of large cartilage lesions in the patellofemoral joint (PFJ) with a minimum of 2 years' follow-up.

**Methods**
We performed a retrospective review of prospectively collected data of all patients submitted to cartilage repair with ACI for focal cartilage defects in the PFJ by a single surgeon. Patient factors, lesion morphology, and preoperative and postoperative patient-reported outcome measures including the Knee Injury and Osteoarthritis Score, Lysholm score, Tegner activity level, and International Knee Documentation Committee Subjective Knee Evaluation Form score were collected. Two independent observers assessed preoperative imaging to determine the presence and grade of trochlear dysplasia. Patients were stratified into 2 groups based on the presence or absence of trochlear dysplasia. Patients without trochlear dysplasia served as controls. Patients were matched 1:1 for sex, age, body mass index, lesion size, and location.

**Results**
Forty-six patients who underwent ACI in the PFJ with a mean follow-up period of 3.7 ± 1.9 years (range, 2-9 years) were enrolled in this study (23 in the trochlear dysplasia group vs 23 in the normal trochlea group). The patients' mean age was 30.1 ± 8.8 years. Patient-reported outcome measures at final follow-up did not differ between the 2 groups ( $P > .05$). No difference in failure rates was seen between the 2 groups (n = 1 [4.3%] vs n = 1 [4.3%], $P > .999$). Additionally, no difference in clinical outcomes was seen between patients with high-grade dysplasia (19 patients; Dejour types B-D) and patients without dysplasia (19 patients) ( $P > .05$).

**Conclusions**
ACI in the PFJ provides favorable outcomes even in patients with trochlear dysplasia, which are comparable to those in patients with normal trochlear anatomy. Thus, trochlear dysplasia seems to not influence the clinical outcomes of ACI in the PFJ.

**Level of Evidence**
Level III, retrospective comparative trial.

BACK

**Medial and Lateral Meniscus Allograft Transplantation Showed No Difference With Respect to Graft Survivorship and Clinical Outcomes: A Comparative Analysis With a Minimum 2-Year Follow-Up**

Kim, C., Bin, S.-I., Kim, J.-M., Lee, B.-S., Song, J.-H., Park, J.-G., & Lee, J.

https://doi.org/10.1016/j.arthro.2020.07.025

**Purpose**
To compare the differences with respect to clinical and graft survivorship and patient-reported outcomes (PROs) between lateral (LMAT) and medial (MMAT) meniscus allograft transplantation.

**Methods**
Patients having a primary MAT between 1998 and 2016 were enrolled. The inclusion criteria were (1) patients who had a minimum 2-year follow-up and (2) patients who had magnetic resonance imaging (MRI) >2 years after surgery. Knees with localized grade 4 articular cartilage lesions >3 cm 2 at the time of MAT were excluded. Clinical failure was defined as follows: modified Lysholm score <65, meniscectomy >50% of the graft, meniscectomy to the meniscocapsular junction zone, conversion to revision MAT, or realignment osteotomy or arthroplasty. Graft failure was defined as follows: tears involving >50% of the graft or unhealed peripheral rim observed on MRI. Kaplan–Meier survival analysis with log-rank test was used to compare survivorship between LMAT and MMAT. Patient-reported outcomes were compared based on the Hospital for Special Surgery, modified Lysholm, and International Knee Documentation Committee subjective scores collected preoperatively and at the final follow-up.

**Results**
A total of 299 knees (249 LMAT, 50 MMAT, mean age 33.0 ± 9.8 years) were included. Twenty clinical [2 MMAT (4.0%), 18 LMAT (7.2%)] and 24 graft [2 MMAT (4.0%), 22 LMAT (8.8%)] failures were identified. The mean clinical follow-up period was 63.1 ± 43.1 months (range 2 to 248), and MRI follow-up period was 62.6 ± 43.8 months (range 2 to 248). No significant differences in clinical and graft survivorship were found between the LMAT and MMAT groups ( P = .481, P = .271, respectively). PROs preoperatively and at last follow-up also showed no significant difference between the groups.

**Conclusion**
No significant differences in clinical survivorship, graft survivorship, and PROs were found between the LMAT and MMAT groups.

**Level of evidence**
Level III, retrospective comparative study.

BACK

**Surgeon Experience in Hip Arthroscopy Affects Surgical Time, Complication Rate, and Reoperation Rate: A Systematic Review on the Learning Curve**

Go, C. C., Kyin, C., Maldonado, D. R., & Domb, B. G.

https://doi.org/10.1016/j.arthro.2020.06.033

**Purpose**
To systematically review the literature to (1) identify the reported learning curves associated with hip arthroscopy and (2) evaluate the effect of the stated learning curves on outcomes, such as complication rates, surgical and traction time, reoperation rates, and patient-reported outcome score (PRO) improvements.

**Methods**
Two independent reviewers screened the PubMed-MEDLINE, Embase, and Cochrane Library electronic databases from inception to January 2020 according to Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines. The following search algorithm was used: “hip arthroscopy” paired with “learning curve,” “competence,” “experience,” “performance,” and “motor skills.” Data regarding study characteristics, patient demographic characteristics, PROs, and learning-curve analyses were collected.

**Results**
We identified 15 studies that reported the impact of the learning curve on surgical progress or clinical outcome measures. Measures of the surgical process included surgical and traction time, as well as fluoroscopy time, whereas clinical outcome measures encompassed PROs, complication rates, and reoperation rates. Three studies reported that the learning curve plateaued at 30 cases, but other studies suggested cutoff points ranging from 20 to 519. Operative time (75-119 minutes vs 45-99 minutes), traction time (55-127 minutes vs 54-112 minutes), complication rates (0.5%-43.3% vs 0.5%-18.0%), revision arthroscopy rates (3.3%-10% vs 1.0%-4.2%), and rates of conversion to total hip arthroplasty (12.2%-22.5% vs 1.5%-3.7%) decreased as surgeons gained more experience. Favorable PROs were observed throughout the surgeons’ experience.

**Conclusions**
Progression along the learning curve of hip arthroscopy led to decreases in complication rates, surgical and traction time, and reoperation rates. PROs benefited from surgery throughout the learning curve. Currently, there exists a wide spread of cutoff numbers proposed to achieve proficiency, ranging from 20 to over 500.

**Level of Evidence**
Level IV, systematic review of Level IV studies

BACK

**Mid-Term Outcomes of Endoscopic Gluteus Medius Repair With Concomitant Arthroscopic Labral Treatment: A Propensity-Matched Controlled Study**

Meghpara, M. B., Yelton, M. J., Annin, S., Shapira, J., Rosinsky, P. J., Maldonado, D. R., … Domb, B. G.

https://doi.org/10.1016/j.arthro.2020.07.020

**Purpose**
To report mid-term outcomes of patients who underwent endoscopic gluteus medius (GM) repair with arthroscopic labral treatment and to compare them with a control cohort of patients who underwent arthroscopic labral treatment without an endoscopic GM repair.

**Methods**
Data were prospectively collected and retrospectively reviewed for all patients who underwent primary hip arthroscopy between February 2008 and August 2013. Patients were included if they underwent arthroscopic labral treatment, endoscopic GM repair, and had preoperative with minimum 5-year follow-up for the following patient-reported outcomes: modified Harris Hip Score (mHHS), Nonarthritic Hip Score (NAHS), and Hip Outcome Score-Sports Specific Subscale (HOS-SSS). Propensity score matching was used to create a control cohort of patients who underwent primary arthroscopic labral treatment without GM repair.

**Results**
There were a total of 46 patients with GM repair eligible for the current study, of whom 43 (93.5%) had 5-year follow-up. The average follow-up time was 73.4 months. At minimum 5-year follow-up, all PROs significantly improved ( $P < .001$). Among the entire GM repair cohort, rates for achieving the patient acceptable symptomatic state (PASS) for mHHS, HOS-SSS, and international Hip Outcome Tool (iHOT-12) were 74.4%, 51.9%, and 71.8%, respectively. Rates for reaching a minimal clinically important difference for mHHS, NAHS, and HOS-SSS were 79.5%, 89.7%, and 73.1%, respectively. When the GM repair cohort was matched, there were 37 cases in the GM repair cohort and 78 in the control cohort. The GM repair cohort outcomes compared satisfactorily to the control cohort for mHHS (82.3 vs 82.6), NAHS (81.9 vs 82.3), and HOS-SSS (66.3 vs 67.5). Rates of achieving minimal clinically important difference and PASS for mHHS, NAHS, HOS-SSS, and iHOT-12 were also favorable.

**Conclusions**
Endoscopic GM repair with arthroscopic labral treatment results in safe, durable, and significant improvement in PROs at a minimum 5-year follow-up. The outcomes compared favorably with a control cohort without GM tears.

**Level of Evidence**
III, retrospective comparative study.

BACK

Knee Surgery, Sports Traumatology, Arthroscopy (KSSTA), Volume 28, Issue 12, pages: 3766–3772

# Protracted alterations in muscle activation strategies and knee mechanics in patients after Anterior Cruciate Ligament Reconstruction.

Burland, J.P., Lepley, A.S., Frechette, L. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-019-05833-4

**Purpose**
Altered quadriceps muscle activity can contribute to reduced ability of the muscle to quickly generate force and appropriately attenuate landing forces, exacerbating poor landing and movement strategies commonly seen after anterior cruciate ligament reconstruction (ACLR). The purpose was to evaluate if electromyographic (EMG) activity and knee biomechanics during a single-limb forward hop task are influenced by a history of ACLR.

**Methods**
Twenty-six individuals with a history of unilateral ACLR (age 20.2 ± 2.7 years, height 1.7 ± 0.1 m; weight 69.6 ± 12.4 kg; time from surgery, 2.9 ± 2.7 years; graft type, 21 bone-patellar-tendon bone, 5 hamstring) and 8 healthy controls (age 23.3 ± 1.8 years, height 1.7 ± 0.1 m; mass 66.3 ± 13.9 kg) volunteered. Sagittal plane knee kinetics and EMG of the vastus lateralis were synchronized and measured using a three-dimensional motion analysis system during a single-limb forward hop task. Mixed-effect models were used to assess the effect of group on kinetic and EMG variables.

**Results**
Kinetic outcomes (peak and rate of knee extension moment) and temporal muscle activity and activation patterns differed between the ACLR limb and healthy-control limb. Inter-limb asymmetries in the ACLR group were observed for all variables except EMG onset time; no limb differences were observed in the healthy cohort.

**Conclusion**
Years after ACLR, persistent quadriceps functional deficits are present, contributing to altered neuromuscular control strategies during functional tasks that may increase the risk of reinjury. To counteract these effects, emerging evidence indicates that clinicians could consider the use of motor learning strategies to improve neuromuscular control after ACLR.

**Level of evidence**
III.

BACK

**Knotless anchor repair produced similarly favourable outcomes as knot anchor repair for anterior talofibular ligament repair.**

Li, H., Zhao, Y., Hua, Y. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-05998-3

**Purpose**
To compare clinical function after knot anchor versus knotless anchor repair of the anterior talofibular ligament (ATFL) in patients with chronic lateral ankle instability.

**Methods**
All patients who underwent arthroscopic surgical ATFL repair using knot or knotless suture anchors were included in this study. Functional scores (American Orthopedic Foot and Ankle Society (AOFAS), Karlsson score and Tegner activity scores) and magnetic resonance imaging (MRI) were used to evaluate the ankle with a follow-up of at least 2 years.

**Results**
A total of 52 patients with chronic ankle instability were included in this study. Among these patients, 23 patients underwent one knot anchor repair procedure (Group A), and the other 29 patients underwent one knotless anchor repair procedure (Group B). At the final follow-up, there were no significant differences between Group A and Group B regarding the AOFAS score (89 ± 9 vs 84 ± 11; ns), Karlsson score (82 ± 14 vs 75 ± 18; ns), or Tegner activity score (4 ± 1 vs 4 ± 2; ns). There also were no significant differences in the mean ATFL signal–noise ratio (SNR) value (7.5 ± 4.4 vs 7.3 ± 2.9; ns) or ATFL angle (82° ± 7° vs 84° ± 9°; ns) between the groups.

**Conclusion**
When compared with knot repair, knotless repair of the lateral ankle ligament produced similar functional outcomes.

**Level of evidence**
III.

BACK

**The ankle ligament reconstruction-return to sport after injury (ALR-RSI) is a valid and reproducible scale to quantify psychological readiness before returning to sport after ankle ligament reconstruction.**

Sigonney, F., Lopes, R., Bouché, PA. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06020-6

**Purpose**
Chronic ankle instability is the main complication of ankle sprains and requires surgery if non-operative treatment fails. The goal of this study was to validate a tool to quantify psychological readiness to return to sport after ankle ligament reconstruction.

**Methods**
The form was designed like the anterior cruciate ligament-return to sport after injury scale and “Knee” was replaced by the term “ankle”. The ankle ligament reconstruction-return to sport after injury (ALR-RSI) scale was filled by patients who underwent ankle ligament reconstruction and were active in sports. The scale was then validated according to the international COSMIN methodology. The AOFAS and Karlsson scores were used as reference questionnaires.

**Results**
Fifty-seven patients (59 ankles) were included, 27 women. The ALR-RSI scale was strongly correlated with the Karlsson score ($r = 0.79$ [0.66–0.87]) and the AOFAS score ($r = 0.8$ [0.66–0.87]). A highly significant difference was found in the ALR-RSI between the subgroup of 50 patients who returned to playing sport and the seven who did not: 68.8 (56.5–86.5) vs 45.0 (31.3–55.8), respectively, $p = 0.02$. The internal consistency of the scale was high ($\alpha = 0.96$). Reproducibility of the test–retest was excellent ($\rho = 0.92$; 95% CI [0.86–0.96]).

**Conclusion**
The ALR-RSI is a valid, reproducible scale that identifies patients who are ready to return to the same sport after ankle ligament reconstruction. This scale may help to identify athletes who will find sport resumption difficult.

**Level of evidence**
III.

BACK

American Journal of Sports Medicine (AJSM), Volume 48, Issue 14, P 3478-3485

# Slope-Correction Osteotomy with Lateral Extra-articular Tenodesis and Revision Anterior Cruciate Ligament Reconstruction Is Highly Effective in Treating High-Grade Anterior Knee Laxity

Ralph Akoto, MD, Lena Alm, MD, Tobias Claus Drenck, MD, Jannik Frings, MD, Matthias Krause, MD, Karl-Heinz Frosch, MD‖

https://doi.org/10.1177/0363546520966327

**Background:**
Both an elevated posterior tibial slope (PTS) and high-grade anterior knee laxity are often present in patients who undergo revision anterior cruciate ligament (ACL) surgery, and these conditions are independent risk factors for ACL graft failure. Clinical data on slope-correction osteotomy combined with lateral extra-articular tenodesis (LET) do not yet exist.

**Purpose:**
To evaluate the outcomes of patients undergoing revision ACL reconstruction (ACLR) and slope-correction osteotomy combined with LET.

**Study Design:**
Case series; Level of evidence, 4.

**Methods:**
Between 2016 and 2018, we performed a 2-stage procedure: slope-correction osteotomy was performed first, and then revision ACLR in combination with LET was performed in 22 patients with ACLR failure and high-grade anterior knee laxity. Twenty patients (6 women and 14 men; mean age, 27.8 ± 8.6 years; range, 18-49 years) were evaluated, with a mean follow-up of 30.5 ± 9.3 months (range, 24-56 months), in this retrospective case series. Postoperative failure was defined as a side-to-side difference of ≥5 mm in the Rolimeter test and a pivot-shift grade of 2 or 3.

**Results:**
The PTS decreased from 15.3° to 8.9°, the side-to-side difference decreased from 7.2 to 1.1 mm, and the pivot shift was no longer evident in any of the patients. No patients exhibited revision ACLR failure and all patients showed good to excellent postoperative functional scores (mean ± SD: visual analog scale, 0.5 ± 0.6; Tegner, 6.1 ± 0.9; Lysholm, 90.9 ± 6.4; Knee injury and Osteoarthritis Outcome Score [KOOS] Symptoms, 95.2 ± 8.4; KOOS Pain, 94.7 ± 5.2; KOOS Activities of Daily Living, 98.5 ± 3.2; KOOS Function in Sport and Recreation, 86.8 ± 12.4; and KOOS Quality of Life, 65.4 ± 14.9).

**Conclusion:**
Slope-correction osteotomy in combination with LET is a safe and reliable procedure in patients with high-grade anterior knee laxity and a PTS of ≥12°. Normal knee joint stability was restored and good to excellent functional scores were achieved after a follow-up of at least 2 years.

BACK

# Slope-Reducing Tibial Osteotomy Combined With Primary Anterior Cruciate Ligament Reconstruction Produces Improved Knee Stability in Patients With Steep Posterior Tibial Slope, Excessive Anterior Tibial Subluxation in Extension, and Chronic Meniscal Posterior Horn Tears

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**Background:**
Steep posterior tibial slope (PTS; >13°), excessive anterior tibial subluxation (ATS) in extension (>10 mm), and meniscus posterior horn tears (MPHTs) have been identified to be associated with primary anterior cruciate ligament (ACL) reconstruction (ACLR) failure. Recent studies have reported that steep PTS is directly correlated with excessive ATS in extension and concomitant MPHTs, especially for those patients with chronic (>6 months) ACL deficiency. There is increasing biomechanical evidence that slope-reducing tibial osteotomy decreases ATS in extension and protects the ACL graft.

**Hypothesis:**
Slope-reducing tibial osteotomy combined with primary ACLR is effective for producing improved knee stability in patients with steep PTS (>13°), excessive ATS in extension (>10 mm), and concomitant chronic MPHTs (>6 months).

**Study Design:**
Case series; Level of evidence, 4.

**Methods:**
Between June 2016 and January 2018, 18 patients with ACL injuries who had steep PTS (>13°), excessive ATS in extension (>10 mm), and concomitant chronic MPHTs (>6 months) underwent slope-reducing tibial osteotomy combined with primary ACLR. The PTS and anterior subluxation of the lateral and medial compartment (ASLC and ASMC) in extension before and after the index procedures were regarded as primary clinical outcomes. Moreover, Lysholm score, Tegner activity score, International Knee Documentation Committee (IKDC) objective grade, pivot-shift test, and KT-1000 side-to-side difference were evaluated preoperatively and at the minimum 2-year follow-up visit.

**Results:**
The mean PTS was 18.5° (range, 17°-20°) preoperatively and 8.1° (range, 7°-9°) postoperatively ($P < .01$). The mean ASLC and ASMC in extension were 12.1 mm and 11.9 mm preoperatively, which reduced to 1.0 mm and 1.5 mm at the last follow-up visit ($P < .05$). In addition, all of the following showed significant improvements (pre- vs postoperatively): mean Lysholm score (46.5 vs 89.5; $P < .05$), mean Tegner activity score (5.7 vs 7.3; $P < .05$), IKDC objective grading results (18 grade D vs 14 grade A and 4 grade B; $P < .05$), pivot-shift tests (15 grade 2+ and 3 grade 3+ vs 18 grade 0; $P < .01$), and KT-1000 side-to-side difference (13.0 mm vs 1.6 mm; $P < .01$). Moreover, no graft reruptures were found at the final follow-up visit.

**Conclusion:**
In this study, slope-reducing tibial osteotomy combined with primary ACLR effectively improved knee stability in patients with steep PTS (>13°), excessive ATS in extension (>10 mm), and concomitant chronic MPHTs (>6 months).

BACK

# Augmentation of Anatomic Anterior Cruciate Ligament Reconstruction With Lateral Extra-articular Tenodesis Does Not Significantly Affect Rotatory Knee Laxity: A Time Zero, In Vivo Kinematic Analysis

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**Background:**
The pivot-shift test is used to assess for rotatory knee laxity in the anterior cruciate ligament (ACL)-deficient knee and ACL-reconstructed knee; however, the pivot shift uses a subjective grading system that is limited by variability between examiners. Consequently, quantified pivot shift (QPS) test software (PIVOT iPad application) has been developed and validated to measure the magnitude of rotatory knee laxity during the positive pivot-shift test.

**Purpose:**
To employ intraoperative QPS (iQPS) to assess for differences in residual rotatory knee laxity after ACL reconstruction (ACLR) versus ACLR augmented with lateral extra-articular tenodesis (ACLR + LET), and to employ iQPS to determine if ACLR and/or ACLR + LET result in overconstrained knee kinematics when compared with the contralateral knee.

**Study Design:**
Cohort study; Level of evidence, 2.

**Methods:**
iQPS was performed in 20 patients by a single surgeon on both the operative and contralateral knees before ACLR. ACLR was augmented with a LET if the lateral compartment tibial translation measured during QPS was greater than or equal to double the amount of lateral tibial compartment translation measured for the contralateral knee. After each reconstruction (ACLR or ACLR + LET), iQPS measurements were performed. iQPS data were compared with the preoperative QPS measurements of the operative and contralateral knees. Postoperative iQPS data were compared with both the preoperative QPS measurements of the operative and contralateral knees with paired samples t tests. Categorical variables were compared using the Fisher exact test.

**Results:**
The mean age in the cohort was 17.3 years (range, 15-24 years). There were no significant differences between the groups in terms of the proportion of male patients (ACLR: 5 male, 5 female vs ACLR + LET: 4 male, 6 female) or age (ACLR: 17.7 ± 3.3 years; 95% CI, 15.4-24.0 vs ACLR + LET: 16.8 ± 2.8 years, 95% CI, 14.8-22.0; P = .999). There were no significant differences between the groups with respect to preoperative QPS performed during examination under anesthesia (ACLR: 4.7 ± 2.0 mm; 95% CI, 3.3-6.1 vs ACLR + LET: 3.6 ± 1.8 mm; 95% CI, 2.3-4.9; P = .2). Both ACLR and ACLR + LET resulted in significant decreases in rotatory knee laxity when compared with preoperative QPS measurements (ACLR: –3.4 ± 1.7 mm; 95% CI, −4.6 to −2.2; P < .001: ACLR + LET: –2.6 ± 1.9 mm; 95% CI, −3.9 to −1.3; P < .002). Moreover, when compared with isolated ACLR, ACLR + LET did not result in a significantly smaller magnitude of change in iQPS between the pre- and postoperative states (P = .3).

**Conclusion:**
Both ACLR and ACLR + LET resulted in significant decreases in rotatory knee laxity. The augmentation of ACLR with LET did not change the constraint of the knee with respect to lateral compartment translation as measured during iQPS

BACK

# Anterior Cruciate Ligament Graft Tunnel Placement and Graft Angle Are Primary Determinants of Internal Knee Mechanics After Reconstructive Surgery

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**Background:**
Graft placement is a modifiable and often discussed surgical factor in anterior cruciate ligament (ACL) reconstruction (ACLR). However, the sensitivity of functional knee mechanics to variability in graft placement is not well understood.

**Purpose:**
To (1) investigate the relationship of ACL graft tunnel location and graft angle with tibiofemoral kinematics in patients with ACLR, (2) compare experimentally measured relationships with those observed with a computational model to assess the predictive capabilities of the model, and (3) use the computational model to determine the effect of varying ACL graft tunnel placement on tibiofemoral joint mechanics during walking.

**Study Design:**
Controlled laboratory study.

**Methods:**
Eighteen participants who had undergone ACLR were tested. Bilateral ACL footprint location and graft angle were assessed using magnetic resonance imaging (MRI). Bilateral knee laxity was assessed at the completion of rehabilitation. Dynamic MRI was used to measure tibiofemoral kinematics and cartilage contact during active knee flexion-extension. Additionally, a total of 500 virtual ACLR models were created from a nominal computational knee model by varying ACL footprint locations, graft stiffness, and initial tension. Laxity tests, active knee extension, and walking were simulated with each virtual ACLR model. Linear regressions were performed between internal knee mechanics and ACL graft tunnel locations and angles for the patients with ACLR and the virtual ACLR models.

**Results:**
Static and dynamic MRI revealed that a more vertical graft in the sagittal plane was significantly related ($P < .05$) to a greater laxity compliance index ($R2 = 0.40$) and greater anterior tibial translation and internal tibial rotation during active knee extension ($R2 = 0.22$ and 0.23, respectively). Similarly, knee extension simulations with the virtual ACLR models revealed that a more vertical graft led to greater laxity compliance index, anterior translation, and internal rotation ($R2 = 0.56$, 0.26, and 0.13). These effects extended to simulations of walking, with a more vertical ACL graft inducing greater anterior tibial translation, ACL loading, and posterior migration of contact on the tibial plateaus.

**Conclusion:**
This study provides clinical evidence from patients who underwent ACLR and from complementary modeling that functional postoperative knee mechanics are sensitive to graft tunnel locations and graft angle. Of the factors studied, the sagittal angle of the ACL was particularly influential on knee mechanics.

**Clinical Relevance:**
Early-onset osteoarthritis from altered cartilage loading after ACLR is common. This study shows that postoperative cartilage loading is sensitive to graft angle. Therefore, variability in graft tunnel placement resulting in small deviations from the anatomic ACL angle might contribute to the elevated risk of osteoarthritis after ACLR.

BACK

# Incidence and Risk Factors of Subsequent Meniscal Surgery After Successful Anterior Cruciate Ligament Reconstruction: A Retrospective Study With a Minimum 2-Year Follow-up

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**Background:**
One of the goals of anterior cruciate ligament (ACL) reconstruction is a meniscal protective effect on the knee. Despite the advancement of ACL reconstruction techniques, subsequent meniscal tears after ACL reconstruction remain a problem, and the risk factors for recurring lesions are still unclear.

**Purpose:**
To investigate the incidence of subsequent meniscal surgery after primary ACL reconstruction without revision ACL surgery and to determine the risk factors associated with this reoperation.

**Study Design:**
Case series; Level of evidence, 4.

**Methods:**
Overall, 518 patients who underwent primary ACL reconstruction between 2004 and 2012 at one instution participated in this study. Data on body mass index, graft type and femoral tunnel-drilling technique of ACL reconstruction, and location and type of meniscal injury and its treatment at ACL reconstruction were collected from medical records. Clinical outcomes were investigated, including side-to-side difference of anterior laxity, pivot-shift grade, and subsequent meniscal surgery without ACL insufficiency (at minimum 2-year follow-up).

**Results:**
The prevalence of tears to the medial meniscus (MM) at the primary ACL reconstruction was 43.6% (226/518), 140 of which were repaired; on the contrary, tears of the lateral meniscus (LM) had a prevalence of 55.8% (289/518), 42 of which were repaired. At a mean 30.3 months (range, 8-124 months) after ACL reconstruction, 20 patients (3.9%; 14 MM tears, 3 LM tears, 3 MM + LM tears) required meniscal surgery without ACL reinjury or recurrence of instability. Of these, 14 MMs and 3 LMs had been repaired at primary ACL reconstruction. The failure rates of repaired MM and LM were 10.0% (14/140) and 7.1% (3/42), respectively. The failure rate of MM repair using the all-inside technique (6/36) was significantly higher compared with no treatment, inside-out repair, or partial resection (P = .045). In multiple regression analysis, the presence of MM injury at the time of ACL reconstruction (odds ratio [OR], 7.81; P = .003), the side-to-side difference of postoperative anterior tibial translation (OR, 1.91; P = .032), and follow-up period after ACL reconstruction (OR, 1.02; P = .003) were risk factors of subsequent meniscal surgery after ACL reconstruction.

**Conclusion:**
Incidence of subsequent meniscal surgery after successful ACL reconstruction was <5%. Presence of MM tear at the time of ACL reconsturuction, small amount of increased anterior laxity, and long-term period after ACL reconstruction were predictive of subsequent meniscal surgery.

BACK

**Adjunct Analgesia Reduces Pain and Opioid Consumption After Hip Arthroscopy: A Systematic Review of Randomized Controlled Trials**

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**Background:**
Patients who undergo hip arthroscopy inevitably experience pain postoperatively; however, the efficacy and safety of adjunct analgesia to prevent or reduce pain are not well-understood.

**Purpose:**
To perform a comprehensive qualitative synthesis of available randomized controlled trials evaluating the effect of adjunct analgesia on postoperative (1) pain, (2) opioid use, and (3) length of stay (LOS) in patients undergoing hip arthroscopy.

**Study Design:**
Systematic review.

**Methods:**
PubMed, OVID/MEDLINE, and Cochrane Controlled Register of Trials were queried for studies pertaining to analgesia interventions for patients undergoing hip arthroscopy. Two authors independently assessed article bias and eligibility. Data pertaining to changes in pain scores, additional analgesia requirements, length of hospital stay, and complications were extracted and qualitatively reported. Network meta-analyses were constructed to depict mean pain, opioid use, and LOS among the 3 analgesia categories (blocks, local infiltration analgesia, and celecoxib).

**Results:**
Fourteen level 1 studies were included; 12 (85.7%) reported pain reductions in the immediate and perioperative period after hip arthroscopy. Of the 7 studies that assessed an intervention (2 celecoxib, 1 fascia iliaca block, 1 lumbar plexus block, 1 femoral nerve block, 1 intra-articular bupivacaine, 1 extracapsular bupivacaine) versus placebo, more than half reported that patients who received an intervention consumed significantly fewer opioids postoperatively than patients who received placebo (lowest P value = .0006). Of the same 7 studies, 2 reported significantly shortened LOS with interventions, while 4 reported no statistically significant difference in LOS and 1 did not report LOS as an outcome.

**Conclusion:**
The majority of studies concerning adjunct analgesia for patients undergoing hip arthroscopy suggest benefits in pain reduction early in the postoperative period. There is mild evidence that adjunct analgesia reduces postoperative opioid use and currently inconclusive evidence that it reduces length of hospital stay. Furthermore, it appears that local infiltration analgesia may provide the greatest benefits in reductions in pain and opioid consumption. We recommend the use of adjunct analgesia in appropriately selected patients undergoing hip arthroscopy without contraindication who are at a high risk of severe postoperative pain.

BACK

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# Ramp Lesions of the Posterior Segment of the Medial Meniscus: What Is Repaired? A Qualitative Histological Study of the Meniscocapsular and Meniscotibial Attachments

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**Background**
Lesions of the posterior segment of the medial meniscus are the most common intraarticular lesions associated with ACL injuries. Ramp lesions are tears in the peripheral attachment of the posterior horn of the medial meniscus. Such injuries are difficult to detect on preoperative MRI. Arthroscopically, the prevalence of these lesions can reach 24%. Anatomical descriptions of the posterior horn of the medial meniscus are becoming clearer, however, histological descriptions are lacking, especially with regard to the presence or absence of capillaries.

**Questions/purposes**
The present qualitative histologic study focused on the posterior segment of the medial meniscus and the meniscocapsular and meniscotibial junctions. Specifically, the objective of this study was to analyze the posterior segment of the medial meniscus and the meniscosynovial junction and to determine whether the meniscus tibial ligament exists.

**Methods**
We dissected 10 unpaired cadaveric knees (five male, five female, age range 55 to 66 years), five left and five right, from the French “Don du corps” body donation program via a posterior approach to the posteromedial capsule. We excluded specimens with intra-articular abnormalities (ACL rupture, meniscal tear, arthrosis) preceding dissection by arthrotomy. We thus accessed the posterior segment of the medial meniscus and the meniscosynovial junction. The proximal capsule, posterior segment of the medial meniscus, entire meniscal capsular-tibial junction, and a fragment of the tibia were removed en bloc. For each knee, three sagittal spaced sections of the posterior segment of the medial meniscus (Zone 4 as defined by Śmigielski) were performed. Two experienced pathologists performed qualitative histological analysis on the 30 samples after Hematoxylin and eosin staining, and Safranin O staining.

**Results**
Macroscopically, the meniscotibial attachments were pellucid and homogeneous, as were the meniscocapsular attachments; however, the meniscocapsular attachments appeared to be denser in both the anterior and posterior regions of the capsule. Microscopy of the meniscosynovial junction revealed loose collagen fibers that were partially oriented but not parallel, a cellular network featuring a few fibroblasts and adipocytes, and several capillaries. No between-attachment histologic differences were apparent; both tissues shared a site of attachment to the posterior horn of the medial meniscus. We did not detect the meniscotibial ligament, macroscopically or microscopically.

**Conclusions**
A ramp lesion may not be a ligamentous injury because the meniscotibial ligament was not detected. Rather, it appears that a ramp lesion is a tear in the common attachment point between the posterior horn of the medial meniscus and meniscocapsular and meniscotibial junctions. This structure is vascularized, and contains nonoriented low cellularity collagen of moderate density.

**Clinical Relevance**
Based on our results, a better rationale for the recommendation of surgical repair of a ramp appears to be needed, given the absence of a meniscotibial ligament, and the presence of capillaries in the meniscocapsular and meniscotibial attachments

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## Miscellaneous

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