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Contact 4@erasmusmc.nl

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Upper extremity

Arthroscopy, Volume 34, Issue 12

Measurement of Glenoid Bone Loss With 3-Dimensional Magnetic Resonance Imaging: A Matched Computed Tomography Analysis

Bryan G. Vopat, M.D., Wenli Cai, Ph.D., Martin Torriani, M.D., Matthew L. Vopat, M.D.'Correspondence information about the author M.D. Matthew L. Vopat, M.D., Murali Hemma, B.A., Gordon J. Harris, Ph.D., Kati Schantz, P.A., CAPT Matthew T. Provencher, M.D., M.C., U.S.N.R.

Arthroscopy, Volume 34, Issue 12, Received: January 5, 2018; Accepted: June 25, 2018

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Purpose
To compare the measurement of glenoid bone surface area (GBSA) and glenoid bone loss (GBL) between 3-dimensional computed tomography (3D CT) and an autosegmentation approach for 3D magnetic resonance imaging (MRI) of patients with recurrent shoulder instability.

Methods
Eight subjects (2 women and 6 men; age range, 15-72 years [mean, 44 ± 19 years]) were consecutively enrolled who had both CT and MRI of the shoulder for clinical shoulder instability. Inclusion criteria were patients with shoulder instability or other shoulder injury who had both a CT scan and MRI performed of the same shoulder. All patients underwent a 3D CT scan and a 3-Tesla 3D MRI with additional volumetric and autosegmented sequences. En face views of the glenoid for both CT and MRI were auto- and manually measured for overall GBSA and GBL using best-fit circle technique; the amount of GBL was compared with loss of GBSA and was expressed as a percentage of bone loss.

Results
There were no differences in GBL measured by 3D CT (41 mm^2, 6.6%) vs 3D MRI (40 mm^2, 6.5%, $P = .852$). The mean GBSA was not different among the manual- and autocalculated 3D CT (644 mm^2 vs 640 mm^2, $P = .482$). In addition, the manual MRI scan glenoid area was similar to the autocalculated 3D MRI (622 mm^2 vs 618 mm^2, respectively; $P = .482$). Overall regression analysis demonstrated excellent correlation between CT and MRI for both GBSA and GBL calculations ($R^2 = 0.84$-0.90).

Conclusions
3D MRI of the glenoid is nearly identical to 3D CT scans for measurement of GBSA and GBL, making 3D MRI a reliable alternative to a CT scan for a preoperative shoulder evaluation of the glenoid pathology. This study shows that a 3D MRI could be a radiation-free and reliable alternative to a preoperative CT shoulder scan.

Level of Evidence
Level III, case-control study.

BACK

Comparison of En Masse Versus Dual-Layer Suture Bridge Procedures for Delaminated Rotator Cuff Tears

Hiroyuki Nakamizo, M.D., Ryosuke Horie, M.D.

Arthroscopy, Volume 34, Issue 12, Received: January 23, 2018; Accepted: June 26, 2018

https://doi.org/10.1016/j.arthro.2018.06.054

Purpose
To compare clinical outcomes between 2 suturing procedures, conventional en masse suture bridging (EMSB) and dual-layer suture bridging (DLSB), for delaminated rotator cuff tears.

Methods
From January 2011 through December 2015, 98 consecutive cases with delaminated rotator cuff tears were included in this study (52 with EMSB and 46 with DLSB). The mean age was 65.0 ± 8.9 years (range, 38-85 years). The mean follow-up period was 28.0 ± 6.3 months (range, 24-40 months). The cases included 78 medium tears (1-3 cm) and 20 large tears (3-5 cm). The University of California, Los Angeles (UCLA) rating scale, the Simple Shoulder Test (SST), a visual analog scale for pain, and active range of motion of the shoulder preoperatively and 2 years after surgery were evaluated. Postoperative magnetic resonance imaging was obtained at 12 months after surgery.

Results
Both the EMSB and DLSB groups showed improved clinical outcomes. Postoperative UCLA and SST scores were higher in the DLSB group than in the EMSB group (UCLA score, 33.2 ± 2.3 vs 32.0 ± 3.3 [*P* = .027]; SST score, 10.0 ± 1.0 vs 9.5 ± 1.2 [*P* = .014]). Postoperative abduction and external rotation of the shoulder were greater in the DLSB group than in the EMSB group (abduction, 160.1° ± 9.1° vs 154.8° ± 19.8° [*P* = .030]; external rotation, 53.7° ± 8.5° vs 46.1° ± 9.4° [*P* = .023]). Postoperative magnetic resonance imaging showed a retear in 7 of 52 cases in the EMSB group and 3 of 46 cases in the DLSB group, with no significant difference between groups.

Conclusions
The DLSB and EMSB procedures for delaminated rotator cuff tears improved clinical and radiographic outcomes, and the DLSB group achieved better postoperative range of motion of the shoulder than the EMSB group. The DLSB procedure is useful for repairing delaminated rotator cuff tears.

Level of Evidence
Level III, retrospective, case-control, comparative study.

BACK

Type VIII SLAP Repair at Midterm Follow-Up: Throwers Have Greater Pain, Decreased Function, and Poorer Return to Play

Mitchell S. Fourman, M.D., M.Phil., Justin W. Arner, M.D., Steve Bayer, B.A., Dharmesh Vyas, M.D., Ph.D., James P. Bradley, M.D.

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Purpose
To evaluate and compare midterm outcomes and return to play (RTP) of throwers and nonthrowers who underwent type VIII SLAP repair.

Methods
With 4-year minimum follow-up, stability, pain, range of motion (ROM), Kerlan-Jobe Orthopaedic Clinic (KJOC), and American Shoulder and Elbow Surgeons (ASES) scores; surgical satisfaction; and RTP were compared between throwing and nonthrowing athletes who underwent repair of type VIII SLAP lesions between 2003 and 2014.

Results
46 patients (27 throwers and 19 nonthrowers) were included. The athletes were aged 24.2 ± 9.2 years at the time of surgery. The mean follow-up period was 6.6 ± 2.0 years. A significant improvement in stability, pain, ROM, KJOC, and ASES scores was seen after surgery in both throwers and nonthrowers ($P < .05$). When postoperative outcomes were compared, throwers had more pain ($P = .047$), decreased ROM ($P = .03$), lower KJOC scores (52.2 ± 24.0 in throwers vs 87.5 ± 18.8 in nonthrowers, $P < .0001$), and lower ASES scores (43.5 ± 7.1 in throwers vs 48.3 ± 3.0 nonthrowers, $P = .02$). There was no difference in stability ($P = .06$), surgical satisfaction (96.3% in throwers vs 100% in nonthrowers, $P > .99$), or overall RTP (70.4% in throwers vs 94.7% in nonthrowers, $P = .06$). However, throwers were less likely to RTP at their preoperative level (37.0% in throwers vs 73.7% in nonthrowers, $P = .02$).

Conclusions
Surgical repair of type VIII SLAP tears led to significant improvements in stability, pain, ROM, and outcome scores at midterm follow-up. Compared with nonthrowers, throwers had significantly more pain, less ROM, and worse function. Throwers were also less likely to RTP at their preoperative level. These findings suggest that type VIII SLAP tears should be repaired in all athletes because outcomes do improve, although throwers require specific counseling and expectation management regarding their ability to RTP at their preinjury level.

Level of Evidence
Level III, therapeutic case-control study.

BACK

Outcomes After Limited or Extensive Bursectomy During Rotator Cuff Repair: Randomized Controlled Trial

Ji-Hoon Nam, M.D., Sanghyun Park, M.D., Hwa-Ryeong Lee, D.P.T., Sae Hoon Kim, M.D., Ph.D.

Arthroscopy, Volume 34, Issue 12, Received: January 23, 2018; Accepted: June 26, 2018

https://doi.org/10.1016/j.arthro.2018.06.056

Purpose
To evaluate the effects of extensive bursectomy (EB) and limited bursectomy (LB) during arthroscopic rotator cuff repair.

Methods
In the EB group (n = 39), subacromial bursae were thoroughly removed from anterior to posterior and lateral to medial. In the LB group (n = 39), bursectomy was minimized to allow torn cuff visualization and tendon repair. Visual analog scale pain scores, passive forward flexion, external rotation at the side (ER), and internal rotation at the back were measured at 5 weeks and 3, 6, and 12 months after surgery. At each time point, bursal thickness was measured and repair integrity was assessed by sonography or magnetic resonance imaging.

Results
The analysis included 36 patients in the LB group and 35 in the EB group. Group visual analog scale pain scores were not significantly different at any time ($P > .05$ for all). Forward flexion and internal rotation at the back showed no intergroup difference during follow-up. However, ER was significantly better in the LB group at 6 months and 1 year postoperatively (31° ± 15° vs 22° ± 16° [$P = .020$] and 40° ± 19° vs 27° ± 20° [$P = .009$], respectively). Integrity failures were not significantly different at 5 weeks and at 3, 6, and 12 months ($P > .05$ for all). Marked bursal thickening (>2 mm) was more frequently observed in the EB group (18 of 32 in the LB group and 27 of 32 in the EB group) at 6 months ($P = .014$).

Conclusions
EB during arthroscopic rotator cuff repair appears to have no benefit in terms of reducing pain. More adhesions in the subacromial space after EB may result in slower motion recovery, especially in terms of ER. The extent of bursectomy did not affect tendon integrity. However, marked bursal thickening was more frequently observed in the EB group.

Level of Evidence
Level I, randomized controlled study.

BACK

Arthroscopic Versus Open Lateral Release for the Treatment of Lateral Epicondylitis: A Prospective Randomized Controlled Trial

Tod Clark, M.D., F.R.C.S.C., Sheila McRae, Ph.D., Jeff Leiter, Ph.D., Yiyang Zhang, M.D., Jamie Dubberley, M.D., F.R.C.S.C., Peter MacDonald, M.D., F.R.C.S.C.

Arthroscopy, Volume 34, Issue 12

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

Purpose
The purpose of this randomized clinical trial was to determine whether quality of life and function, as measured using subjective questionnaires and clinical assessment, are different after open versus arthroscopic debridement of the pathologic extensor carpi radialis brevis origin in the treatment of lateral epicondylitis at 1 year postoperatively.

Methods
Patients older than 16 years with a minimum of 6 months of nonoperative management for lateral epicondylitis were recruited into this prospective, single-blinded randomized clinical trial. Patients were randomized intraoperatively to undergo open or arthroscopic release. Scores on the Disabilities of the Arm, Shoulder and Hand (DASH) outcome measure; visual analog scale (VAS); and Patient-Rated Tennis Elbow Evaluation (PRTEE) were recorded preoperatively and 3, 6, and 12 months postoperatively. Grip strength was assessed by an independent assessor. All patients followed the same physiotherapy regimen.

Results
Between 2002 and 2014, we randomized 37 patients to the open technique and 38 to the arthroscopic technique. Both groups improved significantly from preoperatively to 12 months postoperatively ($P < .001$). There were no significant differences between the 2 groups when comparing the DASH score, VAS score, PRTEE score, or grip strength at any time point. The only significant difference between study groups was that the arthroscopic technique resulted in a longer surgery time: 34.0 minutes (standard error of the mean, 2.9 minutes) versus 22.5 minutes (standard error of the mean, 1.3 minutes) ($P = .005$).

Conclusions
Comparing the open versus arthroscopic technique in the surgical management of lateral epicondylitis through a randomized clinical trial, we determined that there was no difference between the 2 operative modalities when examining the DASH score, VAS score, PRTEE score, grip strength, or complication rate at 12 months postoperatively. A shorter operative time coupled with potentially less setup time may favor open release.

Level of Evidence
Level II, lower-quality randomized trial.

BACK

Journal of Shoulder and Elbow Surgery (JSES), Volume 27, Issue 12

Does arthroscopic rotator cuff repair improve patients' activity levels?

Keith M. Baumgarten, Peter S. Chang, MD, Tasha M. Dannenbring, PhD, Elaine K. Foley, BS

Journal of Shoulder and Elbow Surgery, Volume 27, Issue 12, Pages 2167-2174

https://doi.org/10.1016/j.jse.2018.04.010

Background
Rotator cuff repair decreases pain, improves range of motion, and increases strength. Whether these improvements translate to an improvement in a patient's activity level postoperatively remains unknown. The Shoulder Activity Level is a valid and reliable outcomes survey that can be used to measure a patient's shoulder-specific activity level. Currently, there are no studies that examine the effect of rotator cuff repair on shoulder activity level.

Methods
Preoperative patient-determined outcomes scores collected prospectively on patients undergoing rotator cuff repair were compared with postoperative scores at a minimum of 2 years. These scores included the Shoulder Activity Level, Western Ontario Rotator Cuff Index, American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form, Single Assessment Numeric Evaluation, and simple shoulder test. Inclusion criteria were patients undergoing arthroscopic rotator cuff repair.

Results
Included were 281 shoulders from 273 patients with a mean follow-up of 3.7 years. The postoperative median Western Ontario Rotator Cuff Index (42 vs. 94), American Shoulder and Elbow Surgeons (41 vs. 95), Single Assessment Numeric Evaluation (30 vs. 95), and simple shoulder test (4 vs. 11) scores were statistically significantly improved compared with preoperative scores ($P < .0001$). The postoperative median Shoulder Activity Level score decreased compared with the preoperative score (12 vs. 11; $P < .0001$).

Conclusions
Patients reported a statistically significant deterioration of their Shoulder Activity Level score after rotator cuff repair compared with their preoperative scores, although disease-specific and joint-specific quality of life scores all had statistically significantly improvement. This study suggests that patients generally have (1) significant improvements in their quality of life and (2) small deteriorations in activity level after arthroscopic rotator cuff repair.

Level of Evidence
Level IV

BACK

The pathogenesis and management of cuff tear arthropathy

Caitlin M. Rugg, MD, Robert A. Gallo, MD, Edward V. Craig, MD, Brian T. Feeley, MD

Journal of Shoulder and Elbow Surgery, Volume 27, Issue 12, Pages 2271-2283

https://doi.org/10.1016/j.jse.2018.07.020

Abstract
Massive rotator cuff tears may lead to the development of cuff tear arthropathy (CTA). Although this pathology has been recognized for more than 150 years, treatment strategies have continued to evolve. During the last decade, there has been increased understanding of the molecular and cellular changes that govern rotator cuff tear outcomes and development of new treatment strategies to repair or reconstruct the rotator cuff. These have included an expansion of the use of arthroscopic double-row transosseous–equivalent repairs and the development of superior capsule reconstruction. However, the greatest change in the management of CTA has been the expansion of the use of reverse total shoulder arthroplasty, which has become the standard of care for patients who do not have a repair option and when nonoperative management has failed. This review article summarizes the current literature on the management of CTA, including nonoperative, repair, reconstruction, and replacement options, with a focus on literature in the last 5 years.

Level of Evidence
Narrative Review

BACK

Heterotopic ossification after superior capsular reconstruction

Alex Mulligan, MA (Cantab), FRCS (Tr&Orth), Graham Tytherleigh-Strong, FRCS(Orth), FFSEM(UK), DSportMed

Journal of Shoulder and Elbow Surgery, Volume 27, Issue 12, Pages e380-e386

https://doi.org/10.1016/j.jse.2018.08.021

Abstract
Arthroscopic superior capsular reconstruction (SCR) has been suggested as an effective intervention for the treatment of shoulder disability due to deficient and irreparable superior rotator cuff and capsule. Complications after this procedure are rare. Although heterotopic ossification (HO) around the shoulder after arthroplasty has been described, it is unusual in arthroscopic procedures and is rarely symptomatic or functionally limiting. We could find only 1 other report of HO after arthroscopic shoulder surgery requiring further surgical intervention and no reports of HO after SCR.

Level of Evidence
Case Report

BACK

Biological allograft healing after superior capsule reconstruction

Fabian Plachel, MD, Franka Klatte-Schulz, PhD, Marvin Minkus, MD, Elisabeth Böhm, Philipp Moroder, MD, Markus Scheibel, MD

Journal of Shoulder and Elbow Surgery, Volume 27, Issue 12, Pages e387-e392

https://doi.org/10.1016/j.jse.2018.08.029

Abstract
The management of patients with irreparable rotator cuff tears remains challenging. Several surgical treatment options are available, with reliable improvements in shoulder function and shoulder pain.As an alternative for young and active patients, the superior capsule reconstruction (SCR) was originally described by Mihata et al in 2013. A fascia lata autograft is used to arthroscopically reconstruct the superior glenohumeral capsule and thus, to enhance shoulder function by restoring superior stability.

Level of Evidence
Case Report

BACK

Knee Surgery, Sports Traumatology, Arthroscopy (KSSTA), Volume 26, Issue 12

An arthroscopic bone block procedure is effective in restoring stability, allowing return to sports in cases of glenohumeral instability with glenoid bone deficiency

Ettore Taverna, Guido Garavaglia, Carlo Perfetti, Henri Ufenast, Luca Maria Sconfienza, Vincenzo Guarrella

KSSTA, December 2018, Volume 26, Issue 12, pp 3780–3787

https://doi.org/10.1007/s00167-018-4921-7

Purpose
A group of patients affected by bone loss in the context of recurrent anterior shoulder instability were treated arthroscopically with a modified Eden-Hybinette technique since 2005. The last modification was made in 2013, consisting of fixation using a pair of specifically designed double round Endobuttons, which secure the bone graft to the glenoid rim placed through a guide. This report describes patients operated on after this last modification. No reports have described the results of this technique, and the purpose of this study was to assess early clinical and radiological results of an arthroscopic bone block procedure with double round Endobutton fixation. We hypothesized that this technique would restore shoulder stability in patients with anteroinferior glenohumeral instability with glenoid bone deficit, with excellent clinical and radiological results.

Methods
The clinical and radiological efficacy of this procedure was retrospectively evaluated in 26 patients with an average follow-up of 29.6 months (range 24–33 months).

Results
At minimum 2-year follow-up, we had no recurrent anterior dislocations, excellent clinical results [average Walch-Duplay score 93.2, (SD 7.8); average Rowe score, 96.4 (SD 6.5); average SSV, 87.4 (SD 12.1); satisfaction rate, 88.5%; average loss of external rotation, 4.4° (SD 8.7°)] optimal graft positioning, and a healing rate of 92.3% on computed tomography scan.

Conclusions
Arthroscopic bone block grafting combined with a standard Bankart repair restored shoulder stability in patients with anteroinferior glenohumeral instability with glenoid bone deficit, with excellent clinical and radiological results. This procedure did not substantially limit external rotation, allowing a high rate of return to sports even among competitive, overhead, and “at risk” athletes.

BACK

The arthroscopic Bankart repair procedure enables complete quantitative labrum restoration in long-term assessments

J. Bock, J. Buckup, Y. Reinig, E. Zimmermann, C. Colcuc, R. Hoffmann, F. Welsch, Thomas Stein

KSSTA, December 2018, Volume 26, Issue 12, pp 3788–3796

https://doi.org/10.1007/s00167-018-4922-6

Purpose
The restoration of the labrum complex and the influence on secondary osteoarthritis after arthroscopic Bankart repair on magnetic resonance imaging (MRI) remain unclear.

Methods
Twenty-one patients were retrospectively followed after unilateral primary arthroscopic Bankart repair with knot-tying suture anchors (8.8 ± 2.5 years after surgery, age 25.3 ± 6.3 years). Bilateral structural MRI was performed to assess labrum–glenoid restoration by measurements of the labrum slope angle, height index, and labrum interior morphology according to the Randelli classification. Osteoarthritic status was bilaterally assessed by a modified assessment based on the Samilson–Prieto classification.

Results
MRI assessment revealed full labrum–glenoid complex restoration with equivalent parameters for anterior slope angle (mean ± SD: 21.3° ± 2.6° after Bankart repair vs. 21.9° ± 2.6° control) and height index (2.34 ± 0.4 vs. 2.44 ± 0.4), as well as the inferior slope angle (23.1° ± 2.9° vs. 23.3° ± 2.1°) and height index (2.21 ± 0.3 vs. 2.21 ± 0.3) (all n.s.). The labrum morphology showed only for the anterior labrum significant alterations (1.4 ± 0.9 vs. 0.6 ± 0.7, $p < 0.05$), the inferior labrum occurred similarly (1.3 ± 0.8 vs. 0.8 ± 0.5, n.s.). Osteoarthritic changes were significantly increased after Bankart repair compared to the uninjured shoulder (4.8 ± 5.1 mm vs. 2.5 ± 1.0 mm; $p < 0.05$), with a significant correlation of osteoarthritis status between both shoulders ($p < 0.05$). Scores generally decreased after Bankart repair (constant 84.6 ± 9.5 vs. 94.5 ± 4.9 control, $p < 0.05$; Rowe 84.5 ± 6.5 vs. 96.2 ± 4.2, $p < 0.05$; Walch–Duplay 82.4 ± 7.0 vs. 94.3 ± 4.0, $p < 0.05$) with a strong correlation with osteoarthritis status ($p < 0.05$).

Conclusions
Arthroscopic Bankart repair enabled good clinical outcomes and complete quantitative labrum restoration parameters. Next to several well-known parameters, secondary osteoarthritis after arthroscopic Bankart repair significantly correlated with osteoarthritic status of the uninjured contralateral shoulder but was not influenced by quantitative labrum restoration. The recommendation for arthroscopic Bankart repair should be based on clinical parameters and not on prevention of secondary osteoarthritis.

Study design
Case series.

Level of evidence
IV.

BACK

Arthroscopic treatment for intratendinous rotator cuff tear results in satisfactory clinical outcomes and structural integrity

Sang Jin Cheon, Hyo Yeol Lee, Woong Ki Jeon

KSSTA, December 2018, Volume 26, Issue 12, pp 3797–3803

https://doi.org/10.1007/s00167-018-4931-5

Purpose
This study aimed to evaluate the clinical outcomes and structural integrity of arthroscopic repair of intratendinous rotator cuff tear.

Methods
Patients who were diagnosed with an intratendinous tear but in whom conservative treatment failed were selected and underwent arthroscopic repair. Between 2008 and 2014, a total of 30 patients (6 men, 24 women; mean age, 59 ± 3.7 years) met the inclusion criteria and were followed up. The mean follow-up period was 26.3 ± 0.7 months. The results were evaluated using the University of California at Los Angeles (UCLA) score, the Society of the American Shoulder and Elbow Surgeons rating scale (ASES) questionnaire, and the visual analog scale (VAS) and range of motion (ROM) were measured preoperatively and at final follow-up. Magnetic resonance imaging (MRI) was performed preoperatively and at 6.7 ± 0.2 months postoperatively. Postoperative MRI was performed on 27 out of 30 patients and analysed using the Sugaya classification.

Results
Corresponding to the preoperative MRI findings, arthroscopic findings of intratendinous tears were observed in all 30 patients. The mean active forward elevation ROM was 137.3° ± 15.4° before surgery and 168.8° ± 15.2° at the final follow-up. The internal and external rotations at abduction were 31.7° ± 5.1° and 63.0° ± 11.6° before surgery, respectively, and 60.5° ± 8.0° and 75.2° ± 10.8° after surgery, respectively. The UCLA score improved from of 20.1 ± 7.4 points preoperative to 28.4 ± 5.5 points at the final follow-up. The ASES score improved from 55.7 ± 15.3 points preoperative to 82.6 ± 9.7 points postoperatively. The VAS for pain score decreased from 6.4 ± 1.2 points preoperative to 1.6 ± 0.9 points postoperative. Satisfactory outcomes (excellent/good) in terms of UCLA and ASES scores were observed in 29 of 30 patients. Based on Sugaya classification, grades I, II, and III structural integrities were observed in 9, 14, and 4 patients, respectively.

Conclusions
Successful clinical outcomes and structural integrity can be achieved with arthroscopic repair of intratendinous rotator cuff tears involving more than half thickness (> 50%). Therefore, arthroscopic repair is a practical next treatment option for patients with intratendinous rotator cuff tears in whom conservative treatment fails.

Level of evidence
IV.

BACK

Arthroscopic rotator cuff surgery following shoulder trauma improves outcome despite additional pathologies and slow recovery

Barak Haviv, Tal Frenkel Rutenberg, Shlomo Bronak, Mustafa Yassin

KSSTA, December 2018, Volume 26, Issue 12, pp 3804–3809

https://doi.org/10.1007/s00167-018-4969-4

Purpose
To compare the outcome, recovery and surgical findings after shoulder arthroscopy of clinically defined traumatic and non-traumatic rotator cuff pathology in middle-aged patients.

Methods
Of the patients who underwent rotator cuff surgery, 37 patients who reported a preceding shoulder injury related to their shoulder symptoms (traumatic group) were compared to a control group of 58 patients without a preceding injury (non-traumatic group), matched by age, body mass index and comorbidities. Data included demographic details, patient history, surgical findings, the Oxford Shoulder Score questionnaires and overall satisfaction from surgery.

Results
The mean follow-up time was 33.2 ± 14.4 months. More concomitant pathologies were found in the study group. The proportion of large and massive supraspinatus tears was double in the study group (43%) compared to the control group (22%). The Oxford Shoulder Score (OSS) improved significantly after surgery in both groups ($p < 0.001$) with no differences between groups in OSS and overall satisfaction from surgery. Patients in the study group felt recovered at an average time of 6.1 ± 4.6 months from surgery, while patients in the control group felt recovered at 4.2 ± 2.6 months ($p = 0.02$). Patients who were operated at the first 6 months after the injury had better improvement in OSS than patients who were operated later.

Conclusion
Surgical arthroscopy for rotator pathology of the shoulder in middle-aged patients improved pain and function regardless of a traumatic onset; however, earlier repair after trauma resulted in better outcome scores. Larger full-thickness tears and concomitant pathologies were more common after injury.

Study design
Level III.

BACK

Comparable clinical and structural outcomes after arthroscopic rotator cuff repair in diabetic and non-diabetic patients

Katsutoshi Miyatake, Yoshitsugu Takeda, Koji Fujii, Naoto Suzue, Yoshiteru Kawasak, iYasuyuki Omichi, Kenji Yokoyama

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Purpose
To compare clinical outcome and rotator cuff integrity after arthroscopic rotator cuff repair (ARCR) in patients with and without diabetes mellitus.

Methods
This retrospective study involved 264 consecutive patients who underwent ARCR from 2012 to 2015. Inclusion criteria were a medium or large-sized tear and a minimum of 1-year follow-up. Clinical outcome measures included range of motion (ROM) and the Japanese Orthopaedic Association (JOA) and University of California, Los Angeles (UCLA) scores preoperatively and at final follow-up. Rotator cuff retear was evaluated with magnetic resonance imaging at 3 months post-surgery and final follow-up. Diabetic patients with poor control were pre-operatively hospitalized for intensive diabetic control.

Results
Our inclusion criteria were met by 30 diabetic patients and 126 non-diabetic patients. Demographic data were not significantly different between the groups, except body mass index ($p = 0.021$). Preoperative JOA and UCLA scores of the diabetic patients were significantly lower than those of the non-diabetic patients ($p < 0.001$, and $p = 0.006$, respectively); however, the scores at final follow-up were not different. ROM was significantly restricted in the diabetic patients before surgery (forward flexion, abduction, internal rotation: $p < 0.001$, external rotation: $p = 0.035$), but at the final follow-up, there was no significant difference except for internal rotation ($p = 0.005$). The retear rate in diabetic patients (23.3%) was not significantly different from that in non-diabetic patients (15.1%).

Conclusions
Diabetic patients who had good perioperative glycemic control showed clinical and structural outcomes comparable to non-diabetic patients after ARCR. Intensive perioperative glycemic control and patient education are recommended for preoperative uncontrolled diabetic patients.

Level of evidence
III.

BACK

Increased fatigue of the biceps after tenotomy of the long head of biceps tendon

José Emmanuel García-Rellán, Eduardo Sánchez-Alepuz, Jesús Mudarra-García

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Purpose
The aim of this study is to evaluate the biomechanical parameters of biceps fatigue (time to claudication during elbow flexion) and strength between the shoulder where the tenotomy has been performed and the healthy arm. The hypothesis of this study was that measuring biceps fatigue may be more useful for determining functionality after tenotomy.

Methods
52 patients from 2 hospitals were selected to undergo biomechanical tests of healthy and pathological arms, before and 12 months after surgery. The test consisted of (1) isometric measurement of maximal voluntary contraction (MVC) in elbow flexion and forearm supination (MVS) at baseline conditions. (2) Biceps fatigue test was performed by a submaximal contraction to 33% of MVC maintained at a time as well recorded to the time to claudication. (3) After claudication, measurements of the MVC and MVS were recorded. In addition, the Constant score, SSI functional scale, VAS scale and perceived symptoms were evaluated.

Results
Of the 52 patients included in the study, 26 met the selection criteria. Two patients were lost to follow-up. The mean age was 55 ± 5.6 years. Popeye sign was observed in 58.3% of the cases. Two patients were not satisfied with the results. Preoperatively, MVC was 193.6 ± 55.2 N, which significantly improved after tenotomy to 252.1 ± 61.2 N, but this value was less than the healthy arms (280 ± 68 N). The fatigue time decreased from 141.9 ± 69.7 s preoperatively to 94.2 ± 29.9 s after tenotomy. There was also an improvement in the strength of the arm after the fatigue test. No differences in supination force were found. The Constant, SSI and VAS rating scales improved significantly.

Conclusions
Despite functional improvements of the long head of biceps tendon (LHBT) after tenotomy, this study demonstrates that the shoulder where the tenotomy has been performed will fatigue more quickly than it did preoperatively. Despite this, an improvement in the isometric contraction in flexion of the elbow with respect to the preoperative values. However, this improvement did not reach the flexion power of the contralateral healthy arm. No changes were observed in the supination force of the forearm.

Level of evidence
III.

BACK

Return to sport after acute acromioclavicular stabilization: a randomized control of double-suture-button system versus clavicular hook plate compared to uninjured shoulder sport athletes

D. Müller, Y. Reinig, R. Hoffmann, M. Blank, F. Welsch, U. Schweigkofler, T. Stein

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Purpose
Traumatic high-grade acromioclavicular joint (ACJ) separations can be surgically stabilized by numerous anatomic and non-anatomic procedures. The return to sport (Maffe et al. in Am J Sports Med 23:93–98, 1995] and remaining sport-associated impairments after acute ACJ stabilization has not yet been investigated.

Methods
73 consecutive athletes with acute high-grade ACJ separation were prospectively assigned into two groups (64.4% randomized, 35.6% intention-to-treat): open clavicular hook plate (cHP) implantation (GI) or arthroscopically assisted double double-suture-button (dDSB) implantation (GII). Patients were analyzed using shoulder sport-specific measurement tools for sport ability (ASOSS), sport activity (SSAS), and numerical analog scales: NASpain during sport, NASshoulder function in sport, and NASre-achievement of sport level. Four points of examination were established: preoperative evaluation (FU0) and first postoperative follow-up (FU1) at 6 months; FU2 at 12 months; and FU3 at 24 months after surgery. The control group (GIII) consisted of 140 healthy athletes without anamnesis of prior macro-injury or surgery.

Results
After surgical stabilization, 29 of 35 athletes in GI (82.9%; 38.6 ± 9.9 years) and 32 of 38 in GII (82.9%; 38.6 ± 9.9 years) were followed up for 24 months (FU3) (loss 17.8%). All operated athletes showed significantly increased scores compared to FU0 ($p < 0.05$). Compared to GI, GII showed significantly superior outcome data for sporting ability as well as for NASre-achievement of sport level ($p < 0.05$). While GII re-achieved GIII-comparable SSAS and ASOSS levels, GI remained at a significantly inferior level. Athletes after ACJ injury of Rockwood grade IV/V and overhead athletes benefited significantly from the dDSB procedure.

Conclusion
The dDSB procedure enabled significantly superior sport-specific outcomes compared to the cHP procedure. Athletes after dDSB surgeries re-achieved the sporting ability and the sport activity levels of healthy athletes, whereas athletes after cHP implantation remained at significantly inferior levels. The more extensive dDSB procedure and the more restrictive rehabilitation are recommended for treatment of acute high-grade ACJ separations of functionally high-demanding athletes.

Level of evidence
I.

BACK

Lower Extremity

Arthroscopy, Volume 34, Issue 12

Return to Golf After Arthroscopic Management of Femoroacetabular Impingement Syndrome

Brian R. Waterman, M.D., Gift Ukwuani, M.D., Ian Clapp, B.A., Philip Malloy, M.S., P.T., William H. Neal, B.S., Shane J. Nho, M.D., M.S.

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Purpose
To investigate if patients who reported playing golf before arthroscopic hip surgery for femoroacetabular impingement syndrome were able to return to playing golf postoperatively.

Methods
The study was a retrospective analysis of all consecutive patients undergoing hip arthroscopy for femoroacetabular impingement syndrome between 2012 and 2014. Inclusion criteria required that a patient (1) reported playing golf before the surgery, (2) had a minimum 2-year follow-up, and (3) completed patient-reported outcome measures. An electronic postoperative return to golf questionnaire was completed by patients who reported golf as an activity. To evaluate patients' ability to return to golf after surgery, the following variables were analyzed with paired samples t test and χ-square tests: handedness, holes played, modified-Harris Hip Score, and Hip Outcome Score Activity of Daily Living and Sports-Specific Subscale.

Results
A total of 29 patients (22 men; age, 36.0 ± 11.9 years) with a minimum of 24 months of follow-up who self-reported playing golf preoperatively were included in the analysis. Preoperatively, 23 patients (79%) had discontinued golfing owing to activity-related hip complaints. At the final follow-up, all patients had significant improvements in the Hip Outcome Score Activity of Daily Living (preoperatively, 65.9 ± 19.9; postoperatively, 91.5 ± 12.8; $P < .0001$), the Hip Outcome Score Sports-Specific Subscale (38.2 ± 23.5, 79.7 ± 28.8; $P = .0002$), and modified-Harris Hip Score (54.8 ± 15.6; 84.2 ± 15.8; $P < .0001$). Additionally, there was a decrease in pain from 7.34 ± 1.63 to 1.71 ± 2.3 postoperatively ($P < .0001$), and 97% of patients returned to golf at an average of 7.2 months postoperatively. Postoperatively, 55% of patients (n = 16) noted improved golfing performance, 41% (n = 11) returned to their preinjury level, 1 patient (3%) returned at a lower level owing to non–hip-related problems, and 1 (3%) did not return to golf owing to fear of reinjury.

Conclusions
Arthroscopic treatment of femoroacetabular impingement syndrome in patients who reported playing golf before surgery resulted in significant improvements in hip function and predictably high rates of patient satisfaction, with 97% returning to golfing activity and 55% noting improvement from preinjury sporting performance.

Level of Evidence
Level IV, retrospective case series.

BACK

The Influence of Pain in Other Major Joints and the Spine on 2-Year Outcomes After Hip Arthroscopy

Natalie L. Leong, M.D., Ian M. Clapp, M.S., William H. Neal, B.S., Edward Beck, M.P.H., Charles A. Bush-Joseph, M.D., Shane J. Nho, M.D., M.S.

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Purpose
To determine whether patients who have pain in other major joints or the spine have poorer postsurgical outcomes than patients without comorbid orthopaedic pain.

Methods
We performed a review of a prospectively maintained institutional surgical registry of patients who underwent hip arthroscopy between January 1, 2012, and July 16, 2015, by a single surgeon, with a minimum of 2 years of postoperative follow-up. A musculoskeletal morbidity (MSM) score was assigned to each patient preoperatively based on the presence of pain in other joints and the spine (grade 1, hip only; grade 2, hip and other major joints without spine; grade 3, hip with spine; and grade 4, hip and other major joints with spine). Preoperatively and at 2 years postoperatively, functional outcomes were measured using the Hip Outcome Score–Activities of Daily Living (HOS-ADL), and the percentages of patients achieving a minimal clinically important difference (MCID) and patient-acceptable symptom state (PASS) were calculated.

Results
In total, 821 patients were identified, of whom 700 (85.3%) completed 2-year follow-up. Preoperatively, MSM grade 1 patients had a higher HOS-ADL than grade 2 patients (P = .02), but there was no difference between grade 1 and grade 3 patients (P = .63) or between grade 1 and grade 4 patients (P = .14). Likewise, there was no difference in the preoperative HOS-ADL among grades 2, 3, and 4. Patients with MSM grades 1 and 2 were younger than those with grades 3 and 4. At 2 years postoperatively, MSM grade 1 patients had higher HOS-ADL values than grade 3 (P = .01) and grade 4 (P = .02) but not grade 2 (P = .07) patients. Overall, 84% of patients showed an MCID and 72% of patients achieved a PASS with regard to the HOS-ADL. There were no statistically significant differences among MSM grades in terms of the MCID or PASS.

Conclusions
Overall, 84% of patients improved with hip arthroscopy by MCID criteria for the HOS-ADL. Patients with no pain in other joints (MSM grade 1) had better 2-year postoperative HOS-ADL values after hip arthroscopy than patients with spine pain (grades 3 and 4). However, there were no significant differences in the MCID or PASS among patients with regard to MSM grade. A total of 40.5% of patients who underwent hip arthroscopy had pain in another joint. A limitation, however, is that there is potential for a type II error, in that there may not have been a sufficient number of patients studied to detect a significant difference in outcome among patients with different grades of musculoskeletal comorbidity.

Level of Evidence
Level IV, therapeutic case series.

BACK

Revision Anterior Cruciate Ligament Reconstruction With Hamstrings and Extra-articular Tenodesis: A Mid- to Long-Term Clinical and Radiological Study

Andrea Redler, M.D., Raffaele Iorio, M.D., Edoardo Monaco, M.D., Francesco Puglia, M.D., Megan R. Wolf, M.D., Daniele Mazza, M.D., Andrea Ferretti, M.D.

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https://doi.org/10.1016/j.arthro.2018.05.045

Purpose
To present the mid- to long-term clinical and radiographic outcomes of a series of patients who underwent revision anterior cruciate ligament (ACL) reconstruction with doubled gracilis and semitendinosus (DGST) autograft and a lateral extra-articular tenodesis (LET).

Methods
Patients who underwent revision ACL reconstruction with DGST and LET by a single surgeon between January 1997 and December 2013 were included. Revision was indicated by ACL failure noted on magnetic resonance imaging, persistent clinical instability, or laxity on clinical exam. Patients were evaluated preoperatively and at latest follow-up by an independent board-certified orthopaedic surgeon. Outcomes included Lachman and pivot shift tests, validated clinical and patient reported outcomes scores, and radiographic analysis. The presence of previous meniscectomy or chondral injury was recorded intraoperatively.

Results
A total of 118/132 potential patients (89.4%) was available for follow-up at a mean 10.6 years (3-19 years) postoperatively. Lachman and pivot shift examinations as well as the side-to-side difference on an KT-1000 arthrometer demonstrated significant improvement at latest follow-up ($P < .05$) versus preoperative evaluation. Severe degenerative disease was present in 25% of patients on radiograph and correlated with worsened clinical outcomes. Previous meniscectomy was the only risk factor analyzed that correlated with worsened radiographic grade. No patients had a graft tear based on clinical and/or magnetic resonance imaging evaluation, but 9 (7.6%) failed based on a side-to-side difference of >5 mm on the KT-1000, a grade ≥2+ on pivot shift, or report of continued instability.

Conclusions
Revision ACL reconstruction with DGST and LET at mid- to long-term follow-up provides continued improvement in clinical and radiological outcomes from preoperative assessment. Meniscectomy was the only factor related to worsened radiological grades and clinical outcomes.

Level of Evidence
Level IV, case series.

BACK

Early and Delayed Meniscal Shrinkage After Fresh-Frozen Lateral Meniscal Allograft Transplantation: Magnetic Resonance Imaging Study With a Midterm Follow-up

Bum-Sik Lee, M.D., Seong-Il Bin, M.D., Ph.D., Jong-Min Kim, M.D., Ph.D., Chang-Rack Lee, M.D., Young Hyun Choi, M.D., Young-Hee Kwon, A.P.N.

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Purpose
To evaluate whether fresh-frozen meniscal allograft shrinkage occurs only during the first year of the early remodeling period or progresses over the delayed period of midterm years and to determine whether these changes were associated with certain clinical and radiologic outcomes.

Methods
We retrospectively reviewed meniscal allograft transplantations (MATs) performed by 1 senior surgeon (S-I.B.) using fresh-frozen allograft from 2008 to 2013. The inclusion criteria were the patients who had midterm follow-up magnetic resonance imaging (MRI) scans between 3 and 6 years after isolated lateral MATs. We excluded the graft tears found on the 1-year or midterm MRI scans. MATs were indicated for the treatment persistent compartmental pain in young to middle-aged, physically active patients who had well-aligned nonarthritic joint without ligament insufficiency. The meniscal width of the transplants at the midbody and posterior horn was measured on day 2 (as a reference), at 1 year (after early remodeling period), and after 3 to 6 years (delayed period) postoperatively. Joint space width changes during each interval were measured on 45° flexion posteroanterior views. The Lysholm score and Tegner activity scale were used to evaluate clinical outcomes.

Results
Eighty-four isolated lateral MATs with the midterm MRI scans were identified. Of these, 17 graft tears were found; therefore, we analyzed 67 patients (32 male and 35 female patients) with a mean age of 30.9 years (range, 15-52 years). The mean relative meniscal width at the midbody decreased to 93.7% (95% confidence interval [CI], 91.8%-95.6%; $P < .001$) at 1 year postoperatively and to 88.0% (95% CI, 85.6%-90.3%; $P < .001$) at the midterm follow-up of 4.0 ± 1.0 years. The posterior horn shrank less than the midbody during the same period (96.0%; 95% CI, 94.8%-97.1%) at 1 year ($P < .001$) and 92.5% (95% CI, 91.0%-94.1%) at the last follow-up ($P < .001$). Although there was no severe shrinkage (>50% of the initial size), the incidence of moderate (25%-50%) changes at the midbody increased from 1 (1.5%) at 1 year to 5 (7.5%) at the last follow-up, respectively. We could not find any significant positive correlations between the relative meniscal width and patient-reported outcomes or joint space width changes after 1 year or at the last follow-up.

Conclusions
Shrinkage of fresh-frozen meniscal transplants occurred during both the early remodeling and delayed midterm periods. Although the changes were greater in the midbody than in the posterior horn, the overall changes were less than those of the previous studies using cryopreserved grafts. We could not find that the meniscal shrinkage over the midterm period were significantly associated with inferior outcomes in this series.

Level of Evidence
Level IV, therapeutic case series.

BACK

Opioid Overprescription After Knee Arthroscopy and Related Surgery in Adolescents and Young Adults

Frances A. Tepolt, M.D., Jennifer Bido, M.P.H., Stephanie Burgess, P.A.-C., Lyle J. Micheli, M.D., Mininder S. Kocher, M.D., M.P.H.

Arthroscopy, Volume 34, Issue 12, Received: December 19, 2017; Accepted: July 7, 2018

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Purpose
The purpose of this study was to compare the number of opioids prescribed with the amount of pain medication required after knee arthroscopy and related surgery in adolescent and young adult patients to determine the effectiveness of current pain-control practices at a single institution. The secondary purpose was to determine what demographic or surgical factors are associated with increased opioid intake.

Methods
Adolescent and young adult patients who underwent knee arthroscopy and related surgery, including ligament reconstruction or tibial tubercle osteotomy, between May and August 2016 were provided pain-control logbooks in which they were asked to maintain a record of daily pain medication intake. The outcome of the study was defined as the total number of opioids consumed per patient.

Results
One hundred patients returned completed logbooks, 56% of whom were female patients. The average age was 17.54 years (standard deviation [SD], 3.51 years). Most patients underwent an open procedure concurrent with knee arthroscopy (60%), underwent nerve block placement (51%), and underwent injection of local anesthesia (91%). Use of both intravenous acetaminophen and ketorolac during the perioperative period was also common (41%). Patients were prescribed an average of 50.98 oxycodone pills (SD, 12.50 pills) and reported consuming an average of 16.52 pills (SD, 13.94 pills), approximately 32.4% of those prescribed. Eleven percent never consumed opioids, and only 1 patient requested a refill during the 21-day postoperative period. Multivariate analysis showed that increased weight, longer surgery time, and increased diazepam use were most closely associated with increased opioid consumption.

Conclusions
After knee arthroscopy and related surgery, including ligament reconstruction or tibial tubercle osteotomy, adolescent and young adult patients are commonly overprescribed opioids, consuming on average only approximately one-third of those prescribed.

Level of Evidence
Level IV, case series.

BACK

Extra-articular Lateral Hinge Fracture Does Not Affect the Outcomes in Medial Open-Wedge High Tibial Osteotomy Using a Locked Plate System

Kang-Il Kim, M.D., Gi Beom Kim, M.D., Hwan Jin Kim, M.D., Sang Hak Lee, M.D., Wan-Keun Yoon, M.D.

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Purpose
To compare the radiologic and clinical outcomes in patients with and without lateral hinge fractures (LHFs) during medial open-wedge high tibial osteotomy (MOWHTO) using a locked plate system, as well as to assess whether LHFs could affect the midterm outcomes.

Methods
From May 2008 to November 2015, 164 knees underwent MOWHTO using a locked plate system for the treatment of knee osteoarthritis. LHFs were recognized by radiographs during or after the high tibial osteotomy and were not additionally treated. In all patients, we applied the same rehabilitation protocol that allowed full weight bearing at 6 weeks. Patients were divided into LHF (types I and II) and nonfracture groups. Radiologically, we compared any serial changes in the hip-knee-ankle angle, femorotibial angle, medial proximal tibial angle, and posterior tibial slope angle from the immediate postoperative radiographs to the final radiographs. The union process of the osteotomy site among the groups was also evaluated. Clinically, the postoperative American Knee Society Score and knee range of motion at latest follow-up were compared. Postoperative complications were also evaluated.

Results
The average age at operation was 56.0 years (range, 42-67 years), and the average follow-up period was 62.2 months (range, 24-120 months). LHFs were observed in 37 knees (22.6%) and were divided into the type I (16 knees) and type II (21 knees) groups. All groups showed no significant changes in serial evaluations of the postoperative hip-knee-ankle angle, femorotibial angle, medial proximal tibial angle, and posterior tibial slope angle. The improvements in the American Knee Society Score and knee range of motion were not significantly different among the groups. No patients showed correction loss or union problems.

Conclusions
Type I and II LHFs in MOWHTO using a medial locked plate system and relatively conservative rehabilitation protocol with full weight-bearing walking commenced at 6 weeks postoperatively showed no radiologic changes or functional deterioration during midterm follow-up.

Level of Evidence
Level IV, case series.

BACK

Autograft or Allograft? Irradiated or Not? A Contrast Between Autograft and Allograft in Anterior Cruciate Ligament Reconstruction: A Meta-analysis

ShuaiYi Wang, M.D., Chi Zhang, M.D., YouZhi Cai, M.D., XiangJin Lin, M.D.

Arthroscopy, Volume 34, Issue 12, Received: January 28, 2018; Accepted: June 25, 2018

https://doi.org/10.1016/j.arthro.2018.06.053

Purpose
To compare the clinical outcomes and adverse events associated with irradiated and nonirradiated allografts in anterior cruciate ligament (ACL) reconstruction.

Methods
PubMed, Web of Science, and EMBASE were searched for randomized controlled trials from January 1990 to March 2018 to compare autograft with allograft in ACL reconstruction. Both objective and subjective outcomes of the function and adverse events were meta-analyzed. Two comparisons were summarized: (1) autograft and nonirradiated allograft and (2) autograft and irradiated allograft. The bias risk was based on the *Cochrane Handbook for Systematic Reviews of Interventions*. The overall risk ratio or weighted mean difference was calculated using a fixed- or random-effects model. Heterogeneity between studies was evaluated by the *Q* and the I^2 statistics.

Results
Eleven trials were included in this review for meta-analysis. A total of 1,172 patients were involved (465 autograft and 461 nonirradiated allograft; 141 autograft and 138 irradiated allograft patients). The average follow-up varied from 2 to >10 years. The mean patient age varied from 22 to 32.8 years. The total failure rate was 2.5%. Our analyses demonstrated better clinical outcomes in autograft than irradiated allograft, which could be observed clearly through the International Knee Documentation Committee score (3.84; 95% confidence interval [CI], 1.93-5.76; $P < .0001$; $I^2 = 0\%$), Lysholm score (2.94; 95% CI, 0.66-5.22; $P = .01$; $I^2 = 0\%$), and Tegner score (0.14; 95% CI, –0.08 to 0.36; $P = .22$; $I^2 = 0\%$) with fewer adverse events 0.20 (95% CI, 0.11-0.39; $P < .00001$; $I^2 = 0\%$). There were no significant differences in autograft and nonirradiated allograft groups ($P = .47$, $P = .27$, $P = .24$, and $P = .24$, respectively).

Conclusions
Autograft offered greater advantages in functional outcomes and adverse events than irradiated allograft in ACL reconstruction; however, there were no significant differences between autograft and nonirradiated allograft in ACL reconstruction.

Level of Evidence
Level II, meta-analysis of Level I and Level II studies.

BACK

Knee Surgery, Sports Traumatology, Arthroscopy (KSSTA), Volume 26, Issue 12

Graft failure is more frequent after hamstring than patellar tendon autograft

Karl Eriksson, Christoffer von Essen, Sven Jönhagen, Björn Barenius

KSSTA, December 2018, Volume 26, Issue 12, pp 3537–3546

https://doi.org/10.1007/s00167-018-4982-7

Purpose
The risk of graft failure after anterior cruciate ligament (ACL) reconstructions with hamstring or patellar tendon was evaluated in a French population of athletes.

Methods
Athletes who had undergone ACL autograft reconstruction and who received rehabilitation care at the European Center for Sports Rehabilitation (CERS; Capbreton, France) were screened for this prospective cohort study. Eligibility criteria included a simple hamstring autograft or patellar tendon autograft surgical technique. Patients were contacted by phone to participate in follow-up during the second year after surgery. The primary endpoint was the graft failure frequency, evaluated with a multivariate logistic model with adjustment for baseline patient characteristics. The secondary endpoint was time to graft failure, analyzed by an adjusted Cox model.

Results
A total of 2424 athletes were included after having a hamstring autograft (semitendinosus and gracilis) or a patellar tendon autograft between 2011 and 2014. Of the 988 athletes who responded to a follow-up phone call (40.7% response rate), 33 were excluded for new contralateral ACL rupture (3.3%), with 955 included for analysis (713 hamstring autografts; 242 patellar-tendon autografts). There were no significant differences between the baseline characteristics of the patients analyzed and the population which did not respond to the questionnaire. A significant difference in the frequency of graft failure was seen, 6.5% for hamstring autografts vs 2.1% for patellar-tendon autografts [adjusted odds ratio (OR) = 3.64, 95% CI (1.55; 10.67); p = 0.007]. Mean time to graft failure was 10.7 vs 17.4 months for hamstring and patellar-tendon autografts respectively [adjusted hazard ratio (HR) = 3.50, 95% CI (1.53; 10.11); p = 0.008]. Age less than 25 years significantly increased the frequency of graft failure [adjusted OR = 3.85 (1.89; 8.72); p < 0.001]. The rate of patients returning to competitive sport after the first graft was not significantly different for the two techniques: 70.8% for hamstring and 77.8% for patellar tendon [adjusted OR = 0.718; 95% CI (0.50; 1.02)].

Conclusions
Graft failure is significantly more frequent after hamstring than patellar tendon autografts in a French population, despite similar rates of return to competition. Athletes aged less than 25 years have a higher risk of failure than those aged ≥ 25 years. Our results are in accordance with recent Scandinavian studies.

Level of evidence
II.

BACK

Intraoperative fluoroscopy during MPFL reconstruction improves the accuracy of the femoral tunnel position

P. Koenen, S. Shafizadeh, T. R. Pfeiffer, A. Wafaisade, B. Bouillon, A. C. Kanakamedala, V. Jaecker

KSSTA, December 2018, Volume 26, Issue 12, pp 3547–3552

https://doi.org/10.1007/s00167-018-4983-6

Purpose
Reconstruction of the medial patellofemoral ligament (MPFL) has been established as standard of care for patellofemoral instability. An anatomic femoral tunnel position has been shown to be a prerequisite for restoration of patellofemoral stability and biomechanics. However, the incidence of malpositioning of the femoral tunnel during MPFL reconstruction continues to be notable. Palpation of anatomic landmarks and intraoperative fluoroscopy are the two primary techniques for tunnel placement. The aim of this study was to compare the accuracy of these two methods for femoral tunnel placement.

Methods
From 2016 to 2017, 64 consecutive patients undergoing MPFL reconstruction for patelllofemoral instability were prospectively enrolled. During surgery, the presumed femoral MPFL insertion was identified by both palpation of anatomic landmarks and using fluoroscopy, both of these points were separately documented on true lateral radiographs. They were then analysed and deviations from the Schoettle's Point were measured as anterior–posterior and proximal–distal deviations. A tunnel position within a radius of 7 mm around the Schoettle's Point was designated as an "accurate tunnel position".

Results
Compared to the method of palpation, fluoroscopy led to significantly more anatomic femoral tunnel positoning ($p < 0.0001$). The mean proximal–distal and anterior–posterior distances between the femoral insertion site identified by palpation and the Schoettle's Point were 5.7 ± 4.5 mm (0.3–20.3 mm) and 4.1 ± 3.7 mm (0.1–20.3 mm), respectively, versus 1.7 ± 0.9 mm (0.1–3.6 mm) and 1.8 ± 1.3 mm (0.1–4.8 mm) for fluoroscopy, respectively. Using fluoroscopy, all femoral insertion sites were identified within a 7 mm radius around the centre of the Schoettle's Point. In contrast, only 52% (33) of femoral insertion sites identified by palpation were within this radius. These data were independent of patients' age, gender and BMI. No improvement in accuracy of femoral tunnel positions was detected over time.

Conclusions
The main finding of this study was that, compared to the method of palpation of anatomic landmarks, the use of intraoperative fluoroscopy in MPFL reconstruction leads to more accurate femoral tunnel positioning. Based on these results, the use of intraoperative fluoroscopy has to be recommended for femoral tunnel placement in daily surgical practice to minimize the incidence of malpositioning and to restore native patellofemoral biomechanics.

Study design
Level III Case-control study.

BACK

Arthroscopic patellar release allows timely return to performance in professional and amateur athletes with chronic patellar tendinopathy

Jan M. Pestka, Gernot Lang, Dirk Maier, Norbert P. Südkamp, Peter Ogon, Kaywan Izadpanah

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Purpose
Return to sports rates in amateur and professional athletes with chronic patellar tendinopathy following arthroscopic patellar release are unpredictable. The present study aims to analyse the effectiveness of arthroscopic patellar release in professional compared to amateur athletes.

Methods
A total of 34 amateur and 20 professional athletes with chronic patellar tendinopathy, refractory to conservative treatment, were studied prospectively and underwent arthroscopic tendon release at the inferior patellar pole. Impact of grouped sports on clinical and functional outcome, subjective patient satisfaction and return to sports rates were assessed. Additionally, preoperative MRI-scans of the knee were evaluated and correlated with clinical outcome.

Results
In 40 patients (74.1%) arthroscopic patellar release resulted in complete recovery and return to preinjury exercise levels. Full return to sports was achieved after a median of 3.0 (range 0.5–12.0) months. Functional outcome measures VISA-P (Victorian Institute of sport assessment for patella) and modified Blazina scores improved significantly from pre- to postoperatively (VISA-P: 48.8 vs. 94.0 pts., respectively, $p < 0.0001$; Blazina: 4.47 vs. 0.5, respectively, $p < 0.0001$).

Conclusion
As rapid recovery and timely return to sports are crucial for professional athletes, arthroscopic patellar release should be considered after failed conservative treatment.

Level of evidence
IV.

BACK

Implant preloading in extension reduces spring length change in dynamic intraligamentary stabilization: a biomechanical study on passive kinematics of the knee

Janosch Häberli, Benjamin Voumard, Clemens Kösters, Daniel Delfosse, Philipp Henle, Stefan Eggli, Philippe Zysset

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Purpose
Dynamic intraligamentary stabilization (DIS) is a primary repair technique for acute anterior cruciate ligament (ACL) tears. For internal bracing of the sutured ACL, a metal spring with 8 mm maximum length change is preloaded with 60–80 N and fixed to a high-strength polyethylene braid. The bulky tibial hardware results in bone loss and may cause local discomfort with the necessity of hardware removal. The technique has been previously investigated biomechanically; however, the amount of spring shortening during movement of the knee joint is unknown. Spring shortening is a crucial measure, because it defines the necessary dimensions of the spring and, therefore, the overall size of the implant.

Methods
Seven Thiel-fixated human cadaveric knee joints were subjected to passive range of motion (flexion/extension, internal/external rotation in 90° flexion, and varus/valgus stress in 0° and 20° flexion) and stability tests (Lachman/KT-1000 testing in 0°, 15°, 30°, 60°, and 90° flexion) in the ACL-intact, ACL-transected, and DIS-repaired state. Kinematic data of femur, tibia, and implant spring were recorded with an optical measurement system (Optotrak) and the positions of the bone tunnels were assessed by computed tomography. Length change of bone tunnel distance as a surrogate for spring shortening was then computed from kinematic data. Tunnel positioning in a circular zone with $r = 5$ mm was simulated to account for surgical precision and its influence on length change was assessed.

Results
Over all range of motion and stability tests, spring shortening was highest (5.0 ± 0.2 mm) during varus stress in 0° knee flexion. During flexion/extension, spring shortening was always highest in full extension (3.8 ± 0.3 mm) for all specimens and all simulations of bone tunnels. Tunnel distance shortening was highest (0.15 mm/°) for posterior femoral and posterior tibial tunnel positioning and lowest (0.03 mm/°) for anterior femoral and anterior tibial tunnel positioning.

Conclusion
During passive flexion/extension, the highest spring shortening was consistently measured in full extension with a continuous decrease towards flexion. If preloading of the spring is performed in extension, the spring can be downsized to incorporate a maximum length change of 5 mm resulting in a smaller implant with less bone sacrifice and, therefore, improved conditions in case of revision surgery.

BACK

Three-dimensional printing improves osteochondral allograft placement in complex cases

Kelechi R. Okoroha, Timothy J. Evans, Jeffrey P. Stephens, Eric C. Makhni, Vasilios Moutzouros

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Abstract
The use of three-dimensional (3D) printing has seen a vast expansion over recent years, with an increased application for its use in orthopaedics. This report details the use of 3D printing technology to aid in the treatment of a medial femoral condyle osteochondral defect in a 26-year-old female who had previously undergone a failed autograft procedure. A preoperative computed tomography scan of the knee and chondral defect was used to generate a 3D printed, one-to-one scale replica of the distal femur. This replica was then used to size a patient-specific allograft plug for the osteochondral transplantation procedure. The patient recovered well, and 1 year postoperatively the allograft was well incorporated into the medial femoral condyle and healed. This report illustrates the advantages of using a 3D printed model to allow for tactile feedback and improved visualization that will allow for improved understanding of complex surgical procedures.

Level of evidence
Level V.

BACK

The popliteus tendon provides a safe and reliable location for all-inside meniscal repair device placement

Hervé Ouanezar, William G. Blakeney, Charles Latrobe, Adnan Saithna, Levi Reina Fernandes, Jean Romain Delaloye, Mathieu Thaunat, Bertrand Sonnery-Cottet

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Purpose
Repairs of the posterior horn of the lateral meniscus can be technically challenging. In contrast to medial meniscus repairs, the capsule around the posterior segment attachment of the lateral meniscus is quite thin. This study evaluates the clinical results of an arthroscopic all-inside repair technique for unstable, vertical, lateral meniscus tears, using a suture repair placed directly into the popliteus tendon.

Methods
A retrospective analysis of prospectively collected data from the SANTI database was performed. All patients who had undergone combined ACL reconstruction with lateral meniscus all-inside repair, using sutures placed in the popliteus tendon, between 2011 and 2015, were included. Patients were reviewed clinically at 1 and 2 years' follow-up. At final follow-up, all patients were contacted to identify if they underwent further surgery or had knee pain, locking or effusion. Symptomatic patients were recalled for clinical evaluation by a physician and Magnetic Resonance Imaging of the knee. Operative notes for those undergoing further surgery were reviewed and rates and type of re-operation, including for failed lateral meniscal repair were recorded.

Results
Two hundred patients (mean age 28.6 ± 10.2 years) with a mean follow-up of 45.5 ± 12.8 months (range 24.7–75.2) were included. The mean Subjective International Knee Documentation Committee (IKDC) at final follow-up was 85.0 ± 11.3. The post-operative mean side-to-side laxity measured at 1 year was 0.6 ± 1.0 mm. Twenty-six patients underwent re-operation (13%) at a mean follow-up of 14.8 ± 7.8 months. The ACL graft rupture rate was 5.0%. Other causes for re-operation included medial meniscus tear (2.5%), cyclops lesion (1.5%) and septic arthritis (0.5%). The lateral meniscus repair failure rate was 3.5%. No specific complications relating to placement of sutures in the popliteus tendon were identified.

Conclusion
Arthroscopic all-inside repair of unstable, vertical, lateral meniscus tears using a suture placed in the popliteus tendon is a safe technique. It is associated with a very low failure rate with no specific complications.

Level of evidence
Level IV.

BACK

Bone-to-bone integrations were complete within 5 months after anatomical rectangular tunnel anterior cruciate ligament reconstruction using a bone–patellar tendon–bone graft

Hironari Masuda, Shuji Taketomi, Hiroshi Inui, Naoya Shimazaki, Nobuhiro Nishihara, Seikai Toyooka, Hirotaka Kawano, Takumi Nakagawa

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Purpose
Anterior cruciate ligament (ACL) reconstruction using a bone–patellar tendon–bone (BTB) graft is known to provide secure fixation due to the direct bone-to-bone integration of the bone plug and bone tunnel. It is important to know the time required for bone integration when designing the postoperative rehabilitation protocol or deciding when the patient can return to competition-level activity, especially if the patient is an athlete. However, because reports are scarce, the period necessary for bone-to-bone integration after ACL reconstruction using a BTB graft remains unclear. The purpose of this study was to clarify this issue. It was hypothesised that ACL reconstruction using a BTB graft via an anatomical rectangular tunnel would help in the integration between bone plugs and bone tunnels on both the femoral and tibial sides after at least 6 months, at which point basic exercises similar to pre-injury sporting activity levels can be resumed.

Methods
This study included 40 knees treated with ACL reconstruction using a BTB graft via anatomical rectangular tunnel reconstruction between 2013 and 2014 in a single institute. The integration between bone plugs and bone tunnels was evaluated using multi-slice tomosynthesis, which is a technique for producing slice images using conventional radiographic systems, at 1, 3, and 5 months postoperatively. All procedures were performed by two experienced surgeons. Bone integration was evaluated by two orthopaedic doctors.

Results
The rates of integration of the bone plug and femoral bone tunnel on tomosynthesis at 1, 3, and 5 months postoperatively were 0, 55, and 100%, respectively. On the tibial side, the corresponding rates were 0, 75, and 100%, respectively. The rate of integration on the tibial side was significantly higher than that on the femoral side at 3 months postoperatively ($p = 0.031$).

Conclusions
Bone-to-bone integration on the femoral and tibial sides was complete within 5 months after surgery in all cases. Since the time required for bone integration is important in designing the postoperative rehabilitation approach, these results will serve as a useful guideline for planning rehabilitation protocols.

Level of evidence
IV.

BACK

Device-assisted tensioning is associated with lower rates of graft failure when compared to manual tensioning in ACL reconstruction

Laura Morrison, Chloe Haldane, Darren de SA, Fawaz Findakli, Nicole Simunovic, Olufemi R. Ayeni

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https://doi.org/10.1007/s00167-018-4951-1

Purpose
To describe (1) the current graft tensioning practices in ACL reconstruction (ACLR) and, (2) the failure rates with the use of manual tensioning, or device-assisted tensioning at the time of graft fixation.

Methods
The electronic databases MEDLINE, EMBASE, and PubMed were searched independently by two reviewers from database inception to search date on January 21, 2017. Inclusion criteria were studies reporting graft tensioning method and rate of graft failure. The definition of graft failure used was: (1) side-to-side instrumented laxity > 5 mm, (2) Lachman 2 +, (3) positive pivot-shift testing, (4) MRI-confirmed graft rupture or, (5) need for revision surgery.

Results
A total of 3379 patients and 3380 knees were treated with ACL reconstruction and followed for an average of 41.7 months (range 4–145 months). ACLR with manual tensioning was performed on 1518 (51.9%) patients and device-assisted tensioning was performed on 1802 (48.1%) patients. The average knee position reported was 29.2° in single-bundle ACLR and 22.9° in double-bundle ACLR. The median amount of tension used in manual tensioning was ‘maximum manual tension’ and 50 N in device-assisted tensioning. Overall, the failure rate in studies reporting manual tensioning was 8.9% compared to 4.3% in device-assisted tensioning.

Conclusion
Both manual tensioning and device-assisted tensioning are associated with low overall failure rates (< 10%) in ACLR; however, there is a higher rate of reported failure with manual tensioning compared to device-assisted tensioning. These findings highlight the need to investigate variations in graft tensioning practice, such as specific tension devices and their parameters, with high-quality, randomized controlled trials to elucidate details of their clinical impact.

Level of evidence
Level IV, systematic review of level I–IV studies.

BACK

Atopic dermatitis is a novel demographic risk factor for surgical site infection after anterior cruciate ligament reconstruction

Manabu Kawata, Yusuke Sasabuchi, Shuji Taketomi, Hiroshi Inui, Hiroki Matsui, Kiyohide Fushimi, Hideo Yasunaga, Sakae Tanaka

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Purpose
Although various risk factors for surgical site infection after anterior cruciate ligament reconstruction (ACLR) have been reported, the number of studies with large sample sizes on this topic is limited. The aim of the present study was to clarify the risk factors for early surgical site infection after ACLR in a large cohort using a national database in Japan.

Methods
The data of patients who underwent ACLR from 2010 to 2015 were obtained from the Diagnosis Procedure Combination database, which covers approximately half of all hospital admissions in Japan. The outcome measures were the prevalences of surgical site infection and deep surgical site infection after ACLR during hospitalization. The association between the occurrence of surgical site infection and patients' demographic data, including sex, age, body mass index (BMI), smoking status, preoperative steroid use, and comorbidities such as diabetes, hepatic dysfunction, renal dysfunction, and atopic dermatitis, were examined using a multivariable logistic regression model.

Results
Among 30,536 patients who underwent ACLR, 288 patients with surgical site infection (0.94%) and 86 with deep surgical site infection (0.28%) were identified. The univariate analysis showed that higher prevalences of surgical site infection and deep surgical site infection were associated with male sex, a higher BMI, atopic dermatitis, and preoperative steroid use. Patients with diabetes or hepatic dysfunction had a significantly higher prevalence of surgical site infection. The multivariable analysis showed that surgical site infection was significantly associated with male sex vs. female sex; odds ratio (OR), 2.90; 95% confidence interval (CI), 2.17–3.89, age of ≤ 19 vs. 20–29 years; OR, 1.56; 95% CI 1.13–2.15, BMI of ≥ 30.0 vs. 18.5–22.9 kg/m2; OR, 1.72; 95% CI 1.16–2.54, diabetes (OR, 2.70; 95% CI 1.28–5.71), atopic dermatitis (OR, 7.19; 95% CI 2.94–17.57), and preoperative steroid use (OR, 6.18; 95% CI 2.32–16.52).

Conclusion
Atopic dermatitis, preoperative steroid use, young age (≤ 19 years), obesity (BMI of ≥ 30.0 kg/m2), male sex, and diabetes were independent demographic risk factors for surgical site infection after ACLR. The present study will be useful when surgeons evaluate the risk of SSI after ACLR in terms of demographic aspects.

Level of evidence
III.

BACK

Arthroscopic reduction of a locked patellar dislocation: a new less invasive technique

João Teixeira, Carlo Gamba, Jan Ophuis, Geert A. Buijze, Gino M. M. J. Kerkhoffs

KSSTA, December 2018, Volume 26, Issue 12, pp 3706-3710

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Abstract
Patellar dislocation is a condition that is often reduced by itself or through closed manipulation from a trained professional. In this case of a traumatic lateral patellar dislocation, the patella was caught through the rupture in the lateral retinaculum, as is seen in Boutonniere-like lesions. Reduction of the dislocated patella was obtained by arthroscopic reduction.

Level of evidence
Level V.

BACK

Risk factors for residual pivot shift after anterior cruciate ligament reconstruction: data from the MAKS group

Hiroko Ueki, Yusuke Nakagawa, Toshiyuki Ohara, Toshifumi Watanabe, Masafumi Horie, Hiroki Katagiri, Koji Otabe, Kenta Katagiri, Kanehiro Hiyama, Mai Katakura, Takashi Hoshino, Kei Inomata, Naoko Araya, Ichiro Sekiya, Takeshi Muneta, Hideyuki Koga

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Purpose
To investigate the risk factors for residual pivot shift test after anterior cruciate ligament (ACL) reconstruction based on a multicenter prospective cohort study.

Methods
This study included patients who were registered in the Multicenter Arthroscopic Knee Surgery Study, a prospective longitudinal multicenter cohort study, and who underwent primary ACL reconstruction using autologous hamstring tendon graft between 2013 and 2016. The exclusion criteria included prior injuries or surgeries in the contralateral knee, prior ligamentous injuries in the involved knee, grade 2 or 3 concomitant ligament injuries, and inflammatory or other forms of osteoarthritis. Data from the preoperative period and at 1-year follow-up were used for further analysis, and patients with incomplete data, re-injury and loss to follow-up were also excluded. Logistic regression analysis was conducted with age, gender, Lachman test, pivot shift test, KT measurement, hyperextension, single-bundle vs. double-bundle, meniscus injury sites, and meniscus treatments as the independent variables, and postoperative pivot shift test was used as the dependent variable.

Results
Three hundred and sixty-eight patients were included in the study. Hyperextension knee ($P = 0.025$) and a preoperative pivot shift test under anesthesia ($P = 0.040$) were identified as risk factors for a postoperative pivot shift via logistic regression analysis. There were no statistically significant differences in the other variables.

Conclusions
The results from a multicenter cohort study indicated that knee hyperextension and greater preoperative pivot shift under anesthesia were risk factors for residual pivot shift at 1 year after ACL reconstruction. In cases with a preoperative high-grade pivot shift and knee hyperextension, additional anterolateral structure augmentation might be considered in order to eliminate pivot shift and eventually obtain better outcomes after ACL reconstruction.

Level of evidence
II.

BACK

Earlier anterior cruciate ligament reconstruction is associated with a decreased risk of medial meniscal and articular cartilage damage in children and adolescents: a systematic review and meta-analysis

Jeffrey Kay, Muzammil Memon, Ajay Shah, Yi-Meng Yen, Kristian Samuelsson, Devin Peterson, Nicole Simunovic, Helene Flageole, Olufemi R. Ayeni

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Purpose
To evaluate the association between surgical timing and the incidence of secondary meniscal or chondral damage in children and adolescents with anterior cruciate ligament (ACL) ruptures.

Methods
Three electronic databases, PubMed, MEDLINE, and EMBASE, were systematically searched from database inception until October 16, 2017 by two reviewers independently and in duplicate. The inclusion criteria were English language studies that reported the incidence of meniscal and articular cartilage damage in children or adolescent athletes with ACL injuries as well as the timing of their ACL reconstruction (ACLR). Risk ratios were combined in a meta-analysis using a random effects model.

Results
A total of nine studies including 1353 children and adolescents met the inclusion criteria. The mean age of patients included was 14.2 years (range 6–19), and 45% were female. There was a significantly decreased risk of concomitant medial meniscal injury in those reconstructed early (26%) compared to those with delayed reconstruction (47%) [pooled risk ratio (RR) = 0.49, 95% CI 0.36–0.65, $p < 0.00001$]. There was also a significantly reduced risk of medial femoral chondral (RR = 0.48, 95% CI 0.31–0.75, $p = 0.001$), lateral femoral chondral (RR = 0.38, 95% CI 0.20–0.75, $p = 0.005$), tibial chondral (RR = 0.45, 95% CI 0.27–0.75, $p = 0.002$), and patellofemoral chondral (RR = 0.41, 95% CI 0.20–0.82, $p = 0.01$) damage in the early reconstruction group in comparison to the delayed group.

Conclusion
Pooled results from observational studies suggest that early ACLR results in a significantly decreased risk of secondary medial meniscal injury, as well as secondary medial, lateral, and patellofemoral compartment chondral damage in children and adolescents. This study provides clinicians with valuable information regarding the benefits of early ACL reconstruction in children and adolescents, and can be used in the decision making for athletes in this population.

Level of evidence
IV.

BACK

Changes in the sensorimotor system and semitendinosus muscle morphometry after arthroscopic anterior cruciate ligament reconstruction: a prospective cohort study with 1-year follow-up

Marialuisa Gandolfi, Matteo Ricci, Elena Sambugaro, Nicola Valè, Eleonora Dimitrova, Andrea Meschieri, Silvano Grazioli, Alessandro Picelli, Calogero Foti, Francesco Rulli, Nicola Smania

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Purpose
To evaluate the time course of sensorimotor integration processes involved in balance capability during 1-year follow-up after arthroscopic anterior cruciate ligament (ACL) reconstruction. To evaluate whether an association exists between balance performance and semitendinosus muscle morphometry features.

Methods
Twenty-seven patients (mean age 29.6 ± 10.8 years) were prospectively followed with stabilometry and ultrasound at 3 months (T0), 6 months (T1), and 1 year (T2) after arthroscopic ACL reconstruction. Body sway and sensorimotor integration processes were evaluated by calculating the percentage difference of sway (PDS) on two surface conditions.

Results
A significant difference in PDS was observed over time ($p < 0.001$). The interaction "Time × Condition" showed significant differences ($p = 0.02$), with worse performance on the compliant than the firm surface. There was a significant difference in CSA ($p < 0.001$), MT ($p < 0.001$), and %HRD ($p < 0.001$) over time. The interaction "Time*side" was significant for CSA ($p = 0.02$) and %HRD ($p = 0.01$). A negative correlation between PDS on compliant surface and CSA was measured at 3- ($r = -0.71$, $n = 27$, $p < 0.001$) and 6-month post-surgery ($r = -0.47$, $n = 27$, $p = 0.013$).

Conclusions
Balance was regained within the first 6 months after surgery, while morphometry of the semitendinosus muscle improved mostly between 6 and 12 months in patients who returned to sports activities. Balance capabilities paralleled semitendinosus muscle morphometry improvements. The instrumental assessment of sensorimotor integration processes is relevant in clinical practice as screening tests for primary and secondary prevention of ACL injury.

Level of evidence
Prospective studies, Level II.

BACK

American Journal of Sports Medicine (AJSM), Volume 46, Issue 14

Does the Use of Psychotropic Medication Adversely Affect the Outcomes of Hip Arthroscopy?

Sylvester T. Youlo, MD, Brian E. Walczak, MD, James S. Keene, MD

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Background
Over the past decade, the use of psychotropic medications (PTMs) in the United States has doubled, and currently 20% of adults are taking 1 or more of these antidepressant, antianxiety, antipsychotic, or mood-altering medications. To date, however, the incidence of PTM use in patients undergoing hip arthroscopy and the results of hip arthroscopy in these patients have not been reported.

Purpose
To determine the prevalence of PTM use in patients undergoing hip arthroscopy and to compare the outcomes of patients taking PTMs versus those of patients not taking PTMs.

Study Design Cohort study; Level of evidence, 3.

Methods
Medical records of 880 consecutive patients who underwent hip arthroscopy performed by the senior author were reviewed and data were collected, including the number and types of PTMs that these patients were taking at the time of their hip arthroscopy. All hips were assessed with the Byrd modified Harris Hip Score (mHHS) preoperatively; 709 patients (81%) had scores obtained at 12 months and 669 patients (76%) at 24 months after surgery. Demographic data and mHHS of patients taking psychotropic medications (PTM group) were compared with those of patients not taking PTMs (NPTM group).

Results
Four hundred twenty-two (48%) of the 880 patients studied were taking PTMs at the time of their hip arthroscopy; significant differences between the PTM and NPTM groups were average age (48 vs 35 years, respectively), and the high percentage of females (53%) and low percentage of males (38%) in the PTM group. Preoperative scores for the PTM and NPTM groups were similar (41 vs 42 points, respectively), but postoperative scores of the PTM group were significantly lower at 6 months (72 vs 89 points), 12 months (77 vs 91 points), and 24 months (79 vs 88 points) after surgery ($P = .01$). In contrast, the scores of the subgroups of PTM and NPTM adolescents obtained at 3 months (92.5 vs 88.9 points), 6 months (92.1 vs 90.3 points), 12 months (89.5 vs 92.1 points), and 24 months (90.3 vs 90.1 points) after surgery did not significantly differ.

Conclusion
The incidence of PTM use in this series of patients with hip arthroscopy was triple that reported for US adults (48% vs 17%, respectively) and adolescents (23% vs 6.3%), and the PTM group had significantly lower 12- and 24-month mHHS results than the NPTM group. These results suggest that (1) patients undergoing hip arthroscopy who are taking PTMs are at significantly higher risk for poor outcomes and (2) their use of PTMs should be identified and addressed before proceeding with hip arthroscopy.

BACK

In Revision Hip Arthroscopy, Labral Reconstruction Can Address a Deficient Labrum, but Labral Repair Retains Its Role for the Reparable Labrum: A Matched Control Study

Itay Perets, MD, Danil Rybalko, MD, Brian H. Mu, BA, David R. Maldonado, MD, Gary Edwards, MD, Muriel R. Battaglia, BA, Benjamin G. Domb, MD

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Background
Revision hip arthroscopy is increasingly common and often addresses acetabular labrum pathology. There is a lack of consensus on indications or outcomes of revision labral repair versus reconstruction.

Purpose
To report clinical outcomes of labral reconstruction during revision hip arthroscopy at minimum 2-year follow-up as compared with pair-matched labral repair during revision hip arthroscopy (control group) and to suggest a decision-making algorithm for labral treatment in revision hip arthroscopy.
Study Design Cohort study; Level of evidence, 3.

Methods
Patients who underwent revision hip arthroscopy with labral reconstruction were matched 1:2 with patients who underwent revision arthroscopic labral repair. Patients were matched according to age, sex, and body mass index. Outcome scores, including the modified Harris Hip Score (mHHS), Non-Arthritic Hip Score, Hip Outcome Score–Sport-Specific Subscale, and a visual analog scale for pain, were collected preoperatively and at minimum 2-year follow-up. At latest follow-up, patient satisfaction on a 0-10 scale and the abbreviated International Hip Outcome Tool (iHOT-12) were collected. Complications, subsequent arthroscopies, and conversion to total hip arthroplasty were collected as well.

Results
A total of 15 revision labral reconstructions were pair matched to 30 revision labral repairs. The reconstructions had fewer isolated Seldes type I detachments (P = .008) and lower postoperative lateral center-edge angle, but there were otherwise no significant differences in demographics, radiographics, intraoperative findings, or procedures. Both groups demonstrated significant improvements in all outcomes and visual analog scale at minimum 2-year follow-up. The revision repairs trended toward better preoperative scores: mHHS (mean ± SD: 59.3 ± 16.5 vs 54.2 ± 16.0), Non-Arthritic Hip Score (61.0 ± 16.7 vs 51.2 ± 17.6), Hip Outcome Score–Sport-Specific Subscale (39.6 ± 25.1 vs 30.5 ± 22.1), and visual analog scale (5.8 ± 1.8 vs 6.2 ± 2.2). At follow-up, the revision repair group had significantly higher mHHS (84.1 ± 14.8 vs 72.0 ± 18.3, P = .043) and iHOT-12 (72.2 ± 23.3 vs 49.0 ± 27.6, P = .023) scores than the reconstruction group. The magnitudes of pre- to postoperative improvement between the groups were comparable. The groups also had comparable rates of complications: 1 case of numbness in each group (P > .999), subsequent arthroscopies (repair: n = 2, 6.5%; revision: n = 3, 20%; P = .150), and conversion to total hip arthroplasty (1 patient in each group, P > .999).

Conclusion
Labral reconstruction safely and effectively treats irreparable labra in revision hip arthroscopy. However, labral repair is another treatment option for reparable labra, yielding similar magnitude of improvement. A proposed algorithm may assist in surgical decision making to achieve optimal outcomes based on the condition and history of each patient's acetabular labrum.

BACK

Arthroscopic Capsular Plication in Patients With Labral Tears and Borderline Dysplasia of the Hip: Analysis of Risk Factors for Failure

David R. Maldonado, MD, Itay Perets, MD, Brian H. Mu, BA, Victor Ortiz-Declet, MD, Austin W. Chen, MD, Ajay C. Lall, MD, MS, Benjamin G. Domb, MD

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Background Hip arthroscopy for the treatment of instability in the setting of borderline dysplasia is controversial. Capsular management in such cases is an important consideration, and plication has been described as a reliable technique, with good midterm outcomes reported when indications are appropriate.
Hypothesis Patients with borderline dysplasia who have a lower lateral center-edge angle (LCEA) and greater age will be at a higher risk of failure after arthroscopic capsular plication.
Study Design Case-control study; Level of evidence, 3.

Methods Data were retrospectively reviewed for all patients between 15 and 40 years of age who underwent hip arthroscopy from November 2008 to January 2015. Inclusion criteria were an LCEA between 18° and 25°, Tönnis grade ≤1, primary case with capsular plication, and minimum 2-year follow-up. Patients were excluded if they had any history of ipsilateral hip procedure or conditions such as Legg-Calve-Perthes disease, slipped capital femoral epiphysis, rheumatologic disease, and Tönnis grade ≥2. Age, sex, and body mass index data were retrieved for each patient. Patient-reported outcomes (PROs)—including modified Harris Hip Score (mHHS), Non-Arthritic Hip Score (NAHS), Hip Outcome Score–Sports Specific Subscale, and a visual analog scale (VAS) for pain (0-10)—were obtained preoperatively and at a minimum of 2 years postoperatively, in addition to the postoperative International Hip Outcome Tool–12. The "success" group consisted of all patients who achieved the patient acceptable symptomatic state of mHHS ≥74 and had no ipsilateral hip surgery subsequent to their index arthroscopy. The "failure" group was composed of patients who were below the patient acceptable symptomatic state at latest follow-up or required secondary arthroscopy or conversion to total hip arthroplasty. Patient satisfaction and minimal clinically important difference were also calculated. Mean age for the failure group was applied as a cutoff age for subanalysis, and relative risk for failure was determined.

Results Ninety patients (97 hips; 79.5%) met criteria for the success group, and 25 patients (25 hips) met criteria for the failure group. No significant differences in preoperative baseline scores or VAS were found. However, there did appear to be a trend that the failure group had lower mean preoperative scores for all PRO measures and a higher VAS score. The differences in preoperative mHHS and NAHS closely approached significance (P = .053). Postoperative PRO, VAS, and patient satisfaction scores of the success group were significantly higher than the failure group. The failure group was significantly older than the success group (28.5 ± 7.8 vs 23.5 ± 7.5 years, P = .005). Patients >35 years old were 2.25 times more likely to fail according to relative risk (95% CI, 1.10-4.60; P = .0266). LCEA did not differ between the groups, and no other risk factors for failure were identified.

Conclusion
Stringent criteria for patient selection and meticulous repair or augmentation of the static stabilizers of the hip yielded favorable clinical outcomes in this study cohort with borderline dysplasia. Within this carefully selected group, the analysis revealed that increased age was the main risk factor for failure in the management of borderline hip dysplasia via isolated primary arthroscopic hip surgery with capsular plication.

BACK

A Novel Arthroscopic Technique for Intraoperative Mobilization of Synovial Mesenchymal Stem Cells

Thomas G. Baboolal, BSc, PhD, Alam Khalil-Khan, BSc, MSc, MBBS, MD, Anthony A. Theodorides, MBBS, BSc, FRCS, Owen Wall, BSc, MBChB, FRCS, Elena Jones, PhD, Dennis McGonagle, PhD, FRCPI

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Background
Mesenchymal stem cells (MSCs) have emerged as a promising candidate for tissue regeneration and restoration of intra-articular structures such as cartilage, ligaments, and menisci. However, the routine use of MSCs is limited in part by their low numbers and the need for methods and procedures outside of the joint or surgical field.

Purpose
To demonstrate feasibility of a technique in which minimally manipulated synovial MSCs can be mobilized during knee arthroscopy, thereby showing proof of concept for the future evaluation and clinical use of native joint resident MSCs in single-stage joint repair strategies.
Study Design Descriptive laboratory study.

Methods
Patients (n = 15) undergoing knee arthroscopy who were free from synovitis or active inflammation were selected. Three samples of irrigation fluid were collected from each patient at inception of the procedure, after an initial inspection of the joint, and after agitation of the synovium. MSC numbers were evaluated by colony forming unit–fibroblastic assay. The phenotype of synovial fluid resident and synovial-mobilized MSCs was determined by flow cytometry, and their functionality was determined by trilineage differentiation. Adhesion of culture-expanded mobilized MSCs to fibrin scaffolds was also evaluated to ascertain whether mobilized MSCs might concentrate at sites of bleeding.

Results
Normal irrigation during arthroscopy depleted resident synovial fluid MSCs (4-fold decrease, n = 15). Numbers of MSCs mobilized through use of a purpose-made device were significantly higher (105-fold) than those mobilized through use of a cytology brush (median of 5763 and 54 colonies, respectively; P = .001; n = 15). The mobilized cellular fraction contained viable MSCs with proliferative potential and trilineage differentiation capacity for bone, cartilage, and fat lineages, and cultured daughter cells exhibited the standard MSC phenotype. Following culture, mobilized synovial MSCs also adhered to various fibrin scaffolds in vitro. The technique was simple and convenient to use and was not associated with any complications.

Conclusion
Numbers of functional MSCs can be greatly increased during arthroscopy through use of this technique to mobilize cells from the synovium.

Clinical Relevance
This study highlights a novel, single-stage technique to increase joint-specific, synovial-derived MSCs and thereby increase the repair potential of the joint. This technique can be undertaken during many arthroscopic procedures, and it supports the principle of integrating mobilized MSCs into microfracture sites and sites of bleeding or targeted repair through use of fibrin-based and other scaffolds.

BACK

Miscellaneous

Arthroscopy, Volume 34, Issue 12

Gravity Fluid Flow More Accurately Reflects Joint Fluid Pressure Compared With Commercial Peristaltic Pump Systems in a Cadaveric Model

Meredith Mayo, M.D., Ryan Wolsky, B.S., Todd Baldini, M.S., Peter S. Vezeridis, M.D., Jonathan T. Bravman, M.D.

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Purpose
To evaluate intra-articular fluid pressures and joint compliance generated by fluid management systems on cadaveric shoulders and knees under simulated arthroscopic conditions, and to compare joint compliance between knee and shoulder specimens.

Methods
Intra-articular pressures of 5 cadaver shoulders and 5 knees were recorded for 4 arthroscopic pumps (Stryker FloControl, Stryker CrossFlow, Arthrex DualWave, DePuy Mitek FMS Duo) and a gravity feed system. Each specimen was tested 6 times with a pressure transducer for 2 minutes at 0, 25%, and 50% suction. The average pressures were analyzed with 1-way analysis of variance and Tukey's honestly significant difference tests ($P < .05$).

Results
At all suction levels, all pumps exhibited significantly greater pressure than gravity feed ($P = .001$ to $P < .001$). At both 25% and 50% suction, FloControl displayed significantly greater pressures (P_{max} 160.44 mm Hg) than the other pumps or gravity feed (P_{max} 46.9 mm Hg). CrossFlow had the lowest net percentage error (36.8%, 18.4 mm Hg) when compared with the standard pressure of 50 mm Hg, followed by gravity feed. All pumps had large initial overshoot (ie, $P_{initial}$ CrossFlow 99.4 mm Hg) followed by settling time, whereas gravity feed did not ($P_{initial}$ 55.2 mm Hg).

Conclusions
Gravity feed is an accurate, reliable delivery method for arthroscopic fluid with minimal overshoot and lower intra-articular pressure ranges than commercial pump systems. There was no evidence of plastic deformation of the joint capsule, because capsular compliance increased linearly in both knee and shoulder specimens throughout testing within the established safe range of intra-articular pressures.

Clinical Relevance
Arthroscopic flow management systems produce maximal and overshoot pressures that are not seen with gravity flow. Surgeons should understand intra-articular pressure and fluid delivery behavior during shoulder and knee arthroscopy to adapt to the variability and higher maximal pressures when using pump systems. Maintaining appropriate pressure could prevent fluid extravasation and possible neuromuscular dysfunction.

BACK

Femoral Contact Forces in the Anterior Cruciate Ligament Deficient Knee: A Robotic Study

Peter Z. Du, M.D., Keith L. Markolf, Ph.D., Daniel V. Boguszewski, Ph.D., David R. McAllister, M.D.

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Purpose
To measure contact forces (CFs) at standardized locations representative of clinical articular cartilage defects on the medial and lateral femoral condyles during robotic tests with simulated weightbearing knee flexion.

Methods
Eleven human knees had 20-mm-diameter cylinders of native bone/cartilage cored from both femoral condyles at standardized locations, with each cylinder attached to a custom-built load cell that maintained the plug in its precise anatomic position. A robotic test system was used to flex the knee from 0° to 50° under 200-N tibiofemoral compression without and with a 2 Nm internal tibial torque, 5 Nm external tibial torque, and 45 N anterior tibial force (AF). CFs and knee kinematics were recorded before and after cutting the anterior cruciate ligament (ACL).

Results
ACL sectioning did not significantly increase medial or lateral CFs for any loading condition, with the exception of AF, in which increases in medial CF ranged from 38 N (at 15° flexion, $P < .01$) to 77 N (at 50° flexion, $P < .002$). Compared with the intact condition, ACL sectioning significantly increased anterior tibial translation by 12.33 mm (at 15° flexion, $P < .001$) and 17.4 mm (at 50° flexion, $P < .001$), and increased valgus rotation by 2.4° (at 15° flexion, $P < .001$) and 3.8° (at 50° flexion, $P < .001$).

Conclusions
Our hypothesis that CF would increase after ACL section was confirmed for the AF test condition only, and only for the medial condyle beyond 10° flexion. With the ACL sectioned, it appeared that the increased CF was owing to the medial condyle riding up over the posterior tibial plateau resulting from the large anterior tibial displacements.

Clinical Relevance
Aside from our limited finding with AF, we concluded that CFs were generally unaffected by ACL section.

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