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Upper extremity

Arthroscopy

Volume 33, Issue 6, p1099-1270

Subpectoral Biceps Tenodesis for Tenosynovitis of the Long Head of the Biceps in Active Patients Younger Than 45 Years Old

Dimitri S. Tahal, M.Sc., J. Christoph Katthagen, M.D., Alexander R. Vap, M.D., Marilee P. Horan, M.P.H., Peter J. Millett, M.D., M.Sc.

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Purpose

The objective of this study was to assess the outcomes after subpectoral biceps tenodesis (BT) for long head of the biceps (LHB) tenosynovitis in active patients <45 years old.

Methods

This was an Institutional Review Board–approved, retrospective outcomes study with prospectively collected data. Patients treated with subpectoral BT were included if they met the following criteria: age <45 years, anterior shoulder pain with arthroscopically confirmed LHB tenosynovitis, no concomitant procedures other than debridement and decompression procedures, and minimum 2 years out from surgery. Patients were excluded from analysis if they refused participation. The American Shoulder and Elbow Surgeons (ASES), Short Form-12, Quick Disabilities of the Arm, Shoulder and Hand, Single Assessment Numeric Evaluation, and pain scores as well as sports participation preoperatively and at a minimum of 2 years postoperatively were obtained. Pre- and postoperative scores were compared using paired samples *t*-test and Wilcoxon signed-rank test.

Results

Thirty patients met the inclusion criteria. Two of these patients refused to participate in follow-up and were excluded from analysis. Of the remaining 28 patients (17 male, 11 female; 37.0 ± 8.0 years), minimum 2-year outcomes were available for 24 (13 males, 11 females; 37.7 ± 8.2 years; 85.7%). Mean follow-up was 3.1 years (range, 2.0 to 7.3 years). There were significant improvements in all outcome measures including ASES score ($P < .001$), with a postoperative mean of 95.8 ± 7.8 , visual analog scale “pain today” ($P < .001$), and pain affecting activities of daily living ($P < .001$). Seventeen of 20 (85%) patients who answered the question about postoperative sport participation were able to return to sport. Mean patient satisfaction was 9.2/10 (standard deviation, +1.7). There were no postoperative complications such as Popeye deformity or cramping. There were no clinical failures.

Conclusions

Subpectoral BT is an excellent treatment option for active patients <45 years old with LHB tenosynovitis and chronic anterior shoulder pain, resulting in decreased pain, improved function, high satisfaction, and improved quality of life.

Level of Evidence

Level IV, therapeutic case series.

[BACK](#)

Quantitative and Computed Tomography Anatomic Analysis of Glenoid Fixation for Superior Capsule Reconstruction: A Cadaveric Study

Jason M. Schon, B.S., J. Christoph Katthagen, M.D., Cameron N. Dupre, B.S., Justin J. Mitchell, M.D., Travis Lee Turnbull, Ph.D., Christopher R. Adams, M.D., Patrick J. Denard, M.D., Peter J. Millett, M.D., M.Sc

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Purpose

To investigate glenoid fixation for superior capsule reconstruction (SCR) and evaluate anchor positions, intraosseous trajectories, and proximity to the suprascapular nerve (SSN) and glenoid fossa. The secondary purpose was to provide technical pearls and pitfalls for anchor insertion on the superior glenoid during SCR.

Methods

Three beath pins were arthroscopically inserted into 12 (n = 12) nonpaired human cadaveric shoulders through Neviasser, anterior, and posterior portals to simulate anchor placement on the superior glenoid during SCR. Computed tomography scans were performed to evaluate anchor positioning and insertion trajectories. Specimens were then dissected to delineate the anatomic relations of the beath pins to the SSN and glenoid fossa.

Results

The superior glenoid anchor position was a mean 15.0 ± 4.0 mm to the SSN and 6.5 ± 1.7 mm to the glenoid fossa. The posterior glenoid anchor position was a mean 11.8 ± 2.1 mm to the SSN and 2.9 ± 2.9 mm to the glenoid fossa. On average, the superior pin was placed at $12:30 \pm 0:30$ (left-sided glenoid clock face) and inserted at $19^\circ \pm 9^\circ$ with respect to the sagittal plane of the glenoid, the anterior pin was placed at $11:00 \pm 0:30$ and inserted $40^\circ \pm 17^\circ$ off the glenoid, and the posterior pin was placed at $3:00 \pm 1:00$ and inserted at $52^\circ \pm 12^\circ$ off the glenoid.

Conclusions

The results of the present cadaveric study showed that glenoid fixation was safe with respect to the SSN and delineated technical guidelines and trajectories for inserting 3 anchors into the glenoid.

Clinical Relevance

This study shows that 3 anchors can be inserted into the glenoid without a risk of SSN damage and delineates technical guidelines for anchor insertion.

The Effect of Early Range of Motion on Quality of Life, Clinical Outcome, and Repair Integrity After Arthroscopic Rotator Cuff Repair

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Purpose

To compare the effect of early versus delayed motion protocols on quality of life, clinical outcomes, and repair integrity in patients who have undergone arthroscopic single-tendon rotator cuff repair.

Methods

This was a prospective, randomized, investigator-blinded clinical trial. Seventy-three patients from a single surgeon's practice who underwent arthroscopic repair of a single-tendon rotator cuff tear were randomized to either an early motion protocol (starting 2 to 3 days after surgery) or a delayed motion protocol (starting 28 days after surgery). The primary outcome measure was the Western Ontario Rotator Cuff index (WORC). Secondary outcome measures included clinical outcome scores, integrity of the repair on 6-month magnetic resonance imaging scans, pain scores, physical examination data, and ultrasonography. Study participants were followed up at 3, 6, and 12 weeks; 6 months; and 1 year postoperatively.

Results

There was no statistically significant difference in WORC scores at 6 months (529 ± 472 in delayed group vs 325 ± 400 in early group, $P = .08$). Mixed-effects analysis indicated the early group maintained lower WORC scores throughout the postoperative period (estimated difference of 191, $P = .04$). The proportions of patients with tears on the 6-month postoperative magnetic resonance imaging scan were comparable (31% in delayed group vs 34% in early group, $P = .78$).

Conclusions

There was no difference between the delayed and early motion groups in WORC scores at 6 months after surgery. Early motion was associated with lower WORC scores throughout the postoperative period; however, both groups had a similar trajectory of improvement, suggesting both protocols have the same effect on patient-reported improvement. Although failure rates were similar between the groups, the sample size was not sufficient to support a statement regarding the relation between tear morphology and the rehabilitation protocol.

Level of Evidence

Level II, lesser-quality randomized controlled trial.

Influence of Preoperative Musculotendinous Junction Position on Rotator Cuff Healing After Double-Row Repair

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Purpose

The primary purpose of this study was to determine the effect of the preoperative position of the musculotendinous junction (MTJ) on rotator cuff healing after double-row arthroscopic rotator cuff repair. A secondary purpose was to evaluate how tendon length and MTJ position change when the rotator cuff heals.

Methods

Preoperative and postoperative magnetic resonance imaging (MRI) scans of 42 patients undergoing arthroscopic double-row rotator cuff repair were reviewed. Patients undergoing repairs with other constructs or receiving augmented repairs (platelet-rich fibrin matrix) who had postoperative MRI scans were excluded. Preoperative MRI scans were evaluated for anteroposterior tear size, tendon retraction, tendon length, muscle quality, and MTJ position with respect to the glenoid in the coronal plane. The position of the MTJ was referenced off the glenoid face as either lateral or medial. Postoperative MRI scans were evaluated for healing, tendon length, and MTJ position.

Results

Of 42 tears, 36 (86%) healed, with 27 of 31 small to medium tears (87%) and 9 of 11 large to massive tears (82%) healing. Healing occurred in 94% of tears that had a preoperative MTJ lateral to the face of the glenoid but only 56% of tears that had a preoperative MTJ medial to the glenoid face ($P = .0135$). The measured tendon length increased an average of 14.4 mm in patients whose tears healed compared with shortening by 6.4 mm in patients with tears that did not heal ($P < .001$). The MTJ lateralized an average of 6.1 mm in patients whose tears healed compared with medializing 1.9 mm in patients whose tears did not heal ($P = .026$). The overall follow-up period of the study was from April 2005 to September 2014 (113 months).

Conclusions

The preoperative MTJ position is predictive of postoperative healing after double-row rotator cuff repair. The position of the MTJ with respect to the glenoid face is a reliable, identifiable marker on MRI scans that can be predictive of healing.

Level of Evidence

Level IV, retrospective review of case series; therapeutic study.

The Influence of Trocar Fenestration and Volume on Connective Tissue Progenitor Cells (Stem Cells) in Arthroscopic Bone Marrow Aspiration From the Proximal Humerus

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Purpose

To evaluate the number of connective tissue progenitor cells (CTPs) and nucleated cells obtained during bone marrow aspiration (BMA) from the proximal humerus using either a fenestrated or a nonfenestrated trocar and determine differences in varying amounts of aspiration volume. The first hypothesis was that the number of CTPs extracted with the fenestrated trocar would be greater due to its potential to extract more cells through its fenestrations. The second hypothesis was that using consecutive aspirations with either trocar would provide a consistent number of CTPs and nucleated cells throughout the aspiration with no significant decrease of cells at the end.

Methods

Patients were eligible for inclusion if they underwent primary or revision arthroscopic rotator cuff surgery, were between 18 and 75 years of age, and signed the informed consent. Between January 2011 and September 2013, 24 patients underwent BMA from the proximal humerus during arthroscopic surgery. They were grouped according to which of 3 different trocars were used for aspiration: (1) nonfenestrated, (2) fenestrated trocar A, and (3) fenestrated trocar H. Four consecutive 12 mL double syringes were used for each aspiration: 1 (0-12 mL), 2 (12-24 mL), 3 (24-36 mL), and 4 (36-48 mL). One milliliter was removed from each syringe (nonconcentrated BMA). The remainder of the BMA was then spun using a centrifuge. BMA and concentrated BMA were brought to the laboratory, counted for nucleated cells (million cells/mL BMA) and cultured for 7 days to obtain colony-forming units (CTPs/million cells).

Results

No significant differences were observed in tubes 1 to 4 in the number of nucleated cells in the nonconcentrated and concentrated BMA using the nonfenestrated trocar compared with the fenestrated trocars A and H (all $P > .05$), except for concentrated BMA tube 3 ($P = .014$) and tube 4 ($P = .003$). Nonconcentrated and concentrated BMA from tubes 1 to 4 had a significantly higher CTP prevalence using the nonfenestrated trocar compared with the fenestrated trocars A and H (all $P < .05$). Most of the times the first tube of each aspiration showed a significantly greater amount of cells and a greater CTP prevalence compared with tubes 2, 3, and 4.

Conclusions

Aspiration from the proximal humerus with the nonfenestrated trocar during BMA was associated with higher prevalence of CTPs, suggesting that more CTPs can be obtained using a nonfenestrated trocar. Furthermore, CTPs can be obtained through all consecutive aspirations with a greater amount in the first tubes.

Level of Evidence

Level II, prospective comparative study.

Factors That Increase the Risk of Infection After Elbow Arthroscopy: Analysis of Patient Demographics, Medical Comorbidities, and Steroid Injections in 2,704 Medicare Patients

Christopher L. Camp, M.D., Jourdan M. Cancienne, M.D., Ryan M. Degen, M.D., Joshua S. Dines, M.D., David W. Altchek, M.D., Brian C. Werner, M.D.

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Purpose

To use a national database to determine (1) the incidence of joint infection after elbow arthroscopy, (2) identify independent patient-related risk factors for infection, and (3) determine the influence of concomitant intra-articular corticosteroid injection on infection risk.

Methods

The 100% Medicare Standard Analytic Files were queried to identify patients who underwent elbow arthroscopy from 2005 to 2012. Postoperative elbow infections occurring within 6 months of surgery were identified using both International Classification of Diseases, 9th Revision codes for postoperative infection and Current Procedural Terminology codes for the surgical treatment of a postoperative infection. Patients were excluded if their initial arthroscopic procedure was performed for infection. A multivariate binomial logistic regression analysis was then used to evaluate patient-related risk factors for postoperative infection.

Results

Of the 2,704 elbow arthroscopy cases identified, 42 (1.55%) developed a postoperative infection. The annual incidence of infections did not increase significantly over the course of the study ($P = .374$). A number of patient demographics and medical comorbidities significantly increased the risk of infection. The most notable factors included age ≥ 65 years (odds ratio [OR] 2.38, $P = .006$), body mass index > 40 (OR 1.97, $P = .024$), tobacco usage (OR 1.80, $P = .046$), alcohol usage (OR 4.01, $P < .001$), diabetes mellitus (OR 2.10, $P = .015$), inflammatory arthritis (OR 2.81, $P < .001$), hypercoagulable disorder (OR 2.51, $P = .015$), and intra-articular corticosteroid injection at the time of arthroscopy (OR 2.79, $P = .006$).

Conclusions

The annual number of elbow arthroscopies performed in the United States has increased steadily; however, the postoperative infection rate remained consistently low at 1.55%. There are a number of patient-specific risk factors that increase this risk with OR ranging from 1.97 to 4.01. Similarly, patients who receive an intra-articular corticosteroid injection at the time of surgery are nearly 3 times (OR 2.79) more likely to develop a postoperative infection.

Level of Evidence

Level III, case-control study.

A Systematic Review of Tennis Elbow Surgery: Open Versus Arthroscopic Versus Percutaneous Release of the Common Extensor Origin

Todd P. Pierce, M.D., Kimona Issa, M.D., Benjamin T. Gilbert, B.S., Brian Hanly, B.S., Anthony Festa, M.D., Vincent K. McInerney, M.D., Anthony J. Scillia, M.D.

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Purpose

To compare complications, function, pain, and patient satisfaction after conventional open, percutaneous, or arthroscopic release of the extensor origin for the treatment of lateral epicondylitis.

Methods

A thorough review of 4 databases—PubMed, EBSCOhost, CINAHL (Cumulative Index to Nursing and Allied Health Literature) Plus, and Scopus—was performed to identify all studies that addressed surgical management of lateral epicondylitis. We included (1) studies published between 2000 and 2015 and (2) studies with clearly defined surgical techniques. We excluded (1) non-English-language manuscripts, (2) isolated case reports, (3) studies with fewer than 10 subjects, (4) animal studies, (5) studies with additional adjunctive procedures aside from release of the extensor origin, (6) clinical or systematic review manuscripts, (7) studies with a follow-up period of 6 months or less, and (8) studies in which less than 80% of patients completed follow-up. Each study was analyzed for complication rates, functional outcomes, pain, and patient satisfaction.

Results

Thirty reports were identified that included 848 open, 578 arthroscopic, and 178 percutaneous releases. Patients within each release group had a similar age (46 years vs 46 years vs 48 years; $P = .9$ and $P = .4$, respectively), whereas there was a longer follow-up time in patients who underwent surgery by an open technique (49.4 months vs 42.6 months vs 23 months, $P < .001$). There were no differences in complication rates among these techniques (3.8% vs 2.9% vs 3.9%; $P = .5$ and $P = .9$, respectively). However, open techniques were correlated with higher surgical-site infection rates than arthroscopic techniques (0.7% vs 0%, $P = .04$). Mean Disabilities of the Arm, Shoulder and Hand scores were substantially better with both open and arthroscopic techniques than with percutaneous release (19.9 points vs 21.3 points vs 29 points, $P < .001$). In addition, there was less pain reported in the arthroscopic and percutaneous release groups as opposed to their open counterparts (1.9 points vs 1.4 points vs 1.3 points, $P < .0001$). There were no differences among the techniques in patient satisfaction rate (93.7% vs 89% vs 88%; $P = .08$ and $P = .07$, respectively).

Conclusions

Functional outcomes of open and arthroscopic releases may be superior to those of percutaneous release. In addition, patients may report less pain with arthroscopic and percutaneous techniques. Although the risk of complications is similar regardless of technique, patients may be counseled that their risk of infectious complications may be slightly higher with open releases. However, it is important to note that this statistical difference may not necessarily portend noticeable clinical differences.

Level of Evidence

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

Volume 33, Issue 7, p1271-1434

Patient Outcomes as a Function of Shoulder Surgeon Volume: A Systematic Review

Kent T. Weinheimer, M.D., Dallas M. Smuin, B.S., Aman Dhawan, M.D.

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Purpose

To examine surgical complications, length of stay, surgical time, cost, revision rates, clinical outcomes, current surgical trends, and minimum number of cases in relationship to surgeon volume for shoulder arthroplasty and rotator cuff repair.

Methods

We performed a systematic review of studies using the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. All studies that met inclusion criteria from January 1990 to January 2016 were included. Inclusion criteria included Level IV evidence or greater, contained specific surgeon volume, and were written in or translated into English. Exclusion criteria included non-English manuscripts, abstracts, and review papers. A written protocol was used to extract relevant data and evaluate study results. Data extracted included volume-specific data pertaining to length of stay, operating time, complications, and cost.

Results

A total of 10 studies were included. Seven studies evaluated arthroplasty with 88,740 shoulders, and 3 studies evaluated rotator cuff repair with 63,535 shoulders. Variation was seen in how studies defined low- versus high-volume surgeon. For arthroplasty, <5 cases per year met the criteria for a low-volume surgeon and were associated with increased length of stay, longer operating room time, increased in-hospital complications, and increased cost. Mortality was not significantly increased. In rotator cuff surgery, <12 surgeries per year met the criteria for low volume and were associated with increased length of stay, increased operating room time, and increase in reoperation rate.

Conclusions

Our systematic review demonstrates increased surgical complications, length of stay, surgical time, and surgical cost in shoulder arthroplasty and rotator cuff repair when performed by a low-volume shoulder surgeon, which is defined by those performing <5 arthroplasties and/or <12 rotator cuff repairs per year.

Level of Evidence

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

[BACK](#)

Arthroscopic Repair of Isolated Partial- and Full-Thickness Upper Third Subscapularis Tendon Tears: Minimum 2-Year Outcomes After Single-Anchor Repair and Biceps Tenodesis

J. Christoph Katthagen, M.D., Alexander R. Vap, M.D., Dimitri S. Tahal, M.Sc., Marilee P. Horan, M.P.H., Peter J. Millett, M.D., M.Sc.

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Purpose

To investigate outcomes of arthroscopic single-anchor repair and biceps tenodesis of partial- and full-thickness tears of the upper third subscapularis (SSC).

Methods

Thirty-three patients with arthroscopically confirmed isolated SSC tears, Lafosse type I (>50% of the tendon thickness involved), or type II were included. All patients underwent arthroscopic subcoracoid decompression, coracoplasty if the coracohumeral distance was narrowed, biceps tenodesis, and a single-anchor repair of the upper third SSC. No other reconstructive procedures were performed. Subjective evaluations included American Shoulder and Elbow Surgeons, Short-Form 12, Quick Disabilities of the Arm, Shoulder and Hand, Single Assessment Numeric Evaluation, and visual analog scale pain scores preoperatively and at minimum 2 years postoperatively.

Results

Thirty-one patients (n = 25 male, n = 6 female) were included in the final collective, because 2 patients refused participation. Minimum 2-year follow-up data were available for 28 of the 31 patients (90.3%). The mean age at the time of surgery was 54.8 (range, 36-71) years. The mean follow-up was 4.1 (range, 2.0-8.0) years. The results of all outcome measures improved significantly postoperatively compared with preoperative scores ($P < .05$). Patients with single-anchor repair of type II SSC tears (n = 17) had a significantly higher mean postoperative American Shoulder and Elbow Surgeons score (93.7 ± 10.8) than patients with single-anchor repair of type I SSC tears (n = 11; 86.7 ± 10.9 ; $P = .027$).

Conclusions

Arthroscopic single-anchor repair of upper third SSC tendon tears led to improved function and decreased pain with high patient satisfaction. Outcomes of full-thickness upper third SSC tears were more favorable compared with outcomes of high grade partial-thickness upper third SSC tears.

Level of Evidence

Level IV, retrospective therapeutic case series.

Arthroscopic in Situ Repair of Partial Bursal Rotator Cuff Tears Without Acromioplasty

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Purpose

To evaluate functional outcomes and complications in a consecutive group of patients with partial bursal rotator cuff tears (PBRCTs) treated with insitu repair without acromioplasty.

Methods

Seventy-four patients who had undergone an arthroscopic single row in situ repair for bursal-sided rotator cuff tears were evaluated. Clinical assessment consisted of glenohumeral range of motion measurement, the American Shoulder and Elbow Surgeons score, and the University of California at Los Angeles score. Pain was recorded using a visual analog scale. Postoperative complications were also assessed.

Results

Mean age was 55.2 years (± 6.3) with a minimum of 2-year follow-up. After arthroscopic repair, all active range of motion parameters improved significantly ($P < .0001$). The American Shoulder and Elbow Surgeons scores improved from 42.5 to 86.1; the University of California at Los Angeles scores improved from 15.8 to 31.4, and the visual analog scale scores improved from 6.6 to 0.7 ($P < .0001$). Only 3 patients developed a postoperative adhesive capsulitis that responded to physical therapy.

Conclusions

In the midterm follow-up (42 months), arthroscopic in situ repair of PBRCTs without acromioplasty is a reliable procedure that produces significant functional improvements and pain relief.

Level of Evidence

Level IV, therapeutic case series.

The Effect of Concomitant Biceps Tenodesis on Reoperation Rates After Rotator Cuff Repair: A Review of a Large Private-Payer Database From 2007 to 2014

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Purpose

To determine if reoperation rates are higher for patients who underwent isolated rotator cuff repair (RCR) than those who underwent RCR with concomitant biceps tenodesis using a large private-payer database.

Methods

A national insurance database was queried for patients who underwent arthroscopic RCR between the years 2007 and 2014 (PearlDiver, Warsaw, IN). The Current Procedural Terminology (CPT) 29,827 (arthroscopy, shoulder, surgical; with RCR) identified RCR patients who were subdivided into 3 groups—group 1: RCR without biceps tenodesis; group 2: RCR with concomitant arthroscopic biceps tenodesis (CPT 29827 and 29,828); group 3: RCR with concomitant open biceps tenodesis (CPT 29827 and 23,430). Reoperation rates (revision RCR, subsequent biceps surgeries) and complications at 30 days, 90 days, 6 months, and 1 year were analyzed. Multivariate logistic regression was used to compare reoperations and complications between groups. Rotator cuff tear size, whether the biceps was ruptured and whether a biceps tenotomy was performed, was not available.

Results

Group 1: 27,178 patients. Group 2: 4,810 patients. Group 3: 1,493 patients. More patients underwent concomitant arthroscopic than concomitant open tenodesis ($P < .001$). A total of 2,509 patients underwent a reoperation for RCR or biceps tenodesis within 1 year after RCR. When adjusted for age, sex, and comorbidities, no significant differences in reoperation rates at 30 days or 90 days among the 3 groups, but significantly more patients who had a tenodesis, required a reoperation compared with those who did not have a tenodesis at 6 months and 1 year (both $P < .001$). Urinary tract infections were more common in patients who did not have a tenodesis, whereas dislocation, nerve injury, and surgical site infection were more common in tenodesis patients.

Conclusions

Higher reoperation rates at 1 year were seen in patients who had concomitant biceps tenodesis.

Level of Evidence

Level III, case-control database review study.

Performance Assessment of Arthroscopic Rotator Cuff Repair and Labral Repair in a Dry Shoulder Simulator

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Purpose

To evaluate the use of dry models to assess performance of arthroscopic rotator cuff repair (RCR) and labral repair (LR).

Methods

Residents, fellows, and sports medicine staff performed an arthroscopic RCR and LR on a dry model. Any prior RCR and LR experience was noted. Staff surgeons assessed participants by use of task-specific checklists, the Arthroscopic Surgical Skill Evaluation Tool (ASSET), and a final overall global rating. All procedures were video recorded and were scored by a fellow blinded to the year of training of each participant.

Results

A total of 51 participants and 46 participants performed arthroscopic RCR and LR, respectively, on dry models. The internal consistency or reliability (Cronbach α) using the total ASSET score for the RCR and LR was high (>0.9). One-way analysis of variance for the total ASSET score showed a difference between participants based on year of training ($P < .001$) for both procedures. The inter-rater reliability for the ASSET score was excellent (>0.9) for both procedures. A good correlation was seen between the ASSET score and the year of training, as well as the previous number of sports rotations.

Conclusions

The results of this study show evidence of construct validity when using dry models to assess performance of arthroscopic RCR and LR by residents.

Clinical Relevance

The results of this study support the use of arthroscopic simulation in the training of residents and fellows learning arthroscopic shoulder surgery.

Arthroscopic Debridement Versus Platelet-Rich Plasma Injection: A Prospective, Randomized, Comparative Study of Chronic Lateral Epicondylitis With a Nearly 2-Year Follow-Up

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Purpose

The purpose of this prospective, randomized study was to compare the efficacy of autologous platelet-rich plasma (PRP) injections and arthroscopic lateral release in treating chronic lateral epicondylitis (LE).

Methods

Patients who had a clinical diagnosis of LE confirmed by ultrasound (US) were included in this study. A total of 101 patients received arthroscopic release ($n = 50$) or US-guided PRP injections ($n = 51$). Outcomes were assessed using a visual analog scale for pain, the Patient-Rated Tennis Elbow Evaluation (PRTEE), and a calibrated hand dynamometer for grip strength.

Results

Both patient groups experienced significant improvement in all measures. Between-group comparisons showed a significantly higher value in the PRP group only for grip strength at week 8 ($P = .0073$); all other significant differences were in favor of arthroscopy: overall pain ($P = .0021$), night pain ($P = .0013$), and PRTEE score ($P = .0013$) at week 104 and grip strength at weeks 24, 52, and 104 (all $P < .0001$). Consumption of rescue pain medication was not significantly different between the groups.

Conclusions

The present findings suggest that (1) PRP injections and arthroscopic extensor carpi radialis brevis release are both effective in the short and medium term; (2) PRP patients experienced a significant worsening of pain at 2 years; (3) arthroscopic release ensured better long-term outcomes in terms of pain relief and grip strength recovery; and (4) both procedures were safe and well accepted by patients.

Level of Evidence

Level II, prospective comparative study.

Return to Play After Osteochondral Autograft Transplantation of the Capitellum: A Systematic Review

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Purpose

To determine the rate of return to play and to identify lesion or osteochondral graft characteristics that may influence the return to competitive athletics after osteochondral autograft transplantation (OAT) for symptomatic osteochondritis dissecans (OCD) lesions.

Methods

A systematic review was conducted according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. A duplicate search of PubMed, Embase, Scopus, Web of Science, and CENTRAL databases was performed, beginning from the database inception dates through July 2016, for all articles evaluating the return to play after OAT for OCD lesions of the capitellum. A methodological quality assessment was completed for all included studies. Patient demographics, osteochondral lesion and graft characteristics, the number of patients, and timing of return to competitive activity were collected and evaluated. Association between graft size/number, the time to osseous healing, and return to sport was evaluated.

Results

Seven articles met the inclusion criteria. All included studies were case series of moderate quality with a mean Methodological Index for Non-Randomized Studies score of 12/16. Overall, 94% (119/126) of patients undergoing OAT for OCD lesions of the capitellum successfully returned to competitive sports. The mean reported time for unrestricted return to athletic competition after OAT was 5.6 months (range, 3-14 months).

Conclusions

Current best evidence suggests that OAT is successful in treating advanced OCD lesions of the capitellum and returning athletes to high-level competition. Evidence supporting the association between the size and number of grafts used and the time to osseous healing and return to sport is currently limited. Our assessment of the time to return to athletic competition was limited because of variable surgical technique, postoperative rehabilitation protocols, and outcome assessment.

Level of Evidence

Level IV, systematic review of Level IV studies.

AJSM

Arthroscopic Versus Open Latarjet in the Treatment of Recurrent Anterior Shoulder Dislocation With Marked Glenoid Bone Loss: A Prospective Comparative Study

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Background:

Very few studies have compared open Latarjet versus arthroscopic Latarjet procedures.

Purpose:

To compare the clinical and computed tomographic outcomes between open and arthroscopic Latarjet procedures.

Study Design:

Cohort study; Level of evidence, 3.

Methods:

A prospective, comparative study was performed. The open Latarjet group included 44 patients, and the arthroscopic Latarjet group included 46 patients. All patients had more than 2 years of clinical follow-up (range of motion, American Shoulder and Elbow Surgeons [ASES] score, Constant-Murley score, and Rowe score). The position of the transferred coracoid, the screw orientation, and graft resorption were evaluated on computed tomography (CT) scan.

Results:

The surgery time for the open group was significantly shorter than that for the arthroscopic group ($P = .003$). No recurrent dislocation occurred in either group. The apprehension test was negative in all patients in both groups. At the final follow-up, no significant difference was detected between the open group and the arthroscopic group regarding any of the clinical outcome measurements. The transferred coracoid graft was level with the glenoid in all patients in both groups. The open group had better position in the superior-inferior direction compared with the arthroscopic group ($P < .001$). No significant difference was found in screw orientation between the 2 groups ($P = .102$). At 1 year after surgery, patients in the arthroscopic group had significantly less resorption compared with patients in the open group ($P = .044$).

Conclusion:

Both procedures are effective for the treatment of recurrent anterior shoulder dislocation with marked glenoid bone loss. The open group had better position in the superior-inferior direction compared with the arthroscopic group. At 1 year after surgery, patients in the arthroscopic Latarjet group showed notably less graft resorption compared with patients in the open Latarjet group.

Long-term Correction in Sleep Disturbance Is Sustained After Arthroscopic Rotator Cuff Repair

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Background:

Sleep disturbance is a major complaint of patients with rotator cuff disease that often leads them to seek treatment. The authors previously reported a prospective analysis of patients who underwent rotator cuff repair and found that sleep disturbance significantly improved at 3 months after surgery. That improvement in sleep was maintained at 6 months.

Hypothesis:

In the current study, the authors sought to gain medium-term data on this same population at greater than 2 years. The hypotheses were that improvement in sleep disturbance after arthroscopic rotator cuff repair is maintained at 2-year follow-up and that the continued use of narcotic pain medication has a negative effect on sleep quality at 2-year follow-up.

Study Design:

Case series; Level of evidence, 4.

Methods:

The original cohort of patients was contacted at a minimum of 24 months after their surgery. Thirty-seven of the 56 patients (66%) involved in the original study were available. Patient outcomes were scored using the Pittsburgh Sleep Quality Index (PSQI), Simple Shoulder Test (SST), visual analog scale (VAS) for pain, and Single Assessment Numeric Evaluation (SANE). The newly obtained scores were compared with prior scores, which ranged from preoperatively to 6 months postoperatively.

Results:

The statistically significant improvement of the PSQI score demonstrated in our prior analysis at 6 months postoperatively was maintained, with a mean PSQI score of 5.5 for the 37 patients followed beyond 24 months. Of those patients, 41% still had a PSQI score >5, indicative of sleep disturbance. However, even those patients in our study with a PSQI score >5, indicative of sleep disturbance, had an improved mean score of 9.3 at greater than 24 months compared with those patients with a PSQI score >5 at 6 months, who had a mean PSQI score of 11.5 ($P = .13$). Both the SST and VAS scores displayed continued improvement at greater than 24 months, with both displaying moderate strength correlation to the PSQI score (VAS: Spearman $\rho = 0.479$, $P < .001$; SST: Spearman $\rho = -0.505$, $P < .001$). Regression models again demonstrated the continued use of narcotic pain medication correlating with poor sleep as the difference in the mean PSQI score between users and nonusers increased as postoperative time increased. At greater than 24 months after surgery, patients using narcotics had a mean PSQI score that was 7.4 points higher than narcotic nonusers (standard error [SE] = 1.93; $P = .00017$).

Conclusion:

At greater than 24 months, 41% of patients still demonstrated sleep disturbance, with both SST and VAS scores showing improvement. The prolonged use of narcotic medication negatively affects sleep, with a greater effect seen over time.

[BACK](#)

Pain Management After Outpatient Shoulder Arthroscopy: A Systematic Review of Randomized Controlled Trials

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Background:

Effective postoperative pain management after shoulder arthroscopy is a critical component to recovery, rehabilitation, and patient satisfaction.

Purpose:

This systematic review provides a comprehensive overview of level 1 and level 2 evidence regarding postoperative pain management for outpatient arthroscopic shoulder surgery.

Study Design:

Systematic review.

Methods:

We performed a systematic review of the various modalities reported in the literature for postoperative pain control after outpatient shoulder arthroscopy and analyzed their outcomes. Analgesic regimens reviewed include regional nerve blocks/infusions, subacromial/intra-articular injections or infusions, cryotherapy, and oral medications. Only randomized control trials with level 1 or level 2 evidence that compared 2 or more pain management modalities or placebo were included. We excluded studies without objective measures to quantify postoperative pain within the first postoperative month, subjective pain scale measurements, or narcotic consumption as outcome measures.

Results:

A combined total of 40 randomized control trials met our inclusion criteria. Of the 40 included studies, 15 examined nerve blocks, 4 studied oral medication regimens, 12 studied subacromial infusion, 8 compared multiple modalities, and 1 evaluated cryotherapy. Interscalene nerve blocks (ISBs) were found to be the most effective method to control postoperative pain after shoulder arthroscopy. Increasing concentrations, continuous infusions, and patient-controlled methods can be effective for more aggressively controlling pain. Dexamethasone, clonidine, intrabursal oxycodone, and magnesium have all been shown to successfully improve the duration and adequacy of ISBs when used as adjuvants. Oral pregabalin and etoricoxib administered preoperatively have evidence supporting decreased postoperative pain and increased patient satisfaction.

Conclusion:

On the basis of the evidence in this review, we recommend the use of ISBs as the most effective analgesic for outpatient arthroscopic shoulder surgery.

Outcomes After Arthroscopic Bankart Repair: Patients With First-Time Versus Recurrent Dislocations.

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BACKGROUND:

The young athletic population makes up the largest portion of shoulder instability and, when treated nonoperatively, has a recurrent dislocation rate as high as 71%. It is unknown how the outcomes of those who have a recurrent dislocation are affected versus those who have a stabilization procedure after a first-time dislocation.

PURPOSE:

To report the postoperative outcomes of patients with first-time dislocations versus patients with recurrent dislocations before surgery.

STUDY DESIGN:

Cohort study; Level of evidence, 3.

METHODS:

Current Procedural Terminology codes were used to identify patients who had arthroscopic Bankart repair between 2003 and 2013. A total of 173 eligible patients were identified across 8 fellowship-trained surgical practices. The first phase of the study was a retrospective chart review. Patients were identified as having a first-time dislocation or as having recurrent dislocations when they had >1 dislocation before surgical intervention. The second phase consisted of a survey to record a Simple Shoulder Test score and return to sport and to report postoperative instability and whether patients had further surgery on the shoulder.

RESULTS:

A total of 121 patients participated, providing 70% follow-up at an average of 51 months. There were 53 patients in the recurrent dislocation group and 68 in the first-time dislocation group. The postoperative instability rate was 29% in the first-time dislocation group and 62% in the recurrent dislocation group; this difference was significant ($P < .001$). The odds of postoperative instability were 4 times higher in the recurrent dislocation group (odds ratio = 4.14). The first-time dislocation group reported a 7% rate of repeat operation to address instability, whereas the recurrent dislocation group reported a rate of 32%; this difference was significant ($P < .001$). The odds of needing additional surgery on the index shoulder was 6 times higher in the recurrent dislocation group (odds ratio = 6.01).

CONCLUSION:

Patients with first-time dislocations had lower postoperative instability rates and reoperation rates when compared with patients with recurrent dislocations before surgery. Young patients with shoulder instability should be offered early surgical intervention to lower the risk of postoperative instability and reoperation.

The Effect of Subcritical Bone Loss and Exposure on Recurrent Instability After Arthroscopic Bankart Repair in Intercollegiate American Football

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Background:

There is no consensus on the optimal method of stabilization (arthroscopic or open) in collision athletes with anterior shoulder instability.

Purpose:

To examine the effect of “subcritical” bone loss and football-specific exposure on the rate of recurrent shoulder instability after arthroscopic stabilization in an intercollegiate American football population.

Study Design:

Case-control study; Level of evidence, 3.

Methods:

Fifty intercollegiate football players underwent primary arthroscopic stabilization for anterior shoulder instability and returned to football for at least a single season. Preoperatively, 32 patients experienced recurrent subluxations, and 18 patients experienced a single or recurrent dislocation. Shoulders with glenoid bone loss >20%, an engaging Hill-Sachs lesion, an off-track lesion, and concomitant rotator cuff repair were excluded from the study. The primary outcome of interest was the ability to return to football without subsequent instability. Patients were followed for time to a subsequent instability event after return to play using days of exposure to football and total follow-up time after arthroscopic stabilization.

Results:

Fifty consecutive patients returned to American football for a mean 1.5 seasons (range, 1-3) after arthroscopic stabilization. Three of 50 (6%; 95% CI, 1.3%-16.5%) patients experienced recurrent instability. There were no subsequent instability events after a mean 3.2 years of military service. All shoulders with glenoid bone loss >13.5% (n = 3) that underwent arthroscopic stabilization experienced recurrent instability upon returning to sport, while none of the shoulders with <13.5% glenoid bone loss (n = 47) sustained a recurrent instability event during football ($X^2 = 15.80$, $P < .001$). Shoulders with >13.5% glenoid bone loss had an incidence rate of 5.31 cases of recurrent instability per 1000 athlete-exposures of football. In 72,000 athlete-exposures to football with <13.5% glenoid bone loss, there was no recurrent instability. Significantly more anchors were used during the primary arthroscopic stabilization procedure in patients who experienced multiple preoperative instability events ($P = .005$), and lesions spanned significantly more extensive portions along the circumference of the glenoid ($P = .001$) compared with shoulders having a single preoperative instability event before surgical stabilization.

Conclusion:

Arthroscopic stabilization of anterior shoulder instability in American football players with <13.5% glenoid bone loss provides reliable outcomes and low recurrence rates.

[BACK](#)

Arthroscopic Repair of Anterosuperior Massive Rotator Cuff Tears: Does Repair Integrity Affect Outcomes?

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Background:

The purpose of this study was to investigate clinical outcomes and structural integrity after arthroscopic repair of anterosuperior massive rotator cuff tears (RCTs) and to compare clinical outcomes between healed and retear groups.

Hypothesis:

The authors hypothesized that although both groups would exhibit improved clinical outcomes compared with their preoperative status, the healed group would have better clinical outcomes than the retear group, and in the retear group, the subscapularis retear subgroup would have inferior outcomes compared with the intact subscapularis repair subgroup.

Study Design:

Case-control study; Level of evidence, 3.

Methods:

This study included 73 of 90 eligible patients who underwent arthroscopic repair of an anterosuperior massive RCT. Functional outcomes after 2-year follow-up were assessed using the visual analog scale (VAS) pain score, subjective shoulder value (SSV), American Shoulder and Elbow Surgeons (ASES) score, University of California, Los Angeles (UCLA) shoulder score, and active range of motion. Patients were assigned to the healed group (group H, $n = 34$) or retear group (group R, $n = 39$) based on magnetic resonance arthrography results at 6 months postoperatively. Group R was composed of subgroup R1 (subscapularis retear) and subgroup R2 (intact subscapularis repair).

Results:

Retearing occurred in 53% of patients. At 2-year follow-up, group H exhibited better outcomes for all functional scores versus group R, respectively ($P < .001$): VAS pain score (1.0 vs 2.1), SSV (90.2 vs 77.4), ASES score (90.8 vs 76.6), and UCLA shoulder score (31.0 vs 24.9). Within both groups, all scores improved significantly compared with preoperative values ($P < .001$). At follow-up, group H had significantly better forward flexion ($P = .018$) and internal rotation ($P = .002$) than group R; within both groups, active range of motion improved in all planes compared with the preoperative condition ($P < .001$). Subgroup R1 exhibited inferior outcomes versus subgroup R2, respectively: VAS pain score (2.6 vs 1.5; $P = .012$), ASES score (70.9 vs 83.6; $P = .013$), SSV (70.9 vs 85.4; $P = .005$), and UCLA shoulder score (22.0 vs 28.5; $P = .001$).

Conclusion:

After arthroscopic repair of anterosuperior massive RCTs, 53% of patients exhibited retearing. The healed group had better functional outcomes than the retear group. The subscapularis retear subgroup exhibited significantly inferior outcomes compared with the intact subscapularis repair subgroup.

CORR

What Influence Does Progression of a Nonhealing Rotator Cuff Tear Have on Shoulder Pain and Function?

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Clin Orthop Relat Res 2017, Volume 475, Issue 6

<http://www.clinorthop.org/articles/10.1007/s11999-017-5251-7>

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Background:

There have been numerous reports of clinical outcomes associated with tendon healing after repair that suggest a nonhealed tendon has a negative effect on postoperative clinical outcomes. However, to our knowledge, there has been no report on the relationship between tear size progression of nonhealed tendons and clinical outcomes.

Questions/purposes:

(1) Do patients with healed arthroscopic rotator cuff repairs have better outcomes, less pain, and more strength than patients whose repair did not heal? (2) In patients with nonhealed rotator cuff tendons, does tear size progression (increase or decrease) affect outcomes, pain, and strength? (3) Is there continued improvement beyond 6 months in outcomes, pain, and strength; and how do the improvements differ based on whether the tear size has increased or decreased?

Methods:

Between May 2008 and December 2012, 647 patients underwent arthroscopic rotator cuff repair for full-thickness tears at our institution. Of those, 442 patients (68%) had all MRI and clinical information available to permit inclusion in this retrospective study at a minimum of 2 years followup (mean, 33 ± 4 months; range, 24–43 months). Healing of the repaired tendon and tear size progression were assessed using MRI at 6 months postoperatively. Eighty-two of 442 tears (19%) were not healed. Of the nonhealed tears, 45 (55%) had a decrease and 37 (45%) had an increase in tear size. Shoulder function outcomes using the American Shoulder and Elbow Surgeon (ASES) and Constant scores and pain severity using VAS scores were evaluated preoperatively, at 6 months postoperatively, and at the latest followup. Isometric muscle strength was measured at 6 months postoperatively and at the latest followup.

Results:

Compared with patients with nonhealed tendons after arthroscopic rotator cuff repair, patients with healed repairs had improved ASES scores (healed, 93 ± 5 ; nonhealed, 89 ± 8 ; mean difference, 4; 95% CI, 3–5; $p < 0.001$), better Constant scores (healed, 91 ± 5 ; nonhealed, 85 ± 8 ; mean difference, 6; 95% CI, 4–7; $p < 0.001$), and greater strength ([flexion: healed, $96\% \pm 7\%$; nonhealed, $85\% \pm 12\%$; mean difference, 11%; 95% CI, 9%–13%; $p < 0.001$]; [external rotation: healed, $92\% \pm 8\%$; nonhealed, $80\% \pm 12\%$; mean difference, 11%; 95% CI, 9%–14%; $p < 0.001$]; [internal rotation: healed, $97\% \pm 8\%$; nonhealed, $92\% \pm 8\%$; mean difference, 5%; 95% CI, 3%–7%; $p < 0.001$]); however there was no difference in pain level based on VAS scores (healed, 0.9 ± 0.8 ; nonhealed, 1.0 ± 0.8 ; mean difference, 0.2; 95% CI, 0.0–0.4; $p = 0.226$). Compared with patients with increased tear size, patients with decreased tear size had better ASES scores (decreased, 91 ± 6 ; increased, 86 ± 8 ; $p = 0.001$), improved Constant scores (decreased, 88 ± 6 ; increased, 82 ± 9 ; $p = 0.003$), greater flexion strength (decreased, $91\% \pm 9\%$; increased, $78\% \pm 11\%$; $p < 0.001$), and greater external rotation strength (decreased, $86\% \pm 10\%$; increased, $73\% \pm 11\%$; $p < 0.001$). However, the difference does not seem to meet a minimal clinically important difference. Patients with increased tear size differed from those with decreased tear size with respect to flexion and external rotation strength where the former had no improvement. There was no improvement in flexion (6 months, $78\% \pm 11\%$; latest followup, $78\% \pm 11\%$; $p = 0.806$)

[BACK](#)

and external rotation strength (6 months, 74% ± 12%; latest followup, 73% ± 11%; p = 0.149).

Conclusions:

Patients who had healed tendons after arthroscopic rotator cuff repair had better shoulder function than patients who had nonhealed tendons. Among patients with nonhealed rotator cuff tendons after surgery, those with decreased tear size, observed on their 6-month postoperative MRI, compared with their initial tear size, showed better shoulder function and muscle strength than those with increased tear size beyond 6 months. Although results are statistically different, they seem insufficient to achieve clinically important differences.

Level of Evidence:

Level III, therapeutic study.

BJJ

Arthroscopic decompression not recommended in the treatment of rotator cuff tendinopathy: a final review of a randomised controlled trial at a minimum follow-up of ten years

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<http://bjj.boneandjoint.org.uk/content/99-B/6/799>

Aims

Rotator cuff tendinopathy has a multifactorial origin. Rejecting the mechanistic theory has also led to abandoning operative treatment at initial presentation in the first line. Physiotherapy exercise programmes are the accepted first line treatment. The aim of this study was to assess the long-term additional benefits of subacromial decompression in the treatment of rotator cuff tendinopathy.

Patients and Methods

This randomised controlled trial of 140 patients (52 men, 88 women, mean age 47.1 years; 18 to 60) with rotator cuff tendinopathy extended previous work up to a maximum of 13 years. The patients were randomised into two treatment groups: arthroscopic acromioplasty and a supervised exercise treatment and a similar supervised exercise treatment alone. Self-reported pain on a visual analogue scale (VAS) was the primary outcome measure. Secondary measures were disability, working ability, pain at night, Shoulder Disability Questionnaire score and the number of painful days during the three months preceding the final assessment.

Results

A total of 90 patients (64%) returned questionnaires at a mean 12 years after randomisation. On an intention-to-treat basis, both treatment groups reached statistically significant improvement compared with the initial VAS for pain, but there was no significant difference between groups. The same was true in the secondary outcome measures. Due to group changes, the results were also analysed per protocol: operated or not. No significant differences between the groups were found.

Conclusion

The natural history of rotator cuff tendinopathy probably plays a significant role in the results in the long-term. Even though the patients who underwent operative treatment had a stronger belief in recovery, which is likely to be surgical and the effect of placebo, the exercise group obtained similar results. In the future, an optimum exercise regime should be searched for, as the most clinically and cost-effective conservative treatment for rotator cuff tendinopathy.

Lower extremity

Arthroscopy

Efficacy of Celecoxib for Early Postoperative Pain Management in Hip Arthroscopy: A Prospective Randomized Placebo-Controlled Study

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Purpose

To determine whether 400 mg of celecoxib administered 1 hour before hip arthroscopy surgery would reduce pain, provide reduction in overall narcotic consumption, and lead to more rapid discharge from recovery rooms.

Methods

Ninety-eight patients were randomized to either the celecoxib group ($n = 50$) or the placebo group ($n = 48$). An a priori power analysis was done set to detect a difference of 0.50 on the visual analog scale (VAS), based on the senior author's preference. The number of patients planned for recruitment was rounded up to 100 to allow for flexibility in the study. Inclusion criteria were any patient at least 18 years old who underwent hip arthroscopy surgery performed by the senior author. All patients had less than Tönnis grade 2 arthritis. Exclusion criteria were allergy to sulfa-based drugs, prior adverse reaction to celecoxib, or patients who were on chronic narcotics for whom alternative pain management regimens were arranged before surgery. Randomization was performed on a 1:1 basis in blocks of 10 using sealed envelopes stating celecoxib or placebo. One hour before surgery, all patients received either 400 mg celecoxib or placebo. Patients were evaluated using a VAS preoperatively, immediately postoperatively, and at 1 and 2 hours postoperatively. Time from the operating room to "ready for discharge" and number of morphine equivalents of narcotic medication required in the postanesthesia care unit were recorded.

Results

Age and preoperative VAS were similar between the celecoxib and placebo control group, with average ages of 34.2 ± 11.9 and 35.8 ± 11.6 ($P = .27$) and preoperative VAS of 2.1 ± 2.06 and 2.3 ± 1.98 ($P = .29$), respectively. The celecoxib group had 26 females and 24 males, whereas the placebo group had 29 females and 19 males ($P = .42$). The most common surgical procedures were labral repair (31 patients in the celecoxib group and 29 patients in the placebo group), and labral repair with acetabular osteoplasty (13 patients in the celecoxib group and 11 patients in the placebo group). There were no significant differences in procedures performed between the 2 groups ($P > .05$). At 1 hour postoperatively, patients who received celecoxib had a lower pain score that was statistically significant compared with the placebo group (4.6 vs 5.4, $P = .03$). There was a significant difference in discharge time between patients who received celecoxib and the control group (152.9 minutes vs 172.9 minutes, $P = .04$). There was no significant difference found in morphine equivalents consumed in the postanesthesia care unit between the 2 groups (15.3 vs 15.4, $P = .48$).

Conclusions

A preoperative dose of 400 mg of celecoxib led to statistically significantly reduced patient-reported pain on the VAS in the acute postoperative period after hip arthroscopy surgery, though the difference is not likely clinically significant. There was a significantly shorter time to discharge in patients who received celecoxib versus placebo.

[BACK](#)

Comparison of Intraoperative Fluoroscopic Dunn View With Magnetic Resonance Imaging to Determine Femoral Version

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Purpose

To compare femoral version measured with a fluoroscopic Dunn view taken at the time of hip arthroscopy with values derived from axial magnetic resonance imaging (MRI) scans.

Methods

Of 159 hip arthroscopies performed from January 2014 through March 2015, 50 patients had magnetic resonance imaging (MRI) scans with a protocol that incorporates femoral version analysis. Dunn views are performed as a routine part of the preoperative fluoroscopic examination at the time of arthroscopy. Femoral version was measured from the fluoroscopic views and compared with values calculated from axial MRI images. The measurements were compared with a paired *t* test for difference in means, the intraclass correlation coefficient (ICC) for reliability, and the limits of agreement method of Bland and Altman.

Results

There was a very small but statistically significant difference between the measurement on fluoroscopic Dunn view and the value on axial MRI (mean difference, 1.4°, *P* = .03). The ICC was 0.809 (*P* < .0001), indicating substantial agreement. By the Bland and Altman method, the 95% limits of agreement for fluoroscopic versus MRI measurement were -7.6 to 10.4, with no significant difference in variance by Pitman test (*P* = .526).

Conclusions

With careful attention to technique, the fluoroscopically simulated Dunn view can be used to measure femoral version with acceptable accuracy and obviates the need for repeat 3-dimensional imaging for patients who already have an MRI scan without version analysis.

Level of Evidence

Level II, testing of previously developed diagnostic criteria with a gold standard.

Complication Rates for Hip Arthroscopy Are Underestimated: A Population-Based Study

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Purpose

To identify major and minor complication rates associated with hip arthroscopy from a payer-based national database and compare with the rates reported in the existing literature.

Methods

Patients who underwent hip arthroscopy between 2007 and 2014 were identified using PearlDiver, a publicly available database. Rates of major and minor complications, as well as conversion to total hip arthroscopy (THA), were determined by using Current Procedural Terminology (CPT) and International Classification of Diseases, Ninth Revision (ICD-9), codes. Incidence rates of select major complications across the entire database were used as a comparison group. Statistical significance was set at $P < .05$.

Results

Of 18 million patients screened from 2007 to 2014, a total of 2,581 hip arthroscopies were identified. The rates of major and minor complications within a 1-year postoperative period were 1.74% and 4.22%, respectively. Complications included heterotopic ossification (2.85%), bursitis (1.23%), proximal femur fracture (1.08%), deep vein thrombosis (0.79%), and hip dislocation (0.58%). The rate of conversion to THA within 1 year was 2.85%. When compared to rates in the general population, the relative risks [RRs] of requiring a THA (age <50 years, RR = 57.66, $P < .001$; age >50 years, RR = 22.05, $P < .001$), sustaining a proximal femur fracture (age <50 years, RR = 18.02, $P < .001$; age >50 years, RR = 2.23, $P < .001$), or experiencing a hip dislocation (RR 19.60, $P < .001$) at 1 year after hip arthroscopy were significantly higher in all age groups.

Conclusions

Higher major complication rates after hip arthroscopy were observed using a national payer-based database than previously reported in the literature, especially in regard to hip dislocations and proximal femur fractures. Rates of total hip arthroplasty were similar to prior studies, whereas the rates of revision hip arthroscopy were higher.

Level of Evidence

Level IV, case series.

Comparison Between Intra- and Extra-articular Tension of the Graft During Fixation in Anterior Cruciate Ligament Reconstruction

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Purpose

To evaluate the tension deprivation through the tunnels with and without preconditioning at the time of fixation, and the influences of cyclic loading and pretensioning on graft tension in anatomic single bundle anterior cruciate ligament (ACL) reconstruction using a hamstring tendon.

Methods

Nine fresh-frozen cadaveric knees underwent anatomic ACL reconstruction using hamstring grafts. Each specimen was examined to ensure that there was no severe osteoarthritic change, ligament insufficiency, or torn menisci by manual and arthroscopic evaluation. Applied graft tension was measured at the tibial tunnel outlet using a graft tensor with a load cell. Intra-articular graft tension was evaluated by using an originally developed microforce sensor, which was sutured into the graft. Both tensions were simultaneously measured just after initial tensioning under 3 different conditions: condition 1, just after initial tensioning of 20 N at 20° of knee flexion without preconditioning; condition 2, after the same initial tensioning following 5 rounds of passive cyclic flexion-extension movement; and condition 3, after the same initial tensioning following 5 minutes of static pretensioning of 20 N.

Results

The intra-articular tension was 12.7 ± 5.3 N in condition 1, 12.0 ± 4.8 N in condition 2, and 13.5 ± 4.8 N in condition 3. In these 3 conditions, intra-articular graft tension was significantly lower than the applied tension of around 20 N (no pretension: $P = .009$, cyclic pretension: $P = .004$, static pretension: $P = .008$), with no difference among the 3 conditions ($P = .82$).

Conclusions

The intra-articular graft tension was significantly lower than the applied tension from the outside of the joint, even after cyclic loading and pretensioning.

Clinical Relevance

It is difficult to evaluate the intra-articular graft tension precisely on the basis of the extra-articular tension at time zero in ACL reconstruction.

Magnetic Resonance Imaging Evaluation of Physeal Violation in Adolescents After Transphyseal Anterior Cruciate Ligament Reconstruction

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Purpose

To quantify and compare the amount and location of physis violation of the distal femur and proximal tibia after transphyseal anterior cruciate ligament (ACL) reconstruction in skeletally immature patients.

Methods

This study included 19 patients with open physes of the distal femur and proximal tibia who underwent ACL reconstruction with tibialis anterior allografts. Physeal tunnel volume and location on the growth plate, as well as obliquity to the growth plate, were measured by 3-dimensional postoperative magnetic resonance imaging of the distal femur and proximal tibia.

Results

The percentage of physeal violation (ratio of the tunnel to the entire growth plate area) was similar for the distal femur and proximal tibia (3.95% vs 3.65%, $P = .582$). There were no differences in tunnel obliquity to the growth plate in the coronal (56.1° vs 71.6° , $P = .061$) and sagittal (85.9° vs 74.9° , $P = .092$) planes. The distal femoral tunnel was located 6.2% (17.2% vs 23.4%, $P = .001$) more peripherally in the anteroposterior direction and 9.7% (27.1% vs 36.8%, $P < .001$) more peripherally in the mediolateral direction than was the tibial tunnel.

Conclusions

The mean percentages of physeal violation of tunnel creation during ACL reconstruction in adolescent patients were 3.95% for the distal femur and 3.65% for the proximal tibia. Moreover, femoral tunnels were located more peripherally on the growth plate than were tibial tunnels, in both the anteroposterior and mediolateral directions.

Level of Evidence

Level IV, case series.

Reliability and Validity of the Arthroscopic International Cartilage Repair Society Classification System: Correlation With Histological Assessment of Depth

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Purpose

To determine the interobserver reliability of the International Cartilage Repair Society (ICRS) grading system of chondral lesions in cadavers, to determine the intraobserver reliability of the ICRS grading system comparing arthroscopy and video assessment, and to compare the arthroscopic ICRS grading system with histological grading of lesion depth.

Methods

Eighteen lesions in 5 cadaveric knee specimens were arthroscopically graded by 7 fellowship-trained arthroscopic surgeons using the ICRS classification system. The arthroscopic video of each lesion was sent to the surgeons 6 weeks later for repeat grading and determination of intraobserver reliability. Lesions were biopsied, and the depth of the cartilage lesion was assessed. Reliability was calculated using intraclass correlations.

Results

The interobserver reliability was 0.67 (95% confidence interval, 0.5-0.89) for the arthroscopic grading, and the intraobserver reliability with the video grading was 0.8 (95% confidence interval, 0.67-0.9). A high correlation was seen between the arthroscopic grading of depth and the histological grading of depth (0.91); on average, surgeons graded lesions using arthroscopy a mean of 0.37 (range, 0-0.86) deeper than the histological grade.

Conclusions

The arthroscopic ICRS classification system has good interobserver and intraobserver reliability. A high correlation with histological assessment of depth provides evidence of validity for this classification system.

Clinical Relevance

As cartilage lesions are treated on the basis of the arthroscopic ICRS classification, it is important to ascertain the reliability and validity of this method.

Biomechanical Comparison of Fixed-Loop and Adjustable-Loop Cortical Suspensory Devices for Metaphyseal Femoral-Sided Soft Tissue Graft Fixation in Anatomic Anterior Cruciate Ligament Reconstruction Using a Porcine Model

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Purpose

To compare the displacement, stiffness, and ultimate failure load of a fixed-loop cortical suspensory device with 2 adjustable-loop devices when positioned on metaphyseal bone.

Methods

Thirty devices (10 of each device) were positioned on the metaphyseal cortex of 30 porcine femora simulating anatomic anterior cruciate ligament femoral tunnel placement. Bovine tendons were used for soft tissue grafts, and the constructs were then cycled 1,000 times and pulled to failure, measuring displacement, stiffness, and failure load.

Results

Initial displacement, cyclic displacement, and total displacement were 2.98 mm, 2.09 mm, and 5.08 mm for the Endobutton CL (ECL), 2.82 mm, 2.27 mm, and 5.09 mm for the Tightrope (TRT), and 4.25 mm, 3.19 mm, and 7.44 mm for the adjustable-loop ToggleLoc Inline with Ziploop (TLZ), respectively. There was no difference between the ECL and the TRT on any measured outcome. Differences between the TLZ and ECL were statistically significant (initial displacement $P = .024$, cyclic displacement $P < .001$, and total displacement $P < .001$), as were those between the TLZ and TRT (initial displacement $P = .010$, cyclic displacement $P = .001$, and total displacement $P < .001$). Failure loads were 804 N, 801 N, and 682 N for the TRT, ECL, and TLZ, respectively, with no statistically significant difference.

Conclusions

When positioned on the metaphyseal cortex, there was no difference in the biomechanical performance of the fixed-loop ECL and adjustable-loop TRT, and no lengthening of the TRTs was observed during cycling. However, the TLZ showed statistically significantly lower stiffness and more displacement during cycling with lengthening of the adjustable loop, the clinical significance of which is unknown.

Clinical Relevance

When used for femoral-sided soft tissue graft fixation in an anatomically placed femoral tunnel, the adjustable-loop TRT was biomechanically equivalent to the fixed-loop ECL. However, the adjustable-loop TLZ showed displacement during biomechanical testing that could potentially contribute to clinical failure after anterior cruciate ligament reconstruction. However, the clinical significance was not directly tested.

Proximity of Lateral Critical Structures to the All-Epiphyseal Outside-In Femoral Tunnels in Pediatric Anterior Cruciate Ligament Reconstruction

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Purpose

To describe the proximity of the lateral critical structures (peroneal nerve [PN], popliteus tendon [PT], lateral collateral ligament [LCL], and articular cartilage [AC]) to the femoral tunnel for outside-in all-epiphyseal anterior cruciate ligament (ACL) reconstruction in reference to knee flexion angle.

Methods

All-epiphyseal ACL reconstructions were performed in 12 human cadaveric knees using arthroscopy and outside-in drilling for anatomic femoral tunnel placement that was ensured by identifying the center of the total ACL footprint. Fluoroscopy was used to confirm tunnel position and reconstructions were performed with quadrupled semitendinosus and gracilis autograft with Xtendobutton (Smith & Nephew, Andover, MA) fixation on the femoral side. After reconstruction, the lateral side of the knee was dissected and the LCL, PT, distal and posterior AC, and the PN were identified. The distances of these structures from the center of the exiting femoral tunnel were then measured using a digital caliper at 0°, 30°, 60°, 90°, and 120° of knee flexion. Any gross damage to these structures caused by the femoral drilling was also noted. Data were compiled and the mean and standard deviations (SD) of the distances from the pin to the structures of interest were calculated. The normality of the data at each flexion angle was assessed using Shapiro-Wilk tests ($P > .05$), and the relationship between flexion angle and average distance was evaluated using repeated measures analysis of variance ($P < .05$). Any significant relationships were then evaluated using paired t -tests ($P < .05$) with a Benjamini-Hochberg adjustment for each possible pair of flexion angles. Averages, SD, and P values are reported. A post hoc power analysis was performed.

Results

The violation of the LCL was noted in 3 specimens and that of the PT in 1 specimen as a result of femoral tunnel drilling at flexion angles ranging from 90° to 120°. The distance between the PT and the femoral tunnel also decreased significantly ($P < .001$) with knee flexion with average distances to the center of 8.07 mm at 0°, 7.75 mm at 30°, 6.33 mm at 60°, 4.12 mm at 90°, and 1.89 mm at 120°. The mean \pm SD for distances from the femoral tunnel to the center of the PT at 0° was 8.07 \pm 7.15, at 30° 7.75 \pm 6.66, at 60° 6.33 \pm 6.79, at 90° 4.12 \pm 5.71, and at 120° 1.89 \pm 5.56. As the knee was progressively flexed, the distance between the LCL and the femoral tunnel decreased significantly ($P < .001$) with an average distance of 6.52 mm at 0°, 6.26 mm at 30°, 4.23 mm at 60°, 2.38 mm at 90°, and 0.4 mm at 120°. The mean \pm SD for distances from the femoral tunnel to the center of the LCL at 0° was 6.52 \pm 5.93, at 30° 6.26 \pm 7.32, at 60° 4.23 \pm 7.82, 90° 2.38 \pm 7.31, and at 120° 0.4 \pm 7.01. The PN was remote from the femoral tunnel at all flexion angles with a mean distance of 42.83 to 59.22 mm. The PN to guide pin distance increased significantly with progressive knee flexion ($P < .001$). The AC was not damaged in all specimens.

Conclusions

The LCL and PT are at significant risk during percutaneous femoral drilling for all-epiphyseal anatomic ACL reconstruction using an outside-in technique. This risk was maximized at 120° flexion and minimized in full extension. These findings suggest that the optimal position for femoral drilling in all-epiphyseal ACL reconstruction is full or near-full extension of the knee that

[BACK](#)

can be accomplished by placing the knee in 30° of flexion (after using fluoroscopic guidance to pass the guide pin past the lateral critical structures) to visualize the footprint of the ACL.

Clinical Relevance

Information garnered from this study may help clinicians better understand the risk to the lateral critical structures when an outside-in femoral tunnel is not drilled in the appropriate degree of knee flexion.

Surgical Technique and Clinical Outcomes of Retrograde Osteochondral Autograft Transfer for Osteochondral Lesions of the Tibial Plateau

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Purpose

To present the surgical technique, clinical outcomes, and poor prognostic factors of arthroscopic retrograde osteochondral autograft transfer of the tibial plateau.

Methods

Twelve patients (6 men, 6 women; mean age, 38.7 years) with tibial plateau osteochondral lesions underwent surgery. The primary diseases were osteonecrosis in 4 cases, cartilage injuries in 6, and postfractures of the tibial plateau in 2. Clinical outcomes were evaluated preoperatively and postoperatively according to the International Knee Documentation Committee score and the Japanese Orthopaedic Association score. The International Cartilage Repair Society score was recorded in 7 cases who underwent second-look arthroscopies postoperatively. Statistical analyses were performed to identify prognostic factors associated with the clinical outcomes.

Results

The mean International Knee Documentation Committee and Japanese Orthopaedic Association scores were both significantly improved from 39.0 (range, 13.0-57.1) to 72.4 (range, 33.3-100) ($P = .0022$) and from 65.8 (range, 30.0-85.0) to 85.8 (range, 50.0-100) ($P = .0022 < .05$), respectively. In 2 cases, secondary operations were performed because of knee pain (1 varus osteotomy of the femur and 1 total knee replacement). The mean International Cartilage Repair Society scores were significantly worse in the 2 cases who required a secondary operation (3.5; abnormal) than in the 5 cases who did not (10.6; nearly normal). The secondary operation rate was significantly higher in cases with lesion size ≥ 400 mm² than in those < 400 mm² (Fisher's exact test; $P = .046$).

Conclusions

Most clinical scores improved significantly postoperatively. The results indicate that arthroscopic retrograde osteochondral autograft transfer is an effective procedure to achieve sufficient cartilage congruity for osteochondral lesions of the tibial plateau < 400 mm² in size.

Level of Evidence

Level IV, therapeutic case series.

Association Between Tibial Plateau Slopes and Anterior Cruciate Ligament Injury: A Meta-analysis

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Purpose

To investigate the associations of medial tibial plateau slope (MTPS), lateral tibial plateau slope (LTPS), and coronal tibial plateau slope (CTPS) with anterior cruciate ligament (ACL) injury both in the general population and in different gender subgroups.

Methods

PubMed, Ovid, Embase, and Scopus databases were searched through from inception to August 31, 2016. Observational studies reporting associations of MTPS/LTPS/CTPS with ACL injury were retrieved for analysis. Either a fixed- or random-effects model was used to calculate the overall standardized mean difference (SMD). Reviews, meeting abstracts, cadaver or animal studies, and other studies without disclosing full text were excluded in this study.

Results

A total of 29 studies were included. Subjects with ACL injury exhibited a significant increase in MTPS (SMD: 0.34 [95% confidence interval (CI): 0.18, 0.49]; $P < .0001$) and LTPS (SMD: 0.49 [95% CI: 0.30, 0.68]; $P < .00001$), but not in the CTPS (SMD: 0.09 [95% CI: -0.10, 0.27]; $P = .36$), compared with controls. Meanwhile, significant differences in MTPS and LTPS were observed in the male subgroup (SMD: 0.41 [95% CI: 0.20, 0.62]; $P = .0001$ and SMD: 0.55 [95% CI: 0.26, 0.85]; $P = .0002$, respectively) but not in the female (SMD: 0.31 [95% CI: -0.02, 0.64]; $P = .06$ and SMD: 0.26 [95% CI: -0.04, 0.56]; $P = .09$, respectively).

Conclusions

The present meta-analysis showed that the increases in MTPS and LTPS were overall risk factors of ACL injury. However, these slopes would only be considered as “at risk” for males, but not for females. In addition, it was also proved that CTPS was not a risk factor of ACL injury.

Level of Evidence

Level III, meta-analysis of Level II and III studies.

Volume 33, Issue 7, p1271-1434

Arthroscopic Capsular Plication and Labral Seal Restoration in Borderline Hip Dysplasia: 2-Year Clinical Outcomes in 55 Cases

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Purpose

To report clinical outcomes in patients with borderline dysplasia undergoing an arthroscopic technique of labral seal restoration with minimal acetabular rim resection and capsular plication.

Methods

Patients younger than 40 years with a lateral center-edge angle of 18° greater and 25° or less and 2-year follow-up after undergoing an arthroscopic technique of labral seal restoration with minimal rim resection (≤ 2 mm) and capsular plication (3-5 sutures placed in an oblique orientation to create an imbrication and inferior shift) were included. Patients underwent arthroscopy for symptoms that had marginal improvement with a minimum 6-week structured physical therapy program. Patients with a Tönnis grade of 1 or greater, a center-edge angle of 17° or less, and Legg-Calvé-Perthes disease were excluded. The following patient-reported outcomes (PROs) were recorded prospectively but retrospectively reviewed: modified Harris Hip Score, Non-Arthritic Hip Score, Hip Outcome Score–Sports-Specific Subscale, and Hip Outcome Score–Activities of Daily Living. The visual analog scale score, patient satisfaction score, complications, and revision procedures were also recorded. A 2-tailed paired *t* test was used to analyze change in preoperative to postoperative PRO scores. Significance was defined as $P < .05$.

Results

During the study period, 232 hip arthroscopies were performed in patients with a lateral center-edge angle between 18° and 25°. The inclusion criteria were met by 59 procedures. Of these procedures, 55 (93.2%) were available for follow-up. The labrum was repaired, debrided, and reconstructed in 37 procedures, 17 procedures, and 1 procedure, respectively. The iliopsoas was released in 34 procedures, the ligamentum teres was debrided in 29, and femoral osteoplasty was performed in 32. At 2-year follow-up, there was significant improvement in the mean scores of all PROs compared with baseline. Mean improvements for the modified Harris Hip Score, Hip Outcome Score–Activities of Daily Living, Hip Outcome Score–Sports-Specific Subscale, and Non-Arthritic Hip Score were 20.7, 17.5, 27.6, and 20.0, respectively. There was significant improvement in the visual analog scale score at 2 years, decreasing by 3.16 compared with baseline, and the mean patient satisfaction score was 8.09, with 83.6% of patients achieving a good to excellent result (patient satisfaction score ≥ 7). No complications were related to the procedure, and 6 patients (11%) required revision procedures (4 for labral retear, 1 for painful iliopsoas internal snapping, and 1 for removal of a symptomatic loose body).

Conclusions

Arthroscopic intervention that encompasses minimal rim resection, restoration of labral function, and capsular plication significantly improves outcomes in patients with borderline dysplasia who do not warrant a periacetabular osteotomy.

Level of Evidence

Level IV, therapeutic case series.

[BACK](#)

Arthroscopic Treatment of Labral Tears of the Hip in Adolescents: Patterns of Clinical Presentation, Intra-articular Derangements, Radiological Associations and Minimum 2-Year Outcomes

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Purpose

To report on patterns of clinical presentation, intra-articular derangements, radiological associations, and minimum 2-year outcomes after hip arthroscopy (HA) in patients 18 years or younger.

Methods

This study was a retrospective case series on patients 18 years or younger who had undergone HA for labral tears that had failed nonoperative management from April 2008 to April 2013 with a minimum 2-year follow-up. Exclusion criteria were previous hip conditions or surgery. The following were recorded: demographic, examination, radiological and intraoperative findings, intraoperative procedures performed, patient-reported outcomes (PROs), and patient satisfaction. The PROs reported included the modified Harris Hip Score, Non-Arthritic Hip Score, Hip Outcome Score–Sport-Specific Subscale, Hip Outcome Score–Activities of Daily Living, and Visual Analogue Score for pain.

Results

One hundred and two patients satisfied the inclusion criteria, of whom 90 (88.2%, 77 females and 13 males) had minimum 2-year follow-up. Females had increased external rotation in flexion (58.9° vs 50.0°, $P = .041$). Sixty-eight females had a Beighton's score of >4 compared to 6 males ($P < .001$). There was no distinct pattern within the group or between genders for radiological markers of acetabular coverage, depth, or version and femoral cam size. Mean femoral anteversion for females was 15.7° and for males 11.3°. Females had significantly smaller labral tears (1.73 hours vs 2.34 hours on the acetabular clock face, $P = .028$). Females were more likely to require a capsular plication and iliopsoas fractional lengthening (88.3% vs 46.2%, and 77.9% vs 38.5%, respectively). There was a significant improvement in all PRO measures in both males and females ($P < .01$), but females had lower preoperative and postoperative scores. Mean preoperative and postoperative PROs for males and females were as follows: modified Harris Hip Score 71.0/94.3 and 63.4/88.8, Hip Outcome Score–Activities of Daily Living 78.1/93.4 and 64.0/91.8, Hip Outcome Score–Sport-Specific Subscale 51.7/91.0 and 45.7/78.6, Non-Arthritic Hip Score 78.1/94.5 and 63.1/89.2, and visual analog score 4.77/1.85 and 6.29/2.21. The mean patient satisfaction score was 8.29 out of 10. Five patients (5.56%) required a revision procedure.

Conclusions

HA is associated with improved outcomes and pain and high satisfaction scores at minimum 2-year follow-up in adolescent population. The pattern of labral injury is different in males and females and dictates the arthroscopic approach. Females are likely to require a capsular plication and iliopsoas release to address soft-tissue laxity and impingement.

Level of Evidence

Level IV, therapeutic case series.

[BACK](#)

Functional Outcomes and Cam Recurrence After Arthroscopic Treatment of Femoroacetabular Impingement in Adolescents

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Purpose

To compare the functional outcomes after arthroscopic treatment of femoroacetabular impingement (FAI) in adolescent patients and non-adolescent patients, and to report on the rate of cam recurrence within 2 years after femoral osteoplasty in a limited sample of the adolescent group.

Methods

From 2010 to 2014, patients younger than 18 years with symptomatic FAI (alpha angle $>50^\circ$) who underwent hip arthroscopy with minimum 2-year follow-up or reoperation were identified. A group of non-adolescent patients with identical inclusion criteria, except age of 18 years or older, was also identified for comparison. In addition, a separate group of adolescent patients with 2-year postoperative radiographs was reviewed for cam recurrence. Demographic data, operative data, and radiographic and clinical outcomes (modified Harris Hip Score [mHHS], Hip Outcome Score–Activities of Daily Living [HOS-ADL], Hip Outcome Score–Sport-Specific Subscale [HOS-SSS], and International Hip Outcome Tool 33 [iHOT-33] score) were collected.

Results

We identified 34 adolescent patients (38 hips) with an average age of 16 years (range, 13–17 years). The mean clinical follow-up period was 36.1 ± 11.6 months (range, 24.1–71.7 months) and 29.6 ± 2.4 months (range, 27.9–31.3 months) without and with reoperation, respectively. A control group of 296 non-adolescent patients (306 hips), with a mean age of 31 years (range, 18–59 years), was identified as our non-adolescent group. The mean clinical follow-up period was 34.1 ± 11 months (range, 24.0–77.4 months) and 15.1 ± 9.1 months (range, 3.6–34.6 months) without and with reoperation, respectively. Significant improvement was noted in adolescents in the changes in outcome scores (mHHS, 22.2 [95% confidence interval (CI), 15.4–29.0]; HOS-ADL, 18.6 [95% CI, 11.9–25.2]; HOS-SSS, 33.5 [95% CI, 24.5–42.5]; and iHOT-33 score, 30.5 [95% CI, 21.8–39.2]; $P < .001$). Similar improvements were observed in non-adolescents (mHHS, 21.0 [95% CI, 19.0–23.0]; HOS-ADL, 16.6 [95% CI, 14.6–18.6]; HOS-SSS, 30.1 [95% CI, 26.6–33.6]; and iHOT-33 score, 34.9 [95% CI, 31.5–38.3]; $P < .001$). There was no evidence of a difference in follow-up survey scores between groups ($P > .203$). Revision surgery was required in 2 adolescent hips (5.3% [95% CI, 1.5%–17.3%]) and 19 non-adolescent hips (6.2% [95% CI, 4.0%–9.5%]). Minimum 2-year radiographs were available for review in 24 adolescent patients (30 hips). The alpha angle (mean \pm standard deviation) was reduced from $55.4^\circ \pm 12.1^\circ$ preoperatively to $38.7^\circ \pm 4.9^\circ$ at 6 weeks postoperatively (mean difference, -16.4° [95% CI, -19.8° to -12.9°]; $P < .001$). At 2 years, the alpha angle remained at $39.2^\circ \pm 11.2^\circ$, which did not differ from 6-week measurements (mean difference, 0.5° [95% CI, -2.9° to 3.9°]; $P = .784$). There were no cases of cam recurrence (0% [95% CI, 0%–11.4%]).

Conclusions

Significant improvement in clinical outcomes can be anticipated after arthroscopic treatment of FAI in adolescents. From a limited sample of our adolescent population, the risk of cam recurrence appears low; however, further follow-up is needed to ensure this does not represent a biased sample of the initial population.

[BACK](#)

Level of Evidence

Level III, retrospective comparative study.

Evaluating the Femoral-Side Critical Corner in Posterior Cruciate Ligament Reconstruction: The Effect of Outside-In Versus Inside-Out Creation of Femoral Tunnels on Graft Contact Pressure in a Synthetic Knee Model

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Purpose

To characterize and compare the graft contact characteristics of outside-in (OI) and inside-out (IO) femoral tunnels during single-bundle reconstruction of the anterolateral bundle of the posterior cruciate ligament in a synthetic knee model.

Methods

Femoral tunnels were separately made in 16 synthetic femora (8 OI and 8 IO). Achilles tendon allografts were fixed using suspensory fixation with a pressure sensor between the allograft and femoral tunnel. Grafts were cyclically loaded; force, contact area, contact pressure, and peak pressure at the aperture were measured. This process was repeated using the same allograft to assess the other tunnel angle in a separate specimen.

Results

IO specimens showed higher mean contact pressure at all loading cycles, with significance shown at 50 N ($P = .02$). Peak pressure was also greater in IO specimens at all loading cycles and reached statistical significance at 100 N ($P = .04$). IO specimens had a lower contact area at 150 N ($P = .04$). No statistically significant differences in force were observed between the 2 groups.

Conclusions

OI creation of the femoral tunnel for anterolateral bundle reconstruction of the posterior cruciate ligament resulted in decreased mean and peak contact pressures at the femoral aperture compared with IO tunnel creation at the specific trajectories and loading parameters tested in this synthetic femoral model. These biomechanical data suggest that OI creation of the femoral tunnel may help reduce in vivo graft contact pressure at the femoral aperture.

Clinical Relevance

These data suggest that a tunnel drilled from OI may result in less graft pressure at the femoral aperture, which may prevent graft elongation and optimize graft survival.

Dial Test: Unrecognized Predictor of Anterior Cruciate Ligament Deficiency

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Purpose

To evaluate the effect of isolated anterior cruciate ligament (ACL) injury on tibial external rotation as measured by the dial test.

Methods

Twenty-seven consecutive patients scheduled to undergo a primary ACL reconstruction were prospectively evaluated. Physical examination and magnetic resonance imaging findings were analyzed to exclude multiligamentous injury. The dial test was performed with the patient under anesthesia with a goniometer on both the affected and unaffected knees at 30° and 90°. Intraoperatively, the arthroscopic posterolateral corner gaps before reconstruction and after reconstruction were documented. Postoperatively, the dial test was again performed on both knees at 30° and 90°.

Results

At 30°, there was a significantly larger dial test result in the affected knee before ACL reconstruction compared with after ACL reconstruction (27.6° vs 21.0°, $P < .0001$) and compared with the unaffected knee (27.6° vs 20.5°, $P < .0001$), but this difference was eliminated after reconstruction (21.0° vs 20.5°, $P = .5089$). At 90°, there was a significantly larger dial test result in the affected knee before ACL reconstruction compared with after ACL reconstruction (27.6° vs 21.1°, $P < .0001$) and compared with the unaffected knee (27.6° vs 20.9°, $P < .0001$), with this difference was eliminated after reconstruction (21.1° vs 20.9°, $P = .7831$).

Conclusions

Incompetence of the ACL accounts for nearly 7° of tibial external rotation found by the dial test. During examination of an injured knee, if the dial test is positive, an isolated ACL injury should not be excluded. Findings of the dial test should thus be interpreted with caution in the setting of ACL injury.

Level of Evidence

Level II, prospective comparative study.

In Vivo Analysis of Dynamic Graft Bending Angle in Anterior Cruciate Ligament–Reconstructed Knees During Downward Running and Level Walking: Comparison of Flexible and Rigid Drills for Transportal Technique

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Purpose

To determine the in vivo dynamic graft bending angle (GBA) in anterior cruciate ligament (ACL)–reconstructed knees, correlate the angle to tunnel positions and tunnel widening, and evaluate the effects of 2 femoral tunnel drilling techniques on GBA.

Methods

Patients with an isolated ACL injury undergoing reconstruction from 2011 to 2012 were included. Transportal techniques were used to create femoral tunnels. Tunnel locations were determined by 3-dimensional computed tomography. Tibiofemoral kinematics during treadmill walking and running were assessed by dynamic stereo x-ray analysis 6 months and 2 years postoperatively. The GBA was calculated from the 3-dimensional angle between the graft and femoral tunnel vectors on each motion frame. The cross-sectional areas of femoral tunnels were measured at 6 months and compared with the initial size to assess tunnel widening.

Results

A total of 54 patients were included. Use of flexible drills resulted in significantly higher GBAs during walking ($80.6^\circ \pm 7.8^\circ$, $P < .001$) and running ($80.5^\circ \pm 9.0^\circ$, $P = .025$) than rigid drills (walking, $67.5^\circ \pm 9.3^\circ$; running, $74.1^\circ \pm 9.6^\circ$). Their use led to greater tunnel widening of $113.9\% \pm 17.6\%$, as compared with $97.7\% \pm 17.5\%$ for rigid drills ($P = .003$). The femoral and tibial apertures were located in similar anatomic positions in both groups, but the femoral tunnel exits were located more anteriorly ($P < .001$) in the flexible drill group. A higher GBA was highly correlated with anterior location of femoral exits ($r = 0.63$, $P < .001$) and moderately correlated with greater tunnel widening ($r = 0.48$, $P < .001$).

Conclusions

High GBAs were identified during dynamic activities after anatomic ACL reconstruction with a transportal femoral tunnel drilling technique. The GBA was greater when flexible drills were used. The high bending angle resulted from the more anterior location of the femoral tunnel exits, and it correlated with early bone tunnel widening at 6 months. These results suggest that a high GBA may increase stress at the bone-graft interface and contribute to greater tunnel widening after anatomic ACL reconstruction, although the clinical impact should be further investigated.

Level of Evidence

Level III, retrospective comparative study.

ASJM

Hip Arthroscopy for Atypical Posterior Hip Pain: A Comparative Matched-Pair Analysis

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Background:

Femoroacetabular impingement (FAI) most commonly manifests as anterior groin pain. Patients occasionally have posterior pain but otherwise have clinical and radiographic evidence of FAI.

Purpose:

To compare outcomes of hip arthroscopy for FAI in patients with atypical posterior pain versus a matched group with the typical anterior pain presentation.

Study Design:

Cohort study; Level of evidence, 3.

Methods:

Patients undergoing primary hip arthroscopy for FAI were identified from a clinical repository between January 2012 and 2014. Of 503 patients during the study period, 31 (6.2%) had posterior hip or buttock pain reproduced with flexion, adduction, and internal rotation (FADDIR) and were classified as “atypical,” while those with anterior hip or groin pain were classified as “typical.” Atypical patients were matched in a 1:2 cohort to the typical group based on sex, age, and body mass index (BMI). Postoperative patient-reported outcomes included visual analog scale (VAS) for pain, modified Harris Hip Score (mHHS), and Hip Outcome Scores with Activities of Daily Living (HOS-ADL) and Sports-Specific (HOS-SS) subscales.

Results:

Of the 31 atypical patients, 28 (90.3%) were available for a minimum 2-year follow-up (mean \pm SD, 2.6 ± 0.6 years). These patients were matched with 56 typical patients. No differences were noted between typical and atypical cohorts in preoperative demographic or radiographic parameters. Postoperatively, both groups demonstrated significant improvements in mHHS (atypical 60.1 ± 12.4 to 78.8 ± 12.9 ; typical 60.0 ± 12.3 to 76.9 ± 13.6 ; $P < .001$), HOS-ADL (atypical 68.5 ± 17.0 to 88.6 ± 11.0 ; typical 69.2 ± 17.1 to 86.8 ± 14.7 ; $P < .001$), and HOS-SS (atypical 42.0 ± 25.5 to 71.0 ± 26.2 ; typical 44.4 ± 24.9 to 71.3 ± 27.3 ; $P < .001$). No differences were found in 2-year score improvements between the atypical and typical cohorts (mHHS 18.7 ± 13.4 vs 16.9 ± 13.1 , $P = .48$; HOS-ADL 20.1 ± 16.8 vs 17.6 ± 14.6 , $P = .19$; HOS-SS 29.0 ± 30.2 vs 26.9 ± 27.3 , $P = .93$). Also, no significant differences were found in VAS pain improvement (5.0 ± 3.2 vs 5.6 ± 2.8 , $P = .56$) or postoperative satisfaction (79.5 ± 5.5 vs 77.5 ± 4.1 , $P = .78$).

Conclusion

Atypical posterior hip pain is an uncommon presentation of FAI. Patients demonstrate similar significant improvements after hip arthroscopy in outcome scores, postoperative pain, and satisfaction compared with patients who have classic anterior groin pain.

[BACK](#)

Risk Factors for Revision Surgery After Superior Labral Anterior-Posterior Repair: A National Perspective

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Background:

Data regarding risk factors for revision surgery after superior labral anterior-posterior (SLAP) repair are limited to institutional series.

Purpose:

To define risk factors for revision surgery after SLAP repair among patients in a large national database.

Study Design:

Case-control study; Level of evidence, 3.

Methods:

A national insurance database was queried for patients undergoing arthroscopic SLAP repair (Current Procedural Terminology [CPT] code 29807) for the diagnosis of a SLAP tear. Patients without a CPT modifier for laterality were excluded. Revision surgery was defined as (1) subsequent ipsilateral SLAP repair (CPT 29807), (2) ipsilateral arthroscopic debridement for the diagnosis of a SLAP tear (CPT 29822 or 29823, with diagnosis code 840.7), (3) subsequent ipsilateral arthroscopic biceps tenodesis (CPT 29828), (4) subsequent ipsilateral open biceps tenodesis (CPT 23430), and (5) subsequent biceps tenotomy (CPT 23405). Multivariable binomial logistic regression analysis was performed to identify risk factors for revision surgery after SLAP repair, including patient demographics/comorbidities, concomitant diagnoses, and concomitant procedures performed. Odds ratios (ORs), 95% CIs, and P values were calculated. The estimated financial impact of revision surgery was also calculated.

Results:

There were 4751 patients who met inclusion and exclusion criteria. Overall, 121 patients (2.5%) required revision surgery after SLAP repair. Regression analysis identified numerous risk factors for revision surgery, including age >40 years (OR, 1.5; 95% CI, 1.2-1.8; P = .045), female sex (OR, 1.5; 95% CI, 1.3-1.8; P = .010), obesity (OR, 1.8; 95% CI, 1.5-2.2; P = .001), smoking (OR, 2.0; 95% CI, 1.6-2.4; P < .0001), and diagnosis of biceps tendinitis (OR, 3.5; 95% CI, 3.0-4.2; P < .0001) or long head of the biceps tearing (OR, 5.1; 95% CI, 4.1-6.3; P < .0001) at or before the time of surgery. Concomitant rotator cuff repair and distal clavicle excision were not significant risk factors for revision surgery. The cost of revision surgery averaged almost \$9000.

Conclusion:

Risk factors for revision surgery after SLAP repair include age >40 years, female sex, obesity, smoking, and diagnosis of biceps tendinitis or long head of the biceps tearing. The diagnosis of biceps tendinitis (OR, 3.5) or long head of the biceps tearing (OR, 5.1) at or before the time of surgery was an especially significant risk factor for revision surgery. The high cost of revision surgery highlights the importance of appropriate indications to avoid the need for subsequent procedures.

Rehabilitation Protocols After Isolated Meniscal Repair: A Systematic Review

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Background:

Current postoperative rehabilitation protocols after isolated meniscal repair vary widely. No consensus exists with regard to the optimal amount of weightbearing, range of motion, or speed at which the patient progresses through the rehabilitation phases. Confounding factors including concomitant ligamentous or cartilaginous injuries have made studying isolated meniscal tears problematic.

Purpose:

To systematically review and evaluate the influence of range of motion and weightbearing status during the postoperative rehabilitation period after isolated meniscal repair on clinical efficacy and outcome scores.

Study Design:

Systematic review.

Methods:

A search of PubMed, Scopus, and Cochrane Central Register of Controlled Trials was conducted. The selection criteria for inclusion were English-language in vivo clinical studies reporting on isolated meniscal repairs utilizing an arthroscopically assisted technique that outlined the postoperative rehabilitation protocol and included at least a 2-year follow-up. Titles, abstracts, and articles were reviewed, and data concerning patient demographics, tear type, repair technique, postoperative protocol details, clinical failures, and outcome scores were extracted from the eligible studies. Rehabilitation protocols were divided into “accelerated,” “motion restricted,” “weight restricted,” and “dual restricted” according to the limitations placed on the treatment groups.

Results:

Fifteen studies, containing 17 different treatment groups, met the inclusion criteria. The 2 accelerated groups, 2 motion-restricted groups, 4 weight-restricted groups, and 9 dual-restricted groups showed similar efficacy in terms of clinical success and postoperative outcome scores. Early range of motion and weightbearing status showed no influence over clinical outcomes. Of the 17 groups, 13 reported a greater than 70% clinical success rate with significant variation in the tear type, fixation technique, and postoperative restrictions.

Conclusion:

Early range of motion and immediate postoperative weightbearing appear to have no detrimental effect on the chances for clinical success after isolated meniscal repair. Significant variation exists between postoperative protocols, with no current consensus on the ideal parameters for weightbearing and range of motion. Studies reporting outcomes regarding isolated meniscal repair are limited. Future research should include determining the ideal combination of weightbearing and range of motion for specific tear types.

Anterolateral Ligament Reconstruction Is Associated With Significantly Reduced ACL Graft Rupture Rates at a Minimum Follow-up of 2 Years: A Prospective Comparative Study of 502 Patients From the SANTI Study Group

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Background:

Graft failure and low rates of return to sport are major concerns after anterior cruciate ligament (ACL) reconstruction, particularly in a population at risk.

Purpose:

To evaluate the association between reconstruction techniques and subsequent graft rupture and return-to-sport rates in patients aged 16 to 30 years participating in pivoting sports.

Study Design:

Cohort study; Level of evidence, 2.

Methods:

A prospective study of patients undergoing primary ACL reconstruction with a bone–patellar tendon–bone (B-PT-B) graft, quadrupled hamstring tendon (4HT) graft, or hamstring tendon graft combined with anterolateral ligament reconstruction (HT+ALL) was conducted by the Scientific ACL NeTwork International (SANTI) Study Group. Survivorship data from Kaplan-Meier analysis were analyzed in multivariate Cox regression models to identify the prognosticators of graft ruptures and return to sport.

Results:

Five hundred two patients (mean age, 22.4 ± 4.0 years) with a mean follow-up of 38.4 ± 8.5 months (range, 24-54 months) were included. There were 105 B-PT-B, 176 4HT, and 221 HT+ALL grafts. The mean postoperative scores at latest follow-up were the following: Lysholm: 92.4 ± 8.6, Tegner: 7.4 ± 2.1, and subjective International Knee Documentation Committee (IKDC): 86.8 ± 10.5 for B-PT-B grafts; Lysholm: 91.3 ± 9.9, Tegner: 6.6 ± 1.8, and subjective IKDC: 85.4 ± 10.4 for 4HT grafts; and Lysholm: 91.9 ± 10.2, Tegner: 7.0 ± 2.0, and subjective IKDC: 81.8 ± 13.1 for HT+ALL grafts. The mean side-to-side laxity was 0.6 ± 0.9 mm for B-PT-B grafts, 0.6 ± 1.0 mm for 4HT grafts, and 0.5 ± 0.8 mm for HT+ALL grafts. At a mean follow-up of 38.4 months, the graft rupture rates were 10.77% (range, 6.60%-17.32%) for 4HT grafts, 16.77% (range, 9.99%-27.40%) for B-PT-B grafts, and 4.13% (range, 2.17%-7.80%) for HT+ALL grafts. The rate of graft failure with HT+ALL grafts was 2.5 times less than with B-PT-B grafts (hazard ratio [HR], 0.393; 95% CI, 0.153-0.953) and 3.1 times less than with 4HT grafts (HR, 0.327; 95% CI, 0.130-0.758). There was no significant difference in the graft failure rate between 4HT and B-PT-B grafts (HR, 1.204; 95% CI, 0.555-2.663). Other prognosticators of graft failure included age ≤25 years (P = .012) and a preoperative side-to-side laxity >7 mm (P = .018). The HT+ALL graft was associated with higher odds of returning to preinjury levels of sport than the 4HT graft (odds ratio [OR], 1.938; 95% CI, 1.174-3.224) but not compared with the B-PT-B graft (OR, 1.460; 95% CI, 0.813-2.613).

Conclusion:

[BACK](#)

In a high-risk population of young patients participating in pivoting sports, the rate of graft failure with HT+ALL grafts was 2.5 times less than with B-PT-B grafts and 3.1 times less than with 4HT grafts. The HT+ALL graft is also associated with greater odds of returning to preinjury levels of sport when compared with the 4HT graft.

Anatomic Reconstruction of the Anterior Cruciate Ligament of the Knee With or Without Reconstruction of the Anterolateral Ligament: A Randomized Clinical Trial

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Background:

Rotational instability of the knee remains an issue after anterior cruciate ligament (ACL) reconstruction.

Hypothesis/Purpose:

The purpose was to evaluate the subjective and objective outcomes of combined reconstruction of the ACL and anterolateral ligament (ALL) of the knee. The hypothesis was that favorable outcomes can be achieved with this surgical procedure compared with isolated anatomic reconstruction of the ACL.

Study Design:

Randomized controlled trial; Level of evidence, 2.

Methods:

One hundred ten patients with a unilateral ACL injury and high-grade pivot shift were randomly assigned to undergo either combined ACL and ALL reconstruction (group A) or isolated ACL reconstruction (group B). Preoperative and postoperative evaluations of the patients were conducted by obtaining history details, recording physical examination findings, measuring knee laxity using the KT-1000 arthrometer, and using validated outcome scores for the knee. $P < .05$ was considered as the cut-off level of statistical significance. The Fisher exact and Mann-Whitney U tests were used to assess statistical significance.

Results:

At a mean follow-up of 27 months, 53 and 50 patients in groups A and B, respectively, were available for analysis. No statistically different outcomes were found between the 2 groups except for the KT-1000 arthrometer values. The median KT-1000 arthrometer result for combined ACL and ALL reconstruction was 1.3 mm, while the median result for isolated ACL reconstruction was 1.8 mm ($P < .001$). None of the patients ($n = 0$; 0.0%) who underwent combined ACL and ALL reconstruction had anterior translation of greater than 5 mm at maximum pulling strength compared with their normal knees at final follow-up. On the other hand, 3 (6.0%) patients who underwent isolated ACL reconstruction had anterior translation of more than 5 mm. No serious complications were found in both groups.

Conclusion:

Combined ACL and ALL reconstruction was found to be effective in improving subjective and objective outcomes. Nevertheless, these findings were not significantly superior to isolated ACL reconstruction except for the instrumented knee laxity testing results. This might indicate that ALL reconstruction should not be performed routinely for patients undergoing ACL reconstruction.

Factors That Predict Failure in Anatomic Single-Bundle Anterior Cruciate Ligament Reconstruction

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Background:

Anatomic graft placement in anterior cruciate ligament (ACL) reconstruction has become the preferred technique for many surgeons. The predictive factors for graft failure in anatomic single-bundle ACL reconstruction are relatively unknown.

Purpose:

To determine the risk factors for graft failure and the relative importance of those factors in anatomic single-bundle ACL reconstruction.

Study Design:

Case-control study; Level of evidence, 3.

Methods:

All primary anatomic ACL reconstructions undertaken at a single institution over a 2-year period were evaluated for subjective and objective measures of graft failure. Risk factors evaluated included time since ACL rupture, age, sex, body mass index, intact or deficient medial and lateral meniscus, meniscal repair, hamstring graft size, and femoral and tibial tunnel position as assessed by 3D computed tomography (CT) scan. The significant factors predicting failure and the relative importance of those factors were determined.

Results:

At a median follow-up of 26 months, 123 patients were available for analysis. Ninety-seven patients underwent postoperative 3D CT for tunnel positions, including all 20 cases with graft failure. The significant predictors of graft failure were medial meniscal deficiency (hazard ratio [HR] 15.1; 95% CI, 4.7-48.5; $P < .001$), lateral meniscal deficiency (HR 9.9; 95% CI, 3-33; $P < .001$), shallow nonanatomic femoral tunnel positioning (HR 4.3; 95% CI, 1.6-11.6; $P = .004$), and younger patient age (HR 0.9; 95% CI, 0.9-1; $P = .008$).

Conclusion:

Meniscal deficiency is the most significant factor to predict graft failure in single-bundle anatomic ACL reconstruction. Shallow nonanatomic femoral tunnel positioning and younger patient age are additional risk factors for failure, but their relative importance is less.

Arthroscopic Hip Surgery in the Elite Athlete: Comparison of Female and Male Competitive Athletes

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Background:

Few studies have published the results of hip arthroscopic surgery in elite athletes and none studying a significant number of elite female athletes.

Purpose:

(1) To compare sex-based differences in the ability to return to prior competitive sports activity after arthroscopic hip surgery. (2) To compare sex-based differences in the type of sports activity, diagnosis, and treatment in athletes requiring hip arthroscopic surgery.

Study Design:

Cohort study; Level of evidence, 3.

Methods:

Data on all elite athletes who underwent primary hip arthroscopic surgery between 2007 and 2014 were included. Athletes with a Hip Sports Activity Scale (HSAS) score of over 6 were identified. The preoperative evaluation included a medical history, history of sports activity, and hip-specific outcome scores (Modified Harris Hip Score [MHHS] and International Hip Outcome Tool-33 [iHOT-33]). Surgical findings and time to return to competitive sports were documented.

Results:

Of 547 hips in 484 consecutive patients, 98 elite athletes (49 female) with a mean follow-up of 18.9 ± 12.8 months were identified. Eighty patients desired to return to their original competitive activity: 38 were female (42 hips; mean age, 21.5 ± 3.9 years), and 42 were male (54 hips; mean age, 20.5 ± 1.9 years). Moreover, 84.2% of female athletes and 83.3% of male athletes were able to return to the same level of competition at a mean of 8.3 ± 3.0 and 8.8 ± 2.9 months, respectively. Significant improvements between preoperative and postoperative outcome scores were seen in both groups (all $P < .0001$). Female athletes had more pincer femoroacetabular impingement (FAI) ($P = .0004$) and instability ($P < .0001$). Conversely, male athletes were diagnosed more commonly with combined FAI ($P < .0001$), demonstrated greater acetabular cartilage damage ($P = .0004$), and required microfracture more often ($P = .0014$). Female athletes competed more frequently in flexibility (4/38, 11%; $P = .047$) and endurance (9/38, 24%) sports, while male athletes participated in cutting (14/42, 33%), contact (6/42, 14%), and asymmetric (13/42, 31%) sports more often. Patients who returned to their baseline level of competition had a shorter duration of symptoms preoperatively ($P = .001$). Microfracture status did not affect the ability to return to sports.

Conclusion:

Female and male elite athletes were able to return to competitive sports activity at the same or higher level after hip arthroscopic surgery at a similar rate, although their performance in sports was not measured. Distinct differences in the diagnosis, treatment, and type of sports activity between sexes were seen. The duration of symptoms negatively correlated with outcomes. Microfracture did not affect the return to sports.

Knee Biomechanics During Jogging After Arthroscopic Partial Meniscectomy: A Longitudinal Study

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Background:

Altered knee joint biomechanics is thought to play a role in the pathogenesis of knee osteoarthritis and has been reported in patients after arthroscopic partial meniscectomy (APM) while performing various activities. Longitudinally, understanding knee joint biomechanics during jogging may assist future studies to assess the implications of jogging on knee joint health in this population.

Purpose:

To investigate knee joint biomechanics during jogging in patients 3 months after APM and a healthy control group at baseline and 2 years later at follow-up.

Study Design:

Controlled laboratory study.

Methods:

Seventy-eight patients who underwent medial APM and 38 healthy controls underwent a 3-dimensional motion analysis during barefoot overground jogging at baseline. Sixty-four patients who underwent APM and 23 controls returned at follow-up. External peak moments (flexion and adduction) and the peak knee flexion angle during stance were evaluated for the APM leg, non-APM leg (nonoperated leg), and control leg.

Results:

At baseline, the peak knee flexion angle was 1.4° lower in the APM leg compared with the non-APM leg ($P = .03$). No differences were found between the moments in the APM leg compared with the control leg (all $P > .05$). However, the normalized peak knee adduction moment was 35% higher in the non-APM leg compared with the control leg ($P = .008$). In the non-APM leg, the normalized peak knee adduction and flexion moments were higher compared with the APM leg by 16% and 10%, respectively, at baseline ($P \leq .004$). Despite the increase in the peak knee flexion moment in the APM leg compared with the non-APM leg ($P < .001$), there were no differences in the peak knee flexion moment or any other parameter assessed at 2-year follow-up between the legs ($P > .05$).

Conclusion:

Comparing the APM leg and control leg, no differences in knee joint biomechanics during jogging for the variables assessed were observed. Higher knee moments in the non-APM leg may have clinical implications for the noninvolved leg. Kinematic differences were small (~1.4°) and therefore of questionable clinical relevance.

Clinical Relevance:

These results may facilitate future clinical research regarding the implications of jogging on knee joint health in middle-aged, overweight patients after APM.

[BACK](#)

Outcomes of Hip Arthroscopy in the Older Adult: A Systematic Review of the Literature

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Background:

The indications for hip preservation surgery have expanded to include treatment of hip pathology in older adults. While several studies have examined the efficacy of hip arthroscopy in the setting of osteoarthritis, there has been no review of outcomes in older adults.

Purpose:

To review the outcomes of hip arthroscopy in older adults and identify factors associated with treatment failures.

Study Design:

Systematic review.

Methods:

PubMed, EMBASE, and the Cochrane Library were searched through March 2016 for studies reporting outcomes of primary hip arthroscopy in patients older than 40 years. Inclusion in the review was based on age, patient-reported outcome (PRO) measures, and duration of follow-up. Two authors screened the results and extracted data for use in this review. Standardized mean difference was calculated to estimate effect size for PRO scores within studies.

Results:

Eight studies with 401 total patients undergoing hip arthroscopy for femoroacetabular impingement (FAI) or labral tears were included in this review. Seven of the 8 studies reported favorable PRO scores and significant postoperative improvement with moderate to large effect size. The included studies demonstrated a trend toward higher effect sizes with an increasing percentage of labral repair compared to isolated labral debridement. The complication rate was comparable to that of previous reports involving younger patients; however, the overall reoperation rate was 20.8%. Conversion to hip arthroplasty ranged from 0% to 30%, with an overall conversion rate of 18.5% at a mean time of 17.5 months following arthroscopy. The most common risk factors for conversion to arthroplasty were low preoperative PRO scores and advanced arthritis.

Conclusion:

Hip arthroscopy appears to be a safe and efficacious treatment for labral tears and FAI in older patients who do not have significant underlying degenerative changes. However, in this population, there is a significant proportion of patients who eventually require hip arthroplasty. Outcomes may be affected by type of treatment (ie, labral debridement vs repair). Additional high-quality studies are needed to understand how these factors affect outcomes.

JBJS

Interrater and Intrarater Reliability of Arthroscopic Measurements of Articular Cartilage Defects in the Knee

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http://journals.lww.com/jbjsjournal/Abstract/2017/06210/Interrater_and_Intrarater_Reliability_of.1.aspx

Background:

Cartilage lesions of the knee are difficult to treat. Lesion size is a critical factor in treatment algorithms, and the accurate, reproducible sizing of lesions is important. In this study, we evaluated the interrater and intrarater reliability of, and correlations in relation to, various arthroscopic sizing techniques.

Methods:

Five lesions were created in each of 10 cadaveric knees (International Cartilage Repair Society grade 3C). Three orthopaedic surgeons used 4 techniques (visualization and use of a 3-mm probe, a simple metal ruler, and a sliding metallic ruler tool) to estimate lesion size. Repeated-measures data were analyzed using a mixed-effect linear model. The differences between observed and gold-standard (plastic mold) values were used as the response. Intraclass and interclass correlation coefficient (ICC) values for intrarater and interrater reliability were computed, as were overall correlation coefficients between measurements and gold standards.

Results:

The mean lesion size was 2.37 cm² (range, 0.36 to 6.02 cm²). Rater, lesion location and size, and measurement method all affected the cartilage defect measurements. Surgeons underestimated lesion size, and measurements of larger lesions had a higher percentage of error compared with those of smaller lesions. When compared with plastic molds of lesions, 60.5% of surgeon measurements underestimated lesion size. Overall, the correlation between measurements and gold standards was strongest for the simple metal ruler method and weakest for the visualization method.

Conclusions:

Several factors may influence arthroscopic estimation of cartilage lesion size: the lesion location, measurement tool, surgeon, and defect size itself. The intrarater and interrater reliability was moderate to good using a 3-mm probe, sliding metallic ruler tool, or simple metal ruler and was fair to moderate using visualization only.

Clinical Relevance:

There is a need for more accurate methods of determining the size of articular cartilage lesions.

Survivorship and Outcomes 10 Years Following Hip Arthroscopy for Femoroacetabular Impingement: Labral Debridement Compared with Labral Repair

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http://journals.lww.com/jbjsjournal/Abstract/2017/06210/Survivorship_and_Outcomes_10_Years_Following_Hip.3.aspx

Background:

Studies have demonstrated hip arthroscopy to be an effective treatment for femoroacetabular impingement (FAI) with associated labral tears. The purposes of this study were to report 10-year outcomes and hip survival following hip arthroscopy for FAI and to compare labral debridement with labral repair.

Methods:

Prospectively collected data on patients followed for a minimum of 10 years after hip arthroscopy for FAI with either labral debridement or labral repair performed by a single surgeon were retrospectively analyzed. The primary patient-reported outcome measure was the Hip Outcome Score (HOS) Activities of Daily Living (ADL) subscale. Mann-Whitney U tests were used to compare outcomes between groups, and Wilcoxon signed-rank tests were used to compare preoperative with postoperative scores. Survival analysis was performed using a multivariate Cox proportional hazards model.

Results:

Seventy-nine patients who underwent labral repair and 75 who underwent debridement were included in the study, and 94% (145) were followed for ≥ 10 years. Fifty patients (34%) underwent total hip arthroplasty (THA) within 10 years following the arthroscopy. Older patients, hips with >2 mm of joint space preoperatively, and patients requiring acetabular microfracture had significantly higher prevalences of THA. The multivariate Cox proportional hazards model showed that increased age (hazard ratio [HR] for 31 years to 51 years = 3.06, 95% confidence interval [CI] = 1.69 to 5.56, $p < 0.001$), a joint space of ≤ 2 mm (HR = 4.26, 95% CI = 1.98 to 9.21, $p < 0.001$), and acetabular microfracture (HR = 2.86, 95% CI = 1.07 to 7.62, $p = 0.036$) were independently associated with an increased hazard rate for THA. When the analysis was adjusted for these factors, there was no significant difference in the HR between treatment groups (HR = 1.10, 95% CI = 0.59 to 2.05, $p = 0.762$). There was also no significant difference in postoperative outcome scores between groups. The debridement group demonstrated a significant increase, between the preoperative and postoperative evaluations, in the HOS-ADL score (from 71 to 96; $p < 0.001$), HOS-Sport score (from 42 to 89; $p < 0.001$), modified Harris hip score (mHHS) (from 62 to 90; $p < 0.001$), and Short Form-12 physical component summary (SF-12 PCS) score (from 43 to 56; $p < 0.001$). The repair group also demonstrated a significant increase in the HOS-ADL score (from 71 to 96; $p < 0.001$), HOS-Sport score (from 47 to 87; $p < 0.001$), mHHS score (from 65 to 85; $p < 0.001$), and SF-12 PCS score (from 41 to 56; $p < 0.001$). The median patient satisfaction score was 10 (very satisfied) in both groups.

Conclusions:

Hip arthroscopy for FAI with labral debridement or repair resulted in significant improvements in the patient-reported outcomes and satisfaction of patients who did not eventually require THA. Higher rates of conversion to THA were seen in older patients, patients treated with acetabular microfracture, and hips with ≤ 2 mm of joint space preoperatively, regardless of labral treatment.

Level of Evidence:

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

[BACK](#)

BJJ

Does the type of graft affect the outcome of revision anterior cruciate ligament reconstruction? A meta-analysis of 32 studies

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Bone Joint J 2017;99-B:714–23.

<http://bjj.boneandjoint.org.uk/content/99-B/6/714>

Aims

Our aim was to perform a meta-analysis of the outcomes of revision anterior cruciate ligament (ACL) reconstruction, comparing the use of different types of graft.

Materials and Methods

A search was performed of Medline and Pubmed using the terms “Anterior Cruciate Ligament” and “ACL” combined with “revision”, “re-operation” and “failure”. Only studies that reported the outcome at a minimum follow-up of two years were included. Two authors reviewed the papers, and outcomes were subdivided into autograft and allograft. Autograft was subdivided into hamstring (HS) and bone-patellar tendon-bone (BPTB). Subjective and objective outcome measures were analysed and odds ratios with confidence intervals were calculated.

Results

A total of 32 studies met the inclusion criteria. Five studies used HS autografts, eight reported using BPTB autografts, two used quadriceps tendon autografts and eight used various types. Seven studies reported using allografts, while the two remaining used both BPTB autografts and allografts. Overall, 1192 patients with a mean age of 28.7 years (22.5 to 39) and a mean follow-up of 5.4 years (2.0 to 9.6) were treated with autografts, while 269 patients with a mean age of 28.4 years (25 to 34.6) and a mean follow-up of 4.0 years (2.3 to 6.0) were treated with allografts. Regarding allografts, irradiation with 2.5 mrad was used in two studies while the graft was not irradiated in the seven remaining studies. Reconstructions following the use of autografts had better outcomes than those using allograft with respect to laxity, measured by KT-1000/2000 (MEDmetric Corporation) and the rates of complications and re-operations. Those following the use of allografts had better mean Lysholm and Tegner activity scores compared with autografts. If irradiated allografts were excluded from the analysis, outcomes no longer differed between the use of autografts and allografts. Comparing the types of autograft, all outcomes were similar except for HS grafts which had better International Knee Documentation Committee scores compared with BPTB grafts.

Conclusion

Autografts had better outcomes than allografts in revision ACL reconstruction, with lower post-operative laxity and rates of complications and re-operations. However, after excluding irradiated allografts, outcomes were similar between autografts and allografts. Overall, the choice of graft at revision ACL reconstruction should be on an individual basis considering, for instance, the preferred technique of the surgeon, whether a combined reconstruction is required, the type of graft that was previously used, whether the tunnels are enlarged and the availability of allograft.

Miscellaneous

Arthroscopy

All-Suture Anchors: Biomechanical Analysis of Pullout Strength, Displacement, and Failure Mode

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Purpose

To evaluate the biomechanical and design characteristics of all-suture anchors.

Methods

All-suture anchors were tested in fresh porcine cortical bone and biphasic polyurethane foam blocks by cyclic loading (10-100 N for 200 cycles), followed by destructive testing parallel to the insertion axis at 12.5 mm/s. Endpoints included ultimate failure load, displacement at 100 and 200 cycles, stiffness, and failure mode. Anchors tested included JuggerKnot (1.4, 1.5, and 2.8), Iconix (1, 2, and 3), Y-knot (1.3, 1.8, and 2.8), Q-Fix (1.8 and 2.8), and Draw Tight (1.8 and 3.2).

Results

The mean ultimate failure strength of the triple-loaded anchors (564 ± 42 N) was significantly greater than the mean ultimate failure strength of the double-loaded anchors (465 ± 33 N) ($P = .017$), and the double-loaded anchors were stronger than the single-loaded anchors (256 ± 35 N) ($P < .0001$). No difference was found between the results in porcine bone and biphasic polyurethane foam. None of these anchors demonstrated 5 mm or 10 mm of displacement during cyclic loading. The Y-Knot demonstrated greater displacement than the JuggerKnot and Q-Fix ($P = .025$) but not the Iconix and Draw Tight ($P > .05$). The most common failure mode varied and was suture breaking for the Q-Fix (97%), JuggerKnot (81%), and Iconix anchors (58%), anchor pullout with the Draw Tight (76%), whereas the Y-Knot was 50% suture breaking and 50% anchor pullout.

Conclusions

The ultimate failure load of an all-suture anchor is correlated directly with its number of sutures. With cyclic loading, the Y-Knot demonstrated greater displacement than the JuggerKnot and Q-Fix but not the Iconix and Draw Tight. JuggerKnot (81%) and Q-Fix (97%) anchors failed by suture breaking, whereas the Draw Tight anchor failed by anchor pullout (76%).

Clinical Relevance

All-suture anchors vary in strength and performance, and these factors may influence clinical success. Biphasic polyurethane foam is a validated model for suture anchor testing.

Can Surgical Trainees Achieve Arthroscopic Competence at the End of Training Programs? A Cross-sectional Study Highlighting the Impact of Working Time Directives

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Purpose

To provide training guidance on procedure numbers by assessing how the number of previously performed arthroscopic procedures relate to both competent and expert performance in simulated arthroscopic shoulder tasks.

Methods

A cross-sectional study that assessed simulated shoulder arthroscopic performance was undertaken. A total of 45 participants of varying experience performed 2 validated tasks: a simple diagnostic task and a more complex Bankart labral repair task. All participants provided logbook numbers for previously performed arthroscopies. Performance was assessed with the Global Rating Scale and motion analysis. Receiver operating characteristic curve analyses were conducted to identify optimum cut points for task proficiency at both “competent” and “expert” levels.

Results

Increasing surgical experience resulted in significantly better performance for both tasks as assessed by Global Rating Scale or motion analysis ($P < .0001$). Receiver operating characteristic curve analyses demonstrated 52 previous arthroscopies were needed to perform to a competent level at the diagnostic task and 248 to be competent at the complex task. To perform at an expert level, 290 and 476 previous arthroscopies, respectively, were needed.

Conclusions

This study provides quantified guidance for arthroscopic training and highlights the positive relationship between arthroscopic case load and arthroscopic competency. We have estimated that the number of arthroscopies required to achieve competency in a basic arthroscopic task exceed those recommended in some countries. These estimates provide useful guidance to those responsible for training program.

Clinical Relevance

The numbers to achieve competent arthroscopic performance in the assessed simulated tasks exceed what is recommended and what is possible during surgical training programs in some countries.