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Upper extremity

Arthroscopy, Volume 35, Issue 12

Osteointegration of a Biocomposite Suture Anchor After Arthroscopic Shoulder Labral Repair

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Purpose
To evaluate osteoconductivity of a poly-L-lactide co-glycolide (PLG)–calcium sulfate (CS)–β-tricalcium phosphate (β-TCP) biocomposite suture anchor after arthroscopic shoulder labral repair.

Methods
The subjects of this study were patients who participated in a clinical trial for acquisition of marketing approval of a PLG–CS–β-TCP biocomposite anchor in Japan. They underwent arthroscopic labral repair using the anchor, and computed tomographic (CT) images of the glenoid were obtained 2 years after surgery. Osteoconductivity at the anchor sites was evaluated with the CT images using the established ossification quality score. Shoulder function scores including the Rowe score and Japanese Shoulder Society shoulder instability score were also assessed 2 years after surgery.

Results
CT images and functional scores were obtained from 37 patients, comprising 29 men and 8 women with a mean age of 29 years (range, 25-33 years) at surgery. A total of 148 anchors were implanted in the 37 shoulders. Osteoconductivity was seen in 133 of 148 anchor sites (90.0%) 2 years after implantation. No significant differences in osteoconductivity were found by anchor diameter or position. The Rowe score significantly improved from 39.9 points (95% confidence interval [CI], 33.8-45.9 points) preoperatively to 96.6 points (95% CI, 95.1-98.1 points) at 2 years postoperatively ($P < .001$). The Japanese Shoulder Society shoulder instability score also significantly improved, from 63.1 points (95% CI, 58.4-67.7 points) preoperatively to 96.3 points (95% CI, 94.7-97.8 points) at 2 years postoperatively ($P < .001$).

Conclusions
Biocomposite suture anchors made of PLG, CS, and β-TCP exhibited some osteoconductivity 2 years after arthroscopic labral repair, as well as good clinical outcomes.

Level of Evidence
Level IV, therapeutic case series.

BACK

Influence of Smoking on the Expression of Genes and Proteins Related to Fat Infiltration, Inflammation, and Fibrosis in the Rotator Cuff Muscles of Patients With Chronic Rotator Cuff Tears: A Pilot Study

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Arthroscopy, Volume 35, Issue 12

https://doi.org/10.1016/j.arthro.2019.06.037

Purpose
To evaluate the altered gene and protein expression patterns in the rotator cuff muscles of smokers and non-smokers with rotator cuff tears and to identify the smoking-associated key genetic factor(s) involved in rotator cuff muscle physiology.

Methods
Twenty-four samples of rotator cuff muscle from 12 current heavy smokers (mean age 61.8 ± 5.1 years) and age- and sex-matched 12 non-smokers (mean age 61.8 ± 6.9 years) with medium-sized tears were acquired during arthroscopic surgery. As a statistical method, the propensity score matching technique was used to select control group by 1:1 matching for age and sex. Inclusion criteria were patients who underwent arthroscopic repair for medium-sized full-thickness rotator cuff tears and those that were current smokers with a smoking history >20 packs/year. Patients lacking medium-sized tears, those with recent steroid injection history, isolated subscapularis tear, preoperative stiff shoulder, acute traumatic tear, or previous surgery on the same shoulder, or those that declined to participate were excluded. Alterations in the expression of genes and proteins associated with myogenesis, inflammation, adipogenesis, and muscle fibrosis were compared between smokers and non-smokers with reverse-transcription quantitative polymerase chain reaction, western blotting, and immunohistochemistry.

Results
Histologic analysis revealed increased inflammation and remarkable fat accumulation and fibrogenesis in the rotator cuff muscle from smokers compared with that from non-smokers. The mRNA expression levels of inflammatory high mobility group box 1 (HMGB1; P = .043), adipogenic CCAAT/enhancer-binding protein alpha (P = .046) and peroxisome proliferator-activated receptor gamma (PPARγ; P = .048), myogenic differentiation 1 (P = .032), fibrogenic alpha-smooth muscle actin (α-SMA; P = .033), and metalloproteinase 9 (P = .036) were significantly greater in samples from smokers than from non-smokers. A correlation was observed between gene and protein expression of HMGB1 (P = .034), PPARγ (P = .021), and α-SMA (P = .021).

Conclusions
Smokers with rotator cuff tears showed high inflammation, large fat infiltration, and fibrosis in rotator cuff muscle that is associated with the increased expression of HMGB1, PPARγ, and α-SMA, respectively.

Level of Evidence
Case control study (Prognostic level III)

BACK

Ultrasound Assessment of the Superior Capsular Reconstruction With Dermal Allograft: An Evaluation of Graft Thickness and Vascularity

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Arthroscopy, Volume 35, Issue 12

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Purpose
To assess postoperative changes in the thickness of the dermal allograft of the superior capsular reconstruction (SCR) and to evaluate the graft for the presence of intrasubstance pulsatile vessels.

Methods
A retrospective chart review was conducted to identify SCR patients who had ultrasound evaluations between May 2014 and February 2019. Data were collected and stratified based on time from surgery into 2 groups: 0 to 12 months and past the 12-month follow-up. The primary outcome measure was graft thickness at the articular margin–greater tuberosity interface (tuberosity measurement). Secondary measures included midsubstance graft thicknesses 0.5, 1.0, and 1.5 cm medial to the tuberosity measurement; status of lateral graft fixation; presence of pulsatile vessels; and American Shoulder and Elbow Society and visual analog scale scores.

Results
Eighteen patients were included for analysis. The tuberosity measurement at final follow-up (mean 25 months, range 12-40 months) was (mean ± standard error [95% confidence interval (CI)]) 4.4 ± 0.2 mm (95% CI 4.0-4.8). This differed significantly from the midsubstance measurements: 0.5 cm: 3.6 ± 0.2 mm (95% CI 3.3-4.0, P = .008); 1.0 cm: 3.1 ± 0.2 mm (95% CI 2.7-3.4, P < .001); and 1.5 cm: 2.9 ± 0.2 mm (95% CI 2.6-3.2, P < .001). Ten constructs (56%) showed signs of pulsatile vessels in the first 12 months and all constructs were intact. ASES scores improved from 49.3 ± 4.0 (95% CI 41.6-57.1) preoperatively to 85.1 ± 2.9 (95% CI 79.4-90.8) (P < .001), and VAS scores decreased from 5.3 ± 0.6 (95% CI 4.2-6.5) preoperatively to 0.9 ± 0.3 (95% CI 0.3-1.5) at final follow-up (P < .001).

Conclusions
The SCR dermal allograft significantly thickens at its lateral aspect, presents with evidence of vasculature in most patients in the first year of implantation, and is not resorbed by the body.

Level of Evidence
Level IV – therapeutic case series.

BACK

Outcomes of Primary Biceps Subpectoral Tenodesis in an Active Population: A Prospective Evaluation of 101 Patients

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Purpose
To evaluate the surgical outcomes of a primary subpectoral biceps tenodesis for long head of the biceps tendon (LHBT) pathology in a large cohort of prospectively, serially collected, patients in a young active population that has known high physical demands and requirements of their shoulder to perform their vocation.

Methods
A retrospective review of prospectively collected data from an active military personnel with a diagnosis of a Type II SLAP tear or biceps tenosynovitis was performed. Outcomes were evaluated at a minimum follow-up time of 18 months based on preoperative and postoperative assessments of the Single Assessment Numeric Evaluation, Western Ontario Rotator Cuff index, biceps position, and return to active duty. Inclusion criteria were (1) SLAP tears on magnetic resonance arthrogram (classified into SLAP group), and (2) no SLAP tear but examination findings of biceps tendonitis (placed in the LHBT tendonitis group). Patients were excluded for full-thickness rotator cuff tears, high-grade partial thickness tears requiring repair, acromioclavicular joint pathology, and labral pathology outside of the SLAP lesion. Patients from both groups subsequently were treated with open, subpectoral tenodesis.

Results
Over a 6-year period at a mean follow-up of 2.75 years (range 1.5-5.7 years), 125 active-duty military personnel with mean age of 42.6 years (range 26.3-56.5) were enrolled. A total of 101 of 125 patients (81%) completed study requirements at a mean of 2.75 years (range 1.5-5.7 years). In total, 40 patients were diagnosed with type II SLAP tears (39.6%) and 61 with biceps tendonitis without SLAP tear (60.4%). Following open, subpectoral tenodesis, there was a significant improvement in patient outcomes (Western Ontario Rotator Cuff = 54% preoperative vs 89% postoperative, Single Assessment Numeric Evaluation = 58 preoperative vs 89.5 postoperative, $P < .01$). In total, 82% of patients returned to full activity at a mean of 4.1 months. The biceps muscle measured relative to the antecubital fossa of operative (mean 3.20 cm) versus nonoperative (3.11 cm) was not clinically different ($P = .57$). There was an 8% complication rate, including 3 requiring revision, 2 superficial infections, and 3 transient neurapraxias.

Conclusions
Primary subpectoral open biceps tenodesis for SLAP tears or pathology of the LHBT provides significant improvement in shoulder outcomes with a reliable return to activity level with low risk for complications.

Level of evidence
Level IV (Case series).

BACK

Arthroscopic Side-to-side Repair for Large U-shaped Full-Thickness Rotator Cuff Tears: Is the Repair Integrity Actually Maintained?

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Purpose
To evaluate the clinical and structural outcomes of arthroscopic side-to-side repair of large U-shaped full-thickness rotator cuff tears (FTRCTs) by assessing the functional score of the patients and the integrity of the tendon repair using magnetic resonance imaging with a minimum follow-up duration of 2 years.

Methods
In this case series, 59 consecutive patients who underwent arthroscopic side-to-side repair of large U-shaped FTRCTs, with a minimum follow-up duration of 2 years (range 25 to 72 months), were retrospectively enrolled. The mean patient age was 58.6 years. Patients' functional scores and integrity of the tendon repairs were evaluated.

Results
The mean visual analog scale score improved from 5.7 ± 2.1 preoperatively to 2.4 ± 1.3 postoperatively ($P < .001$). The mean range of motion (forward flexion) improved from 152.7° ± 11.4° to 164.5° ± 9.5° ($P < .001$). The mean Constant-Murley score improved from 57.3 ± 7.2 preoperatively to 77.8 ± 6.9 postoperatively ($P < .001$). Postoperative magnetic resonance imaging examinations demonstrated cuff integrity with a retear rate of 54.2%. The retear rate of patients who underwent anchor fixation to the medial row (45%) was significantly lower than that of patients who underwent simple side-to-side repair (73.7%) ($P = .039$). The University of California at Los Angeles shoulder rating and Constant-Murley scores were not significantly different between the healed and retear groups ($P = .639$ and $P = .863$, respectively).

Conclusions
Arthroscopic side-to-side repair of large U-shaped FTRCTs demonstrated satisfactory clinical outcomes. However, the retear rate was higher than expected when simple side-to-side fixation was performed without footprint fixation. Therefore, medial row fixation is recommended if arthroscopic side-to-side repair is performed.

Level of Evidence
III, comparative therapeutic trial.

BACK

Arthroscopic Latarjet Stabilization: Analysis of the Learning Curve in the First 90 Primary Cases: Early Clinical Results and Computed Tomography Evaluation

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Purpose
To assess the learning curve of arthroscopic Latarjet, evaluating time of surgery, clinical outcomes, complications, revisions, and recurrence.

Methods
Arthroscopic Latarjet procedures performed from 2011 to 2016 were reviewed. Satisfaction rate, subjective shoulder value, Walch–Duplay, Rowe scores, range of motion, and stability were evaluated on clinical examination. Graft position and fusion were analyzed using computed tomography. All patients were divided into 3 chronological groups.

Results
Ninety patients (3 groups of 30) were available for clinical evaluation (96,8%). The mean follow-up was 23.7 months. Surgical time was significantly (P = .0028) longer in group I (mean 128 minutes, standard deviation [SD] 33.6) when compared with groups II (mean 102 minutes, SD 16.2) and III (mean 108 minutes, SD 21.8). A regression analysis and cumulative sum learning curve analysis showed the surgeon oscillated around mean operative time (112.7 minutes; SD 27.2) after 30 procedures. The number of intraoperative complications was significantly greater (P = .024) in Group I (5 cases; 17%) compared with zero in group II, and 3 (10%) in group III. All 3 cases (3.3%) of recurrence were reported in group I (P = .033). Significantly, 2 of 3 patients with recurrence had intraoperative graft complications (P = .0107). Overall patient satisfaction was evaluated as 92%, SSV 90%, Walch–Duplay and Rowe scores, respectively, 79 and 81 points. Nine revisions (10%) were reported. No significant differences were found between the results and revisions of the 3 chronological groups.

Conclusions
This study confirms that the arthroscopic Latarjet procedure provides good clinical and radiologic results at short-term follow-up. The surgical time, frequency of complications, and number of hardware problems significantly decreased after the first 30 cases. As such, surgeons should be aware of the elevated potential for complications and recurrence early in the learning curve—serious intraoperative complications are important risk factors for recurrence.

Level of evidence
III. Therapeutic study: case–control study.

BACK

Is Bony Morphology and Morphometry Associated With Degenerative Full-Thickness Rotator Cuff Tears? A Systematic Review and Meta-analysis

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Purpose
To scope the scientific literature and analyze the influence of bony risk factors for degenerative full-thickness primary rotator cuff tear.

Methods
A systematic review of databases PubMed, Scopus, EMBASE, and Cochrane Library was performed up to June 30, 2018. Meta-analysis was performed with mean difference (MD) or risk ratio for degenerative full-thickness rotator cuff injury, and when there were ≥3 studies for the considered potential risk factor. Methodologic quality was assessed using the Newcastle-Ottawa scale.

Results
We analyzed 34 studies comprising 5,916 shoulders (3,369 shoulders with rotator cuff tear and 2,546 controls) and identified 19 potential risk factors for degenerative full-thickness rotator cuff tears. There was moderate evidence that a higher critical shoulder angle (MD = 4.41, 95% confidence interval [CI] 3.43 to 5.39), higher acromion index (MD = 0.06, 95% CI 0.04 to 0.09), and lower lateral acromion angles (MD = −7.11, 95% CI −8.32 to −5.90) were associated with degenerative full-thickness rotator cuff tears compared with controls. Moderate evidence showed that a type III acromion significantly increases the risk for full-thickness degenerative rotator cuff tear (risk ratio = 2.26, 95% CI 1.38 to 3.70).

Conclusion
There is moderate evidence that larger critical shoulder angle, higher acromion index, lower lateral acromion angles, and a type III acromion are significantly associated with degenerative full-thickness rotator cuff tears. Other potential risk factors identified showed insufficient evidence.

Level of Evidence
Level IV, systematic review of level II to IV studies.

BACK

Journal of Shoulder and Elbow Surgery (JSES), Volume 28, issue 12

Arthroscopic anatomy medial to the coracoid: an anatomic study of the axillary and musculocutaneous nerves

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DOI: https://doi.org/10.1007/s00167-019-05351-3

Purpose
The purpose of this study was to provide arthroscopic measurements and orientations of the axillary and musculocutaneous nerves medial to the coracoid.

Methods
A retrospective chart review of 29 patients undergoing arthroscopic subscapularis repair and arthroscopic cadaveric dissection of 23 shoulders was used to analyze neuroanatomical distances to arthroscopic landmarks and to document the orientations of the axillary and musculocutaneous nerves using a clock face analogy. The clock face data was analyzed by separating the clock face into four quadrants and the frequency of any crossing nerve within each of the four quadrants was then determined.

Results
In vivo, the axillary nerve was found 1.5 ± 0.5 cm medial to the coracoid tip and the musculocutaneous nerve was found 1.6 ± 0.6 cm medial to the coracoid tip. In cadavera, the axillary nerve was found 2.0 ± 0.6 cm medial to the coracoid tip and the musculocutaneous nerve was found 1.5 ± 0.5 cm medial to the coracoid tip. The posterosuperior quadrant of the subcoracoid space contained a crossing nerve in 4 of 29 (13.8%) patients undergoing arthroscopic rotator cuff repair medial to the coracoid, compared to 9 of 23 (39.1%) cadavera undergoing arthroscopic dissection medial to the coracoid. The posteroinferior quadrant contained a crossing nerve in 16 of 29 (55.2%) patients compared to 17 of 23 (73.9%) cadavera.

Conclusions
The axillary and musculocutaneous nerves run in close proximity to the coracoid tip and coracoid arch, most consistently within 1–2 cm medial to these structures, which is closer than has been previously documented in the literature. Crossing nerves are least frequently encountered within the posterosuperior quadrant of the subcoracoid space medial to the coracoid, followed by the posteroinferior quadrant. Arthroscopic dissection of this space should begin in the posterosuperior quadrant and carefully progress to the posteroinferior quadrant to decrease the risk of intraoperative nerve injury. Given the close proximity and frequently encountered nerves in this area, extreme caution must be exercised when working arthroscopically within the subcoracoid space.

BACK

Arthroscopically assisted acromioclavicular joint stabilization leads to significant clavicular tunnel widening in the early post-operative period

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DOI https://doi.org/10.1007/s00167-019-05662-5

Purpose
Arthroscopically assisted acromioclavicular joint (ACJ) stabilization techniques use bone tunnels in the clavicle and coracoid process. The tunnel size has been shown to have an impact on the fracture risk of clavicle and coracoid. The aim of the present study was to radiographically evaluate the alterations of the clavicular tunnel size in the early post-operative period. It was hypothesized that there would be a significant increase of tunnel size.

Methods
Twenty consecutive patients with acute high-grade ACJ (Rockwood type IV–V) injury underwent arthroscopic-assisted ACJ stabilization. The median age of the patients was 40 (26–66) years. For all patients, a single tunnel button–tape construct was used along with an additional ACJ tape cerclage. Radiologic measurements were undertaken on standardized Zanca films at two separate time points, immediate post-operative examination (IPO) and at late post-operative examination (> 4 months; LPO). The LPO radiographs were taken at a median follow-up period of 4.5 (3–6) months. Clavicular tunnel width (CT) and coracoclavicular distance (CCD) were measured using digital calipers by two independent examiners and the results are presented as median, range, and percentage.

Results
The median CCD increased significantly from 9.5 (8–13) mm at IPO to 12 (7–20) mm at LPO ($p < 0.05$). Median tunnel size showed significant difference from 3 (3–4) mm at IPO to 5 (4–7) mm at LPO ($p < 0.05$). Despite a significant increase of 2 mm (66.6%) of the initial tunnel size, there was no correlation between tunnel widening and loss of reduction.

Conclusion
Arthroscopic ACJ stabilization with the use of bone tunnels led to a significant increase of clavicular tunnel size in the early post-operative period. This phenomenon carries a higher fracture risk, especially in high-impact athletes, which needs to be considered preoperatively.

Level of evidence
IV

BACK

The effect of concomitant coracohumeral ligament release in arthroscopic rotator cuff repair to prevent postoperative stiffness: a retrospective comparative study

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DOI: https://doi.org/10.1007/s00167-019-05433-2

Purpose
This study was to evaluate the efficacy and safety of coracohumeral ligament (CHL) release from the coracoid process concomitant with arthroscopic rotator cuff repair for preventing postoperative stiffness.

Methods
Data on patients who underwent arthroscopic rotator cuff repair with a minimum follow-up of 1 year were collected retrospectively. Propensity score matching (1-to-1) was performed between a no-releasing group (Group I) and CHL-releasing group (Group II). In total, 76 patients in each group were matched. Clinical outcomes were assessed and compared between the two groups, including range of motion (ROM) and visual analogue scale for pain (pVAS) at postoperative 3 months, 6 months, and 1 year. The integrity of the repaired tendon was assessed at 1-year follow-up using either magnetic resonance imaging or ultrasonography.

Results
External rotation (ER) at side at postoperative 3 months in Group II was better than that in Group I (48.6° ± 11.6° vs. 38.4° ± 13.0°, $P < 0.001$). When evaluating only patients with a small-to-medium sized tear at postoperative 3 months, ER at side was 49.8° ± 10.9° in Group II versus 37.8° ± 13.1° in Group I ($P < 0.001$). In patients with a large-to-massive sized tear, however, there was no significant difference in ER at side at postoperative 3 months (n.s.). There was no significant difference in ROM and functional scores at postoperative 6 months and 1 year, and there was no significant difference in healing failure rate (6 cases in Group I (7.9%), 2 cases in Group II (2.6%); n.s.). No complications of the CHL release procedure occurred.

Conclusions
In arthroscopic rotator cuff repair, CHL release from the coracoid process without creating a rotator interval defect could be an effective and safe method to prevent early postoperative stiffness, especially ER at side in patients with a small-to-medium sized tear. Therefore, CHL release can be used as a selective procedure to prevent postoperative stiffness in patients that may benefit from this procedure with decreased preoperative ER compared to the normal side.

Level of evidence
Level III.

BACK

Novel and effective arthroscopic extracapsular stabilization technique for anterior shoulder instability-BLS

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DOI: https://doi.org/10.1007/s00167-019-05496-1

Purpose
Arthroscopic Bankart repair for the treatment of anterior shoulder instability is associated with a high rate of recurrent instability. Extracapsular stabilization of the glenohumeral joint with enhancement of anterior wall soft tissues may be an effective alternative treatment technique. The aim of this study is to retrospectively assess clinical outcomes in the treatment of anterior shoulder instability using a novel technique of anterior extracapsular stabilization—"between glenohumeral ligaments and subscapularis tendon" (BLS).

Methods
Patients with anterior shoulder instability who underwent surgical treatment with a novel arthroscopic BLS technique between 2008 and 2016 were eligible for inclusion. According to the level of glenoid bone loss, patients were separated into four groups. Group 1 comprised patients with GBL equal to or less than 5%, group 2 patients with GBL 6–10%, group 3 patients with GBL 11–15%, and group 4 patients with GBL > 15%. A positive outcome in this study was defined as full restoration of joint stability. To evaluate clinical results, preoperative range of ER and IR measured in 90 degrees of abduction were compared with ER and IR measured at final follow-up. Additional outcome instruments used consisted of the Constant Score and the Walch-Duplay Score.

Results
A total of 150 patients underwent arthroscopic BLS surgery. During the study period, 50 patients were lost to follow-up and 100 patients were available for final analysis. Mean patient age was 27.5 (± 10.3) years at the time of surgery. Mean duration of follow-up was 82.9 (± 29.4) months. At final assessment, 86 patients (86%) were categorized as having a positive outcome, with full restoration of joint stability. Recurrence of shoulder instability was observed in 14 (14%) patients, including 6 (6%) cases that were associated with major trauma. At final follow-up, the mean Constant Score was 88.2 ± 10.1, compared to 82.9 ± 9.1 preoperatively ($p < 0.05$). The mean final and mean preoperative Walch-Duplay Scores were 81.5 ± 18.9 and 52.2 ± 11.9, respectively ($p < 0.05$). There was no statistically significant limitation of external or internal rotation.

Conclusions
The BLS technique has been shown to be an effective method to anterior shoulder instability in patients without significant glenoid bone loss. It was shown that this technique provides significant improvement in shoulder function without reducing shoulder range of motion.

Level of evidence
IV

BACK

Instability severity index score values below 7 do not predict recurrence after arthroscopic Bankart repair

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DOI: https://doi.org/10.1007/s00167-019-05471-w

Purpose
To evaluate the efficacy of the Instability Severity Index Score (ISIS) in predicting an increased recurrence risk after an arthroscopic Bankart repair.

Methods
Retrospective review of a cohort of patients operated in three different centres. The inclusion criteria (recurrent anterior instability [dislocation or subluxation] with or without hyperlaxity, arthroscopic Bankart repair) and the exclusion criteria (concomitant rotator cuff lesion, acute first-time dislocation, surgery after a previous anterior stabilization, surgery for an unstable shoulder without true dislocation or subluxation; multidirectional instability) were those used in the study that defined the ISIS score. The medical records and a telephone interview were used to identify the six variables that define the ISIS and identify recurrences.

Results
One hundred and sixty-three shoulders met the inclusion and exclusion criteria. Of these, 140 subjects (22 females/118 males; mean age 35.5 ± 7.9) with 142 (89.0%) shoulders were available for follow-up after 5.3 (1.1) (range 3.1–7.4) years. There were 20 recurrences (14.1%). The mean (SD) preoperative ISIS was 1.8 (1.6) in the patients without recurrence and 1.8 (1.9) in the patients with recurrence (n.s.). In the 117 subjects with ISIS between 0 and 3 the recurrence rate was 12.8%; in the 25 with ISIS 4 to 6 the rate was 20% (n.s.).

Conclusion
For subjects with anterior shoulder instability in which an arthroscopic Bankart repair is being considered, the use of the ISIS, when the values obtained are ≤ 6 was not useful to predict an increased recurrence risk in the midterm in this retrospectively evaluated case series. The efficacy of the ISIS score in defining a group of subjects with a preoperative increased risk of recurrence after an arthroscopic Bankart instability repair is limited in lower risk populations (with ISIS scores ≤ 6).

Level of evidence
Retrospective case series, Level IV.

BACK

Intra-articular injection of steroids in the early postoperative period does not have an adverse effect on the clinical outcomes and the re-tear rate after arthroscopic rotator cuff repair

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DOI: https://doi.org/10.1007/s00167-019-05486-3

Purpose
The purpose of this study was to compare clinical outcomes and structural integrity following arthroscopic rotator cuff repair, either with intra-articular injection of corticosteroids in the early postoperative period using ultrasound guidance or without it.

Methods
This study included 318 patients who underwent arthroscopic repair for either a partial-thickness or small-to-medium-sized full-thickness rotator cuff tear from 2012 to 2015. Patients were divided into two groups based on the administration of an intra-articular corticosteroids injection at 3 months after the surgery: group A (with corticosteroid injection, n = 56) and group B (without corticosteroid injection, n = 262). Functional outcomes were evaluated using the visual analog scale (VAS) pain score, subjective shoulder value (SSV), American Shoulder and Elbow Surgeons (ASES) score, University of California Los Angeles (UCLA) shoulder score, and active range of motion (ROM). Postoperative magnetic resonance arthrography (MRA) was performed 6 months postoperatively to assess structural integrity.

Results
At the 2-year follow-up, both groups showed no significant differences in VAS pain score (group A/B, 1.1 ± 0.9/1.1 ± 1.1), functional scores including SSV (88.5 ± 10.8/88.3 ± 10.0), ASES (90.8 ± 6.6/90.4 ± 6.9), and UCLA scores (30.2 ± 5.6/30.7 ± 5.2), and active ROM including forward flexion (151° ± 8°/153° ± 7°), external rotation (54° ± 5°/55° ± 7°), and internal rotation (10 ± 1/10 ± 2). Follow-up MRA imaging collected 6 months after surgery showed no significant difference in the re-tear rate (n.s.) between group A and B (n = 10/56, 17.9% and 45/262, 17.2%, respectively).

Conclusions
Intra-articular corticosteroids injection in the early postoperative period after arthroscopic rotator cuff repair provided satisfactory pain relief and ROM improvement without increasing the re-tear rate or deteriorating clinical outcomes at the 2-year follow-up.

Level of evidence
III.

BACK

Ten percent re-dislocation rate 13 years after the arthroscopic Bankart procedure

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Purpose
The aim of the present study was to determine the long-term outcome after the arthroscopic Bankart procedure, in terms of recurrent instability, shoulder function, glenohumeral arthropathy and patient satisfaction.

Methods
Patients who underwent the arthroscopic Bankart procedure between January 1999 and the end of December 2005 were invited to complete a set of Patient Reported Outcome Measures (PROMs) and visit the hospital for clinical and radiological assessment. PROMs included the Western Ontario Shoulder Instability Index (WOSI), the Oxford Shoulder Instability Score (OSIS) and additional questions on shoulder instability and patient satisfaction. Clinical assessment included the apprehension test and the Constant–Murley score. The Samilson–Prieto classification was used to assess arthropathy on standard radiographs. The primary outcome was a re-dislocation that needed reduction. Secondary outcomes in terms of recurrent instability included patient-reported subluxation and a positive apprehension test.

Results
Of 104 consecutive patients, 71 patients with a mean follow-up of 13.1 years completed the PROMs, of which 53 patients (55 shoulders) were also available for clinical and radiological assessment. Re-dislocations had occurred in 7 shoulders (9.6%). Subluxations occurred in 23 patients (31.5%) and the apprehension test was positive in 30 (54.5%) of the 55 shoulders examined. Median functional outcomes were 236 for WOSI, 45 for OSIS, and 103 for the normalized Constant–Murley score. Of all 71 patients (73 shoulders), 29 (39.7%) reported being completely satisfied, 33 (45.2%) reported being mostly satisfied and 8 (11%) reported being somewhat satisfied. Glenohumeral arthropathy was observed in 33 (60%) of the shoulders.

Conclusion
Despite 10% re-dislocations and frequent other signs of recurrent instability, shoulder function and patient satisfaction at 13 years after arthroscopic Bankart repair were good.

Level of evidence
Level IV.

BACK

Arthroscopic subscapularis augmentation combined with capsulolabral reconstruction is safe and reliable

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Purpose
The study aimed to compare modified arthroscopic subscapularis augmentation (MASA) with tenodesis of the upper third of the subscapularis tendon using a tendon combined with capsulolabral reconstruction (Group A) or Bankart repair (Group B) for recurrent anterior shoulder instability (RASI).

Methods
A retrospective series of 49 patients underwent primary surgery for RASI with glenoid bone loss (GBL) < 25%. Outcomes included the Oxford Shoulder Instability Score (OSIS), Visual Analogue Scale (VAS) score, Rowe score, and American Shoulder and Elbow Surgeons (ASES) functional outcome scale score. Recurrent instability, sports activity level, and range of motion (ROM) were also analysed.

Results
No significant differences were observed at baseline. Forty-six patients were available for more than 2 years of follow-up. At the last follow-up after surgery, the patients in both groups had experienced significant improvements in all outcome scores ($P < 0.05$ for all), and obvious decreases in forward flexion and external rotation were noted in both groups ($P < 0.05$ for all). Group A had superior ASES scores, VAS scores, and OSISs ($P < 0.05$) but did not experience significant differences in either the Rowe score or ROM compared to Group B. Group A had lower rates of recurrent instability and superior outcomes for the return to sports activities. One patient in Group A had subluxation, and 4 patients in Group B had dislocation or subluxation. No patients in either group experienced neurovascular injury, joint stiffness, or surgical wound infection.

Conclusion
For RASI with GBL < 25%, MASA with tenodesis of the upper third of the subscapularis tendon using a tendon combined with capsulolabral reconstruction was a safe technique that produced better outcomes in terms of ASES scores, VAS scores, OSISs, the return to sports, and postoperative recurrent instability and did not decrease the ROM compared to that achieved by arthroscopic Bankart repair.

Level of evidence
III.

BACK

American Journal of Sports Medicine (AJSM), Volume 47, Issue 14

All-Suture Anchor Settling After Arthroscopic Repair of Small and Medium Rotator Cuff Tears

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Background: All-suture anchors are increasingly being used in rotator cuff repair. However, there are debates on the micromotion of all-suture anchors.

Purpose: To perform rotator cuff repair on patients with rotator cuff tears and different shoulder bone mineral densities (BMDs) and investigate (1) where the anchor is located under the cortex, (2) if there is any anchor migration settling during follow-up, and (3) if structural outcome differs according to shoulder BMD.

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

Methods: We retrospectively investigated 88 patients who underwent arthroscopic single-row repair for small- to medium-sized rotator cuff tears (age [mean ± SD], 58.8 ± 7.1 years) from 712 cases of rotator cuff tendon repair between November 2015 and February 2018. Inclusion criteria were as follows: use of an all-suture anchor; preoperative shoulder BMD; and magnetic resonance imaging (MRI) conducted preoperatively, 2 days after surgery, and 10 months after surgery. Patients were excluded from the study if they underwent open rotator cuff repair (n = 118), got surgery with a double-row technique (n = 178), underwent surgery with anchors other than the all-suture type (n = 273), received anchor insertion in sites other than the greater tuberosity owing to concomitant procedures such as biceps tenodesis and subscapularis repair (n = 29), did not take preoperative shoulder BMD (n = 15), had more than a large-size tear (n = 6), and were lost to follow-up (n = 5). After compression of the all-suture anchor during surgery, the strands were pulled multiple times to ensure that the anchor was fixed onto the bone with appropriate tension. BMD was measured before surgery. Depth to anchor (DA), anchor settling, and repaired rotator cuff integrity were measured with MRI. Patients were categorized into 3 groups: group A (BMD, <0.4 g/cm$_2$; n = 31), group B (BMD, 0.4-0.6 g/cm$_2$; n = 32), and group C (BMD, >0.6 g/cm$_2$; n = 25). A total of 65 patients had follow-up MRI. On the basis of rotator cuff tendon integrity, patients were categorized into either a sufficient thickness group (group S, Sugaya classification grade II or lower; n = 44) or an insufficient thickness group (group I, Sugaya classification grade III or higher; n = 21).

Results: On time-zero MRI, the DA differed significantly among groups (group A, 3.62 ± 2.02 mm; group B, 5.18 ± 2.13 mm; group C, 6.30 ± 3.34 mm) (P = .001). The DA was deeper in patients with a higher BMD at time zero (r = 0.374; P = .001), but the DA did not differ at follow-up MRI (mean, 10.3 months after surgery). On follow-up MRI, anchor settling tended to increase with deeper time-zero DA (r = 0.769; P < .001). Anchor settling was significantly different among groups (group A, 1.33 ± 1.08 mm; group B, 2.78 ± 1.99 mm; group C, 3.81 ± 2.19 mm) (P = .001). The proportion of patients with sufficient thickness in each group did not show a statistical difference (group A, 70.8%; group B, 72.7%; group C, 57.9%) (P = .550).

BACK

Conclusion: In conclusion, this study confirmed that the postoperative site of anchor insertion in arthroscopic single-row rotator cuff repair with all-suture anchors was located farther from the cortex in patients with higher shoulder BMD and closer to the subcortical bone in patients with lower BMD. On follow-up MRI, no further settling occurred past a certain distance from the cortex, and there was no significant difference in anchor depth or integrity of the rotator cuff tendon based on shoulder BMD. Therefore, minimal settling in the all-suture anchor did not show clinical significance.

BACK

Lower Extremity

Arthroscopy, Volume 35, Issue 12

Functional and Clinical Outcomes of Patients Undergoing Revision Hip Arthroscopy With Borderline Hip Dysplasia at 2-Year Follow-up

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Purpose
To compare outcomes of borderline hip dysplasia (BHD) patients undergoing revision hip arthroscopy with 1) patients with BHD undergoing primary hip arthroscopy for femoroacetabular impingement syndrome (FAIS) and 2) patients without BHD undergoing revision hip arthroscopy for FAIS.

Methods
A retrospective cohort study was performed to identify patients who underwent arthroscopy from January 2012 to January 2016 by a single fellowship-trained surgeon, including a 2-year follow-up. Patient demographics, comorbid medical conditions, and preoperative outcome scores were compared between patients with BHD (lateral center-edge angle 18° to 25°) who had revision hip arthroscopy to patients with BHD undergoing primary arthroscopy and patients without BHD (lateral center-edge angle >25°) undergoing revision arthroscopy. Cohorts were matched 2:1 by age and body mass index. Multivariate regressions were used to compare Hip Outcome Score, Activities of Daily Living subscale (HOS-ADL) and Sports subscale (HOS-SS) scores and modified Harris Hip Score (mHHS) between the cohorts at 2-year follow-up. Binomial regression analysis was used to determine predictors of achieving minimal clinically important difference (MCID) and patient-acceptable symptom state (PASS).

Results
There was no statistical difference in age and BMI between the BHD revision (29.1 ± 8.8 years; 25.5 ± 3.58 kg/m2), BHD nonrevision (28.9 ± 8.5 years; 24.6 ± 3.1 kg/m2), and non-BHD revision (29.15 ± 8.6 years; 25.01 ± 3.2 kg/m2) cohorts. There were no statistically significant differences in 2-year clinical outcomes between BHD revision patients and either BHD primary or non-BHD revision patient groups, but BHD revision patients were significantly less likely to achieve PASS for HOS-SS compared with BHD primary and non-BHD revision groups (P = .047 and P = .031, respectively).

Conclusion
Surgeons should exercise caution when indicating patients for revision hip arthroscopy with BHD. Although the current study lacks statistical power, the available data suggest that patients undergoing revision surgery with BHD may still experience clinical improvement but be less likely to achieve PASS metrics for several patient-reported outcomes at 2-year follow up.

Level of Evidence
III, case-control study.

BACK

Is There an Association Between Preoperative Expectations and Patient-Reported Outcome After Hip Arthroscopy for Femoroacetabular Impingement Syndrome?

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Arthroscopy, Volume 35, Issue 12

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Purpose
To determine the relationship between preoperative patient expectation and postoperative satisfaction and overall patient-reported outcome (PRO) of patients undergoing hip arthroscopy for femoroacetabular impingement syndrome.

Methods
Patients who underwent hip arthroscopy for femoroacetabular impingement syndrome completed the validated Hip Preservation Surgery Expectations Survey (21 questions; 0-100 range), as well as multiple PROs before surgery. High expectation was defined as an expectation score greater than 1 standard deviation above the mean. Patients with osteoarthritis, dysplasia, and those having undergone previous hip surgery were excluded. At 1 year postoperatively, patient visual analog scale (VAS) satisfaction, VAS pain, and PROs were assessed. Univariable and multivariate analyses were performed.

Results
One-hundred fifty-three subjects (mean age 34.4 ± 12.6 years, female: 114 [71.3%], body mass index: 25.9 ± 5.3 kg/m2) participated. The mean expectation score was 84.5 ± 12.3. Significant correlations between high expectation scores (>96.7) and achieving the minimal clinical important difference (MCID) for modified Harris Hip Score (mHHS; r = 0.339; P = .043) and patient acceptable symptomatic state (PASS) for Hip Outcome Score-Activities of Daily Living Subscale (HOS-ADL; r = 0.207; P = .032) were observed. There were no significant correlations between high expectation scores and preoperative or postoperative PROs or patient satisfaction scores. $\chi 2$ analysis demonstrated patients with greater expectations had increased rates of reaching MCID mHHS (92.3% vs 74.7%; P = .08), PASS mHHS (85.7% vs 69.7%; P = .046), and PASS HOS-ADL (93.8% vs 67.4%; P = .031).

Conclusions
High preoperative expectation is associated with increased rates of MCID/PASS achievement on mHHS and increased rate of PASS achievement on HOS-ADL. Preoperative expectations did not have an impact on Hip Outcome Score-Sports Subscale; however, patients with high preoperative expectations also have a high baseline Hip Outcome Score-Sports Subscale. In addition, preoperative expectations are not associated with postoperative VAS satisfaction scores.

Level of Evidence
III; non-randomized cohort, therapeutic.

BACK

Outcome Trends After Hip Arthroscopy for Femoroacetabular Impingement: When Do Patients Improve?

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Arthroscopy, Volume 35, Issue 12

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Purpose
To determine when patients reach critical thresholds of clinical improvement after hip arthroscopy for femoroacetabular impingement (FAI) using previously defined cutoffs for the minimal clinically important difference (MCID) and patient acceptable symptomatic state (PASS) and to identify risk factors for prolonged recovery.

Methods
Consecutive patients with a diagnosis of FAI who underwent unilateral hip arthroscopy between January 2010 and January 2015 with at least 2 years of clinical follow-up were studied. The modified Harris Hip Score was collected prospectively at 6 consecutive time points. The number of patients reaching the MCID and PASS at each time point was determined.

Results
During the study period, 340 consecutive hip arthroscopies were performed in 316 patients with a mean final follow-up period of 50 months (range, 29-84 months). The mean modified Harris Hip Score and percentage of patients reaching the MCID and PASS increased at each time point. At 2 years, 271 patients (93%) surpassed the MCID and 212 patients (73%) achieved the PASS. Female sex, age of 40 years or older, and body mass index of 30 or greater were associated with lower rates of achieving the MCID and PASS at set time points. Patients undergoing labral repair had superior PASS rates at 3 months and beyond than patients undergoing labral debridement alone. Patients who did not achieve the PASS by 3 months were more likely to require reoperation.

Conclusions
Hip arthroscopy for FAI results in increased patient-reported outcome measures at interval follow-up. Most patients reach critical thresholds of minimal and satisfactory clinical improvement. Patients who are female, older, or obese or who undergo labral debridement alone are less likely to reach these milestones at major time intervals. Patients who do not reach the PASS by 3 months are more likely to require reoperation.

Level of Evidence
Level IV, therapeutic case series.

BACK

Unplanned Admissions Following Hip Arthroscopy: Incidence and Risk Factors

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Arthroscopy, Volume 35, Issue 12

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Purpose
To determine the rate of and risk factors for 30-day unplanned admissions following hip arthroscopy in a U.S. population.

Methods
Patients undergoing hip arthroscopy were identified in the American College of Surgeons National Surgical Quality Improvement Program database using validated Current Procedural Terminology and International Classification of Diseases, Ninth Revision and Tenth Revision codes. Patient demographics, comorbidities, preoperative laboratory values, surgical details, and postoperative outcomes were compared between patients with unplanned admissions and those without. Univariate analysis comparing study cohorts was performed using 2-tailed Student t tests with Levene's test for equality of variance or $\chi 2$/Fisher exact tests as appropriate. Using variables that were significant in the univariate analysis, we created Cox proportional hazard models to identify independent predictors for unplanned admission.

Results
A total of 1931 cases of hip arthroscopy were identified. There were 18 cases of unplanned admissions within 30 days of index procedure (0.9%). The median time to unplanned admission was 14.5 days (interquartile range: 3.875-25.125 days). The most common reasons for admission were surgical-site infection (11.1%), wound complications (11.1%), and thromboembolic events (11.1%). There were 4 patients who required reoperation (22.2%). There were 7 cases (39.0%) that were readmitted for reasons unrelated to the index hip arthroscopy procedure. Multivariate analysis identified increasing body mass index, chronic corticosteroid use, and perioperative blood transfusion as factors independently associated with increased risk for unplanned admission.

Conclusions
There exists a low incidence of 30-day unplanned admission, predominantly secondary to surgical-site infections, wound complications, and thromboembolic events. Independent risk factors for unplanned admission include greater body mass index, chronic corticosteroid use, and perioperative transfusions.

Level of Evidence
Level III Retrospective Cohort Study.

BACK

A Cost-Effectiveness Analysis of Isolated Meniscal Repair Versus Partial Meniscectomy for Red-Red Zone, Vertical Meniscal Tears in the Young Adult

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Arthroscopy, Volume 35, Issue 12

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Purpose
To evaluate the cost-effectiveness of treating isolated red-red zone, vertical meniscal tears with either isolated meniscal repair (IMR) or partial meniscectomy (PM) in the young adult using conservative modeling.

Methods
A decision-analytic Markov disease progression model with a 40-year horizon was created simulating outcomes after IMR or PM for an isolated meniscal tear. Event probabilities, costs, and utilities were used for the index procedures, and the development of osteoarthritis (OA) and subsequent need for knee arthroplasty were calculated or selected from the published literature. Differences in cost, difference in quality-adjusted life years (QALYs), and the incremental cost effect ratio were calculated to determine which index procedure is most cost effective.

Results
Total direct costs from PM were modeled at $38,648, and the total direct costs of IMR were $23,948, resulting in a projected cost savings of $14,700 with IMR. There was a modeled gain in QALYs of 17 for PM and 21 for IMR, resulting in an increase in 4 QALYs for the IMR treatment group. This results in an incremental cost effect ratio of $3,935 per QALY, favoring IMR as the dominant procedure.

Conclusions
Meniscal repair for isolated red-red zone, vertical meniscal tears was predicted to have lower direct costs and improve QALYs compared with partial meniscectomy over 40-year modeling, indicating isolated meniscal repair to be the cost-effective procedure in the treatment of an isolated meniscal tear in the young adult population.

Level of Evidence
Level 3: economic and decision analysis.

BACK

Body Mass Index Screening in Knee Arthroscopy: An Analysis Using the National Surgical Quality Improvement Database

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Arthroscopy, Volume 35, Issue 12

https://doi.org/10.1016/j.arthro.2019.06.039

Purpose
To analyze patients undergoing knee arthroscopy stratified by body mass index (BMI) and assess the tradeoffs in complications avoided versus access to care that occur when instituting BMI eligibility criteria.

Methods
The National Surgical Quality Improvement Program (NSQIP) database was used to identify patients who underwent knee arthroscopy from 2015 to 2016. Patients were categorized by BMI, and differences in complication rates between BMI categories were assessed. The positive predictive value (PPV) was calculated for various BMI cutoffs, with further analysis performed to identify the number of surgeries that would be denied to avoid a single complication.

Results
There were 44,153 knee arthroscopy cases identified and an overall complication rate of 1.7%. There was no significant difference found in major complication rate between those with a BMI >40 kg/m2 and those with a BMI <40 (1.7% vs 1.7%, P = .70), and no significant associations between increased complications and a higher BMI were found on binary logistic regression. Instituting a BMI cutoff of 40 has a PPV of 1.7% and would result in the avoidance of 11% of complications while denying 10% of otherwise uncomplicated surgeries. This cutoff would deny 57 surgeries for every complication avoided.

Conclusion
In patients undergoing knee arthroscopy, this study failed to detect a significant increased risk of major complications associated with having a BMI >40. The institution of BMI eligibility cutoffs would result in low PPVs and a high number of denials for surgery that would otherwise be complication free.

Level of Evidence
Level IV, retrospective cohort-based database study.

BACK

Primary Arthroscopic Repair of the Anterior Cruciate Ligament: A Systematic Review of Clinical Outcomes

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Arthroscopy, Volume 35, Issue 12

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Purpose
To describe the clinical outcomes after primary arthroscopic anterior cruciate ligament (ACL) repair.

Methods
A systematic review of the PubMed, Embase, and Cochrane Library databases was performed according to the PRISMA guidelines. All English-language literature published from 2000 to 2018 that reported the clinical outcomes after primary arthroscopic repair (AR) of complete tear of the ACL (without augmentation) with a minimum 2-year follow-up was reviewed by 2 independent reviewers. Outcomes included repair failure, reoperation, postoperative knee stability, and patient-reported outcomes. Descriptive statistics are presented. Study quality was evaluated with the Modified Coleman Methodology Score (MCMS) and the Methodological Index for Nonrandomized Studies (MINORS) score.

Results
Six studies (2 level III, 4 level IV) were included. The mean MCMS was 62.2. The mean MINORS score for noncomparative studies was 11.8, and for comparative studies, 18. Six studies reported outcomes of 89 patients who underwent AR of the ACL from 2007 to 2016 (age, 8 to 67 years; follow-up, 24 to 110 months). All 6 studies included exclusively proximal avulsion tears. Overall, 0% to 25.0% of patients experienced repair failure (I^2 = 23.7%; 95% confidence interval, 0% to 67.6%), and 0% to 20.0% of patients had a subsequent reoperation (I^2 = 12.1%; 95% confidence interval, 0% to 77.7%). Similar inconsistent results were shown for postoperative knee stability measures and patient-reported outcomes.

Conclusions
The literature on clinical outcomes of primary arthroscopic ACL repair is limited. The reported rates of repair failure and reoperation are highly inconsistent. Most studies report relatively high failure rates.

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

BACK

American Journal of Sports Medicine (AJSM), Volume 47, Issue 14

Rate of Return to Sport and Functional Outcomes After Bilateral Hip Arthroscopy in High-Level Athletes

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Background: Bilateral hip symptoms are common in athletes, and athletes may require treatment with bilateral hip arthroscopy. Return-to-sport (RTS) rates in competitive athletes after unilateral procedures have been reported at 74% to 93%; however, RTS rates after bilateral hip arthroscopy are still unknown.

Purpose/Hypothesis: The purpose was to determine rate of RTS in competitive athletes undergoing bilateral hip arthroscopy and report minimum 1-year patient-reported outcomes (PROs) for this cohort. We hypothesized that after bilateral hip arthroscopy, the RTS rate would be similar to the square of the probability of returning after unilateral hip arthroscopy.

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

Methods: Data were prospectively collected on patients undergoing hip arthroscopy at our institution from November 2011 to July 2018. Patients were included if they underwent bilateral hip arthroscopy and were a high school, collegiate, or professional athlete before their first surgery. A patient's RTS was defined as return to competitive participation in one's sport at a level the same as or higher than the preoperative level. Additionally, minimum 1-year PROs, including modified Harris Hip Score (mHHS), nonarthritic hip score, and Hip Outcome Score–Sports Specific Subscale (HOS-SSS), as well as complication rates and future surgery were compared for all patients. Rates of reaching the minimal clinically importance difference (MCID) and patient acceptable symptomatic state (PASS) for the mHHS (8 and 74, respectively) and HOS-SSS (6 and 75, respectively) were also recorded.

Results: A total of 87 patients met inclusion criteria, for which follow-up was available for 82 (94.3%). At latest follow-up, 100% of professional athletes had returned to their sport, while 53.7% of the entire cohort returned to their sport, with 75.8% of male patients returning versus 38.8% of female patients ($P < .001$). Of patients returning, 56% did so at the same ability or higher. The most common reason for not returning was graduation or lifestyle change (47.4%). Patients returning to sport had significantly higher PROs at latest follow-up relative to those who did not return, including mHHS (93.7 vs 87.5), nonarthritic hip score (94.4 vs 88.2), and HOS-SSS (90.9 vs 78.2) ($P < .05$). Rates of achieving the PASS and MCID for the mHHS were not significantly different. However, for the HOS-SSS, patients who returned had significantly higher rates of achieving the MCID and PASS thresholds.

Conclusion: The rate of RTS among competitive athletes after bilateral hip arthroscopy was similar to the square of published RTS rates after unilateral hip arthroscopy. Both those who returned to play and those who did not showed significant improvement in PROs after surgery. However, those who returned to sports achieved significantly higher scores in all outcome measures. Additionally, patients returning to sports showed a significantly higher rate of attaining the MCID and PASS scores for the HOS-SSS.

BACK

Anterior Cruciate Ligament Reconstruction: A Systematic Review and Meta-analysis of Outcomes for Quadriceps Tendon Autograft Versus Bone–Patellar Tendon–Bone and Hamstring-Tendon Autografts

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Background: Comprehensive studies evaluating quadriceps tendon (QT) autograft for anterior cruciate ligament (ACL) reconstruction are lacking. The optimal choice of graft between bone–patellar tendon–bone (BPTB), hamstring tendon (HT), and QT is still debatable.

Hypothesis: The current literature supports the use of QT as a strong autograft with good outcomes when used in ACL reconstruction.

Study Design: Meta-analysis; Level of evidence, 2.

Methods: A systematic search of the literature was performed in PubMed, MEDLINE, Cochrane, and Ovid databases to identify published articles on clinical studies relevant to ACL reconstruction with QT autograft and studies comparing QT autograft versus BPTB and HT autografts. The results of the eligible studies were analyzed in terms of instrumented laxity measurements, Lachman test, pivot-shift test, Lysholm score, objective and subjective International Knee Documentation committee (IKDC) scores, donor-site pain, and graft failure.

Results: Twenty-seven clinical studies including 2856 patients with ACL reconstruction met the inclusion criteria. Comparison of 581 QT versus 514 BPTB autografts showed no significant differences in terms of instrumented mean side-to-side difference ($P = .45$), Lachman test ($P = .76$), pivot-shift test grade 0 ($P = .23$), pivot-shift test grade 0 or 1 ($P = .85$), mean Lysholm score ($P = .1$), mean subjective IKDC score ($P = .36$), or graft failure ($P = .50$). However, outcomes in favor of QT were found in terms of less donor-site pain (risk ratio for QT vs BPTB groups, 0.25; 95% CI, 0.18-0.36; $P < .00001$). Comparison of 181 QT versus 176 HT autografts showed no significant differences in terms of instrumented mean side-to-side difference ($P = .75$), Lachman test ($P = .41$), pivot-shift test grade 0 ($P = .53$), Lysholm score less than 84 ($P = .53$), mean subjective IKDC score ($P = .13$), donor-site pain ($P = .40$), or graft failure ($P = .46$). However, outcomes in favor of QT were found in terms of mean Lysholm score (mean difference between QT and HT groups, 3.81; 95% CI, 0.45-7.17; $P = .03$).

Conclusion: QT autograft had comparable clinical and functional outcomes and graft survival rate compared with BPTB and HT autografts. However, QT autograft showed significantly less harvest site pain compared with BPTB autograft and better functional outcome scores compared with HT autograft.

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