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## **Upper extremity**

Arthroscopy, Volume 34, Issue 7

### **Anatomic Tunnel Placement Is Not Feasible by Transclavicular-Transcoracoid Drilling Technique for Coracoclavicular Reconstruction: A Cadaveric Study**

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#### **Purpose**

To evaluate the feasibility of anatomic tunnel placement by a transclavicular-transcoracoid drilling technique and with reference to the coracoclavicular ligaments' insertional anatomy and their orientations.

#### **Methods**

We used 12 fresh-frozen human cadaveric shoulders (6 matched pairs; mean age, 70 years; age range, 51–82 years) to simulate intraoperative tunnel placement with the transclavicular-transcoracoid drilling technique. After both the conoid and trapezoid ligaments were identified, two 2.5-mm guide pins were inserted from the clavicle to the coracoid, passing the centers of the clavicular and coracoid insertions of the conoid and the trapezoid ligaments, in a collinear fashion to the orientation of both ligaments. The entry point of the drill at the clavicle and the exit point at the coracoid undersurface, as well as the tunnel orientations, were measured. Complications due to the procedure, including a breach of the bone cortex of the clavicle and/or coracoid process, were recorded.

#### **Results**

The transclavicular-transcoracoid drilling technique for anatomic conoid ligament tunnel placement resulted in a medial cortical breach at the coracoid process in 6 of 12 shoulders. In the remaining 6 shoulders without a breach, the distance of the exit point from the medial cortex of the inferior coracoid process was only  $3.6 \pm 4.3$  mm. For anatomic trapezoid ligament tunnel placement, no medial cortex breaching at the coracoid process occurred. However, the distance of the exit point was  $3.1 \pm 4.2$  mm, indicating an eccentric location to the medial cortex of the coracoid process, similar to the conoid ligament.

#### **Conclusions**

This cadaveric study showed that anatomic tunnel placement by the transclavicular-transcoracoid drilling technique would not be feasible without breaching or almost breaching the medial cortex of the coracoid process.

#### **Clinical Relevance**

The transclavicular-transcoracoid drilling technique for CC ligament reconstruction may not reproduce the anatomy of the CC ligaments but may place the coracoid process at high risk of fracture during tunnel placement.

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## **Treatment for Symptomatic SLAP Tears in Middle-Aged Patients Comparing Repair, Biceps Tenodesis, and Nonoperative Approaches: A Cost-Effectiveness Analysis**

Albit R. Paoli, B.S.E., Heather T. Gold, Ph.D., M.A., Siddharth A. Mahure, M.D., M.B.A., David H. Mai, M.D., M.P.H., Christoph A. Agten, M.D., Andrew S. Rokito, M.D., Mandeep S. Virk, M.D.

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### **Purpose**

To evaluate the cost-effectiveness of nonoperative management, primary SLAP repair, and primary biceps tenodesis for the treatment of symptomatic isolated type II SLAP tear.

### **Methods**

A microsimulation Markov model was constructed to compare 3 strategies for middle-aged patients with symptomatic type II SLAP tears: SLAP repair, biceps tenodesis, or nonoperative management. A failed 6-month trial of nonoperative treatment was assumed. The principal outcome measure was the incremental cost-effectiveness ratio in 2017 U.S. dollars using a societal perspective over a 10-year time horizon. Treatment effectiveness was expressed in quality-adjusted life-years (QALY). Model results were compared with estimates from the published literature and were subjected to sensitivity analyses to evaluate robustness.

### **Results**

Primary biceps tenodesis compared with SLAP repair conferred an increased effectiveness of 0.06 QALY with cost savings of \$1,766. Compared with nonoperative treatment, both biceps tenodesis and SLAP repair were cost-effective (incremental cost-effectiveness ratio values of \$3,344/QALY gained and \$4,289/QALY gained, respectively). Sensitivity analysis showed that biceps tenodesis was the preferred strategy in most simulations (52%); however, for SLAP repair to become cost-effective over biceps tenodesis, its probability of failure would have to be lower than 2.7% or the cost of biceps tenodesis would have to be higher than \$14,644.

### **Conclusions**

When compared with primary SLAP repair and nonoperative treatment, primary biceps tenodesis is the most cost-effective treatment strategy for type II SLAP tears in middle-aged patients.

Primary biceps tenodesis offers increased effectiveness when compared with both primary SLAP repair and nonoperative treatment and lower costs than primary SLAP repair.

### **Level of Evidence**

Level III, economic decision analysis.

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## **Arthroscopic Latarjet Techniques: Graft and Fixation Positioning Assessed With 2-Dimensional Computed Tomography Is Not Equivalent With Standard Open Technique**

Lionel Neyton, M.D., Johannes Barth, M.D., Geoffroy Nourissat, M.D., Pierre Métais, M.D., Pascal Boileau, M.D., Gilles Walch, M.D., Laurent Lafosse, M.D.

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### **Purpose**

To analyze graft and fixation (screw and EndoButton) positioning after the arthroscopic Latarjet technique with 2-dimensional computed tomography (CT) and to compare it with the open technique.

### **Methods**

We performed a retrospective multicenter study (March 2013 to June 2014). The inclusion criteria included patients with recurrent anterior instability treated with the Latarjet procedure. The exclusion criterion was the absence of a postoperative CT scan. The positions of the hardware, the positions of the grafts in the axial and sagittal planes, and the dispersion of values (variability) were compared.

### **Results**

The study included 208 patients (79 treated with open technique, 87 treated with arthroscopic Latarjet technique with screw fixation [arthro-screw], and 42 treated with arthroscopic Latarjet technique with EndoButton fixation [arthro-EndoButton]). The angulation of the screws was different in the open group versus the arthro-screw group (superior,  $10.3^\circ \pm 0.7^\circ$  vs  $16.9^\circ \pm 1.0^\circ$  [ $P < .001$ ]; inferior,  $10.3^\circ \pm 0.8^\circ$  vs  $15.7^\circ \pm 0.9^\circ$  [ $P < .0001$ ]). The angulation of the EndoButtons was  $5.7^\circ \pm 0.5^\circ$ ; this was different from that of open inferior screws ( $P = .003$ ). In the axial plane (level of equator), the arthroscopic techniques resulted in lateral positions (arthro-screw,  $1.5 \pm 0.3$  mm lateral [ $P < .001$ ]; arthro-EndoButton,  $0 \pm 0.3$  mm lateral [ $P < .0001$ ]) versus the open technique ( $0.9 \pm 0.2$  mm medial). At the level of 25% of the glenoid height, the arthroscopic techniques resulted in lateral positions (arthro-screw,  $0.3 \pm 0.3$  mm lateral [ $P < .001$ ]"; (arthro-EndoButton,  $0.7 \pm 0.3$  mm lateral [ $P < .0001$ ]) versus the open technique ( $1.0 \pm 0.2$  mm medial). Higher variability was observed in the arthro-screw group. In the sagittal plane, the arthro-screw technique resulted in higher positions (55% ± 3% of graft below equator) and the arthro-EndoButton technique resulted in lower positions (82% ± 3%,  $P < .0001$ ) versus the open technique (71% ± 2%). Variability was not different.

### **Conclusions**

This study shows that the position of the fixation devices and position of the bone graft with the arthroscopic techniques are statistically significantly different from those with the open technique with 2-dimensional CT assessment. In the sagittal plane, the arthro-screw technique provides the highest positions, and the arthro-EndoButton technique, the lowest. Overall, the mean position of the bone block with the open Latarjet technique in the axial plane is slightly medial to the joint line, as recommended. Conversely, with the arthroscopic techniques, the bone grafts are more lateral with a slight overhang. The main differences are observed in the dispersion of the values (more extreme positions) with the arthro-screw technique, given the acknowledged limitations. Despite the statistical significance, the clinical significance of these differences is yet unknown.

### **Level of Evidence**

Level III, retrospective comparative study.

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## **Outcomes of Arthroscopic Rotator Cuff Repair in Patients Who Are 70 Years of Age or Older Versus Under 70 Years of Age: A Sex- and Tear Size-Matched Case-Control Study**

Ji-Yong Gwark, M.D., Chang-Meen Sung, M.D., Jae-Boem Na, M.D., Ph.D., Hyung Bin Park, M.D., Ph.D.

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### **Purpose**

To compare the structural and clinical outcomes after arthroscopic rotator cuff repair (ARCR) of a case group aged 70 and above with those of a control group younger than 70, with the 2 groups matched for sex and tear size.

### **Methods**

The case group, comprising 53 patients 70 or older, and the control group, comprising 159 patients younger than 70, all received ARCR to 1 shoulder with symptomatic full-thickness rotator cuff tear. The case and the control subjects, who were matched for sex and tear size to minimize bias related to tendon healing, received ARCR during the same period. The mean age was  $71.8 \pm 2.6$  years in the case group and  $59.3 \pm 7.1$  years in the control group. The minimum follow-up period was 1 year in both groups. Cuff integrity was evaluated using ultrasonography. Structural and clinical outcomes of the 2 groups were compared.

### **Results**

Regarding structural outcomes, the complete healing, partial-thickness retear, and full-thickness retear rates were 66% (35/53), 15% (8/53), and 19% (10/53) in the case group, and 68% (108/159), 19% (30/159), and 13% (21/159), respectively, in the control group. The 2 groups had no significantly different retear rates ( $P = .52$ ). Regarding clinical outcomes, the mean improvements in range of motion, pain, muscle strength, and age- and sex-matched Constant scores were not significantly different between the 2 groups ( $P > .37$ ). The preoperative tear size was significantly associated with retear in both studied groups ( $P = .02$ ).

### **Conclusions**

The clinical and structural outcomes of ARCR in patients 70 or older with symptomatic full-thickness rotator cuff tear are comparable with those in patients younger than 70 with at least 1-year follow-up. Preoperative tear size, a biological factor, is a strong predictor for retear.

### **Level of Evidence**

Level III, a retrospective comparative (case-control) study.

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## **Native Enthesis Preservation Versus Removal in Rotator Cuff Repair in a Rabbit Model**

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### **Purpose**

The purpose of this study was to explore whether preservation of native enthesis during rotator cuff repair (RCR) results in a histologically and biomechanically better rotator cuff-greater tuberosity (RC-GT) connection in an animal model.

### **Methods**

Thirty-six New Zealand white rabbits were used in this study. The supraspinatus tendons were cut from the footprint to create a rotator cuff tear (RCT) on both shoulders, followed by immediate repair, with a 1 mm thick tendon stump remaining on the footprint. On one side, RCR was performed by attaching the medial rotator cuff to the GT over the footprint stump layer (enthesis preservation [EP] approach). On the other side, the footprint stump and enthesis were fully removed and the footprint was decorticated. The repair was performed by attaching the medial rotator cuff onto the spongy bone surface in the footprint area (enthesis removal [ER] approach). Twelve rabbits were sacrificed at 4, 8, and 12 weeks, of which 6 were used for histological analysis and 6 for biomechanical evaluation.

### **Results**

Histological examination revealed that in the EP group, the native enthesis healed well with the reattached cuff tendon, and continuous collagen crossed the tendon-tendon interface area at 12 weeks. However, in the ER group, there was only fibrous scar tissue formation at the tendon-bone interface. Biomechanical testing revealed a significantly higher load to failure ( $P = .001$ ) of the RC-GT structure in the EP group than that in the ER group at 12 weeks.

### **Conclusions**

For acute RCT with remnant enthesis, EP-RCR incorporates the native enthesis functionally in the restored RC-GT connection and enhances the RC-GT connection when compared with ER-RCR at 12 weeks in a rabbit model.

### **Clinical Relevance**

This finding justifies a human trial because in RCR with a remnant footprint, the EP technique may be adopted for a better RC-GT connection.

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## **Arthroscopic Incomplete Repair Using a “Hybrid Technique” for Large to Massive Rotator Cuff Tears: Clinical Results and Structural Integrity**

Jeung Yeol Jeong, M.D., Young Cheol Yoon, M.D., Sang Min Lee, C.E.S., Jae Chul Yoo, M.D.

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### **Purpose**

The first aim of this study was to introduce the concept of hybrid repair (incomplete repair) for large to massive rotator cuff tears and to report clinical results and structural integrity of patients with a minimum 2-year follow-up. The second aim was to compare arthroscopic hybrid repair with partial repair for large to massive rotator cuff tears.

### **Methods**

We retrospectively evaluated 65 patients who underwent arthroscopic incomplete (hybrid) repair (45 patients) or partial repair (20 patients) for large to massive cuff tears from March 2011 to January 2015. The pain visual analog scale, function visual analog scale, American Shoulder and Elbow Surgeons, and Constant scores and range of motion (ROM) (active flexion, elevation, abduction, external rotation, and internal rotation) were assessed preoperatively, at first follow-up (approximately 6 months postoperatively), at second follow-up (1 year postoperatively), and at final follow-up (2 years postoperatively). The healing status of the repaired tendon was evaluated with postoperative magnetic resonance imaging, with a focus on tendon integrity.

### **Results**

Comparisons of the preoperative values and final follow-up results of hybrid repair showed significant improvement in the mean pain visual analog scale score (5.56 and 0.93, respectively), mean function visual analog scale score (4.77 and 8.59, respectively), and questionnaire results (American Shoulder and Elbow Surgeons score, 44.89 and 84.67, respectively; Constant score, 44.27 and 73.46, respectively) (all  $P \leq .001$ ). Most shoulder ROM measures showed some improvement compared with presurgical ROM at last follow-up ( $\geq 2$  years). However, there was no statistical significance. Retears occurred in 9 patients (20%) in the hybrid-repair group. Most of the postoperative clinical outcomes showed excellent results with hybrid repair compared with partial repair.

### **Conclusions**

Arthroscopic incomplete repair (hybrid technique) showed more satisfactory clinical trial outcomes than partial repair of large to massive rotator cuff tears. Therefore, we propose the use of incomplete repair, which provides improvements in both pain and functional outcomes, as another repair option for large to massive rotator cuff tears.

### **Level of Evidence**

Level III, retrospective comparative study.

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## Prediction of the Irreparability of Rotator Cuff Tears

In-Bo Kim, M.D., Dong Wook Jung, M.D., Kuen Tak Suh, M.D., Ph.D.

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### Purpose

To determine the influence of preoperative factors on reparability of rotator cuff tears (RCTs) and yield a predictive model for predicting irreparability preoperatively.

### Methods

Among patients with full-thickness RCTs, the repairable group underwent arthroscopic rotator cuff repairs for reparable RCTs whereas the irreparable group underwent alternative surgical procedures for irreparable RCTs. We analyzed age, sex, chronic pseudoparalysis (CPP), mediolateral and anteroposterior tear sizes, acromiohumeral distance (AHD), tangent sign, fatty infiltration (FI) (group 1, Goutallier stage 0 or 1; and group 2, Goutallier stage 2, 3, or 4), and tendon involvement (TI) (type 1, supraspinatus; type 2, supraspinatus and subscapularis; type 3, supraspinatus and infraspinatus; and type 4, all 3 tendons).

### Results

The irreparability rate was 12.5%. Between the repairable (663 patients) and irreparable (95 patients) groups, significant differences were found in age ( $58.8 \pm 8.3$  years vs  $65.6 \pm 8.0$  years,  $P < .001$ ); female sex (46.9% vs 63.2%,  $P = .014$ ); CPP (6.5% vs 36.8%,  $P < .001$ ); mediolateral tear size ( $23.7 \pm 12.1$  mm vs  $47.4 \pm 9.1$  mm,  $P < .001$ ); anteroposterior tear size ( $17.9 \pm 11.5$  mm vs  $43.4 \pm 16.2$  mm,  $P < .001$ ); AHD ( $9.0 \pm 1.7$  mm vs  $5.8 \pm 1.6$  mm,  $P < .001$ ); tangent sign (2.9% vs 61.1%,  $P < .001$ ); group 2 FI of the subscapularis (6.9% vs 20.0%,  $P < .001$ ), supraspinatus (12.1% vs 58.9%,  $P < .001$ ), infraspinatus (26.8% vs 69.5%,  $P < .001$ ), and teres minor (4.2% vs 10.5%,  $P = .008$ ); and type 1, 2, 3, and 4 TI (88.1%, 6.2%, 5.4%, and 0.3%, respectively, vs 29.5%, 21.1%, 28.4%, and 21.1%, respectively;  $P < .001$ ). Multiple logistic regression analysis showed CPP, mediolateral tear size, AHD, tangent sign, group 2 FI of the supraspinatus, and type 4 TI were significant independent predictors of irreparability, with odds ratios of 3.539 ( $P = .007$ ), 1.087 ( $P < .001$ ), 0.624 ( $P < .001$ ), 6.141 ( $P < .001$ ), 2.233 ( $P = .034$ ), and 12.350 ( $P = .016$ ), respectively. These factors yielded a predictive model for irreparability as follows: Logit  $P = 1.264 \times \text{CPP} + 0.084 \times \text{Mediolateral tear size} - 0.472 \times \text{AHD} + 0.804 \times \text{Group 2 FI of supraspinatus} + 1.815 \times \text{Tangent sign} + 2.514 \times \text{Type 4 TI} - 3.460$ .

### Conclusions

The irreparability of RCTs is strongly associated with CPP, mediolateral tear size, AHD, tangent sign, group 2 FI of the supraspinatus, and type 4 TI and can be preoperatively calculated using the predictive equation.

### Level of Evidence

Level III, retrospective comparative study.

## **Topographic Analysis of 2 Alternative Donor Sites of the Ipsilateral Elbow in the Treatment of Capitellar Osteochondritis Dissecans**

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### **Purpose**

To find the best topographic subchondral bone match between the capitellum and 2 proposed alternative donor sites of the ipsilateral elbow for capitellar osteochondral autologous transplantation: the non-articulating part of the radial head and the lateral olecranon tip.

### **Methods**

In our retrospective database, 20 patients with an unremarkable computed tomography scan of the elbow despite clinical suspicion were identified for analysis. Included were patients aged 11 to 20 years with intact osseous structures and a computed tomography slice thickness of 1.25 mm or less. Three-dimensional polygon models were created using a standard predefined threshold, after which 4 articular surface lesions on the capitellum were created: central 40°, central 60°, lateral 40°, and lateral 60°. In addition, 3 donor locations on the non-articulating part of the radial head (diameter, 5 mm) and the lateral olecranon tip (diameter, 3.5 mm) were created. For each of 24 donor-recipient combinations, the donor graft surface was virtually placed on the recipient surface to quantify the mean distance between surfaces.

### **Results**

The group of 20 patients consisted of 16 male and 4 female patients with a mean age of 15.9 years (range, 12-18 years). For a central 40° lesion, the mean distance across all 6 donor-recipient combinations ranged from  $0.085 \pm 0.023$  to  $0.118 \pm 0.036$  mm; for a central 60° lesion, the mean distance ranged from  $0.075 \pm 0.018$  to  $0.117 \pm 0.062$  mm; for a lateral 40° lesion, the mean distance ranged from  $0.087 \pm 0.030$  to  $0.182 \pm 0.226$  mm; and for a lateral 60° lesion, the mean distance ranged from  $0.084 \pm 0.048$  to  $0.115 \pm 0.045$  mm. There were no differences in topographic matching between donor-recipient combinations.

### **Conclusions**

The findings of this study show a less than 0.2-mm difference in the topographic subchondral bone match between 4 common lesion locations on the capitellum and 2 alternative donor sites of the ipsilateral elbow for capitellar osteochondral autologous transplantation: the non-articulating part of the radial head and the lateral olecranon tip.

### **Clinical Relevance**

These findings suggest that the non-articulating part of the radial head and the lateral olecranon tip may potentially be used as a donor source when treating capitellar osteochondritis dissecans.

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## **Arthroscopic Management of SLAP Lesions With Concomitant Spinoglenoid Notch Ganglion Cysts: A Systematic Review Comparing Repair Alone to Repair With Decompression**

Amanda J. Schroeder, M.D., Yehia H. Bedeir, M.B.B.Ch., Mch.Ort. , Adam P. Schumaier, M.D., Vishal S. Desai, B.S., Brian M. Grawe, M.D.

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### **Purpose**

To determine if cyst management is necessary in the setting of SLAP lesions with concomitant paralabral ganglion cysts.

### **Methods**

We performed a systematic review according to Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines, including all studies that met inclusion criteria from January 1975 to July 2015. We included patients with a SLAP II-VII lesion and a concomitant paralabral ganglion cyst who underwent arthroscopic labral repair with or without cyst decompression. Patients with follow-up of less than 3 months, a SLAP I lesion, or who underwent concomitant cuff repair were excluded. The Methodological Index for Non-randomized Studies (MINORS) scoring system was used to quantify the potential bias in each study. Outcome measures reported were provided in a table format and a subjective analysis was performed.

### **Results**

Nineteen studies were included yielding a total of 160 patients: 66 patients treated with repair alone [R] and 94 patients with additional cyst decompression or excision [R+D]. The VAS, Rowe, and Constant scores were excellent and similar in both groups. The mean VAS was 0.6 in [R] and ranged between 0 and 2 in [R+D] (0.5, 0, 2, 0.2). The mean Rowe scores were 94 and 98 in [R] and 95 in [R+D]. The mean Constant scores were 97 in [R] and ranged between 87 and 98 in [R+D] (98, 87, 92, 94). In total, 5 of 90 patients were unable to return to work and 2 of 45 were unable to return to sport. All 15 patients who had follow-up electromyographies displayed resolution, and in the 115 patients with follow-up MRIs, 12 did not have complete resolution of the cyst.

### **Conclusions**

Despite the lack of high-quality evidence, the studies subjectively analyzed in this review suggest that both groups have excellent results. The results do not show any advantages from performing decompression.

### **Level of Evidence**

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

[BACK](#)

Journal of Shoulder and Elbow Surgery (JSES), Volume 27, Issue 8

**A randomized controlled trial of arthroscopic capsular release versus hydrodilatation in the treatment of primary frozen shoulder**

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**Background**

Arthroscopic capsular release (ACR) and hydrodilatation (HD) have been developed for the management of frozen shoulder refractory to conservative treatment. To date no randomized trial has directly compared the efficacy of both interventions. The aim of this trial was to determine whether the Oxford Shoulder Score (OSS) differs between patients with frozen shoulder randomized to treatment with ACR or HD.

**Methods**

Patients presenting with severe idiopathic frozen shoulder deemed suitable for surgical intervention by a consultant shoulder surgeon were randomized to ACR or HD. The primary outcome measure was OSS at 6 months, with secondary outcomes measures of the EuroQol-5D visual analog scale, external rotation, complications, and crossover rate also recorded.

**Results**

Between June 2013 and December 2016, 50 patients were randomized to HD or ACR. The average age of the HD and ACR cohorts was 55.2 and 52.6 years, respectively ( $P = .36$ ). At 6 months after the intervention, 20 patients were available for follow-up in the HD cohort and 19 in the ACR cohort. Both groups demonstrated significant improvements in OSS from baseline, but the OSS was significantly higher in the ACR cohort than the HD cohort (43.8 vs. 38.5,  $P = .023$ ). The OSS was noted to improve rapidly after the intervention, with 75% of improvement in OSS noted at 6 weeks after surgery in both groups.

**Conclusions**

Patients randomized to ACR reported a significantly higher OSS at 6 months than those randomized to HD. Both groups, however, showed a significant improvement.

[BACK](#)

**Failure following arthroscopic Bankart repair for traumatic anteroinferior instability of the shoulder: is a glenoid labral articular disruption (GLAD) lesion a risk factor for recurrent instability?**

Jonas Pogorzelski, MD, MHBA, Erik M. Fritz, MD, Marilee P. Horan, MPH, J. Christoph Katthagen, MD, Matthew T. Provencher, MD, CAPT, MC, USNR, Peter J. Millett, MD, MSc

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**Background**

Recurrent instability is a frequent complication following arthroscopic Bankart repair. The purpose of this study was to investigate risk factors for poor patient-reported clinical outcome scores and failure rates.

**Methods**

Patients who underwent arthroscopic Bankart repair at least 2 years earlier were included. Preoperative and postoperative Single Assessment Numeric Evaluation; Quick Disabilities of the Arm, Shoulder and Hand; American Shoulder and Elbow Surgeons; and satisfaction scores were collected. The relationship of the following factors with outcomes and failure rates was assessed: (1) previous arthroscopic stabilization, (2) 3 or more dislocations prior to surgery, (3) glenoid labral articular disruption (GLAD) lesion, (4) concurrent superior labral anterior-to-posterior tear repair, and (5) concurrent biceps tenodesis.

**Results**

The study included 72 patients with a median age of 23 years (range, 14-49 years). Subsequent revision was required in 9 (12.5%); 1 additional patient (1.4%) had recurrent dislocation. Outcome data were available at a median follow-up of 3 years (range, 2-9 years). All scores significantly improved from preoperatively to postoperatively ( $P < .05$ ); the mean patient satisfaction score was 9, with a median of 10 (range, 1-10). None of the analyzed factors were associated with worse postoperative outcome scores. GLAD lesions were significantly associated with a higher rate of failure ( $P = .007$ ). No other analyzed factors had a significant association with failure rates ( $P > .05$ ).

**Conclusions**

Patients with arthroscopic Bankart repair for traumatic anteroinferior shoulder instability had excellent outcomes, even in the context of previous arthroscopic stabilization surgery, 3 or more dislocations prior to surgery, concurrent superior labral anterior-to-posterior tear repair, or concurrent biceps tenodesis. However, GLAD lesions were associated with higher rates of failure, and the presence of a GLAD lesion may herald the presence of changes in the articular version or other as-yet-undetermined factors that could predispose patients to failure.

[BACK](#)

## **Arthroscopic isolated capsular release for shoulder contracture after brachial plexus birth palsy: clinical outcomes in a prospective cohort of 28 children with 2 years' follow-up**

Justin Ruyer, Sophie Grosclaude, MD, Philippe Lacroix, MD, Sabine Jardel, MD, Aram Gazarian, MD

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### **Background**

The primary objective of this study was to evaluate improvements in external rotation after isolated arthroscopic capsular release in children with shoulder contracture due to brachial plexus birth palsy.

### **Materials and methods**

This study included all children older than 2 years with a range of active external rotation limited to 30° or less and/or active anterior elevation (AE) limited to 90° or less secondary to brachial plexus palsy treated between 2011 and 2015. Passive glenohumeral motion, passive global (glenohumeral plus scapulothoracic) motion, active global motion for external rotation with the elbow at the side (ER1), AE, and internal rotation with the elbow at the side were recorded before and 2 years after surgery. Improvement was evaluated by comparing the preoperative and follow-up values. The operation performed was subscapularis-sparing arthroscopic capsular release.

### **Results**

Thirty-five patients were included, and 28 completed 2 years of follow-up. The average changes in active global ER1, passive glenohumeral ER1, and passive global ER1 were +35° (range, -20° to +100°;  $P < .0001$ ), +35° (range, +0° to +75°;  $P < .0001$ ), and +26° (range, -15° to +60°;  $P < .0001$ ), respectively. There were no significant changes in internal rotation with the elbow at the side or AE. The mean improvement in the aggregate Mallet score was 3.9 points (range, -3 to +9 points;  $P < .0001$ ).

### **Conclusions**

For children with shoulder contracture secondary to brachial plexus palsy, subscapularis-sparing isolated capsular release improves external rotation and functional scores and avoids any loss of active internal rotation but does not improve AE.

[BACK](#)

**Can inadequate acromiohumeral distance improvement and poor posterior remnant tissue be the predictive factors of re-tear? Preliminary outcomes of arthroscopic superior capsular reconstruction**

Seung-Jun Lee, Young-Kyoung Min

KSSTA, July 2018, Volume 26, Issue 7, pp 2205–2213

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**Purpose**

The factors affecting the anatomical and functional outcomes of arthroscopic superior capsular reconstruction (ASCR) were investigated in this study. Continuity between the posterior remnant tissue and graft, as well as medial-to-lateral anatomical graft continuity, might play a vital role in shoulder stability and functional recovery, which could be correlated with postoperative factors such as the acromiohumeral distance (AHD).

**Methods**

Thirty-two patients (36 shoulders) who underwent ASCR were included. The follow-up period was  $24.8 \pm 6.9$  months. The relationship between graft continuity and preoperative, intraoperative, and postoperative factors that could affect the clinical and radiological outcomes of ASCR were investigated.

**Results**

The American Shoulder and Elbow Surgeons score increased from  $50.3 \pm 9.1$  points preoperatively to  $84.0 \pm 5.0$  points postoperatively ( $p < 0.01$ ), and the Constant score increased from  $56.3 \pm 9.0$  to  $82.8 \pm 5.6$  points ( $p = 0.02$ ). Re-tearing occurred in 13 patients during the postoperative follow-up period. The re-tear rate was relatively high (36.1%). The gap between the immediate postoperative and preoperative AHDs was  $1.6 \pm 2.2$  mm in the re-tear (+) group and  $3.8 \pm 2.8$  mm in the re-tear (-) group ( $p = 0.02$ ). The integrity of the posterior remnant tissue had a statistically significant and different re-tear rate ( $p < 0.01$ ).

**Conclusion**

Care should be taken in patients with inadequate AHD improvement and poor posterior remnant tissue immediately postoperatively, because the possibility of re-tearing is high. Therefore, better results can be predicted when considering these factors at the time of surgery.

**Level of evidence**

IV.

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## **Lower Extremity**

Arthroscopy, Volume 34, Issue 7

### **Outcomes of Hip Arthroscopy in a Military Population Are Similar to Those in the Civilian Population: Matched Paired Analysis at 2 Years**

Jun-Il Yoo, M.D., Tae-Ho Lee, M.D., Jae-Yoon Kim, M.D., Jae-Hyung Kim, M.D., Yong-Chan Ha, M.D.

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#### **Purpose**

The purpose of this study was to compare the clinical outcomes, including the visual analog pain score, University of California Los Angeles activity, modified Harris hip score, and radiologic outcomes after hip arthroscopy in male patients whose symptoms developed during military services with those in a matched-pair control group of active young, nonmilitary patients at a minimum postoperative follow-up of 2 years.

#### **Methods**

From September 2009 to December 2014, 28 male patients with mechanical symptoms that developed during military service underwent hip arthroscopic surgery. The control group included 28 professional male athletes who were matched with gender, Tönnis grade 0 or 1, crossover percentage, and labral procedure. At the minimum 2-year follow-up, radiographic and clinical outcomes were assessed using serial radiography. Statistical analysis was performed to confirm the differences between the preoperative and postoperative outcome measures.

#### **Results**

Most common arthroscopic procedures in the study and control groups were femoroplasty (64.4% vs 53.6%) and labral repair (64.3% vs 53.6%). All improvements in both groups were statistically significant at the last postoperative follow-up ( $P < .001$ ). In the study group, 89.3% of soldiers were able to return to their preoperative military branch. Although radiologic and clinical outcomes in both groups were not significantly different, hospitalization time in soldiers was significantly longer than that in the control group ( $79.4 \pm 27.0$  vs  $4.0 \pm 1.3$  days,  $P < .001$ ). Time of return to their preoperative military branch in the study group was similar to sports activity in the control group ( $5.9 \pm 4.3$  vs  $6.3 \pm 3.7$  months,  $P = .258$ ).

#### **Conclusions**

Male patients with symptoms that developed during military services achieved similar levels of benefit from hip arthroscopy as those in the control group of active young patients. Although hospitalization time in the military population was significantly longer than that in the control group, time to return to activity was similar in both groups.

#### **Level of Evidence**

Level III, comparative trial

[BACK](#)

## **Anatomy of the Pudendal Nerve and Other Neural Structures Around the Proximal Hamstring Origin in Males**

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### **Purpose**

To define the anatomy of the pudendal nerve in relationship to the proximal hamstring and other nearby neurological structures during proximal hamstring repair.

### **Methods**

Six fresh-frozen human cadaveric hemi-pelvises from male patients ages  $64.0 \pm 4.1$  years were dissected in prone position with hips in  $10^\circ$  flexion to identify the relationship of proximal hamstring origin to surrounding neurologic structures including the pudendal nerve, sciatic nerve, and posterior femoral cutaneous nerve. Two independent observers used digital calipers to measure distances.

### **Results**

The pudendal nerve emerged at the inferior border of the piriformis muscle  $6.3 \pm 1.4$  cm from the superior aspect of the proximal hamstring origin. It passed the superior border of the sacrotuberous ligament  $3.0 \pm 0.6$  cm from the superior aspect and  $3.9 \pm 0.7$  cm from the medial aspect of the hamstring origin. It crossed the inferior border of the sacrotuberous ligament  $3.0 \pm 0.4$  cm from the superior aspect and  $2.7 \pm 0.7$  cm from the medial aspect of the proximal hamstring origin. The shortest distance from the hamstring origin to the pudendal nerve was  $2.6 \pm 0.5$  cm from the superior aspect and  $2.3 \pm 0.8$  cm from the medial aspect. The shortest distance from the hamstring origin to the pudendal nerve was located deep to the sacrotuberous ligament in all cadavers. The sciatic nerve was an average of  $1.1 \pm 0.1$  cm lateral to the lateral aspect of the proximal hamstring origin. The posterior femoral cutaneous nerve was located between the hamstring origin and the sciatic nerve,  $0.7 \pm 0.2$  cm lateral to the lateral aspect of the proximal hamstring origin.

### **Conclusions**

The proximal hamstring origin lies in close proximity to surrounding nerves, including the pudendal, sciatic, and posterior femoral cutaneous nerves.

### **Clinical Relevance**

Knowledge that the pudendal nerve lies 2 to 3 cm superior and medial to the proximal hamstring origin may help to prevent iatrogenic damage during surgical dissection and retraction when performing proximal hamstring repair or deep gluteal space endoscopy.

[BACK](#)

## **Standardizing the Prearthritic Hip Joint Space Width: An Analysis of 994 Hips**

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### **Purpose**

The purposes of this study were (1) to define a normal prearthritic hip joint space width (JSW) in symptomatic and asymptomatic patients with various degrees of acetabular coverage based on the lateral center edge angle (LCEA) and (2) to determine predictors of JSW using patient-specific variables.

### **Methods**

In a consecutive series of patients presenting to a hip preservation clinic between July 2012 and April 2016, a standard weight-bearing anteroposterior pelvic view was obtained. JSW was defined as the distance between the bony contour of the acetabular rim and femoral head in 2 locations (lateral and medial weight-bearing zone). Hips with severe anatomic deformity, a Tönnis grade >0, or a lateral or medial JSW <2.5 mm were excluded. A linear mixed model analysis was performed in order to determine which variables (age, sex, side, height, weight, symptomatic/asymptomatic, LCEA, and clinical diagnosis) were significantly related to JSW.

### **Results**

A total of 994 hips were included. LCEA was found to be a significant predictor of both the lateral and medial JSW, with a decreased JSW associated with increasing degrees of acetabular bony coverage ( $P < .02$ ). A mean 0.9 mm (20%) difference in medial JSW was found between patients with frank dysplasia (LCEA <20°) compared with those with pincer-type FAI (LCEA ≥40°). There was no difference between symptomatic and asymptomatic hips, either for lateral (asymptomatic:  $4.51 \pm 0.83$  mm; symptomatic:  $4.52 \pm 0.85$  mm;  $P = .58$ ) or medial JSW (asymptomatic:  $4.02 \pm 0.96$  mm; symptomatic:  $3.97 \pm 0.84$  mm;  $P = .49$ ).

### **Conclusions**

The LCEA is a significant predictor of hip JSW, with the mean JSW decreasing with increasing degrees of acetabular bony coverage. Joint space is not a major factor in symptomatology in adults with prearthritic hip pain.

### **Level of Evidence**

Level III, retrospective comparative study.

[BACK](#)

## **Posterior Bony Impingement—Potential Mechanism of Ligamentum Teres Tears**

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PlumX Metrics

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### **Purpose**

To describe a potential causal mechanism of ligamentum teres (LT) tears, a specific treatment for posterior impingement of the LT, and to report the minimum 2-year outcome of this treatment.

### **Methods**

We retrospectively reviewed data collected from 1,251 hip arthroscopies performed by the senior surgeon over a 26-month period. During this time, 424 LT tears were identified including 9 patients with isolated partial LT tears caused by impingement of the LT against a prominent acetabular fossa posterior wall and no other intra-articular pathology. All 9 patients were treated with LT tear debridement and excision of the impinging bony prominence using an arthroscopic burr. Patients were followed with a modified Harris hip score and nonarthritic hip score for a minimum of 24 months (mean, 29 months; range, 24-38 months).

### **Results**

After surgery, all patients returned to their preinjury level of activity. The modified Harris hip score increased from a mean of 58.9 preoperatively (range, 41.8-84.7) to 89.2 (range, 70.3.5-96.7) ( $P = .02$ ) at a minimum of 2-year follow-up. Similarly, the nonarthritic hip score increased from a mean of 56.2 (range, 35-90) to 91.9 (range, 81.5-98.5) ( $P = .01$ ) at a minimum of 2 years after surgery. There were no complications associated with the procedure and no revision surgeries performed over the 2-year follow-up.

### **Conclusions**

LT tears may, very uncommonly, be caused by impingement of the mid-part of the ligament against a prominent posterior acetabular fossa edge. In this group of 9 cases, debridement of the torn ligament segment, in combination with resection of the impinging bone, was associated with marked symptomatic improvement and full return to activities for a minimum of 2 years.

### **Level of Evidence**

Level IV, therapeutic case series.

[BACK](#)

# **Assessing the Outcome of Hip Arthroscopy for Labral Tears in Femoroacetabular Impingement Using the Minimum Dataset of the British Non-arthroplasty Hip Register: A Single-Surgeon Experience**

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## **Purpose**

The aim of this study was to assess changes in British Non-arthroplasty Hip Register (NAHR) minimum dataset (MDS) patient-reported outcome measures (PROMs) after hip arthroscopy for femoroacetabular impingement (FAI) and define the relation between these and patient satisfaction. Secondary aims included exploring the impact of patient characteristics (age, sex, and social deprivation status) on MDS PROMs and satisfaction and determining the Net Promoter Score for hip arthroscopy for FAI.

## **Methods**

Preoperative data were collected from the NAHR, and postoperative data were collected through the NAHR, by mail, and by telephone survey. Correlations between satisfaction, International Hip Outcome Tool 12 (iHOT-12), and EQ-5D scores were explored.

## **Results**

A consecutive series of 89 primary hip arthroscopy procedures for FAI in 88 patients is reported. Patients reported improvements in the iHOT-12 score (mean, 34.08; 95% confidence interval [CI], 27.88 to 40.28;  $P < .001$ ), EQ-5D index score (+0.124; 95% CI, 0.063 to 0.185;  $P < .001$ ), and EQ-5D visual analog scale (VAS) (+4.49; 95% CI, -1.56 to 10.54;  $P = .061$ ) after hip arthroscopy for FAI. Satisfaction was predicted by both change in iHOT-12 score (Spearman  $r_s = 0.54$ ,  $P < .001$ ) and absolute postoperative iHOT-12 score ( $r_s = 0.78$ ,  $P < .001$ ), change in EQ-5D index score ( $r_s = 0.42$ ,  $P < .001$ ) and absolute postoperative EQ-5D index score ( $r_s = 0.70$ ,  $P < .001$ ), and change in EQ-5D VAS score ( $r_s = 0.30$ ,  $P = .012$ ) and absolute postoperative EQ-5D VAS score ( $r_s = 0.59$ ,  $P < .001$ ); and the strength of correlation was greater with the absolute postoperative score than with the change in score for all 3. Sex, age, and social deprivation status did not predict postoperative PROMs ( $P \geq .15$ ) or satisfaction ( $P \geq .32$ ). The postoperative iHOT-12 score correlated strongly with EQ-5D index ( $r_s = 0.90$ ,  $P < .001$ ) and EQ-5D VAS ( $r_s = 0.81$ ,  $P < .001$ ) scores. The Net Promoter Score for hip arthroscopy for FAI was 70.31.

## **Conclusions**

This study showed significant improvements in hip-specific function (iHOT-12) and health-related quality of life (EQ-5D), as measured by the NAHR MDS, in patients undergoing hip arthroscopy for FAI. Satisfaction rates were high (75.7%) and correlated strongly with hip-specific and general health PROMs. Satisfied patients were more likely to be willing to undergo similar surgery in the future. Self-reported postoperative hip function correlated very strongly with general health-related quality of life.

## **Level of Evidence**

Level IV, case series.

[BACK](#)

## **Assessing the Readability of Online Information About Hip Arthroscopy**

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### **Purpose**

To investigate the current readability of online information pertaining to hip arthroscopy.

### **Methods**

The terms “hip arthroscopy” and “hip scope” were entered into the advanced search functions of Google, Yahoo!, and Bing on March 25, 2017, and results from the first 3 pages were analyzed. Results were required to be unique, accessible websites with information about hip arthroscopy conveyed primarily via analyzable text. Two reviewers applied inclusion criteria to the initial 97 results, discussing to reach consensus in cases of disagreement. Overall, 60 unique results were reviewed with 48 meeting inclusion criteria. Websites were categorized as physician-sponsored, academic, commercial, governmental and nonprofit organization (NPO), or unspecified. Readability was measured via 6 different indices: the Flesch-Kincaid grade level (FKGL), Flesch Reading Ease (FRE), Gunning Fog Score, SMOG Index, Coleman-Liau Index (CLI), and Automated Readability Index (ARI) along with an average grade level and readability classification score.

### **Results**

Forty-eight unique websites were assessed for readability, with physician-sponsored webpages composing the majority (47.92%) followed by academic sources (35.42%). The webpages' average grade level, incorporating information from all 6 metrics, was  $12.79 \pm 1.98$ .

### **Conclusions**

The current readability of online information pertaining to hip arthroscopy is at an inappropriately high reading level compared with the sixth-grade level recommended by the American Medical Association and National Institutes of Health, thus introducing significant barriers to understanding for many patients. Online materials should be edited to reduce word and sentence length and complexity, use simpler terms, and minimize use of passive voice to facilitate patient knowledge acquisition and understanding of online information about hip arthroscopy.

### **Clinical Relevance**

This study shows that the current readability of online information on hip arthroscopy exceeds the suggested sixth-grade reading level. It also emphasizes the need for simplifying written materials and offers specific suggestions on doing so to increase accessibility of information for patients.

[BACK](#)

## **Does Posterior Tibial Slope Affect Graft Rupture Following Anterior Cruciate Ligament Reconstruction?**

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### **Purpose**

The purpose of this study was to evaluate the association between posterior tibial slope (PTS) and anterior cruciate ligament (ACL) graft rupture in patients who have undergone ACL reconstruction by comparing results in patients who experienced graft rupture and a matched control group.

### **Methods**

The study included 64 knees of 64 patients (58 men and 6 women), of mean age 31 years (range, 18-60 years) who underwent revision ACL reconstruction for ACL graft rupture, as well as a control group without ACL graft rupture matched for age, sex, body mass index (BMI), and left or right side. The mean time to failure in study group was 48.5 months, and after revision surgeries, the mean follow-up period was 37.7 months. The graft used for the primary surgery was autograft in 3 patients (4.7%) and allograft in 49 patients (76.6%). The type of graft could not be confirmed in the remaining 12 patients (18.7%). PTS was measured on plain radiographs and compared in the 2 groups.

### **Results**

Mean PTS was significantly higher in patients with ( $13.2^\circ \pm 2.5^\circ$ ; range,  $8.5^\circ$ - $18.2^\circ$ ) than without ( $10.9^\circ \pm 3.1^\circ$ ; range,  $4.9^\circ$ - $13.6^\circ$ ) rerupture ( $P < .01$ ). When mean PTS was compared in the 37 patients who underwent primary surgery by the same surgeon, it was significantly higher in patients with ( $13.5^\circ \pm 2.5^\circ$ ; range,  $8.5^\circ$ - $18.2^\circ$ ) than without ( $11.1^\circ \pm 2.9^\circ$ ; range,  $5.1^\circ$ - $13.6^\circ$ ) rerupture ( $P < .01$ ). PTS in patients with rerupture was not significantly associated with age, gender, BMI, and right or left side. The odds ratio of ACL graft rupture in knees with PTS  $\geq 12^\circ$  was 4.52 ( $P < .001$ ).

### **Conclusions**

This study showed that mean PTS was significantly greater in patients with than without noncontact ACL graft rerupture ( $13.2^\circ$  vs  $10.9^\circ$ ,  $P < .01$ ). The failure of ACL reconstruction appears to be associated with increased PTS, with PTS  $\geq 12^\circ$  a risk factor for the failure of ACL reconstruction.

### **Level of Evidence**

Level III, retrospective comparative study.

[BACK](#)

## **Effect of Increased Coronal Inclination of the Tibial Plateau After Opening-Wedge High Tibial Osteotomy**

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### **Purpose**

To assess whether the increased inclination of the tibial plateau on the coronal view after opening-wedge high tibial osteotomy affects radiographic coronal alignment, clinical outcomes, and cartilage findings.

### **Methods**

After adjustment for the preoperative medial proximal tibial angle (MPTA), patients who underwent opening-wedge high tibial osteotomy were retrospectively divided into those with postoperative MPTA values of 95° or less (normal group) and greater than 95° (increased group), with each group containing 43 knees. The 2 groups were compared regarding their arthroscopic cartilage findings at 1 year postoperatively and radiographic coronal alignment and clinical outcomes at 2 years postoperatively. Cartilage regeneration in the medial condyles and cartilage deterioration in the lateral condyles were evaluated at the time of second-look arthroscopy. Clinical outcomes were evaluated by the American Knee Society knee and function scores, Lysholm knee scoring scale, and Knee Injury and Osteoarthritis Outcome Score (KOOS).

### **Results**

The postoperative anatomic femorotibial angle in the increased group was lower than that in the normal group ( $P < .001$ ), and the amount of overcorrection in the increased group was higher than that in the normal group ( $P < .001$ ). The postoperative joint line obliquity in the increased group was higher than that in the normal group ( $P < .001$ ). Cartilage regeneration in the medial condyles and deterioration in the lateral condyles did not differ significantly on the femoral and tibial sides between the groups. The postoperative American Knee Society knee score and KOOS sports and recreational function subscale score in the normal group were higher than those in the increased group (both  $P < .001$ ).

### **Conclusions**

There were no significant differences in the changes in the appearance of the articular surfaces between the 2 groups at 1 year postoperatively. Patients with a postoperative MPTA greater than 95° had more valgus alignment and higher joint line obliquity and had a lower KOOS sports and recreational function subscale score than patients with a postoperative MPTA of 95° or less at 2 years postoperatively.

### **Level of Evidence**

Level III, retrospective comparative study.

[BACK](#)

## **Incidence of Anterolateral Ligament Tears in the Anterior Cruciate Ligament-Deficient Knee: A Magnetic Resonance Imaging Analysis**

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### **Purpose**

The purpose of this study is to determine the incidence of anterolateral ligament (ALL) tears on magnetic resonance imaging (MRI) in patients diagnosed with anterior cruciate ligament (ACL) tears. Furthermore, this study sought to determine the inter- and intraobserver reliability in diagnosing an ALL tear.

### **Methods**

The MRI radiologic database at a community military hospital was queried for ACL tears over the period of January 2011 to April 2015. During this time, 181 MRIs were identified as having ACL tears. The MRIs were then independently reviewed by an orthopaedic surgeon and a musculoskeletal (MSK) trained radiologist. Both reviewers, independently confirmed the ACL tears, and the ALL was noted to be either torn, intact, or not visualized on axial, sagittal, and coronal images. Four weeks later the same MRIs were then reviewed for the presence and location of an ALL tear to determine inter- and intraobserver reliability.

### **Results**

The MSK radiologist found ALL tears on MRI in 28.2% of the cases, while the orthopaedic surgeon found ALL tears in 39.8% of the cases; 5.5% of the MRIs were characterized as having a nonvisualized ALL. The interobserver reliability was noted to have a kappa value of 0.333. The intraobserver reliability of the MSK radiologist and orthopaedic surgeon demonstrated a kappa value of 0.654 and 0.251, respectively.

### **Conclusions**

This study shows that the majority of patients with a known ACL tear on MRI do not have a tear of the ALL. Additionally, the interobserver reliability of surgeons and radiologist is fair. In this study, the MSK radiologist had higher intraobserver reliability when looking for an ALL tear.

### **Level of Evidence**

Level IV, case control study.

[BACK](#)

## **Arthroscopic Cartilage Lesion Preparation in the Human Cadaveric Knee Using a Curette Technique Demonstrates Clinically Relevant Histologic Variation**

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### **Purpose**

To examine the quality of arthroscopic cartilage debridement using a curette technique by comparing regional and morphologic variations within cartilage lesions prepared in human cadaveric knee specimens for the purpose of cartilage repair procedures. A secondary aim was to compare the histologic properties of cartilage lesions prepared by surgeons of varying experience.

### **Methods**

Standardized cartilage lesions (8 mm × 15 mm), located to the medial/lateral condyle and medial/lateral trochlea were created within 12 human cadaver knees by 40 orthopaedic surgeons. Participants were instructed to create full-thickness cartilage defects within the marked area, shouldered by uninjured vertical walls of cartilage, and to remove the calcified cartilage layer, without violating the subchondral plate. Histologic specimens were prepared to examine the verticality of surrounding cartilage walls at the front and rear aspects of the lesions, and to characterize the properties of the surrounding cartilage, the cartilage wall profile, the debrided lesion depth, bone sinusoid access, and the bone surface profile. Comparative analysis of cartilage wall verticality measured as deviation from perpendicular was performed, and Spearman's rank correlation analysis was used to examine associations between debrided wall verticality and surgeon experience.

### **Results**

Mean cartilage wall verticality relative to the base of the lesion was superior at the rear aspect of the lesion compared to the front aspect (12.9° vs 29.2°,  $P < .001$ ). Variability was identified in the morphology of the surrounding cartilage ( $P < .001$ ), cartilage wall profile ( $P = .016$ ), debrided lesion depth ( $P = .028$ ), bone surface profile ( $P = .040$ ), and bone sinusoid access ( $P = .009$ ), with sinusoid access identified in 42% of cases. There was no significant association of cartilage lesion wall verticality and surgeon years in practice ( $r_s = 0.161$ ,  $P = .065$ ) or arthroscopic caseload ( $r_s = -0.071$ ,  $P = .419$ ).

### **Conclusions**

Arthroscopic cartilage lesion preparation using standard curette technique in a human cadaveric knee model results in inferior perpendicularity of the surrounding cartilage walls at the front aspect of the defect, compared to the rear aspect. This technique has shown significant variability in the depth of debridement, with debridement depths identified as either too superficial or too deep to the calcified cartilage layer in more than 60% of cases in this study. Surgeon experience does not appear to impact the morphologic properties of cartilage lesions prepared arthroscopically using ring curettes.

### **Clinical Relevance**

To optimize restoration of hyaline-like cartilage tissue, careful attention to prepared cartilage lesion morphology is advised when arthroscopically performing cartilage repair, given the tendency for standard curette technique to create inferior verticality of cartilage walls at the front of the lesion, and the variable depth of debridement achieved.

[BACK](#)

## **Inter-rater Reliability for Metrics Scored in a Binary Fashion—Performance Assessment for an Arthroscopic Bankart Repair**

Anthony G. Gallagher, Ph.D., D.Sc., Richard K.N. Ryu, M.D., Robert A. Pedowitz, M.D., Ph.D., Patrick Henn, M.B., Richard L. Angelo, M.D., Ph.D.

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### **Purpose**

To determine the inter-rater reliability (IRR) of a procedure-specific checklist scored in a binary fashion for the evaluation of surgical skill and whether it meets a minimum level of agreement ( $\geq 0.8$  between 2 raters) required for high-stakes assessment.

### **Methods**

In a prospective randomized and blinded fashion, and after detailed assessment training, 10 Arthroscopy Association of North America Master/Associate Master faculty arthroscopic surgeons (in 5 pairs) with an average of 21 years of surgical experience assessed the video-recorded 3-anchor arthroscopic Bankart repair performance of 44 postgraduate year 4 or 5 residents from 21 Accreditation Council for Graduate Medical Education orthopaedic residency training programs from across the United States.

### **Results**

No paired scores of resident surgeon performance evaluated by the 5 teams of faculty assessors dropped below the 0.8 IRR level (mean = 0.93; range 0.84–0.99; standard deviation = 0.035). A comparison between the 5 assessor groups with 1 factor analysis of variance showed that there was no significant difference between the groups ( $P = .205$ ). Pearson's product-moment correlation coefficient revealed a strong and statistically significant negative correlation, that is,  $-0.856$  ( $P < .000$ ), indicating that as intra-operative error rate scores increased, the IRR decreased.

### **Conclusions**

Arthroscopy Association of North America shoulder faculty raters from across the United States showed high levels of IRR in the assessment of an arthroscopic 3-anchor Bankart repair procedure. All paired assessments were above the 0.8 level and the mean IRR of all resident assessments was 0.93, indicating that they could be used for high-stakes decisions.

### **Clinical Relevance**

With the move toward outcomes-based performance evaluation for graduate medical education, high-stakes assessments of surgical skill will require robust, reliable measurement tools that are able to withstand challenge. Surgical checklists employing metrics scored in a binary fashion meet the need and can show a high (>80%) IRR.

[BACK](#)

## **Lateral Knee Compartment Portals: A Cadaveric Study Defining a Posterolateral Viewing Safety Zone**

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### **Purpose**

This study attempted to define a reproducible “safe zone” based on extra- and intra-articular knee anatomy for placing one or 2 accessory portals in the lateral tibiofemoral compartment for posterolateral region viewing.

### **Methods**

Standard portals were created in 10 cadaveric knees to enable posterolateral region arthroscopic lateral tibiofemoral joint compartment viewing. After identifying the lateral knee surface tissue “soft spot,” an accessory posterolateral portal (A) was created using an 18-gauge spinal needle and 4-mm cannula under direct visualization of a 70° arthroscope through the anteromedial portal. A second accessory portal (B) was then created 1 cm posterior and 1 cm superior to portal A. Accessory portal locations were measured relative to capsular fold and popliteus tendon locations. Distances from the peroneal nerve, lateral collateral ligament, popliteus tendon, and the biceps tendon were determined. Statistical analysis compared portal location differences from key anatomical structures ( $P < .05$ ).

### **Results**

Accessory portal A (mean  $\pm$  95% confidence interval) was located  $8.8 \pm 2.7$  mm from the popliteus tendon,  $11.6 \pm 2.7$  mm from the lateral collateral ligament (LCL),  $26.8 \pm 2.3$  mm from the peroneal nerve, and  $4.9 \pm 2.5$  mm from the biceps tendon. Accessory portal B was located  $17.3 \pm 2.8$  mm from the popliteus tendon,  $20 \pm 2.8$  mm from the LCL,  $30.3 \pm 3.3$  mm from the peroneal nerve, and  $7.0 \pm 4.8$  mm from the biceps tendon. Accessory portal B was located a greater distance from the LCL and the popliteus tendon than portal A ( $P < .0001$ ).

### **Conclusions**

Using intra- and extra-articular anatomic landmarks, both accessory portals could be safely placed in the lateral tibiofemoral joint compartment to enable posterolateral region viewing. Accessory portals used individually or in combination may enable easier posterolateral region viewing for arthroscopic repair of lateral tibiofemoral compartment structures.

### **Clinical Relevance**

Lateral tibiofemoral compartment portals can be safely created to enable improved visibility for complex arthroscopic procedures in the posterolateral viewing region.

[BACK](#)

# **Three-dimensional Magnetic Resonance Imaging of the Anterolateral Ligament of the Knee: An Evaluation of Intact and Anterior Cruciate Ligament–Deficient Knees From the Scientific Anterior Cruciate Ligament Network International (SANTI) Study Group**

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## **Purpose**

To determine the visualization rate of the anterolateral ligament (ALL) in uninjured and anterior cruciate ligament (ACL)–deficient knees using 3-dimensional (3D) magnetic resonance imaging (MRI) and to characterize the spectrum of ALL injury observed in ACL-deficient knees, as well as determine the interobserver and intraobserver reliability of a 3D MRI classification of ALL injury.

## **Methods**

A total of 100 knees (60 ACL deficient and 40 uninjured) underwent 3D MRI. The ALL was evaluated by 2 blinded orthopaedic surgeons. The ALL was classified as follows: type A, continuous, clearly defined low-signal band; type B, warping, thinning, or iso-signal changes; and type C, without clear continuity. The comparison between imaging performed early after ACL injury (<1 month) and delayed imaging (>1 month) was evaluated, as was intraobserver and interobserver reliability.

## **Results**

Complete visualization of the ALL was achieved in all uninjured knees. In the ACL-deficient group, 24 knees underwent early imaging, with 87.5% showing evidence of ALL injury (3 normal, or type A, knees [12.5%], 18 type B [75.0%], and 3 type C [12.5%]). The remaining 36 knees underwent delayed imaging, with 55.6% showing evidence of injury (16 type A [44.4%], 18 type B [50.0%], and 2 type C [5.6%]). The difference in the rate of injury between the 2 groups was significant ( $P = .03$ ). Multivariate analysis showed that the delay from ACL injury to MRI was the only factor (negatively) associated with the rate of injury to the ALL. Interobserver reliability and intraobserver reliability of the classification of ALL type were good ( $\kappa = 0.86$  and  $\kappa = 0.93$ , respectively).

## **Conclusions**

Three-dimensional MRI allows full visualization of the ALL in all normal knees. The rate of injury to the ALL in acutely ACL-injured knees identified on 3D MRI is higher than previous reports using standard MRI techniques. This rate is significantly higher than the rate of injury to the ALL identified on delayed imaging of ACL-injured knees.

## **Level of Evidence**

Level IV, diagnostic, case-control study.

[BACK](#)

# **The Effect of Cartilage Fragments on Femoral Tunnel Widening After Anterior Cruciate Ligament Reconstruction: A Prospective Randomized Controlled Study**

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## **Purpose**

To analyze the effect of cartilage fragments on tunnel widening and tendon-bone integration at 2 years' follow-up after anterior cruciate ligament reconstruction (ACLR).

## **Methods**

A prospective randomized controlled study was performed in 116 patients who underwent ACLR with autologous hamstring tendons augmented with cartilage fragments (study group, n = 56) or without any augmentation (control group, n = 60). All patients were followed up for 25.6 months (range, 24-28 months), and the International Knee Documentation Committee score, Lysholm score, and visual analog scale score were determined. Computed tomography scans of all patients were obtained 2 years after surgery to evaluate the diameter of the femoral tunnel and thereby assess the amount of tunnel widening. Magnetic resonance imaging evaluation was performed 2 years postoperatively to evaluate the status of the graft in the femoral tunnel. In addition, 5 patients underwent biopsy of the tendon-bone interface at 24 months postoperatively with histologic assessment and transmission electron microscopy.

## **Results**

A total of 107 patients completed the follow-up. There were no significant differences between the 2 groups in terms of International Knee Documentation Committee score ( $P = .07$ ), Lysholm score ( $P = .10$ ), and visual analog scale score ( $P = .57$ ) at 24 months' follow-up. The femoral tunnel diameter and the tunnel widening percentage in the study group were significantly smaller than those in the control group ( $P < .001$ ). The signal-noise quotient value of the graft in the femoral tunnel was  $10.4 \pm 7.0$  in the study group, which was significantly lower than that in the control group ( $19.5 \pm 9.2$ ,  $P < .001$ ). Histologic studies of the tendon-bone interface showed that there were more bone formations containing chondroid cells with aligned connective tissue in the study group compared with the control group; in addition, the diameter of the collagen fibrils in the study group was considerably thicker than that in the control group ( $P < .05$ ).

## **Conclusions**

The use of cartilage fragments was effective in preventing femoral tunnel widening and seemed to promote the tendon-bone integration process after ACLR.

## **Level of Evidence**

Level II, prospective randomized controlled study

[BACK](#)

## **Increased Accuracy of Varus Stress Radiographs Versus Magnetic Resonance Imaging in Diagnosing Fibular Collateral Ligament Grade III Tears**

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### **Purpose**

To evaluate the diagnostic accuracy of magnetic resonance imaging and varus stress radiographs for fibular collateral ligament (FCL) tears, and compare these modalities to intraoperative findings.

### **Methods**

All patients who underwent an isolated FCL or combined anterior cruciate ligament (ACL)/FCL reconstruction by a single surgeon between 2010 and 2017 with preoperative varus stress radiographs and magnetic resonance imaging (MRI) were included in this study. A control group was composed of patients with an MRI and intact ACL and FCL. Sensitivity and specificity of diagnosing FCL injuries on MRI were determined based on review by a fellowship-trained musculoskeletal radiologist, blinded to the pathology associated with each patient (FCL injury vs control), and compared with the gold standard of examination under anesthesia, followed by surgical confirmation of an FCL tear at the time of FCL reconstruction. The sensitivity of diagnosing an FCL injury based on varus stress radiographs was also determined. Furthermore, the ability of both imaging modalities to identify an FCL injury was stratified based on acute versus chronic etiology.

### **Results**

A total of 232 patients were included: 98 patients in the FCL tear group (mean age:  $33.6 \pm 12.2$  years) and 134 patients in the control group (mean age:  $44.0 \pm 17.2$  years). Varus stress radiographs were determined to be more sensitive in diagnosing FCL injuries compared with MRI, with an overall sensitivity of 70% compared with 66%, respectively. Based on MRI, overall specificity was 68%. Based on chronicity of the injuries, MRI was more accurate for detecting acute FCL injuries than chronic injuries ( $P = .002$ ), and varus stress radiographs were more accurate for detecting chronic FCL injuries than acute injuries ( $P = .041$ ).

### **Conclusions**

The results support the use of both varus stress radiographs and MRI in diagnosing FCL injuries, because MRI is more sensitive in diagnosing an acute FCL tear, and varus stress radiographs are more sensitive in diagnosing a chronic FCL tear. Both imaging modalities are recommended to diagnose both acute and chronic FCL injuries.

### **Level of Evidence**

Level II, case-control study.

[BACK](#)

**Low-impact sports activities are feasible after meniscus transplantation: a systematic review**

Sue D. Barber-Westin, Frank R. Noyes

KSSTA, July 2018, Volume 26, Issue 7, pp 1950–1958

<https://doi.org/10.1007/s00167-017-4658-8>

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**Purpose**

To determine sports activities achieved after meniscus transplantation and if associations exist between sports activity levels and transplant failure or progression of tibiofemoral osteoarthritis (OA).

**Methods**

A systematic search was performed using PubMed and Cochrane online databases. Inclusionary criteria were English language, clinical trials published from 1996 through May 2017, minimum 2 years of follow-up, and sports activity data reported.

**Results**

Twenty-eight studies were included in which 1521 menisci were implanted into 1497 patients. The mean age was  $34.3 \pm 6.7$  years, and the mean follow-up was  $5.0 \pm 3.7$  years. Details on sports activities were provided in 7 studies (285 patients) that reported 70–92% of patients returned to a wide variety of sports activities. Mean Tegner activity scores were reported in 24 investigations. The mean score was <5 in 58% of these studies, indicating many patients were participating in light recreational activities. There was no association between mean Tegner scores and transplant failure rates. A moderate correlation was found between failure rates and mean follow-up time ( $R = 0.63$ ). The effect of sports activity levels on progression of tibiofemoral OA could not be determined because of limited data. Only two studies determined whether symptoms occurred during sports activities; these reported 1/38 (3%) and 5/69 (7%) patients had knee-related problems.

**Conclusions**

It appeared that the majority of individuals returned to low-impact athletic activities after meniscus transplantation. The short-term follow-up did not allow for an analysis on the effect of return to high-impact activities on transplant failure rates or progression of OA.

**Level of evidence**

IV.

## **Young athletes return too early to knee-strenuous sport, without acceptable knee function after anterior cruciate ligament reconstruction**

Susanne Beischer, Eric Hamrin Senorski, Christoffer Thomeé, Kristian Samuelsson, Roland Thomeé

KSSTA, July 2018, Volume 26, Issue 7, pp 1966–1974

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### **Purpose**

The purpose of this study was to evaluate the return to knee-strenuous sport rate, muscle function and subjective knee function among adolescent patients (15–20 years of age) and adult patients (21–30 years of age) 8 and 12 months, respectively, after anterior cruciate ligament (ACL) reconstruction. It was hypothesised that no differences in outcome would be found between age groups at 8 or 12 months after ACL reconstruction.

### **Methods**

Cross-sectional data from five tests of muscle function, from the Knee injury and Osteoarthritis Outcome Score (KOOS) and the Tegner Activity Scale (Tegner), performed at 8 and 12 months after a primary ACL reconstruction, were extracted from a rehabilitation outcome register. A total of 270 (51% women) athletes, aged 15–30 years, who were all involved in knee-strenuous sport prior the injury, were included at 8 months after ACL reconstruction. At 12 months 203 (51% women) were included. The return to knee-strenuous-sport rates and the rate of achieving a limb symmetry index of  $\geq 90\%$  in all five tests of muscle function, defined as recovery of muscle function, and subjective knee function scores, as measured with the KOOS, were compared between age groups.

### **Results**

The adolescent patients had a higher (50%) return to knee-strenuous sport rate compared with the adult patients (38%) 8 months after ACL reconstruction ( $p = 0.04$ ). At the 12-month follow-up, no difference was found between the age groups; 74 and 63%, respectively. At the 8-month follow-up, 29% of the patients, in both age groups, who had returned to sport had recovered their muscle function in all five tests of muscle function. At the 12-month follow-up, the corresponding results were 20% for the adolescents and 28% for the adult patients. No difference in mean KOOS scores was found between the age groups at 8 or at 12 months after ACL reconstruction.

### **Conclusion**

The majority of young athletes make an early return to knee-strenuous sport after a primary ACL reconstruction, without recovering their muscle function. To set realistic expectations, clinicians are recommended to ensure that young athletes receive information about not to return before muscle function is recovered and that this may take longer time than 12 months.

### **Level of evidence**

II.

[BACK](#)

## **Searching for consensus in the approach to patients with chronic lateral ankle instability: ask the expert**

The ESSKA-AFAS Ankle Instability Group, Jorge Acevedo, Jorge Batista, Thomas Bauer, James Calder, Dominic Carreira, Woojin Choi, Nuno Corte-real, Mark Glazebrook, Ali Ghorbani, Eric Giza, Stéphane Guillo, Kenneth Hunt, Jon Karlsson, S. W. Kong, Jin Woo Lee, Frederick Michels, Andy Molloy, Peter Mangone, Kentaro Matsui, Caio Nery, Saturo Ozek, iChris Pearce, Hélder Pereira, Anthony Perera, Bas Pijnenburg, Fernando Raduan, James Stone, Masato Takao, Yves Tourné, Jordi Vega

KSSTA, July 2018, Volume 26, Issue 7, pp 2095–2102

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### **Purpose**

The purpose of this study is to propose recommendations for the treatment of patients with chronic lateral ankle instability (CAI) based on expert opinions.

### **Methods**

A questionnaire was sent to 32 orthopaedic surgeons with clinical and scientific experience in the treatment of CAI. The questions were related to preoperative imaging, indications and timing of surgery, technical choices, and the influence of patient-related aspects.

### **Results**

Thirty of the 32 invited surgeons (94%) responded. Consensus was found on several aspects of treatment. Preoperative MRI was routinely recommended. Surgery was considered in patients with functional ankle instability after 3–6 months of non-surgical treatment. Ligament repair is still the treatment of choice in patients with mechanical instability; however, in patients with generalized laxity or poor ligament quality, lateral ligament reconstruction (with grafting) of both the ATFL and CFL should be considered.

### **Conclusions**

Most surgeons request an MRI during the preoperative planning. There is a trend towards earlier surgical treatment (after failure of non-surgical treatment) in patients with mechanical ligament laxity (compared with functional instability) and in high-level athletes. This study proposes an assessment and a treatment algorithm that may be used as a recommendation in the treatment of patients with CAI.

### **Level of evidence**

V.

[BACK](#)

## **Optimal suture anchor direction in arthroscopic lateral ankle ligament repair**

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KSSTA, July 2018, Volume 26, Issue 7, pp 2110–2115

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### **Purpose**

In this study, the distance between the insertion point of the suture anchors and posterior surface of the fibula during arthroscopic lateral ankle ligament repair was investigated on computed tomography (CT) images. The hypothesis of this study was that there is an optimal insertional direction of the suture anchor to avoid anchor-related complications.

### **Methods**

One hundred eleven ankles of 98 patients who had undergone three-dimensional CT scans for foot or ankle disorders without deformity of the fibula were assessed (59 males, 52 females; median age 25.5 years; age range 12–78 years). The shortest distance from the insertion point of the suture anchor to the deepest point of the fossa/top of the convex aspect of the fibula was measured on the axial plane, tilting from the longitudinal axis of the fibula at 90°, 75°, 60°, and 45°. The distance from the insertion point of the suture anchor to the posterior surface of the fibula was also measured in a direction parallel to the sagittal plane of the lateral surface of the talus on the axial plane, tilting from the longitudinal axis of the fibula at 90°, 75°, 60°, and 45°.

### **Results**

The posterior fossa was observed in all cases on the 90° and 75° images. The distance from the insertion point to the posterior surface of the fibula in the parallel direction was  $15.0 \pm 3.4$  mm at 90°,  $17.5 \pm 3.2$  mm at 75°,  $21.7 \pm 3.3$  mm at 60°, and  $25.7 \pm 3.6$  mm at 45°. The posterior points in the parallel direction were located on the posterior fossa in 36.0% of cases at 90°, in 12.6% at 75°, and in 0.0% at 60° and 45°.

### **Conclusions**

The suture anchor should be directed from anterior to posterior at an angle of <45° to the longitudinal axis of the fibula, parallel to the lateral surface of the talus, to avoid passing through the fibula.

### **Level of evidence**

Cohort study, Level III.

[BACK](#)

## **Treatment of talus osteochondral defects in chronic lateral unstable ankles: small-sized lateral chondral lesions had good clinical outcomes**

Hong Li, Yinghui Hua, Hongyun Li, Shengkun Li, Kui Ma, Shiyi Chen

KSSTA, July 2018, Volume 26, Issue 7, pp 2116–2122

<https://doi.org/10.1007/s00167-017-4591-x>

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### **Purpose**

To assess and compare the clinical and MRI outcomes of patients with talus osteochondral defect (OCD) and patients without OCD in a cohort with chronic lateral ankle instability.

### **Methods**

All patients who underwent open or arthroscopic anterior talofibular ligament repair of the lateral ligament complex by a single surgeon were included in this study. Ankle arthroscopic surgery was initially performed to manage any intra-articular OCD, including debridement and microfracture. Functional scores (AOFAS, Karlsson score) and Tegner activity level scores were determined. An MRI scan was performed at follow-up to assess talus OCD after treatment. Spearman's correlation coefficients were calculated between functional scores and various factors.

### **Results**

A total of 104 patients with chronic ankle instability were included in this study. Among them, 33 patients had cartilage injury on the talus (OCD group), and the other 71 patients had no cartilage injury (control group). After surgery, there was a significant increase in the AOFAS scores ( $p < 0.001$ ), the Karlsson scores ( $p < 0.001$ ), and the Tegner activity scores ( $p < 0.001$ ) in both the OCD group and the control group. However, there was no significant difference in the AOFAS scores ( $90.7 \pm 6.6$  vs.  $92.5 \pm 8.5$ ; n.s.), the Karlsson scores ( $89.7 \pm 9.3$  vs.  $91.2 \pm 9.1$ ; n.s.), or the Tegner activity scores (5 vs. 6; n.s.) between the OCD group and the control group postoperatively. In the OCD group, there was a significant negative association between the functional scores (AOFAS, Karlsson score, or Tegner score) and the number of intra-articular lesions. For the lateral OCD, the mean lesion area significantly decreased from  $49.0 \pm 10.7$  mm<sup>2</sup> preoperatively to  $18.3 \pm 13.1$  mm<sup>2</sup> at the final follow-up ( $p < 0.001$ ).

### **Conclusion**

No significant difference in functional outcomes was found between the OCD group and the control group postoperatively. Arthroscopic microfracture is a good option for the long-term treatment of lateral talus OCD.

### **Level of evidence**

III.

[BACK](#)

## **Talus bipartitus: a systematic review and report of two cases with arthroscopic treatment**

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### **Purpose**

The aim of this study was to provide a literature review on talus bipartitus and to introduce an arthroscopic treatment option.

### **Methods**

A systematic review of published case reports and small case series was performed. Medline, Embase, CINAHL, Google Scholar and Web of Science databases were searched for relevant publications. In addition, three cases of talus bipartitus treated in our institute were discussed.

### **Results**

Eleven articles were identified, reporting on 23 patients, of whom one patient had a bilateral talus bipartitus. Fourteen were males (61%). The median age at presentation was 15.5 years (IQR 14–24.3). In 21 of the symptomatic cases (96%), the patient experienced ankle pain, and 13 had a restricted range of motion (54%). In our institution, two patients were treated arthroscopically and had excellent short- and long-term outcomes.

### **Conclusion**

Talus bipartitus is a rare anatomical anomaly. Symptoms are characterized by pain and restricted subtalar motion in young patients. Surgical treatment is focused on either fixation or excision of the bony fragment. Our two cases have demonstrated that an arthroscopic approach can be a safe and effective treatment option in patients with a symptomatic talus bipartitus.

### **Level of evidence**

IV.

[BACK](#)

## **No superior treatment for primary osteochondral defects of the talus**

Jari Dahmen, Kaj T. A. Lambers, Mikel L. Reilingh, Christiaan J. A. van Bergen, Sjoerd. A. S. Stufkens, Gino M. M. J. Kerkhoffs

KSSTA, July 2018, Volume 26, Issue 7, pp 2142–2157

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### **Purpose**

The purpose of this systematic literature review is to detect the most effective treatment option for primary talar osteochondral defects in adults.

### **Methods**

A literature search was performed to identify studies published from January 1996 to February 2017 using PubMed (MEDLINE), EMBASE, CDSR, DARE, and CENTRAL. Two authors separately and independently screened the search results and conducted the quality assessment using the Newcastle–Ottawa Scale. Subsequently, success rates per separate study were calculated. Studies methodologically eligible for a simplified pooling method were combined.

### **Results**

Fifty-two studies with 1236 primary talar osteochondral defects were included of which forty-one studies were retrospective and eleven prospective. Two randomised controlled trials (RCTs) were identified. Heterogeneity concerning methodological nature was observed, and there was variety in reported success rates. A simplified pooling method performed for eleven retrospective case series including 317 ankles in the bone marrow stimulation group yielded a success rate of 82% [CI 78–86%]. For seven retrospective case series investigating an osteochondral autograft transfer system or an osteoperiosteal cylinder graft insertion with in total 78 included ankles the pooled success rate was calculated to be 77% [CI 66–85%].

### **Conclusions**

For primary talar osteochondral defects, none of the treatment options showed any superiority over others.

### **Level of evidence**

IV.

[BACK](#)

## No superior surgical treatment for secondary osteochondral defects of the talus

Kaj T. A. Lambers, Jari Dahmen, Mikel L. Reilingh, Christiaan J. A. van Bergen, Sjoerd A. S. Stufkens, Gino M. M. J. Kerkhoffs

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### Purpose

The purpose of this systematic review was to identify the most effective surgical treatment for talar osteochondral defects after failed primary surgery.

### Methods

A literature search was conducted to find studies published from January 1996 till July 2016 using PubMed (MEDLINE), EMBASE, CDSR, DARE and CENTRAL. Two authors screened the search results separately and conducted quality assessment independently using the Newcastle–Ottawa scale. Weighted success rates were calculated. Studies eligible for pooling were combined.

### Results

Twenty-one studies with a total of 299 patients with 301 talar OCDs that failed primary surgery were investigated. Eight studies were retrospective case series, twelve were prospective case series and there was one randomized controlled trial. Calculated success percentages varied widely and ranged from 17 to 100%. Because of the low level of evidence and the scarce number of patients, no methodologically proper meta-analysis could be performed. A simplified pooling method resulted in a calculated mean success rate of 90% [CI 82–95%] for the osteochondral autograft transfer procedure, 65% [CI 46–81%] for mosaicplasty and 55% [CI 40–70%] for the osteochondral allograft transfer procedure. There was no significant difference between classic autologous chondrocyte implantation (success rate of 59% [CI 39–77%]) and matrix-associated chondrocyte implantation (success rate of 73% [CI 56–85%]).

### Conclusions

Multiple surgical treatments are used for talar OCDs after primary surgical failure. More invasive methods are administered in comparison with primary treatment. No methodologically proper meta-analysis could be performed because of the low level of evidence and the limited number of patients. It is therefore inappropriate to draw firm conclusions from the collected results. Besides an expected difference in outcome between the autograft transfer procedure and the more extensive procedures of mosaicplasty and the use of an allograft, neither a clear nor a significant difference between treatment options could be demonstrated. The need for sufficiently powered prospective investigations in a randomized comparative clinical setting remains high. This present systematic review can be used in order to inform patients about expected outcome of the different treatment methods used after failed primary surgery.

### Level of evidence

IV.

[BACK](#)

**The subchondral bone healing after fixation of an osteochondral talar defect is superior in comparison with microfracture**

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**Purpose**

Arthroscopic bone marrow stimulation (BMS) has been considered the primary surgical treatment for osteochondral defects (OCDs) of the talus. However, fixation has been considered as a good alternative. Recently, a new arthroscopic fixation technique was described: the lift, drill, fill and fix procedure (LDFF). The purpose of this study was to evaluate the clinical and radiological results between arthroscopic LDFF and arthroscopic BMS in primary fixable talar OCDs at 1-year follow-up.

**Methods**

In a prospective comparative study, 14 patients were treated with arthroscopic BMS and 14 patients with arthroscopic LDFF. Pre- and postoperative clinical assessment included the American Orthopaedic Foot and Ankle Society (AOFAS) score and the numeric rating scales (NRSs) of pain at rest and running. Additionally, the level of the subchondral plate (flush or depressed) was analysed on the 1 year postoperative computed tomography scans.

**Results**

No significant differences in the AOFAS and NRS pain at rest and running were found between both groups at 1-year follow-up. After LDFF the level of the subchondral bone plate was flush in 10 patients and after BMS in three patients ( $p = 0.02$ ).

**Conclusion**

No clinical differences were found between arthroscopic LDFF and arthroscopic BMS in the treatment of talar OCDs at 1-year follow-up. However, the subchondral bone plate restores significantly superior after arthroscopic LDFF compared to arthroscopic BMS. It may therefore give less progression of ankle osteoarthritis in the future with a thus potential better long-term outcome.

**Level of evidence**

III.

[BACK](#)

**Anatomic stabilization techniques provide superior results in terms of functional outcome in patients suffering from chronic ankle instability compared to non-anatomic techniques**

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**Purpose**

To determine the best surgical treatment for chronic ankle instability (CAI) a systematic review was performed to compare the functional outcomes between various surgical stabilization methods.

**Methods**

A systematic search was performed from 1950 up to April 2016 using PubMed, EMBASE, Medline and the Cochrane Library. Inclusion criteria were a minimum age of 18 years, persistent lateral ankle instability, treatment by some form of surgical stabilization, described functional outcome measures. Exclusion criteria were case reports, (systematic) reviews, articles not published in English, description of only acute instability or only conservative treatment, medial ankle instability and concomitant injuries, deformities or previous surgical treatment for ankle instability. After inclusion, studies were critically appraised using the Modified Coleman Methodology Score.

**Results**

The search resulted in a total of 19 articles, including 882 patients, which were included in this review. The Modified Coleman Methodology Score ranged from 30 to 73 points on a scale from 0 to 90 points. The AOFAS and Karlsson Score were the most commonly used patient-reported outcome measures to assess functional outcome after surgery. Anatomic repair showed the highest post-operative scores [AOFAS 93.8 (SD ± 2.7; n = 119); Karlsson 95.1 (SD ± 3.6, n = 121)], compared to anatomic reconstruction [AOFAS 90.2 (SD ± 10.9, n = 128); Karlsson 90.1 (SD ± 7.8, n = 35)] and tenodesis [AOFAS 86.5 (SD ± 12.0, n = 10); Karlsson 85.3 (SD ± 2.5, n = 39)]. Anatomic reconstruction showed the highest score increase after surgery (AOFAS 37.0 (SD ± 6.8, n = 128); Karlsson 51.6 (SD ± 5.5, n = 35) compared to anatomic repair [AOFAS 31.8 (SD ± 5.3, n = 119); Karlsson 40.9 (SD ± 2.9, n = 121)] and tenodesis [AOFAS 19.5 (SD ± 13.7, n = 10); Karlsson 29.4 (SD ± 6.3, n = 39)] (p < 0.005).

**Conclusion**

Anatomic reconstruction and anatomic repair provide better functional outcome after surgical treatment of patients with CAI compared to tenodesis reconstruction. These results further discourage the use of tenodesis reconstruction and other non-anatomic surgical techniques. Future studies may be required to indicate potential value of tenodesis reconstruction when used as a salvage procedure. Not optimal, but the latter still provides an increase in functional outcome post-operatively. Anatomic reconstruction seems to give the best results, but may be more invasive than anatomic repair. This has to be kept in mind when choosing between reconstruction and repair in the treatment of CAI.

**Level of evidence**

IV.

[BACK](#)

**Minimum Five-Year Outcomes of Hip Arthroscopy for the Treatment of Femoroacetabular Impingement and Labral Tears in Patients with Obesity: A Match-Controlled Study**

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[https://journals.lww.com/jbjssjournal/Abstract/2018/06060/Minimum\\_Five\\_Year\\_Outcomes\\_of\\_Hip\\_Arthroscopy\\_for.9.aspx](https://journals.lww.com/jbjssjournal/Abstract/2018/06060/Minimum_Five_Year_Outcomes_of_Hip_Arthroscopy_for.9.aspx)

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**Background:** Obesity is a negative prognostic factor for various surgical procedures. The purpose of this study was to compare patients with obesity who underwent hip arthroscopy for femoroacetabular impingement and labral tears with a match-controlled group of normal-weight patients.

**Methods:** Data were prospectively collected and retrospectively reviewed for patients who underwent arthroscopy between February 2008 and December 2011. Inclusion criteria were treatment for femoroacetabular impingement and labral tears and completed preoperative patient-reported outcomes and visual analog scale (VAS) for pain. Exclusion criteria were previous ipsilateral hip conditions or preoperative Tönnis grade of  $\geq 2$ . Patients with obesity (body mass index [BMI] of  $\geq 30 \text{ kg/m}^2$ ) were matched and were compared with normal-weight patients (BMI of 18.5 to  $24.99 \text{ kg/m}^2$ ) using a 1:1 ratio by age at the time of the surgical procedure within 5 years, sex, acetabular Outerbridge grade (0 or 1 compared with 2, 3, or 4), and capsular treatment.

**Results:** Of the 96 obesity cases with follow-up, 74 were pair-matched to control cases. The mean BMI was  $34.3 \text{ kg/m}^2$  for the obesity group and  $22.7 \text{ kg/m}^2$  for the control group ( $p < 0.0001$ ). The mean follow-up time was 71.6 months for the obesity group and 71.3 months for the control group ( $p = 0.41$ ). All mean preoperative patient-reported outcomes and VAS scores for patients without conversion to total hip arthroplasty were significantly worse in the obesity group: modified Harris hip score ( $p = 0.0001$ ), Non-Arthritic Hip Score ( $p = 0.0001$ ), Hip Outcome Score Sports-Specific Scale (HOS-SSS) ( $p = 0.015$ ), and VAS ( $p = 0.01$ ). No significant differences were observed with regard to demographic characteristics, intraoperative findings, procedures, follow-up scores, magnitudes of improvement, or secondary arthroscopy rates ( $p > 0.05$ ). Both groups demonstrated significant improvements in mean outcome scores at  $\geq 5$  years ( $p < 0.0001$ ). In both groups, no significant differences were detected in mean outcome scores between 2 years and  $\geq 5$  years ( $p > 0.05$ ). The conversion rate to total hip arthroplasty was 29.7% for the obesity group and 14.9% for the control group (relative risk, 2.0 [95% confidence interval, 1.1 to 3.8];  $p = 0.04$ ).

**Conclusions:** Hip arthroscopy for the treatment of femoroacetabular impingement and labral tears in patients with obesity yielded significant improvements at  $\geq 5$  years; these results were similar to a matched group of normal-weight patients. However, patients with obesity demonstrated a twofold increased risk of conversion to total hip arthroplasty.

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

The Bone and Joint Journal, volume 100, issue 7

**Does acetabular coverage influence the clinical outcome of arthroscopically treated cam-type femoroacetabular impingement (FAI)?**

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**Aims**

What represents clinically significant acetabular undercoverage in patients with symptomatic cam-type femoroacetabular impingement (FAI) remains controversial. The aim of this study was to examine the influence of the degree of acetabular coverage on the functional outcome of patients treated arthroscopically for cam-type FAI.

**Patients and Methods**

Between October 2005 and June 2016, 88 patients (97 hips) underwent arthroscopic cam resection and concomitant labral debridement and/or refixation. There were 57 male and 31 female patients with a mean age of 31.0 years (17.0 to 48.5) and a mean body mass index (BMI) of 25.4 kg/m<sup>2</sup> (18.9 to 34.9). We used the Hip2Norm, an object-oriented-platform program, to perform 3D analysis of hip joint morphology using 2D anteroposterior pelvic radiographs. The lateral centre-edge angle, anterior coverage, posterior coverage, total femoral coverage, and alpha angle were measured for each hip. The presence or absence of crossover sign, posterior wall sign, and the value of acetabular retroversion index were identified automatically by Hip2Norm. Patient-reported outcome scores were collected preoperatively and at final follow-up with the Hip Disability and Osteoarthritis Outcome Score (HOOS).

**Results**

At a mean follow-up of 2.7 years (1 to 8, sd 1.6), all functional outcome scores significantly improved overall. Radiographically, only preoperative anterior coverage had a negative correlation with the improvement of the HOOS symptom subscale ( $r = -0.28$ ,  $p = 0.005$ ). No significant difference in relative change in HOOS subscale scores was found according to the presence or absence of radiographic signs of retroversion.

**Discussion**

Our study demonstrated the anterior coverage as an important modifier influencing the functional outcome of arthroscopically treated cam-type FAI.

[BACK](#)