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BACK

Upper extremity

Arthroscopy, Volume 35, Issue 1

Arthroscopic Coracoclavicular Fixation Using Multiple Low-Profile Devices in Acute Acromioclavicular Joint Dislocation

Seung-Jin Lee, M.D., Yon-Sik Yoo, M.D., Ph.D., Yoon-Sang Kim, Ph.D., Seong-Wook Jang, M.S., Jeehyoung Kim, M.D., Ph.D., Sung-Jae Kim, M.D., Byung-Su Kim, M.D., Koo-Hyun Jung, M.D., Ankit Varshney, M.S.

Arthroscopy, Volume 35, Issue 1, Received: August 20, 2017; Accepted: July 5, 2018

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Purpose
To introduce an arthroscopically assisted coracoclavicular (CC) fixation technique using multiple low-profile devices to evaluate the clinical and radiologic outcomes in patients with acute high-grade acromioclavicular (AC) joint dislocation.

Methods
Between July 2014 and September 2015, cases of AC joint dislocation that were treated with arthroscopic CC fixation using multiple low-profile devices with a minimum follow-up of 24 months were included. We measured the vertical coracoclavicular distance (CCD) on the anteroposterior view and the horizontal acromioclavicular distance on 3-dimensional computed tomography images to evaluate the changes in radiologic outcomes before and after surgery. We compared final radiologic outcomes between initial AC reduction groups based on hierarchical clustering. Clinical outcomes were evaluated using the Constant-Murley score.

Results
We enrolled 27 patients in total, and the mean follow-up period was 27.2 months. The mean CCD of the injured shoulder was 13.68 ± 3.98 mm preoperatively and decreased to 5.72 ± 1.68 mm immediately postoperatively but increased to 7.32 ± 2.29 mm at last follow-up ($P = .07$). Horizontal displacement of the distal clavicle was 1.1 ± 1.0 mm immediately postoperatively but decreased to 0.9 ± 0.6 mm at last follow-up ($P < .05$). In particular, in the 2 groups that were determined using the hierarchical cluster analysis, patients with excellent recovery of the initial CCD (20 patients) showed less of an increase in the CCD at last follow-up than did those in the other group (7 patients) ($P < .001$). The Constant-Murley score was 93.5 ± 2.7 points on the injured side at last follow-up ($P = .074$).

Conclusions
Our CC fixation technique with multiple low-profile devices exhibited satisfactory clinical and radiologic outcomes. In particular, ensuring good initial recovery of the CCD and the precise placement and location of the AC joints was important in maintaining the proper AC position at the final follow-up.

Level of Evidence
Level IV, case series.

BACK

Superior Capsular Reconstruction Reverses Profound Pseudoparalysis in Patients With Irreparable Rotator Cuff Tears and Minimal or No Glenohumeral Arthritis

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Arthroscopy, Volume 35, Issue 1, Received: January 3, 2018; Accepted: July 9, 2018

https://doi.org/10.1016/j.arthro.2018.07.023

Purpose
The purpose of the study was to investigate the rate and magnitude of return of active forward elevation (aFE) of the arm for patients with severe preoperative elevation dysfunction (less than 45° of aFE and termed profound pseudoparalysis) and massive, irreparable (or partially reparable) rotator cuff tears without arthritis treated with arthroscopic superior capsular reconstruction (SCR).

Methods
The period for this retrospective study was October 2014 to October 2016. Inclusion criteria included patients treated arthroscopically for an incompletely reparable massive rotator cuff tear (2 tendons fully torn or tear dimension > 5 cm), preoperative aFE of less than 45° (profound pseudoparalysis) with full passive elevation, an intact or reparable subscapularis tendon, radiographic classification Hamada 0-3, and 12-month clinical follow-up. The primary outcome measure was aFE (degrees) at 1 year postoperative. Secondary outcomes included visual analog scale pain rating (0-10), American Shoulder and Elbow Surgeons score, subjective shoulder value, and active external rotation. Graft integrity and Goutallier grade of supraspinatus and infraspinatus at 1 year postoperative were evaluated by magnetic resonance imaging.

Results
Ten patients met the inclusion criteria. Nine of 10 patients (90%) regained active overhead use of the arm after SCR with preoperative aFE (mean ± standard error of the mean [95% confidence interval (CI)]) 27° ± 2° [95% CI, 24°-30°] improving to postoperative aFE 159° ± 15° [95% CI, 130°-187°; P < .0001]. All secondary outcome measures were also improved at 1 year postoperative (visual analog scale, 4.6 ± 0.8 to 0.5 ± 0.2; P = .001; American Shoulder and Elbow Surgeons, 52 ± 6 to 89 ± 3; P = .0002; subjective shoulder value, 36 ± 3 to 91 ± 1; P < .0001; active external rotation, 24° ± 7° to 43° ± 8°; P = .002), and 7 of 10 SCR grafts were fully healed by MRI. No complications or reoperations occurred.

Conclusions
Profound pseudoparalysis of the shoulder (active elevation less than 45°) in massive, irreparable rotator cuff tears without arthritis was reversed in 90% of patients after arthroscopic SCR. Reverse shoulder replacement has been proposed to be the only reliable surgical option in this patient group, but SCR appears to be a valid joint-preserving option for improving function with a low rate of complications.

Level of Evidence
Level IV, therapeutic case series.

BACK

Return to Sports After in Situ Arthroscopic Repair of Partial Rotator Cuff Tears

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Arthroscopy, Volume 35, Issue 1, Received: March 9, 2018; Accepted: July 13, 2018

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Purpose
To evaluate return to sport, clinical outcomes, and complications in a series of athletes with painful partial-thickness rotator cuff tears treated with the arthroscopic in situ repair with a minimum 2-year follow-up.

Methods
Retrospective case series. Seventy-two patients who had undergone an arthroscopic in situ repair for partial-thickness rotator cuff tears were evaluated. We assessed return to sport and the level achieved after surgery. Clinical assessment consisted of glenohumeral range of motion measurement and the American Shoulder and Elbow Surgeons score. Pain was recorded using a visual analog scale. Postoperative complications were also assessed.

Results
The mean age was 42.2 years (range, 21-66 years), and the mean follow-up was 54 months (range, 24-113 months). Sixty-one patients (87%) were able to return to sports. Fifty-six patients (80%) returned to the same level they had previous to the injury. The mean interval between surgery and return to competition was 5.6 months. The final functional outcomes were related neither to the type of sports nor to the level of competition before the injury. All active range of motion parameters improved significantly ($P < .0001$). The American Shoulder and Elbow Surgeons score improved from 43.3 to 88.1, and the visual analog scale scores improved from 6.1 to 1.2 ($P < .0001$). No significant difference regarding return to sports or functional outcomes was found between articular and bursal-sided tears. Only 5 patients developed a postoperative adhesive capsulitis that responded to physical therapy.

Conclusions
In patients with partial-thickness rotator cuff tears, arthroscopic in situ repair resulted in excellent functional outcomes, with most of the patients returning to sport and at the same level they had before injury. The results were equally favorable in articular and bursal tears.

Level of Evidence
Level IV, therapeutic case series.

BACK

Factors Affecting the Cost and Profitability of Arthroscopic Rotator Cuff Repair

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Arthroscopy, Volume 35, Issue 1, Received: December 19, 2017; Accepted: July 20, 2018

https://doi.org/10.1016/j.arthro.2018.07.034

Purpose
To examine the cost metrics and profitability of rotator cuff repairs (RCRs) in a large health care system.

Methods
A retrospective study was performed using value analysis team data from 2 hospitals within a large metropolitan health system from 2010 to 2014. Cost and profit metrics were collected and compared against surgeon volume, surgeon subspecialty training, implant costs, Current Procedural Terminology (CPT) coding, length of stay, and hospital site.

Results
A total of 5,899 RCRs were identified with a mean contribution margin of $2,133. Surgical supplies were the largest contributor to direct costs. Hospital site also significantly affected contribution margin ($1,912 at hospital 1 vs $3,129 at hospital 2, $P < .001$). The number of billed CPT codes was not significantly correlated to contribution margin; however, significant differences were noted in contribution margin and direct cost associated with different CPT code combinations, with arthroscopic RCR with subacromial decompression and distal clavicle excision being the most profitable, at an average contribution margin of $2,147. There was no correlation between surgeon volume and contribution margin or direct cost.

Conclusions
Our overall findings show that improvement in the profitability of arthroscopic RCR for hospital systems is possible, both by examining institutions' direct costs and by providing individual surgeons with cost breakdowns and contribution margin information to improve the profitability of their practice.

Level of Evidence
Level IV, economic and decision analysis.

BACK

Increasing Numbers of Shoulder Corticosteroid Injections Within a Year Preoperatively May Be Associated With a Higher Rate of Subsequent Revision Rotator Cuff Surgery

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Arthroscopy, Volume 35, Issue 1, Received: February 15, 2018; Accepted: July 30, 2018

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Purpose
To identify any dose-dependent association between the use of subacromial corticosteroid injections within a year before rotator cuff repair (RCR) and subsequent need for revision rotator cuff surgery.

Methods
Two large administrative databases were queried for patients undergoing arthroscopic RCR. A minimum of 1 year of preoperative database exposure and 2 years of postoperative database follow-up were required for inclusion. Patients were stratified into groups that received 0 (control), 1, 2, or 3 or more ipsilateral corticosteroid shoulder injections within the year prior to RCR. The outcome of interest was ipsilateral revision arthroscopic or open RCR or arthroscopic debridement for a diagnosis of rotator cuff tear within 2 years of the index surgery. Revision rates were compared between groups using a multivariate logistic regression analysis controlling for demographic and comorbidity confounders.

Results
A total of 110,567 patients from the Medicare database and 12,892 patients from the private insurance database were included. There was no association between a single injection within the year prior to RCR and revision surgery in either cohort. The use of 2 or more injections was associated with a significant increase in the risk of requiring revision surgery in both the Medicare (odds ratio [OR], 2.76-3.26; $P < .0001$) and private insurance (OR, 2.53-2.87; $P < .0001$) populations.

Conclusions
A single shoulder injection within a year prior to arthroscopic RCR was not associated with any increased risk of revision surgery; however, the administration of 2 or more injections was associated with a substantially increased risk of subsequent revision rotator cuff surgery (OR, 2.53-3.26). Although causality cannot be established on the basis of this database review, caution is recommended when considering more than 1 shoulder corticosteroid injection in patients with potentially repairable rotator cuff tears.

Level of Evidence
Level III, retrospective cohort study.

BACK

Minimal Clinically Important Differences and Correlating Factors for the Rowe Score and the American Shoulder and Elbow Surgeons Score After Arthroscopic Stabilization Surgery for Anterior Shoulder Instability

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Arthroscopy, Volume 35, Issue 1

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Purpose
To determine the minimal clinically important differences (MCIDs) for the Rowe score and the American Shoulder and Elbow Surgeons (ASES) score after arthroscopic stabilization surgery for anterior shoulder instability and to evaluate the effect of various patient- and treatment-related factors on MCIDs.

Methods
The study enrolled 216 patients who underwent arthroscopic stabilization surgery for anterior shoulder instability. The patients were categorized into “no-change” and “minimal-change” groups by a 15-item questionnaire at the 1-year postoperative visit. The Rowe and ASES scores were assessed preoperatively and at the 1-year postoperative follow-up visit. MCIDs were calculated using an anchor-based method. Correlations between MCIDs and several factors were evaluated using Spearman correlation analysis and univariate regression analysis.

Results
On the basis of the questionnaires administered at the 1-year postoperative follow-up visit, 10 patients were assigned to the no-change group and 33 patients were placed in the minimal-change group. MCIDs for the Rowe and ASES scores were 9.7 and 8.5, respectively. Body mass index was negatively correlated with the MCID for the Rowe score (P = .01). Number of dislocations, symptom duration, and presence of Hill-Sachs lesions were positively correlated with the MCID for the ASES score (P = .02, P = .04, and P = .02, respectively). Other variables such as age, sex, and arm dominance were not related to the MCIDs for either the Rowe or ASES score.

Conclusions
In patients who underwent arthroscopic stabilization surgery, differences of at least 9.7 in the Rowe score and 8.5 in the ASES score were clinically relevant. Patients with a greater body mass index required a smaller change in the Rowe score and patients with a greater number of dislocations, a longer symptom duration, or a Hill-Sachs lesion required a larger change in the ASES score to feel clinically relevant changes.

Level of Evidence
Level IV, case series.

BACK

Patient Positioning in Arthroscopic Management of Posterior-Inferior Shoulder Instability: A Systematic Review Comparing Beach Chair and Lateral Decubitus Approaches

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Arthroscopy, Volume 35, Issue 1, Received: March 27, 2018; Accepted: June 19, 2018

https://doi.org/10.1016/j.arthro.2018.06.057

Purpose
To analyze the available literature pertaining to clinical outcomes and complications of posterior-inferior shoulder stabilization performed arthroscopically in either the beach chair (BC) or lateral decubitus (LD) position.

Methods
According to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA), 3 databases (PubMed, EMBASE, and Medline) were searched up to January 2018 for English-language studies on posterior shoulder instability. Descriptive statistics are presented. The Methodological Index for Non-Randomized Studies (MINORS) scale was used to assess quality.

Results
Twenty-five studies were included, examining 1,085 patients (n = 140 BC; n = 945 LD), of mean age 25.0 years, 27.1% female, and mean 3.1 years of follow-up. MINORS scores for BC and LD were 11.2 and 9.8, respectively. Regardless of positioning, patients did not differ across numerous outcomes and various surgical factors (e.g., number of portals, anchors, anchor types, concomitant pathology, or postoperative rehabilitation protocol). Postoperative patient satisfaction ranged from 85% to 87.5% and 93% to 100% for patients treated in BC and LD positions, respectively. Although not reported for BC, overall and preinjury return-to-play (RTP) rates in LD patients ranged from 72% to 100% and 55% to 100%, respectively, returning from 3 to 7.6 months postoperatively. Failure rates in the BC and LD positions ranged from 0% to 9.4% and 0% to 29%, respectively. There were no differences in reported incidences of neuropraxia, stroke, nonfatal pulmonary embolus, vision loss, cardiac arrest, or other positioning-related complications.

Conclusions
Arthroscopic management of posterior-inferior shoulder instability has a successful track record and minimal complication profile. Although patient positioning appears to influence results, with those treated in the LD position experiencing marginally higher patient satisfaction and failure rates, the current data prevent any conclusions being made regarding the superiority of one approach over another. As the clinical relevance of patient positioning remains to be determined, larger, higher-level study designs with long-term follow-up are required.

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

BACK

Full-Thickness Rotator Cuff Tears: What Is the Rate of Tear Progression? A Systematic Review

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Arthroscopy, Volume 35, Issue 1, Received: January 9, 2018; Accepted: July 12, 2018

https://doi.org/10.1016/j.arthro.2018.07.031

Purpose
To systematically review the literature and determine the rate of radiographic tear progression of nonoperatively treated full-thickness rotator cuff tears.

Methods
The PubMed, Embase, and Cochrane Library databases were systematically reviewed to identify all articles related to nonoperatively treated rotator cuff tears. English-language studies of Level I through IV evidence examining chronic, full-thickness rotator cuff tears in adults were included. Partial-thickness tears were excluded. Rotator cuff tears were analyzed according to the presence or absence of symptoms. The primary outcome was radiographic tear progression defined as an increase in tear size of 5 mm or greater on magnetic resonance imaging or ultrasound.

Results
Eight studies were included for statistical analysis, and 411 tears were analyzed for progression. No difference in the rate of tear progression was detected between the asymptomatic and symptomatic groups (40.6% at 46.8 months and 34.1% at 37.8 months, respectively; $P = .65$). Calculation of the number needed to treat showed that for an 8% retear rate at 2-year follow-up, approximately 7 patients with rotator cuff tears would have to undergo operative repair to prevent 1 tear from progressing radiographically.

Conclusions
This study showed that with the data available, asymptomatic and symptomatic rotator cuff tears carry similar rates of tear progression over time. Most of these tears will not progress significantly over short- to intermediate-term follow-up.

Level of Evidence
Level IV, systematic review of Level I through IV evidence.

BACK

Journal of Shoulder and Elbow Surgery (JSES), Volume 28, issue 1

Arthroscopic versus open release of internal rotation contracture in the obstetrical brachial plexus paralysis (OBPP) sequela

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Journal of Shoulder and Elbow Surgery, Volume 28, Issue 1, Published online: September 06, 2018

https://doi.org/10.1016/j.jse.2018.06.020

Background
Latissimus dorsi (LD) and teres major (TM) tendon transfers are effective surgical procedures to improve shoulder abduction and external rotation for children with obstetrical brachial plexus palsy (OBPP). Open pectoralis major (PM) tendon Z-plasty and arthroscopic subscapularis (SS) release are 2 options for the release of internal rotation contractures to enhance muscle transfers. This study compared the functional results of LD and TM tendon transfers with open PM tendon Z-plasty or arthroscopic SS release.

Methods
The study included 24 patients who underwent LD and TM tendon transfers for OBPP (9 arthroscopic SS release, 15 open PM tendon Z-plasty) with a mean follow-up of 41.33 months (range, 36-60 months) and 47.2 months (range, 36-60 months), respectively. Functional evaluation was made according to range of motion and Mallet scoring system.

Results
Shoulder abduction–external rotation degrees and scores in all sections of the Mallet scoring system significantly increased in both groups ($P < .001$). Postoperatively, the arthroscopic SS release group had significantly better abduction degrees ($P = .003$), total Mallet scores ($P < .001$), and superior abduction ($P = .043$), active external rotation ($P = .043$), hand-to-head ($P = .043$), and hand-to-mouth ($P < .001$) scores for the Mallet scoring system.

Discussion
Transfer of LD together with TM tendons combined with one of the internal rotation contracture release procedures yielded good clinical and functional results in patients younger than age 7, regardless of the type of release method. However, arthroscopic SS release, although requiring an experienced surgeon, revealed better clinical and functional outcomes and is considered to be a less invasive and superior method.

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

BACK

Contribution of arthroscopy in the treatment of anterior glenoid rim fractures: a comparison with open surgery

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Journal of Shoulder and Elbow Surgery, Volume 28, Issue 1, Published online: September 24, 2018

https://doi.org/10.1016/j.jse.2018.07.008

Background
This study assessed the clinical and radiologic outcomes of Ideberg type IA glenoid fractures treated using conventional open surgery compared with those treated with arthroscopic surgery.

Materials and methods
This was a retrospective, multicenter study of anterior glenoid rim fractures (Ideberg IA) treated with conventional open surgery (group O) or arthroscopic surgery (group A). Included were 56 patients: 10 in group O and 46 in group A. The patients were reviewed after a minimum of 12 months of follow-up. The Constant score was used as an objective clinical outcome. Radiographs were reviewed to assess the quality of the postoperative reduction, fracture healing, complications, and whether osteoarthritis was present at the last follow-up.

Results
At a mean follow-up of 30 months (range, 12-115 months), there was no significant difference between the groups based on the Constant Score (group O: 74 points; group A: 84 points, $P = .07$). None of the shoulders showed signs of instability. Conversely, the rate of postoperative complications was higher in group O than in group A (30% vs. 4%; $P = .03$). Glenohumeral osteoarthritis was found in 10% of group O patients and 18% of group A patients ($P = .65$).

Conclusions
This study shows that anterior glenoid rim fractures have similar functional outcomes, whether treated using conventional open surgery or arthroscopic surgery. Arthroscopic surgery appears to reduce the complication and reoperation rate.

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

BACK

Return to play after arthroscopic treatment for shoulder instability in elite and professional baseball players

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Journal of Shoulder and Elbow Surgery, Volume 28, Issue 1, Published online: September 26, 2018

https://doi.org/10.1016/j.jse.2018.07.006

Background
This study evaluated the clinical outcome of arthroscopic treatment for anterior shoulder dislocation in elite and professional baseball players.

Methods
This study included 51 baseball players who underwent arthroscopic Bankart repair between 2008 and 2015. The follow-up duration was set at 24 months or longer, based on clinic visit or telephone survey. After surgery, players who played in 1 or more official games were considered to have returned to play (RTP), and those who participated in more than 10 official games were considered to have solidly returned to play (sRTP). The RTP and sRTP rates were analyzed by player position (pitcher, catcher, and in-fielder), and the period of RTP after surgery (rehabilitation period) was investigated.

Results
Of 51 baseball players (mean age, 20.9 years), 14 were pitchers, 6 were catchers, and 31 were in-fielders. Pitchers showed 64% RTP and 57% sRTP, catchers, 83% RTP and 83% sRTP, and in-fielders, 90% RTP and 90% sRTP. The overall RTP and sRTP rates were 82% and 80%, respectively. The average RTP period after surgery (rehabilitation period) was 8.4 months, with 9.6, 9.1, and 7.4 months for pitchers, catchers, and in-fielders, respectively.

Conclusions
The RTP after arthroscopic Bankart repair shows favorable results, with the nonthrowing shoulder and in-field position yielding the best results. Players undergoing arthroscopic Bankart repair and the surgeon should be aware of the possible outcomes based on the throwing/nonthrowing arm and various positions.

Level of evidence:
Level IV, Case Series, Treatment Study

BACK

Anatomic considerations for arthroscopic glenoid reconstruction using iliac crest grafts: a radiologic study

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Journal of Shoulder and Elbow Surgery, Volume 28, Issue 1, Published online: July 24, 2018

https://doi.org/10.1016/j.jse.2018.06.010

Background
Arthroscopic glenoid reconstruction using autografts is an advanced procedure that requires experience and preparation. Knowledge about anatomic pitfalls is therefore important to establish well-positioned portals and prevent neurovascular damage.

Methods
We included 43 computed tomography scans from 43 patients. The distance between the tip of the coracoid process and a perpendicular line representing the anteroinferior glenoid was measured. From these results an anteroinferior working portal was designed, and the angulation needed for screw insertion to fixate a hypothetical graft was measured. In a second step, 9 patients underwent magnetic resonance imaging scans 34 ± 10 months after glenoid reconstruction, and the distance between the screw approach path and the neurovascular bundle was measured.

Results
In the analyzed scans, average defect size was 23%, and the coracoid process to the anteroinferior glenoid distance was 32 ± 7 mm. We thus hypothesized that a corridor 20 to 30 mm inferior to the coracoid process would be the ideal position for a working portal. Through this portal, 85% of screws could be applied with 0° to 30° angulation. When the postoperative scans were analyzed, the distance from the neurovascular bundle showed an average of 26 ± 6 mm for the superior screw and 21 ± 5 mm for the inferior screw.

Conclusions
The ideal distance between the coracoid process and an anteroinferior working portal is 32 mm. Having established the portal, instruments should not be inserted pointing in a medial direction of the coracoid process due to the proximity of the neurovascular bundle.

Level of evidence
Anatomy study, Imaging

BACK

Bone and Joint Journal (BJJ), Volume 101, issue 1

Cost-effectiveness analysis of a placebo-controlled randomized trial evaluating the effectiveness of arthroscopic subacromial decompression in patients with subacromial shoulder pain

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https://doi.org/10.1302/0301-620X.101B1.BJJ-2018-0555.R1

Aims
The aims of this study were to compare the use of resources, costs, and quality of life outcomes associated with subacromial decompression, arthroscopy only (placebo surgery), and no treatment for subacromial pain in the United Kingdom National Health Service (NHS), and to estimate their cost-effectiveness.

Patients and Methods
The use of resources, costs, and quality-adjusted life-years (QALYs) were assessed in the trial at six months and one year. Results were extrapolated to two years after randomization. Differences between treatment arms, based on the intention-to-treat principle, were adjusted for covariates and missing data were handled using multiple imputation. Incremental cost-effectiveness ratios were calculated, with uncertainty around the values estimated using bootstrapping.

Results
Cumulative mean QALYs/mean costs of health care service use and surgery per patient from baseline to 12 months were estimated as 0.640 (standard error (se) 0.024)/£3147 (se 166) in the decompression arm, 0.656 (se 0.020)/£2830 (se 183) in the arthroscopy only arm and 0.522 (se 0.029)/£1451 (se 151) in the no treatment arm. Statistically significant differences in cumulative QALYs and costs were found at six and 12 months for the decompression versus no treatment comparison only. The probabilities of decompression being cost-effective compared with no treatment at a willingness-to-pay threshold of £20 000 per QALY were close to 0% at six months and approximately 50% at one year, with this probability potentially increasing for the extrapolation to two years.

Discussion
The evidence for cost-effectiveness at 12 months was inconclusive. Decompression could be cost-effective in the longer-term, but results of this analysis are sensitive to the assumptions made about how costs and QALYs are extrapolated beyond the follow-up of the trial.

BACK

Lower Extremity

Arthroscopy, Volume 35, Issue 1

Knotless Anchors in Acetabular Labral Repair: A Biomechanical Comparison

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Purpose
To analyze the failure mechanism, stiffness, and pullout strength of acetabular knotless suture anchors.

Methods
Seven suture anchors were tested in high-density (0.48 g/cc) synthetic blocks. The anchors were implanted perpendicular to the bone block. The anchor's suture(s) were tied around a loop of 8 high-strength nonabsorbable sutures and pulled in line with the anchor at a rate of 1 mm/s until failure. The following knotless anchors were tested: Stryker Knotilus 3.5, Arthrex Pushlock 2.9, Linvatec PopLok 2.8, Linvatec PopLok 3.3, ArthroCare SpeedLock HIP (3.4-mm), and Smith & Nephew Bioraptor Knotless 2.9. The standard knot tying Smith & Nephew Bioraptor 2.9 mm served as a baseline for comparison.

Results
Stiffness was highest in the Pushlock, the SpeedLock HIP, and Knotilus. At 1 mm displacement, the SpeedLock HIP exhibited significantly higher load than all other anchors, excluding the Pushlock and PopLok 3.3 ($P \leq .012$ for all comparisons). Excluding the SpeedLock HIP and Knotilus, the Pushlock displayed significantly higher load than all other anchors at 2-mm displacement ($P \leq .015$ for all comparisons). Maximum load was the highest for the Knotilus and Bioraptor knotted anchor ($P < .001$ compared with all other anchors).

Conclusions
All knotless suture anchors used in hip arthroscopy, except for the Knotilus 3.5, failed by suture pullout from the anchor. The 2 anchors with the highest maximum load, the Knotilus 3.5 and knotted Bioraptor 2.9, failed by suture failure; however, these anchors displayed the lowest stiffness and load at 1 mm displacement among all anchors tested. Stiffness and loads at clinically relevant displacements, not maximum load alone, may be most important in predicting anchor clinical performance during the early phases of labral healing.

Clinical Relevance
Knotless suture anchors tend to fail by suture pullout from the anchor, yet the stiffness of these constructs suggests that minimal displacement of the repair will occur under physiologic loads.

BACK

The Effect of Complete Tearing of the Ligamentum Teres in Patients Undergoing Primary Hip Arthroscopy for Femoroacetabular Impingement and Labral Tears: A Match-Controlled Study

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Arthroscopy, Volume 35, Issue 1

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Purpose
To compare the patient-reported outcomes scores (PROs) of patients with femoroacetabular impingement (FAI), labral tears, and complete ligamentum teres (LT) tears to a matched-pair control group with intact LTs, as well as to report the relative risk of total hip arthroplasty (THA) conversion.

Methods
Data between February 2008 and April 2015 were retrospectively reviewed. Patients undergoing hip arthroscopy included those who had complete LT tear, labral tears, FAI, and minimum 2-year follow-up with modified Harris Hip Score (mHHS), Non-arthritic Hip Score (NAHS), Hip Outcome Score–Sports Specific Subscale (HOS-SSS), International Hip Outcome Tool–12 (iHOT-12), and visual analog scale (VAS). Patients were excluded for Tönnis osteoarthritis grade >1, previous hip conditions or surgeries, and Worker's Compensation claims. Patients with full LT tears were matched in a 1:3 ratio with patients without LT tears based on age at surgery ± 5 years, sex, body mass index ± 5, capsular treatment, and acetabular Outerbridge grade. Revision surgeries and conversions to THA were documented. Relative risk for conversion to THA was determined ($P = .05$).

Results
Eighteen patients (18 hips) had minimum 2-year follow-up and were eligible for matching; as described, each study group patient was matched to 3 control patients, resulting in a size of 18 to 54 patients. PROs showed significant improvement in the complete LT tear group with the exception of the HOS-SSS measure. In the intact LT control group, all PROs significantly improved, with no exception. Based on relative risk, patients with complete LT tears were 3 times more likely to require THA than a matched control group.

Conclusions
After hip arthroscopy, patients with FAI and complete LT tears reported significant improvement in PROs. Among hips that did not require THA, functional scores were comparable to a matched control group. However, patients with complete LT tears were 3 times more likely to require an eventual THA than the matched control group. We conclude that patients with complete LT tears should be considered an at-risk population, and that indications and treatment may be refined to incorporate the clinical significance of complete LT tears.

Level of Evidence
Level III, comparative trial, case-control.

BACK

Frequency of Subspine Impingement in Patients With Femoroacetabular Impingement Evaluated With a 3-Dimensional Dynamic Study

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Purpose
(1) To estimate the frequency of subspine impingement (SSI) morphology in patients with a diagnosis of femoroacetabular impingement (FAI) and (2) to describe the performance of the alpha angle, range of motion, and femoral and acetabular anteversion for the identification of cases with and without SSI morphology.

Methods
We performed a retrospective observational study of patients with symptomatic FAI evaluated by computed tomography between February 2015 and June 2017. SSI morphology was identified using a 3-dimensional dynamic study with Move Forward software. A case was considered positive if a contact area of the anterior inferior iliac spine with the femoral neck was evidenced. Measurements of acetabular anteversion, femoral anteversion, the lateral center-edge angle, the alpha angle, and the neck-shaft angle, as well as range-of-mobility data, were collected.

Results
The study included 135 patients (194 hips), with a mean age of 39.1 ± 13.9 years; 65.2% were women. SSI morphology was found in 23.7% of hips (46 hips) (95% confidence interval, 18.3%-30.2%). Of the hips identified with SSI, 52.2% had a type I anterior inferior iliac spine, 41.3% had type II, and 6.5% had type III. In hips with SSI, median femoral anteversion was 5.6° (interquartile range, 2.1°-7.5°) and values of less than 8° would increase the suspected SSI morphology (81.8% sensitivity, 70.5% specificity).

Conclusions
SSI morphology is a frequent finding in patients with symptomatic FAI through a 3-dimensional dynamic study. A decrease in femoral anteversion could be considered a useful criterion to suspect SSI morphology.

Level of Evidence
Level IV, case series.

BACK

Concentrated Bone Marrow Aspirate May Decrease Postoperative Cyst Occurrence Rate in Autologous Osteochondral Transplantation for Osteochondral Lesions of the Talus

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Purpose
To clarify if the use of concentrated bone marrow aspirate (CBMA) would affect both postoperative functional outcomes and magnetic resonance imaging (MRI) outcomes compared with those of autologous osteochondral transplantation (AOT) alone; in addition, to assess the efficacy of CBMA reducing the presence of postoperative cyst formation following AOT in the treatment of osteochondral lesions of the talus.

Methods
Fifty-four (92%) of 59 eligible patients who underwent AOT between 2004 and 2008 were retrospectively assessed at a minimum of 5-year follow-up. Twenty-eight patients were treated with AOT and CBMA (AOT/CBMA group) and 26 patients were treated with AOT alone (AOT-alone group). Clinical outcomes were evaluated using the Foot and Ankle Outcome Scores (FAOS) and Short-Form 12 (SF-12) preoperatively and at final follow-up. Postoperative MRI was evaluated with the modified Magnetic Resonance Observation of Cartilage Repair Tissue (MOCART) scoring system. Cyst formation was also evaluated on postoperative MRI.

Results
The mean FAOS and SF-12 significantly improved in both the AOT/CBMA and AOT-alone groups, but there were no statistical differences between groups in FAOS (80.5 vs 75.5, P = .225) and SF-12 (71.1 vs 69.6, P = .756) at final follow-up. Additionally, there was no difference in the mean MOCART score (80.4 vs 84.3, P = .484); however, AOT/CBMA did result in a statistically lower rate of cyst formation (46.4% vs 76.9%, P = .022). No significant differences were found in the mean postoperative FAOS and SF-12 between patients with and without cysts postoperatively.

Conclusions
CBMA reduced postoperative cyst occurrence rate in patients treated with AOT; however, CBMA did not result in significant differences in medium term functional outcomes and MOCART score in patients who underwent AOT.

Level of Evidence
Level III, retrospective comparative trial.

BACK

The Effect of Obesity on Operative Times and 30-Day Readmissions After Anterior Cruciate Ligament Reconstruction

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Purpose
To understand the effect of obesity on operative times and 30-day readmission rates after arthroscopic anterior cruciate ligament reconstruction (ACLR).

Methods
The American College of Surgeons National Surgical Quality Improvement Program database was queried using Current Procedural Terminology billing codes to identify all patients aged 18 years and older who underwent ACLR between 2007 and 2014. The Student t test was used for continuous variables, and the χ-square or Fisher exact test was used for categorical variables. Multivariate analysis was conducted to identify factors associated with 30-day readmission.

Results
We identified 9,000 patients who underwent ACLR. In the readmission analysis, the total readmission rate was 0.70%. After multivariate analysis, a body mass index (BMI) of 40 or greater was associated with a significantly increased risk of 30-day readmission (odds ratio, 3.06; 95% confidence interval, 1.09-8.57). An operative time of less than 80 minutes was associated with a decreased risk of readmission (odds ratio, 0.40, 95% confidence interval, 0.18-0.92). In the operative-time analysis, the mean operative time was 100.7 minutes. Older age was predictive of decreasing operative time, with the operative time being 32.75 minutes shorter in patients aged 65 years or older than in those younger than 25 years. After multivariate analysis, class II obesity (BMI of 35-39.9) predicted an increase of 7.11 minutes and class III obesity (BMI ≥ 40) predicted an increase of 8.70 minutes compared with normal weight (BMI of 18.5-24.9).

Conclusions
Obesity is associated with longer operative times and increased 30-day readmissions after ACLR, with patients with a BMI of 40 or greater having over 3 times the risk of readmission compared with patients with a normal weight. Male sex, black race, and younger age are all also associated with increased operative times.

Level of Evidence
Level III, observational, retrospective cohort study.

BACK

How Does Obesity Impact Pediatric Anterior Cruciate Ligament Reconstruction?

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Purpose
To assess the relationship of elevated body mass index (BMI) on postoperative outcomes, including graft rupture, contralateral anterior cruciate ligament (ACL) tear, new meniscus injuries, isokinetic strength testing, and range of motion (ROM) in a large group of pediatric patients. We also sought to calculate the risk of graft rupture in overweight patients with small femoral or tibial tunnels. The secondary objective was to evaluate the association between BMI and concurrent meniscus tears and the need for meniscectomy at the time of primary ACL reconstruction.

Methods
We retrospectively reviewed all pediatric patients undergoing primary ACL reconstruction at our institution. BMI percentile for age was used to categorize children as having normal BMI or being overweight or obese per Centers for Disease Control and Prevention guidelines. Demographic data, intraoperative findings and techniques, postoperative complications (including graft rupture, contralateral ACL tear, and meniscus injuries), ROM, and isokinetic strength testing were recorded. Univariate analysis was followed by stepwise, logistic regression to control for confounders.

Results
Of the 1,056 patients included, 535 (50.7%) were male and 521 were (49.3%) female, with a mean age of 15.1 ± 2.4 years. The average BMI was 23.1 ± 4.7. There were 675 (63.9%) children with normal BMI, 228 (21.6%) who were overweight, and 153 (14.5%) who were obese. In multivariate analysis, children with elevated BMI had a higher rate of concurrent meniscus tears compared with those with normal BMI (76.3% vs 70.2%; $P = .02$) and 1.6 times higher odds of requiring a meniscectomy (95% confidence interval, 1.2-2.2; $P < .01$). The 723 patients included in the analysis of postoperative complications had a mean follow-up duration of 26.2 ± 3.3 months Postoperatively, BMI did not impact the rate of graft rupture, contralateral ACL injury, or new meniscus tears. There was no increased risk of graft failure in overweight children with smaller graft size (≤8 mm). There was no clinically relevant difference in postoperative ROM or isokinetic strength testing.

Conclusions
After ACL rupture, overweight and obese children sustained more overall meniscus tears and more irreparable meniscus tears than those with normal BMI. Graft size did not impact the risk of early graft failure in overweight patients. With an appropriate rehabilitation protocol, there was no increased risk of graft rupture, contralateral ACL injury, or new meniscus tear in early follow-up.

Level of Evidence
Level III, retrospective comparative study.

BACK

Management of Chondral Lesions of the Knee: Analysis of Trends and Short-Term Complications Using the National Surgical Quality Improvement Program Database

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Purpose
To provide updated surgical trends of cartilage procedures differentiated by the classic groups of palliative, repair, and restorative modalities.

Methods
The American College of Surgeons National Surgical Quality Improvement Program database was queried from 2010-2016 for the following cartilage procedures: chondroplasty, microfracture, arthroscopic osteochondral autograft or allograft transplantation, open osteochondral autograft or allograft transplantation, and autologous chondrocyte implantation. Demographic variables and short-term (30-day) complications were analyzed with 1-way analysis of variance and post hoc analysis. Linear regression analysis was performed to analyze trends over time.

Results
A total of 15,609 procedures performed between 2010 and 2016 were analyzed. On average, 342.2 ± 27.9 cartilage procedures were performed per 100,000 operations. There was a linear increase in the management of overall cartilage procedures per 100,000 operations ($P = .002$). There were also linear increases in arthroscopic osteochondral autograft transplantation, arthroscopic osteochondral allograft transplantation, open osteochondral autograft transplantation, open osteochondral allograft transplantation, and autologous chondrocyte implantation ($P < .001$, $P = .037$, $P = .001$, $P = .006$, and $P = .002$, respectively). Meniscectomy was the most frequently performed concomitant procedure (9.7%-64.2% of cases). Chondroplasty and microfracture showed no change in frequency over time ($P = .140$ and $P = .720$, respectively). The overall complication rate was 2.1% for chondroplasty, 1.4% for microfracture, 1.8% for arthroscopic osteochondral autograft transplantation, 1.0% for arthroscopic osteochondral allograft transplantation, 1.4% for open osteochondral autograft transplantation, 1.1% for open osteochondral allograft transplantation, and 0.75% for autologous chondrocyte implantation. Deep vein thrombosis was the most common complication, occurring in 0.4% to 1.0% of cases. No statistically significant difference was found in complication rates between procedures ($P = .105$).

Conclusions
Cartilage restoration is becoming an increasingly popular modality to address chondral defects. Minimal complication rates suggest that these procedures may be safely performed concomitantly with other interventions.

Level of Evidence
Level IV, retrospective database analysis.

BACK

Single Intravenous Administration of Tranexamic Acid in Anterior Cruciate Ligament Reconstruction to Reduce Postoperative Hemarthrosis and Increase Functional Outcomes in the Early Phase of Postoperative Rehabilitation: A Randomized Controlled Trial

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Arthroscopy, Volume 35, Issue 1

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Purpose
To evaluate the effect of tranexamic acid (TXA) in patients undergoing anterior cruciate ligament (ACL) reconstruction in reducing intra-articular effusion and affecting clinical outcomes 3 months after surgery.

Methods
Eighty consecutive patients undergoing ACL reconstruction were prospectively assessed from 2014 to 2016. Patients were randomly allocated to 1 of 2 groups: The test group received an intravenous infusion of 15 mg/kg of TXA, and the control group did not receive TXA. The patellar circumference, range of motion (ROM), Coupens and Yates (CY) value, visual analog scale score for pain assessment, and quadriceps strength (QS) were considered on postoperative day (PD) 1, PD 7, and PD 15 and at 1 month and 3 months after surgery. Blood volume in the intra-articular drainage was recorded on PD 1. Any adverse effect, such as fever onset (>37.5°C), hemarthrosis, or infection, was also considered.

Results
We found a statistically significant reduction in drainage blood volume ($P < .001$) and CY value ($P = .0044$) on PD 1 in patients in the test group compared with those in the control group. On PD 7, a significant improvement was found for mean CY values ($P = .0057$), ROM ($P = .0031$), and QS ($P = .015$). On PD 15, we noted significant improvements in CY values ($P < .001$), patellar circumference ($P = .0019$), QS ($P = .0089$), and visual analog scale values ($P = .0032$) in the test group. We noted 13 fever episodes in the control group and 2 fever episodes in the study group ($P = .047$). No differences for any outcomes or complications were found at 3 months.

Conclusion
TXA administration reduced hemarthrosis and the amount of suction drainage blood volume, improved ROM and QS, and reduced fever episodes during the first 2 weeks after surgery. TXA use improved early-phase outcomes in the postoperative period after ACL reconstruction.

Level of Evidence
Level I, randomized controlled trial.

BACK

Length of Time Between Anterior Cruciate Ligament Reconstruction and Return to Sport Does Not Predict Need for Revision Surgery in National Football League Players

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Purpose
To determine whether the length of time between primary anterior cruciate ligament reconstruction (ACLR) and return to sport (RTS) predicted the need for revision ACLR in National Football League (NFL) athletes.

Methods
All NFL players who underwent ACLR from 2009 to 2015 were identified. The date of index ACLR and date of return to NFL regular-season game play after surgery were recorded. The length of time between ACLR and RTS was compared between players who required revision ACLR and those who did not. Correlation coefficients were used to assess whether players who RTS sooner sustained recurrent anterior cruciate ligament injury at an earlier date.

Results
A total of 130 NFL players (average age, 25.3 ± 3.2 years) who underwent ACLR and returned to sport were identified. The average time to RTS after ACLR was 49.7 weeks after surgery. Of the players, 23 (18%) required revision ACLR. There was no significant difference in the length of time between ACLR and RTS in players who did not require revision ACLR (50.2 ± 10.1 weeks) and those who did (48.3 ± 11.0 weeks, $P = .40$). Time to RTS was not found to correlate with time to reinjury in athletes requiring revision ACLR ($R = 0.21$; 95% confidence interval, –0.18 to 0.54). A large proportion of players (56%) sustained a reinjury within the first 10 weeks of returning to NFL game play.

Conclusions
Our study found that timing of RTS after ACLR was not a significant risk factor for revision surgery in NFL athletes. Time to RTS was also not shown to correlate with time to reinjury.

Level of Evidence
Level III, case-control study.

BACK

Defining a Safe Zone for All-Inside Lateral Meniscal Repairs in Pediatric Patients: A Magnetic Resonance Imaging Study

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Purpose
To establish a safe zone for all-inside meniscal fixation in pediatric patients by use of magnetic resonance imaging (MRI) measurements between the popliteal tendon (PT) and popliteal neurovascular bundle (PNVB).

Methods
Patients aged 5 to 16 years with normal or nearly normal knee MRI scans were included. They were grouped by age: group I, 5 to 7 years (n = 61); group II, 8 to 10 years (n = 59); group III, 11 to 13 years (n = 60); and group IV, 14 to 16 years (n = 70). At the level of the lateral meniscus, 2 lines starting at the lateral patellar tendon border and ending at the medial edge of the PT (D1) and the lateral edge of the PNVB (D2) were made on an axial knee MRI scan. A third line (D3) connected D1 to D2 at the meniscocapsular junction of the posterior horn of the lateral meniscus (PHLM). A fourth line (D4), derived geometrically, was parallel and 8 mm anterior to D3, simulating the anterior edge of the PHLM.

Results
Axial MRI scans of 250 pediatric patients (aged 5-16 years) were retrospectively reviewed. Analysis showed significant correlation between age and sex for D3 ($P < .0001$). For D3, there were significant differences among all age groups, except between groups III and IV. The average D3 by age group was 14.1 mm (standard deviation [SD], 3.1 mm) for group I, 15.8 mm (SD, 2.5 mm) for group II, 17.0 mm (SD, 3.3 mm) for group III, and 17.2 mm (SD, 3.1 mm) for group IV. The average D4 was 11.39 mm (SD, 2.6 mm), 13.24 mm (SD, 2.24 mm), 14.59 mm (SD, 2.89 mm), and 14.80 mm (SD, 2.79 mm), respectively. There were significant differences in D3 and D4 in male versus female patients (17.6 mm vs 15.7 mm, $P < .001$, and 14.9 mm vs 13.2 mm, $P < .001$, respectively), particularly in groups III and IV (17.0 mm vs 13.8 mm and 16.8 mm vs 13.9 mm, respectively).

Conclusions
This study provides normative data of the distance between the PNVB and PT at the meniscocapsular junction (D3) and anterior edge of the PHLM (D4) with the knee in full extension. Combined with previous studies showing that the addition of knee flexion increases the distance between the meniscus and the neurovascular bundle, these data can be used by surgeons to improve the safety of PHLM repair in pediatric patients.

Level of Evidence
Level III, diagnostic study of nonconsecutive patients.

BACK

Cartilage Restoration Surgery: Incidence Rates, Complications, and Trends as Reported by the American Board of Orthopaedic Surgery Part II Candidates

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Arthroscopy, Volume 35, Issue 1

https://doi.org/10.1016/j.arthro.2018.08.028

Purpose
To evaluate the current status of advanced cartilage restoration procedures among newly trained orthopaedic surgeons in the United States.

Methods
The American Board of Orthopaedic Surgery database was queried to identify all advanced cartilage restoration procedure cases submitted by American Board of Orthopaedic Surgery part II board certification examination candidates from 2003 to 2015. All documented autologous chondrocyte implantation, autologous osteochondral transfer, osteochondral allograft transplantation, and marrow stimulation techniques (MSTs) procedures were analyzed. Analysis was performed to describe trends in annual incidence, types of complications, concomitant procedures, and geographical differences in incidence of advanced cartilage procedures.

Results
From 2003 to 2015, a total of 2,827 surgeons submitted 7,522 cartilage restoration procedures, with 7,060 cases documented as MST (80.01%). The number of cartilage cases decreased significantly from 2003 to in 2015 ($P < .001$), with MST having the largest decline ($P < .001$). The incidence of open osteochondral allograft transplantation (odds ratio = 1.35; $P = .023$) and open autologous osteochondral transfer (odds ratio = 0.84; $P = .004$) increased over the study period. Overall, the majority of patients (57.0%) were male; however, female patients were on average significantly older than male patients ($P < .001$). Cartilage procedures were performed concomitantly with a realignment osteotomy procedure in 1.7% of cases. The incidence of surgical complications increased throughout the study period from 2.9% in 2003 to 9.5% in 2015 ($P < .001$).

Conclusions
Cartilage restoration procedures, specifically MSTs, are being decreasingly performed among recently trained orthopaedic surgeons. In contrast, complication rates have been increasing since 2003, demonstrating a possible paradigm shift toward more complex cartilage procedures, specifically osteochondral grafting procedures.

Clinical Relevance
This study demonstrates a significant decline in the use of MSTs by recently trained orthopaedic surgeons. In addition, an increase in several more complex cartilage restoration procedures was found. Taken in sum, these changes may reflect a shift in residency and fellowship training away from marrow stimulation procedures that elicit a fibrocartilage reparative tissue and toward more complex procedures that provide a more hyaline-like articular cartilage surface.

BACK

Anteromedial Portal Drilling Yielded Better Survivorship of Anterior Cruciate Ligament Reconstructions When Comparing Recent Versus Early Surgeries With This Technique

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Arthroscopy, Volume 35, Issue 1

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Purpose
To compare anteromedial (AM) and transtibial (TT) femoral drilling hole techniques in primary anterior cruciate ligament reconstruction, using the Danish Knee Ligament Reconstruction Register, comparing revision rates and clinical outcomes from 2 time periods, 2007 to 2010 and 2012 to 2015.

Methods
A total of 8,386 primary anterior cruciate ligament reconstructions were registered between January 2007 to December 2010 and 8,818 in the period January 2012 to December 2015. Revision ACL was the primary endpoint. Secondary endpoints were the objective and subjective clinical outcomes. Crude and adjusted relative risks (RRs) with 95% confidence interval (CIs) were calculated.

Results
The adjusted RR for revision surgery in the AM (2007-10) group compared with the TT (2007-10) group was 1.45 (95% CI, 1.17-1.78; $P < .05$), but when comparing the AM (2012-15) group with TT (2012-15) group, the RR was 0.99 (95% CI, 0.68-1.45; $P = .96$). One-year postoperative objective stability testing showed an RR = 1.38 (95% CI, 1.19-1.60; $P < .01$) for rotational stability and an RR = 1.37 (95% CI, 0.99-1.89; $P < .01$) for sagittal stability when comparing AM (2007-10) to TT (2007-10). No significant difference in objective stability was found in the more recent period. Lastly, comparing the subjective scores, the AM (2012-15) had a significantly higher Tegner score 1 year postoperatively compared with the TT-group (2012-15).

Conclusions
This study found an increased RR of revision anterior cruciate ligament and rotational and sagittal instability 1 year postoperatively for the AM technique in the period from 2007 to 2010. However, there was no significant difference in revision surgery and objective measures between the techniques from 2012 to 2015. Nevertheless, a higher activity level was found in the AM group. The results could indicate that the results found in the period 2007 to 2010 may have been caused by a learning curve when introducing a new and more complex procedure (AM).

Level of Evidence
Level III, retrospective comparative trial.

BACK

The Utility of Hip Arthroscopy in the Setting of Acetabular Dysplasia: A Systematic Review

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Arthroscopy, Volume 35, Issue 1
https://doi.org/10.1016/j.arthro.2018.07.048

Purpose To compare patient-reported outcomes, progression of osteoarthritis, and conversion to total hip replacement in a dysplastic population when hip arthroscopy was used as an isolated treatment or as an adjunct to pelvic reorientation osteotomy.

Methods
An exhaustive search of the existing literature was conducted according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines. Three databases (PubMed, CINAHL [Cumulative Index to Nursing and Allied Health Literature], Embase) were searched for studies from January 1930 through January 2018 published in the English language concerning the use of hip arthroscopy with diagnostic and therapeutic intentions in individuals with acetabular dysplasia. We excluded studies that presented ambiguous data sets or in which clear identification of the strategy for arthroscopy was absent.

Results
The selection criteria were defined, and 33 studies (1,368 hip arthroscopies) were included in the final analysis. Studies that met the inclusion criteria were classified within 5 different categories: (1) hip arthroscopy for screening, chondral mapping, and planning (9 studies, 729 hip arthroscopies); (2) isolated arthroscopic treatment (13 studies, 434 hip arthroscopies); (3) outcomes of hip arthroscopy after previous reorientation pelvic osteotomy for acetabular dysplasia (4 studies, 52 hip arthroscopies); (4) arthroscopy followed by unplanned hip-preservation surgery (3 studies, 48 hip arthroscopies); and (5) combined arthroscopy and periacetabular osteotomy (4 studies, 106 hip arthroscopies). A risk-of-bias analysis showed a moderate to high risk of bias (level 3 or 4) within and across the included studies.

Conclusions
Although hip arthroscopy can be used to accurately grade the severity of chondral injuries in the native hip and provide zone-specific geographic mapping that may aid in subsequent surgical planning, there is insufficient evidence to conclude that arthroscopic characterization alone has any bearing on the ultimate clinical outcomes after osseous structural correction. Isolated arthroscopic treatment is not recommended in the setting of moderate to severe dysplasia, given the inferior clinical outcomes and risk of iatrogenic instability reported for this group. However, there is limited evidence to suggest that the isolated use of hip arthroscopy may be considered in cases of borderline acetabular dysplasia when careful attention is paid to labral and capsular preservation. Limited evidence supports the conclusion that after prior reorientation pelvic osteotomy for acetabular dysplasia, hip arthroscopy leads to improved clinical and functional outcomes and should be considered in this setting. Furthermore, there is insufficient evidence to conclude that failed hip arthroscopy compromises or challenges the ultimate clinical outcomes in patients undergoing subsequent reorientation pelvic osteotomy. Last, there is insufficient evidence to conclude that the adjunctive use of hip arthroscopy with reorientation pelvic osteotomy produces superior clinical outcomes compared with pelvic osteotomy alone. In summary, arthroscopic techniques may provide a useful complement to the correction of acetabular dysplasia and should be thoughtfully considered on a case-by-case basis when designing a comprehensive treatment strategy in dysplastic populations.

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

BACK

The Clinical Evidence Behind Biologic Therapies Promoted at Annual Orthopaedic Meetings: A Systematic Review

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Purpose
The purpose of this study is to systematically evaluate the available clinical data for biologic therapies promoted for articular cartilage defects and osteoarthritis of the knee at the 2016 American Orthopaedic Society for Sports Medicine Meeting (AOSSM) and the 2017 Arthroscopy Association of North America meeting (AANA).

Methods
Our sample included all exhibitors at the 2016 AOSSM meeting and 2017 AANA meeting. All biologic products marketed at each conference were identified by reviewing exhibition booths and company websites. A systematic review of the clinical data on each product was then completed using PubMed, EMBASE, and the product's own webpage. All clinical peer-reviewed studies with level I-IV evidence were included in the study. Basic science or preclinical studies were excluded.

Results
There were 16 products promoted for biologic therapy for articular cartilage defects or osteoarthritis of the knee at the AOSSM meeting and 11 products promoted at the AANA meeting. A total of 280 articles detailed clinical findings for the articular cartilage products displayed at AOSSM and AANA. Of the 280, there were 36 level I evidence studies, 37 level II evidence studies, 18 level III evidence studies, and 189 level IV evidence studies. Of these articles, 91% were for 4 products. Of all biologic products promoted at the 2 meetings, 65% did not have any peer-reviewed clinical data supporting their use.

Conclusion
Overall, many biologic therapies promoted at leading arthroscopy and sports medicine conferences did not have clinical evidence evaluating their use in the peer-reviewed literature. Although scientific advancement requires new technology, orthopaedic surgeons should be cautious about using biologic therapies in their practice with no proven efficacy. There are likely promising new interventions that, with additional scientific research, will be proven efficacious for our patients.

Clinical Relevance
This article gives orthopaedic surgeons a detailed example of some of the biologic treatments being offered on the market for the treatment of knee articular cartilage disease. When patients request these treatments, physicians must be able to explain the data supporting their use.

BACK

Influence of Graft Source on Postoperative Activity and Joint Laxity in Posterior Cruciate Ligament Reconstruction: A Systematic Review

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Purpose
To compare the clinical and functional outcomes of allograft and autograft reconstruction in patients with posterior cruciate ligament (PCL) deficiency.

Methods
The MEDLINE, Embase, and Cochrane Library databases were used to identify all relevant articles. Clinical outcomes including International Knee Documentation Committee, Tegner, and Lysholm scores; joint laxity; and posterior tibial displacement were evaluated.

Results
Among the 145 unique articles identified during the title screening, 25 studies published between 2002 and 2016 with a combined population of 900 patients were deemed eligible for inclusion in the review. Of the 900 patients, 603 were treated with autograft and 297 were treated with allograft PCL reconstruction. Five of the included studies directly compared autograft and allograft PCL reconstruction. Most studies found postoperative functional outcomes and joint laxity to improve postoperatively regardless of graft source. With only 1 exception, the included comparative studies found no significant postoperative difference in any of the functional outcome scores between patients treated with allograft and those treated with autograft. Two comparative studies found autograft reconstruction to result in significantly less posterior laxity than in the allograft group, whereas 2 comparative studies found no significant difference in posterior laxity between the 2 groups.

Conclusions
PCL reconstruction results in improved functional outcome scores and joint laxity regardless of graft source. Current studies suggest there is no significant difference in postoperative functional outcomes between patients treated with autograft and those treated with allograft. Patients treated with autograft have donor-site morbidity that is not associated with allograft reconstruction. Some evidence suggests that autograft reconstruction may result in reduced posterior laxity relative to allograft reconstruction. The magnitude of this finding, however, may not be clinically significant. Our review found that decision making based on the current literature is at high risk of potential bias.

Level of Evidence
Level IV, systematic review of Level I to IV studies.

BACK

Intra-articular Mesenchymal Stem Cells in Osteoarthritis of the Knee: A Systematic Review of Clinical Outcomes and Evidence of Cartilage Repair

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Purpose
To provide a systematic review of the clinical literature reporting the efficacy of mesenchymal stem cells (MSCs) in terms of clinical outcomes including pain and function and cartilage repair in patients with osteoarthritis.

Methods
We systematically reviewed any studies investigating clinical outcomes and cartilage repair after the clinical application of cell populations containing MSCs in human subjects with knee osteoarthritis through MEDLINE, EMBASE, the Cochrane Library, CINAHL, Web of Science, and Scopus. Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines were followed. Studies with a level of evidence of IV or V were excluded. Methodological quality was assessed using the Modified Coleman Methodology Score. Clinical outcomes were assessed using clinical scores, and cartilage repair was assessed using magnetic resonance imaging and second-look arthroscopy findings.

Results
A total of 17 studies that met the criteria of 50 full-text studies were included in this review, with 6 randomized controlled trials, 8 prospective observational studies, and 3 retrospective case-control studies. Among 17 studies, 8 studies used bone marrow–derived MSCs, 6 used adipose tissue–derived stromal vascular fraction, 2 used adipose tissue–derived MSCs, and 1 used umbilical cord blood–derived MSCs. All studies except 2 reported significantly better clinical outcomes in the MSC group or improved clinical outcomes at final follow-up. In terms of cartilage repair, 9 of 11 studies reported improvement of the cartilage state on magnetic resonance imaging, and 6 of 7 studies reported repaired tissue on second-look arthroscopy. The mean Modified Coleman Methodology Score was 55.5 ± 15.5 (range, 28-74).

Conclusions
Intra-articular MSCs provide improvements in pain and function in knee osteoarthritis at short-term follow-up (<28 months) in many cases. Some efficacy has been shown of MSCs for cartilage repair in osteoarthritis; however, the evidence of efficacy of intra-articular MSCs on both clinical outcomes and cartilage repair remains limited.

Level of Evidence
Level III; systematic review of level I, II, and III studies.

BACK

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Is Hip Arthroscopy Effective in Patients With Combined Excessive Femoral Anteversion and Borderline Dysplasia? A Match-Controlled Study

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Background
Appropriate patient selection is critical when hip arthroscopy is considered in the setting of borderline dysplasia (BD). It is presumable that excessive femoral anteversion (EFA) and BD may contraindicate arthroscopy.

Hypothesis
Patients with combined EFA and BD (EFABD) demonstrate significantly inferior short-term outcomes after arthroscopic labral preservation and capsular closure when compared with a similar control group with normal lateral coverage and femoral anteversion.

Study Design Cohort study; Level of evidence, 3.

Methods
Data were prospectively collected and retrospectively reviewed on patients undergoing hip arthroscopy between April 2010 and November 2014. The EFABD group's inclusion criteria were BD (lateral center-edge angle, 18°-25°), labral tear, capsular closure, and femoral version ≥20°, as well as preoperative modified Harris Hip Score, Nonarthritic Hip Score, Hip Outcome Score–Sports Specific Subscale, and visual analog scale. Exclusion criteria were workers' compensation, preoperative Tönnis grade >1, microfracture, abductor pathology, or previous ipsilateral hip surgery or conditions. Patients in the EFABD group were matched 1:2 to a similar control group with normal coverage and femoral anteversion by age at surgery ± 6 years, sex, body mass index ± 5, acetabular Outerbridge grade (0, 1 vs 2, 3, 4), and iliopsoas fractional lengthening.

Results
Sixteen EFABD cases were eligible for inclusion, and 100% follow-up was obtained at ≥2 years postoperatively. Twelve EFABD cases were matched to 24 control cases. Mean femoral version was 22.4° in the EFABD group and 10.2° in the control group (P = .01). Mean lateral center-edge angle was 22.1° in the EFABD group and 31.5° in the control group (P < .0001). Acetabuloplasty was performed significantly more frequently in the control group (P = .0006). No other significant differences were found regarding demographics, findings, procedures, or preoperative scores. At latest follow-up, the EFABD group demonstrated significantly lower mean modified Harris Hip Score (76.1 vs 85.9; P = .005), Nonarthritic Hip Score (74.8 vs 88.5; P < .0001), Hip Outcome Score–Sports Specific Subscale (58.3 vs 78.4; P = .02), and patient satisfaction (7.1 vs 8.3; P = .005). There were 4 secondary surgical procedures (33.3%) in the EFABD group and 1 (4.2%) in the control group (P = .03). One patient in each group required arthroplasty.

Conclusion
Patients treated with arthroscopic labral preservation and capsular closure in the setting of EFABD demonstrated significant improvements from presurgery to latest follow-up. However, their results are significantly inferior when compared with a matched-controlled group. Consideration of periacetabular osteotomy or femoral osteotomy may be warranted in the setting of EFABD to achieve optimal benefit.

BACK

Preoperative Symptom Duration Is Associated With Outcomes After Hip Arthroscopy

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Background
Prolonged disease chronicity has been implicated as a cause of suboptimal clinical outcomes after hip arthroscopy for femoroacetabular impingement syndrome (FAIS), possibly due to disease progression, deconditioning, and the development of compensatory pathomechanics.

Purpose
To evaluate the effect of increasing duration of preoperative symptoms on patient-reported outcomes, reoperation, and clinical failure of hip arthroscopy for FAIS.

Study Design Cohort study; Level of evidence, 3.

Methods
A retrospective cohort study was performed to identify all patients undergoing primary hip arthroscopy between January 1, 2012, and July 30, 2014, by a single surgeon, with minimum follow-up of 2 years. Patient demographics, comorbid medical conditions, and preoperative outcome scores were compared between patients with preoperative symptoms lasting less than 2 years and those with symptoms lasting 2 years or longer. Multivariate regressions were used to compare Hip Outcome Score Activities of Daily Living (HOS-ADL), Hip Outcome Score Sport-Specific (HOS-SS), and modified Harris Hip Score (mHHS) between the 2 cohorts at 2 years of follow-up.

Results
A total of 624 patients were included, with an average age of 34.0 ± 13.5 years; 235 (37.7%) patients had experienced preoperative symptoms 2 years or longer. Patients with symptoms lasting less than 2 years had statistically significant higher outcome scores than those with symptoms lasting 2 or more years for the HOS-ADL (86.3 ± 16.4 vs 80.3 ± 19.9, respectively), HOS-SS (75.0 ± 25.3 vs 65.1 ± 29.0), and mHHS (79.1 ± 16.6 vs 74.0 ± 18.8), as well as higher satisfaction (82.1 ± 30.7 vs 71.1 ± 31.6) and lower pain scores (2.6 ± 2.3 vs 3.5 ± 2.6). On multivariate analysis, patients with symptoms 2 years or longer had significantly higher visual analog scale–Pain score (β = 0.6, P = .039) and lower HOS-ADL (β = −3.4, P = .033), HOS-SS (β = −6.3, P = .012), and satisfaction (β = −6.7, P = .028) at 2-year follow-up. Patients with longer duration of symptoms also demonstrated less improvement in HOS-SS (β = −10.3, P = .001) at 2 years after surgery. Patients with symptoms for 2 years or longer were significantly less likely to achieve a patient acceptable symptomatic state for HOS-ADL (relative risk [RR] = 0.8, P = .024) and HOS-SS (RR = 0.8, P = .032) at 2 years of follow-up. Patients with symptoms 2 years or longer also demonstrated significantly higher rates of revision arthroscopy (RR = 10.1, P = .046).

Conclusion
Patients with untreated, FAIS-related symptoms lasting 2 years or longer before arthroscopic management had significantly worse patient-reported outcomes and higher rates of reoperation at 2 years after surgery when compared with those patients with a shorter duration of preoperative symptoms.

BACK