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Upper extremity

Arthroscopy, Volume 37, Issue 4

Arthroscopic-Assisted Coracoclavicular Ligament Reconstruction: Clinical Outcomes and Return to Activity at Mean 6-Year Follow-Up

Joseph D. Lamplot, Sarav S. Shah, Justin M. Chan, Kyle J. Hancock, Joseph Gentile, Scott A. Rodeo, Answorth A. Allen, Riley J. Williams, David W. Altchek, David M. Dines, Russell F. Warren, Frank A. Cordasco, Lawrence V. Gulotta, Joshua S. Dines

https://doi.org/10.1016/j.arthro.2020.11.045

Purpose
To report clinical and functional outcomes including return to preinjury activity level following arthroscopic-assisted coracoclavicular (CC) ligament reconstruction (AA-CCR) and to determine associations between return to preinjury activity level, radiographic outcomes, and patient-reported outcomes following AA-CCR.

Methods
A institutional registry review of all AA-CCR using free tendon grafts from 2007 to 2016 was performed. Clinical assessment included Single Assessment Numeric Evaluation (SANE) score and return to preinjury activity level at final follow-up. Treatment failure was defined as (1) revision acromioclavicular stabilization surgery, (2) unable to return to preinjury activity level, or (3) radiographic loss of reduction (RLOR, >25% CC distance compared with contralateral side). SANE scores, return to activity, and RLOR were compared between patients within each category of treatment failure, by grade of injury, and whether concomitant pathology was treated.

Results
There were 88 patients (89.8% male) with mean age of 39.6 years and minimum 2-year clinical follow-up (mean 6.1 years). Most injuries were Rockwood grade V (63.6%). Mean postoperative SANE score was 86.3 ± 17.5. Treatment failure occurred in 17.1%: 8.0% were unable to return to activity, 5.7% had RLOR, and 3.4% underwent revision surgery due to traumatic reinjury. SANE score was lower among patients who were unable to return to activity compared with those with RLOR and compared with nonfailures (P = .0002). There were no differences in revision surgery rates, return to activity, or SANE scores according to Rockwood grade or if concomitant pathology was treated.

Conclusions
AA-CCR with free tendon grafts resulted in good clinical outcomes and a high rate of return to preinjury activity level. RLOR did not correlate with return to preinjury activity level. Concomitant pathology that required treatment did not adversely affect outcomes. Return to preinjury activity level may be a more clinically relevant outcome measure than radiographic maintenance of acromioclavicular joint reduction.

Level of Evidence
IV (Case Series).

BACK

Chronic Preoperative Opioids Are Associated With Revision After Rotator Cuff Repair

Sarah Bhattacharjee, Bria Jordan, Andrew Sohn, Henry Seidel, Michael J. Lee, Jason Strelzow, Lewis L. Shi

https://doi.org/10.1016/j.arthro.2020.11.046

Purpose
We sought to clarify the relationship between chronic preoperative opioids and complications following rotator cuff repair. Specifically, we assessed revision, a definitive postoperative end point for surgical outcome.

Methods
This study used PearlDiver, a United States national insurance claims database. All patients undergoing rotator cuff repair from 2008 to 2018 were identified and stratified based on a minimum of 2 opioid prescriptions within the 6 months before surgery, with 1 prescription occurring within 0 to 3 months before surgery and a second prescription within 4 to 6 months before surgery. Univariate logistic regressions of risk factors were conducted, followed by multivariate analysis of comorbidities, including ongoing preoperative opioids, any preoperative nonsteroidal anti-inflammatory drug (NSAID) prescriptions, age, sex, diabetes, tobacco, and obesity.

Results
In total, 28,939 patients undergoing rotator cuff repair were identified, of whom 10,695 had opioid prescriptions within both 0 to 3 months and 4 to 6 months before index rotator cuff repair, whereas 18,244 had no opioid prescriptions within the 6-month preoperative period. In total, 977 (3.4%) patients underwent revision within 6 months, which increased to 1311 (4.5%) within 1 year of the index procedure. In the multivariate analysis controlling for age, preoperative NSAID prescriptions, tobacco, diabetes, obesity, and sex, we observed a significant association between chronic preoperative opioid prescriptions and rotator cuff repair revision (6-month odds ratio 1.12; $P = .021$, 1-year odds ratio 1.43; $P < .001$) following index procedure.

Conclusions
We report increased rates of revision within both 6 months and 1 year in patients with prolonged preoperative opioid prescriptions. The opioid cohort had greater rates of preoperative NSAID use and tobacco use, which also were observed to be independent risk factors for revision at both timepoints.

Level of Evidence
III; Retrospective comparative study.

BACK

Decreased Glenoid Retroversion Is a Risk Factor for Failure of Primary Arthroscopic Bankart Repair in Individuals With Subcritical Bone Loss Versus No Bone Loss

Ryan T. Li, Andrew Sheean, Kevin Wilson, Darren de SA, Gillian Kane, Bryson Lesniak, Albert Lin

https://doi.org/10.1016/j.arthro.2020.11.055

Purpose
To determine whether glenoid retroversion is an independent risk factor for failure after arthroscopic Bankart repair.

Methods
This was a retrospective review of patients with a minimum 2-year follow-up. In part 1 of the study, individuals with no glenoid bone loss on magnetic resonance imaging (MRI) and who failed arthroscopic Bankart repair (cases) were compared with individuals who did not fail Bankart repair (controls). In part 2 of the study, cases with subcritical (<20%) glenoid bone loss as measured on sagittal T1 MRI sequences who failed arthroscopic Bankart repair were compared with controls who did not. For each part of the study, glenoid version was measured using axial T2 MRI sequences. Positive angular measurements were designated to represent glenoid anteversion, whereas negative measurements were designated to represent glenoid retroversion. Independent t tests were conducted to determine the association between glenoid version and failure after arthroscopic Bankart repair.

Results
There were 20 cases and 40 controls in part 1 of the study. In part 2, there were 19 cases and 21 controls. There was no difference in baseline characteristics between cases and controls. Among individuals with no glenoid bone loss, there was no difference in glenoid version between cases and controls (cases: 6.0° ± 8.1° vs controls: 5.1° ± 7.8°, P = .22). Among individuals with subcritical bone loss, cases (3.8° ± 4.4°) were associated with significantly less mean retroversion compared with controls (7.1° ± 2.8°, P = .0085). Decreased retroversion (odds ratio 1.34; 95% confidence interval 1.05-1.72, P = 20) was a significant independent predictor of failure using univariable logistic regression.

Conclusions
While glenoid retroversion is not associated with failure after arthroscopic Bankart repair in individuals with no glenoid bone loss, decreased retroversion is associated with failure in individuals with subcritical bone loss.

Level of Evidence
Level 3: Retrospective review

BACK

Hydrogen Peroxide Does Not Significantly Reduce Cutibacterium acnes Suture Contamination in Arthroscopic Rotator Cuff Repair

Kotaro Yamakado, M.D., Ph.D.

https://doi.org/10.1016/j.arthro.2020.12.186

Purpose
To evaluate the efficacy of application of the 3% hydrogen peroxide (HP)–soaked gauze as an addition to the standard preoperative sterile skin preparation for Cutibacterium acnes suture contamination in arthroscopic rotator cuff repairs.

Methods
A prospective randomized study was undertaken to evaluate 151 consecutive patients undergoing arthroscopic rotator cuff repair. Each shoulder was prepared with 1 of the 2 randomly selected protocols: chlorhexidine alcohol (1% chlorhexidine gluconate in 70% isopropyl alcohol)(control group) and chlorhexidine alcohol with 3% HP (HP-treated group). In the HP-treated group, the 3% HP–soaked gauze was applied over the shoulder for 5 minutes before the application of the chlorhexidine-alcohol. The first cut-tails of the anchor suture after cuff fixation were submitted to aerobic and anaerobic cultures. Patients were clinically evaluated for infection 10 days, 28 days, 3 months, 6 months, and 12 months after surgery.

Results
The rate of C acnes–positive cultures was 13.0% (10 of 77 cases) in the control group and 6.8% (5 of 74 cases) in the HP-treated group. The HP-treated group showed a trend of lower C acnes–positive culture rate, which did not reach statistical significance (relative risk, 0.52; 95% confidence interval, 0.19 and 1.45; number needed to treat, 16.1; P = .20). One case of coagulase-negative Staphylococcus (Staphylococcus intermedius) was isolated in the HP-treated group (1 of 74 cases, 1.3%). No other bacteria were isolated. No infections occurred in any of the patients treated in this study during the minimum 3-month follow-up period. One patient in the HP-treated group complained of skin irritation.

Conclusions
The use of a 3% HP–soaked gauze as an addition to the standard preoperative sterile skin preparation for arthroscopic rotator cuff repairs showed only a marginal effect (statistically insignificant) in reducing the C acnes suture contamination rate in the arthroscopic rotator cuff repair patients.

Level of Evidence
I, prospective, randomized trial.

BACK

Knotted Versus Knotless Anchors for Labral Repair in the Shoulder: A Systematic Review

Matache, B. A., Hurley, E. T., Kanakamedala, A. C., Jazrawi, L. M., Virk, M., Strauss, E. J., & Campbell, K. A.

https://doi.org/10.1016/j.arthro.2020.11.056

Purpose
To compare biomechanical and clinical outcomes between knotless and knotted anchors in arthroscopic labral repair, specifically in (1) Bankart repair, (2) SLAP repair, (3) posterior labral repair, and (4) remplissage augmentation of Bankart repair.

Methods
MEDLINE, EMBASE, and the Cochrane Library were searched according to the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines to find biomechanical and clinical studies comparing knotted and knotless anchors using the search term “knotless anchor.”

Results
Overall, 17 studies met inclusion criteria. There were 7 studies evaluating the biomechanical outcomes, of which 5 found mixed results between knotted and knotless anchors for arthroscopic Bankart repair, 1 demonstrated a difference for SLAP repair favoring knotless anchors, and 2 showed no significant difference for Remplissage in terms of ultimate load-to-failure. Four studies evaluated knotless labral anchors compared with knotted anchors in patients undergoing arthroscopic Bankart repair with no significant differences in outcomes reported between the 2 anchor types, except in one study that found an improved visual analog scale score and a lower recurrence and revision rate with knotted anchors. Five studies evaluated knotless anchors compared with knotted anchors in patients undergoing SLAP repair, and none of the included studies found any significant differences in the patient reported outcome measures or revision rates. Of the 5 studies comparing operative time, 4 found a reduced time with knotless anchors.

Conclusions
The clinical results show no significant differences in outcomes between knotless and knotted anchors for labral repair in the shoulder, including Bankart repair, SLAP repair, and posterior labral repair. However, there was conflicting evidence supporting knotless or knotted anchors in the biomechanical studies. However, operative times may be reduced with the use of knotless anchors.

Level of Evidence
III, A Systematic Review of Level II and III studies.

BACK

Journal of Shoulder and Elbow Surgery (JSES), Volume 30, issue 4

Risk factors for and prognosis of folded rotator cuff tears: a comparative study using propensity score matching.

Jeong, H.J., Kim, H.S., Rhee, S.M., et al.

https://doi.org/10.1016/j.jse.2020.07.010

Background
The prognosis of rotator cuff repair (RCR) may be affected by the shape and quality of the torn rotator cuff tendon. However, only a few studies have reported on folded rotator cuff tears (FCTs). Therefore, this study aimed to evaluate the prognostic factors for FCT and clinical outcomes of FCT repair.

Methods
Through propensity score matching (PSM), 200 (40 patients with FCTs and 160 controls) of 1927 patients who underwent RCR from 2010 to 2016 were included. The variables not used for PSM were compared. The anatomic and functional outcomes were assessed at the final follow-up (32.3 ± 21.2 months), and the related prognostic factors for FCTs were evaluated.

Results
The risk factors for FCT were heel-type spur (odds ratio [OR], 11.6; $P < .001$) and delamination (OR, 2.3; $P = .034$). Although the functional scores at the final follow-up for both groups improved postoperatively and were not significantly different, the visual analog scale scores for pain (1.9 ± 2.1 vs. 1.2 ± 1.7, $P = .034$) and American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form (ASES) scores (83.1 ± 14.3 vs. 88.5 ± 12.2, $P = .018$) were significantly worse in the FCT group at 6 months postoperation. The retear rate was significantly higher in the FCT group (25.0 vs. 10.0%, $P = .018$). An FCT was a significant risk factor for retears (OR, 3.0; $P = .015$); however, a subgroup analysis revealed that the retear rate according to the management strategy for the folded portion (débridement of the folded portion vs. en masse repair including the folded portion) was not significantly different (26.7 vs. 24.0%, $P > .99$).

Conclusion
The risk factors for FCTs were heel-type spur and delamination. The retear rate was significantly higher for patients with FCTs. An FCT was indicative of poor quality of the remaining tendon; therefore, FCT may be a prognostic factor for worse functional outcomes during the early postoperative period and poor healing potential.

Level of evidence
Level III, Retrospective Cohort Comparison Treatment Study

BACK

Does the timing of surgical intervention impact the clinical outcomes and overall duration of symptoms in frozen shoulder?

Hasegawa, A., Mihata, T., Fukunishi, K., et al.

https://doi.org/10.1016/j.jse.2020.07.023

Background
The optimal timing of arthroscopic capsular release in patients with frozen shoulder is controversial. Some surgeons delay surgery in the belief that early surgical intervention results in a poorer prognosis. However, whether early surgical intervention causes inferior clinical outcomes and a longer duration of symptoms in frozen shoulder remains unclear. The objective of this study was to compare the clinical outcomes and overall duration of symptoms in frozen shoulder between patients who underwent early surgical intervention and those subjected to late surgical intervention. Our hypotheses were that (1) early surgical intervention would provide significant improvement in symptoms but inferior clinical outcomes because of more severe synovitis compared with late surgical intervention and (2) early surgical intervention would shorten the overall duration of symptoms compared with late surgical intervention.

Methods
We reviewed 60 consecutive patients with frozen shoulder who underwent arthroscopic capsular release. We compared clinical outcomes and the overall duration of symptoms between 2 groups: Group I comprised 27 patients who underwent surgery <6 months after onset (mean, 3.8 months), whereas group II comprised 33 patients who underwent surgery ≥6 months after onset (mean, 11.1 months). The severity of glenohumeral synovitis at the time of surgery was evaluated. Patient-reported pain, shoulder function, and range of motion, as well as the presence of sleep disturbance, were assessed preoperatively and at 3 and 6 months after surgery.

Results
Both groups showed significant improvements in the visual analog scale pain score, Japanese Orthopaedic Association score, American Shoulder and Elbow Surgeons score, and prevalence of sleep disturbance after surgery ($P < .001$), although the glenohumeral synovitis score was significantly higher in group I than in group II ($P < .0001$). Forward flexion at 6 months after surgery was significantly greater in group I than in group II ($P = .007$). The overall duration of symptoms was shorter in group I than in group II ($P < .0001$). Neither the pain score, functional score, prevalence of sleep disturbance, nor postoperative recovery time differed between groups.

Conclusions
Arthroscopic capsular release provided significant pain relief and improvement in shoulder function in patients with frozen shoulder regardless of the timing of surgery. Early surgical intervention might shorten the overall duration of symptoms in frozen shoulder and is not associated with inferior clinical outcomes when compared with late surgical intervention. Surgeons do not need to delay surgical intervention for patients who have intolerable pain and/or nocturnal pain with sleep disturbance.

Level of evidence
Level III Retrospective Cohort Comparison Treatment Study

BACK

The clinical efficacy of leukocyte-poor platelet-rich plasma in arthroscopic rotator cuff repair: a meta-analysis of randomized controlled trials.

Zhao, D., Han, Y., Pan, J., et al.

https://doi.org/10.1016/j.jse.2020.10.014

Background
The efficacy of platelet-rich plasma (PRP) in the arthroscopic treatment of rotator cuff injury has been reported in the literature. However, conclusions have been inconsistent and more often related to differences in the types of PRP used. Therefore, to minimize these differences, we performed a meta-analysis of only studies investigating leukocyte-poor PRP to evaluate whether PRP promotes and improves the effects of arthroscopic rotator cuff repair.

Methods
A comprehensive search of the PubMed, Embase, and Cochrane Library databases was conducted to evaluate the efficacy of leukocyte-poor PRP in arthroscopic rotator cuff repair. The available data were extracted, and the methodologic quality of the included studies was evaluated by the Cochrane risk-of-bias assessment tool.

Results
In total, 10 randomized controlled trials involving 742 patients were included. The results of the meta-analysis showed that treatment with leukocyte-poor PRP performed better than the control treatment in relieving postoperative pain in the short-term (mean difference [MD], –0.57; 95% confidence interval [CI], –0.79 to –0.35; $P < .0001$) and medium- and long-term (MD, –0.18; 95% CI, –0.34 to –0.03; $P = .02$) follow-up groups. However, the changes in the MD in the visual analog scale score were below the minimal clinically important difference. Regarding the Constant shoulder (MD, 3.35; 95% CI, 1.68-5.02; $P < .0001$) and University of California, Los Angeles (MD, 1.73; 95% CI, 0.94-2.52; $P < .0001$) scores, statistically significant differences were found in favor of leukocyte-poor PRP over the control treatment. However, the changes in the MD in both the Constant and University of California, Los Angeles scores were below the minimal clinically important difference. Moreover, during medium- and long-term follow-up, the retear rate in the leukocyte-poor PRP group was lower than that in the control group regardless of the rotator cuff tear size (small and medium [<3 cm] [risk ratio (RR), 0.64; 95% CI, 0.43-0.97; $P = .03$] vs. medium and large [>3 cm] [RR, 0.51; 95% CI, 0.34-0.77; $P = .001$]) and surgical repair method (single-row repair [RR, 0.61; 95% CI, 0.43-0.87; $P = .007$] vs. double-row suture bridge repair [RR, 0.57; 95% CI, 0.38-0.84; $P = .005$]).

Conclusion
According to our study, leukocyte-poor PRP can significantly reduce the postoperative retear rate in the medium and long term regardless of the tear size and the method used for rotator cuff repair. However, the use of leukocyte-poor PRP failed to show clinically meaningful effects in terms of postoperative pain and patient-reported outcomes.

Level of evidence
Level II Systematic Review and Meta-analysis

BACK

Variation in technique and postoperative management of the Latarjet procedure among orthopedic surgeons.

Sharareh, B., Edwards, T.B., Shah, A., et al.

https://doi.org/10.1016/j.jse.2020.07.027

Background
The Latarjet procedure has become a treatment of choice for glenohumeral instability in the setting of large glenoid osseous defects (>20%) and for prior failed soft tissue repairs. However, surgical techniques and postoperative rehabilitation protocols vary among expert shoulder surgeons. The purpose of this survey study was to characterize the variation in current practice patterns among fellowship-trained orthopedic shoulder surgeons and identify factors related to variation.

Methods
A 9-question survey was created (SurveyMonkey, San Mateo, CA, USA) and distributed to orthopedic surgeons who are active members of the American Shoulder and Elbow Surgeons or American Orthopaedic Society for Sports Medicine. The survey asked questions regarding surgeon experience with the Latarjet procedure, fellowship training, open vs. arthroscopic approach, method of coracoid-to-glenoid fixation, period of sling use postoperatively, and time before clearance to return to sport. Subgroup analysis was performed to determine whether further variation was evident between surgeons who completed sports medicine vs. shoulder and elbow fellowship training.

Results
In total, 242 surgeons completed the survey. Of these, 55% indicated performing a sports medicine fellowship and 39% indicated completing a shoulder and elbow fellowship. Among all surgeons, the classic open Latarjet procedure was the strongly preferred technique (79%), followed by the open congruent-arc (17%) and all-arthroscopic (3%) techniques. With respect to fixation, 98% used screw fixation and only 1% indicated cortical button use. With respect to the postoperative course, >85% of surgeons preferred immobilization for 3-6 weeks after the procedure and 42% of respondents stated they waited ≥6 months prior to clearing their patients to return to sport. Subgroup analysis revealed that surgeons who completed a shoulder and elbow fellowship performed the classic open technique 89% of the time compared with 63% of those who completed a sports medicine fellowship ($P < .001$).

Conclusion
The results of our survey study indicate an overall strong preference for the open classic Latarjet technique as well as an overall strong preference for screw fixation of the coracoid graft to the glenoid among all surgeons. Shoulder and elbow fellowship–trained surgeons are significantly more likely to perform open surgery with a classic technique compared with sports medicine fellowship–trained surgeons. Furthermore, the significant variation in postoperative sling use and return to sport suggests that further research is needed to develop an evidence-based postoperative Latarjet rehabilitation protocol.

Level of evidence
Survey Study, Experts

BACK

Mild inflammation persists in the glenohumeral joint of patients with recurrent shoulder dislocation.

Muneshigea, K., Kenmokua, T., Nagura, N., et al.

https://doi.org/10.1016/j.jse.2021.01.005

Purpose
Approximately two-thirds of patients with a history of shoulder dislocation have the potential to develop OA in the future; however, the cause is unclear. The purpose of this study was to evaluate the expression of inflammatory mediators in the glenohumeral joint of patients with recurrent shoulder dislocation (RSD). We hypothesized that the high prevalence of OA in RSD is due to persistent mild inflammation.

Methods
This study included 26 patients with RSD who underwent arthroscopic Bankart repair and 25 patients with rotator cuff tears (RCTs) who received arthroscopic rotator cuff repair (control group). Synovial tissue samples were harvested from the patients in both test groups for the analysis of *TNF-α*, *IL-1β*, *β-FGF*, and *VEGF* expressions using quantitative reverse transcription polymerase chain reaction. Differences between the samples of the patients with RSD and those with RCT were compared using the Welch *t* test or Mann-Whitney *U* test.

Results
The expression levels of *TNF-α*, *IL-β*, *β-FGF*, and *VEGF* were significantly higher in the RSD group than in the control group ($p<.01$).

Discussion
Cartilage abrasion occurs in the glenohumeral joint owing to dislocation or joint instability. The destructive response of the synovium, which is induced by cartilage damage, upregulated the inflammatory mediators. Inflammatory mediators can act independently or in conjunction with other cytokines to initiate and propagate inflammation. In addition, mild inflammation may play a role in the development of shoulder OA, similarly to hip and knee OA.

Conclusion
Mild inflammation persists in the shoulder with RSD and can induce OA progression.

BACK

American Journal of Sports Medicine (AJSM), Volume 49, Issue 4

Comparison Between Osteochondral Autograft Transplantation and Arthroscopic Fragment Resection for Large Capitellar Osteochondritis Dissecans in Adolescent Athletes: A Minimum 5 Years' Follow-up

Yusuke Ueda, MD, Hiroyuki Sugaya, MD†, Norimasa Takahashi, MD, Keisuke Matsuki, MD, Morihito Tokai, MD, Takeshi Morioka, MD, Shota Hoshika, MD, Yasutaka Takeuchi, MD

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Background: The choice of surgical option for unstable large capitellar osteochondritis dissecans (OCD) lesions in skeletally immature athletes remains controversial.

Purpose/Hypothesis: The purpose was to investigate functional and radiographic outcomes after arthroscopic fragment resection and osteochondral autograft transplantation (OAT) for unstable large capitellar OCD lesions in skeletally immature athletes with a minimum 5 years' follow-up. We hypothesized that the outcomes after OAT for large capitellar OCD lesions would be superior to those after arthroscopic fragment resection.

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

Methods: A total of 19 elbows in 19 patients (17 male and 2 females) who underwent arthroscopic resection were assigned to group 1 (mean age, 14 years [range, 13-15 years]), whereas 29 elbows in 29 patients (29 male) who underwent OAT were assigned to group 2 (mean age, 14 years [range, 13-15 years]), with the mean follow-up of 8 (range, 5-11 years) and 7 (range, 5-13 years) years, respectively. All OCD lesions were larger than one-half of the radial head diameter. Functional scores, patient satisfaction, and range of motion were compared between the groups. Radiographic changes, including superior migration, radial head enlargement, and osteoarthritis (OA) grade, were examined.

Results: All patients returned to sports activity. Functional scores, patient satisfaction, and flexion at the final follow-up were significantly improved in both groups compared with preoperative values, and differences were not significant between groups at the final follow-up. Extension showed a significant improvement in both groups (group 1: –17° to 0°; group 2: –18° to −6°; $P < .001$). Extension in group 1 was significantly better than that in group 2 at the final follow-up ($P = .045$). No elbows developed postoperative severe OA in group 1, whereas 3 elbows in group 2 had grade 3 OA; these 3 elbows had preoperative superior migration and radial head enlargement.

Conclusion: No differences were observed in clinical and radiographic outcomes between patients undergoing arthroscopic fragment resection and OAT, except for elbow extension, at a minimum 5 years' follow-up. We believe that for adolescents with large capitellar OCD lesion, OAT is a good option for skeletally immature elbows and that arthroscopic fragment resection is a reliable and less invasive surgical option for relatively mature elbows

BACK

Arthroscopic Bankart Repair Versus Immobilization for First Episode of Anterior Shoulder Dislocation Before the Age of 25: A Randomized Controlled Trial

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Background: The risk of recurrence after the first episode of anterior shoulder dislocation is high with nonoperative treatment in younger patients.

Purpose/Hypothesis: The aim of this study was to compare the results of arthroscopic Bankart repair and nonoperative treatment for shoulder dislocation in patients younger than 25 years, with a minimum of 2 years of follow-up. The hypothesis was that surgery would decrease the risk of recurrence.

Study design: Randomized controlled trial; Level of evidence, 1.

Methods: We included patients aged between 18 and 25 years after a first episode of anterior shoulder dislocation and divided them into 2 groups. The first group was treated surgically with an arthroscopic Bankart repair within 2 weeks after the dislocation; the second group was treated nonoperatively. Both groups were immobilized for 3 weeks in internal rotation and followed the same physical therapy protocol. Standard radiography and computed tomography were performed immediately after reduction of the dislocation, and follow-up was performed at 3, 6, 12, and 24 months. The primary outcome measure was instability recurrence, defined as another anterior shoulder dislocation requiring closed reduction by another person (the patient was unable to reduce the dislocated joint themselves), a subluxation, or a positive apprehension test. Secondary outcome measures included range of motion, return to sport, and functional scores such as the short version of the Disabilities of the Arm, Shoulder and Hand score the Walch-Duplay score, and the Western Ontario Shoulder Instability Index (WOSI).

Results: A total of 20 patients were included in each group. The mean ± SD age was 21 ± 1.8 years, and there were 33 men (82.5%) and 7 women (17.5%) in the total sample. Recurrence of instability was significantly decreased in the surgical treatment group compared with the nonoperative group (2 [10%] vs 14 [70%], respectively; P = .0001). Fewer patients in the surgical treatment group versus the nonoperative group had another episode of dislocation (0 vs 6 [30%], respectively), subluxation (2 [10%] vs 13 [65%], respectively; P = .003), or a positive apprehension test (1 [5%] vs 11 [58%], respectively; P = .0005). The Walch-Duplay score (88.4 vs 70.3 points; P = .046) and WOSI (11.5 vs 17.7 points; P = .035) were significantly better in the surgical group versus the nonoperative group after a 2-year follow-up. Level of sport was the same or better in 89% of the surgical treatment group vs 53% of the nonoperative treatment group (P = .012). No surgical complication was recorded. We did not find any significant difference in range of motion.

Conclusion: In patients with first-time shoulder dislocations, arthroscopic labral repair (Bankart procedure) reduced the risk of secondary shoulder dislocation and improved functional outcome versus nonoperative treatment after a 2-year follow-up. Surgical treatment after a first episode of shoulder dislocation could be offered as a primary treatment option in a younger population if these results are confirmed by larger studies with a longer follow-up.

BACK

Clinical Orthopaedics and Related Research (CORR), Volume 479, Issue 4

The Incidence of Posterior and Combined AP Shoulder Instability Treatment with Surgical Stabilization Is Higher in an Active Military Population than in the General Population: Findings from the US Naval Academy

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doi: 10.1097/CORR.0000000000001530

Background
Anterior instability has consistently been shown to be the most common type of glenohumeral instability. Recent studies have demonstrated a higher percentage of posterior and combined (anterior and posterior) instability than had previously been reported; however, this work has not been replicated recently in a particularly young military population, which may be representative of an especially athletic or high-demand group.

Question/purpose
What proportion of arthroscopic shoulder stabilization procedures are performed to address isolated anterior instability, isolated posterior instability, and combined instability in a young, military population?

Methods
Between August 2009 and January 2020, two sports medicine fellowship–trained surgeons performed arthroscopic shoulder surgery on 543 patients at a single institution. During that time, the indication to be treated with arthroscopic stabilization surgery was symptomatic glenohumeral instability, as diagnosed by the operative surgeon, that restricted patients from carrying out their military duties. Of those, 82% (443 of 543) could be evaluated in this retrospective study, while 18% (100 of 543) were excluded due to either incomplete data or because the procedure performed was not to address instability. No patient underwent an open stabilization procedure during this period. Of the 443 patients investigated, the mean age was 22 ± 4 years, and 88% (392 of 443 patients) were men. Instability type was characterized as isolated anterior, isolated posterior, or combined (anterior and posterior) according to the physician's diagnosis as listed in the patient's clinical records and operative reports after the particular capsulolabral pathology was identified and addressed.

Results
Isolated anterior instability occurred in 47% of patients (210 of 443). Isolated posterior instability happened in 18% of patients (80 of 443), while combined anteroposterior instability occurred in 35% of patients (153 of 443).

Conclusion
Shoulder instability is common in the military population. Although anterior instability occurred most frequently, these findings demonstrate higher proportions of posterior and combined instability than have been previously reported. Surgeons should have a heightened suspicion for posterior and combined anteroposterior labral pathology when performing arthroscopic stabilization procedures to ensure that these instability patterns are recognized and treated appropriately. The current investigation examines a unique cohort of young and active individuals who are at particularly high risk for instability and whose findings may represent a good surrogate for other active populations that a surgeon may encounter.

Level of Evidence
Level III; therapeutic study

BACK

Bone and Joint Journal (BJJ), Volume 103, issue 4

Glenoid erosion is a risk factor for recurrent instability after Hill-Sachs remplissage

Maxime Cavalier, Tyler Robert Johnston, Laurie Tran, Marc-Olivier Gauci, Pascal Boileau

https://doi.org/10.1302/0301-620X.103B4.BJJ-2019-0736.R2

Aims
The aim of this study was to identify risk factors for recurrent instability of the shoulder and assess the ability to return to sport in patients with engaging Hill-Sachs lesions treated with arthroscopic Bankart repair and Hill-Sachs remplissage (ABR-HSR).

Methods
This retrospective study included 133 consecutive patients with a mean age of 30 years (14 to 69) who underwent ABR-HSR; 103 (77%) practiced sports before the instability of the shoulder. All had large/deep, engaging Hill-Sachs lesions (Calandra III). Patients were divided into two groups: A (n = 102) with minimal or no (< 10%) glenoid bone loss, and B (n = 31) with subcritical (10% to 20%) glenoid loss. A total of 19 patients (14%) had undergone a previous stabilization, which failed. The primary endpoint was recurrent instability, with a secondary outcome of the ability to return to sport.

Results
At a mean follow-up of four years (1.0 to 8.25), ten patients (7.5%) had recurrent instability. Patients in group B had a significantly higher recurrence rate than those in group A (p = 0.001). Using a multivariate logistic regression, the presence of glenoid erosion of > 10% (odds ratio (OR) = 35.13 (95% confidence interval (CI) 8 to 149); p = 0.001) and age < 23 years (OR = 0.89 (0.79 to 0.99); p = 0.038) were associated with a higher risk of recurrent instability. A total of 80 patients (78%) could return to sport, but only 11 athletes (65%) who practiced high-risk (collision or contact-overhead) sports. All seven shoulders which were revised using a Latarjet procedure were stable at a mean final follow-up of 36 months (11 to 57) and returned to sports at the same level.

Conclusion
Patients with subcritical glenoid bone loss (> 10%) and younger age (≤ 23 years) are at risk of failure and reoperation after ABR-HSR. Furthermore, following this procedure, one-third of athletes practicing high-risk sports are unable to return at their pre-instability level, despite having a stable shoulder.

BACK

Lower Extremity

Arthroscopy, Volume 37, Issue 4

Role of Age on Success of Arthroscopic Primary Repair of Proximal Anterior Cruciate Ligament Tear

Vermeijden, H. D., Yang, X. A., van der List, J. P., & DiFelice, G. S.

https://doi.org/10.1016/j.arthro.2020.11.024

Purpose
To assess failure rates and patient-reported outcomes measures following arthroscopic primary anterior cruciate ligament (ACL) repair of proximal tears in different age groups.

Methods
Between 2008 and 2017, the first 113 consecutive patients treated with repair were retrospectively reviewed at minimum of 2 years. Patients were stratified into 3 age groups: ≤21, 22-35, and >35 years. Primary outcomes were ipsilateral reinjury or reoperation, and contralateral injury rates, and secondary outcomes consisted of Lysholm, modified Cincinnati, Single Assessment Numeric Evaluation, International Knee Documentation Committee subjective, pain, and satisfaction scores. Group differences were compared using $\chi 2$ tests and Mann–Whitney U tests.

Results
Follow-up was obtained in 113 patients (100%). Median age was 35 years (interquartile range [IQR] 23-43) and median follow-up was 2.2 years (IQR 2.0-2.8). Overall, ACL reinjury occurred in 13 patients (11.5%), reoperation in 7 patients (6.2%), complications in 2 patients (1.8%) and contralateral ACL injury in 4 patients (3.5%). Overall, median Lysholm was 95 (IQR 89-100) and International Knee Documentation Committee subjective 92 (IQR 84-99). Treatment failure was significantly greater in the youngest age group (37.0%) as compared with the middle and older groups (4.2% and 3.2%, both $P < .005$). No significant differences were seen in reoperation, complication, or contralateral injury rates between groups (all $P > .2$), nor in patient-reported outcomes measures between the groups (all $P > .1$).

Conclusions
The failure rate of primary repair of proximal ACL tears is high in patients aged 21 or younger (37.0%), and this should be taken into account when discussing repair in this patient group. In patients older than 21, repair may be an excellent treatment with low failure (3.5%) and complication rates (1.2%) and good subjective scores.

Level of Evidence
Level III, retrospective comparative therapeutic trial.

BACK

Machine Learning Algorithms Predict Clinically Significant Improvements in Satisfaction After Hip Arthroscopy

Kyle N. Kunze, Evan M. Polce, Jonathan Rasio, Shane J. Nho

https://doi.org/10.1016/j.arthro.2020.11.027

Purpose
To assess the outcomes of complete, primary, arthroscopic hip labral reconstruction among patients aged 40 years and older compared with those who underwent primary labral repair and compared with patients aged 30 to 39 years who underwent complete, primary labral reconstruction.

Methods
We recruited all patients who underwent arthroscopic labral reconstruction between March 2010 and June 2015 and were aged 30 to 65 years or who underwent arthroscopic labral repair between June 2009 and June 2015 and were aged 40 to 65 years. The modified Harris Hip Score (mHHS), Lower Extremity Function Score, and visual analog scale score for average pain were collected preoperatively and at minimum 2-year follow-up. Failure was defined as the need for revision ipsilateral hip surgery. The rate of conversion to total hip arthroplasty (a subset of failure) was assessed separately.

Results
A total of 363 hips in 343 patients met the inclusion criteria. Follow-up was available for 312 hips (86.0%), and the average time to follow-up was 4.2 years (range, 2.0-8.5 years). After adjustment for differences in follow-up time between groups, failure was 3.29 times more likely for hips in the repair group aged 40 years and older than for hips in the reconstruction group aged 40 years and older (relative rate, 3.29; 95% confidence interval, 1.25-8.69; P = .02), and there was no difference in the failure rate for hips in the reconstruction group aged 40 years and older compared with hips in the reconstruction group aged 30 to 39 years (relative rate, 0.58; 95% confidence interval, 0.18-1.89; P = .37). The rate of conversion to total hip arthroplasty was not meaningfully different between the 3 groups. Among hips for which treatment did not fail, average improvement in the mHHS measured 35 points and both labral reconstruction groups saw a greater mHHS improvement than the labral repair group of patients aged 40 years and older (P = .01 and P < .01).

Conclusions
Labral reconstruction led to a lower failure rate, greater average improvement in the mHHS, and equivalent postoperative patient-reported outcome scores compared with labral repair among patients aged 40 years and older in this study population, and the outcomes of labral reconstruction were similar between patients aged 40 years and older and those aged 30 to 39 years. Complete labral reconstruction may be particularly advantageous in patients aged 40 years and older.

Level of Evidence
Level III, retrospective comparative study

BACK

Treatment of the Wave Sign With Femoral Osteoplasty With and Without Chondrolabral Stabilization Using Suture Anchors

Makovicka, J. L., Hassebrock, J. D., Chhabra, A., Wilcox, J., & Economopoulos, K. J.

https://doi.org/10.1016/j.arthro.2020.11.048

Purpose
To discuss the surgical outcomes of patients identified to have the wave sign without an accompanying labral tear treated with and without stabilization of the chondrolabral junction in conjunction with femoral osteoplasty.

Methods
A retrospective study was performed in patients with cartilage delamination (wave sign) treated with femoral osteoplasty alone (FO group) or femoral osteoplasty with chondrolabral stabilization (CLS group). Patient-reported outcomes including the modified Harris Hip Score, Hip Outcome Score (HOS)–Activities of Daily Living, and HOS–Sports-Specific Subscale were obtained at a minimum of 2 years postoperatively. Other outcomes included rates of revision hip arthroscopy and conversion to hip arthroplasty.

Results
The study consisted of 47 patients in the FO group and 38 in the CLS group. Both groups showed significant increases in all patient-reported outcomes over the study period compared with preoperative values. The final modified Harris Hip Score was 72.8 ± 9.2 in the FO group and 79.9 ± 9.3 in the CLS group ($P < .001$). The HOS–Activities of Daily Living in the FO and CLS groups was 81.4 ± 10.3 and 87.2 ± 7.5, respectively ($P < .001$). There was no difference in the HOS–Sports-Specific Subscale between the FO group (74.4 ± 10.3) and the CLS group (78.0 ± 14.6) at final follow-up ($P = .198$). Revision hip arthroscopy was required in 5 patients in the FO group (13%) and 3 in the CLS group (6.3%). No patient in either group required conversion to hip arthroplasty throughout the study period.

Conclusions
Chondrolabral stabilization in conjunction with femoral osteoplasty is an effective treatment in patients with the wave sign without labral tears.

Level of Evidence
Level III, retrospective cohort study.

BACK

Surgical Intervention for Femoroacetabular Impingement Can Lead to Improvements in Both Hip and Back Function in Patients With Coexisting Chronic Back Pain at 1-Year Follow-Up

Yuhang Sun, Kamali A. Thompson, Christon Darden, Thomas Youm

https://doi.org/10.1016/j.arthro.2020.11.043

Purpose
To determine whether patients with coexisting lumbar back pain experience back pain improvement after undergoing hip arthroscopy for femoroacetabular impingement (FAI).

Methods
An institutional review board–approved retrospective chart review compared patients undergoing hip arthroscopy for FAI with lumbar spine back pain to patients solely reporting hip pain. The modified Harris Hip Score (mHHS) and Nonarthritic Hip Score (NAHS) were recorded preoperatively and at 1-year follow up. The Oswestry Disability Index score, which quantifies disability from lower back pain, and visual analog scale were recorded from the hip–spine cohort alone. Statistical analysis was performed using paired sample t tests with $P \leq .05$ considered significant.

Results
Sixty-eight patients who underwent hip arthroscopy between November 2016 and October 2018 were enrolled. Thirty-four patients with a mean age of 48.2 ± 14.0 years and body mass index of 26.6 ± 6.6 had a history of back pain and 34 patients were age- and sex-matched for the matched-control (MC) cohort. The MC cohort had lower mHHS and NAHS scores preoperatively. The MC cohort reported a larger increase in the mHHS ($P = .01$) and NAHS scores ($P = .01$) postoperatively. More patients in the MC cohort reached minimally clinically important difference with mHHS ($P = .003$) and NAHS ($P = .06$). Following surgery, the hip–spine cohort reported a lower Oswestry Disability Index score, indicating minimal disability ($P = .01$).

Conclusions
Surgical intervention for FAI can lead to improvements in hip and back pain in patients with coexisting lumbar pathology.

Level of Evidence
III, retrospective comparative study

BACK

Linear Anterior-Posterior Computed Tomography Parameters Used to Quantify Trochlear Dysplasia Are More Reliable Than Angular Measurements

Peter Wilhelm Ferlic, Armin Runer, Christopher Seeber, Maria Thöni, Anna Spicher, Michael Christian Liebensteiner

https://doi.org/10.1016/j.arthro.2020.11.032

Purpose
(1) To evaluate the reliability of 9 commonly used quantitative parameters of the trochlear morphology on computed tomography (CT) and (2) to analyze for differences in the reliability regarding patient subgroups (patellofemoral instability [PFI] vs non-PFI).

Methods
A retrospective analysis of lower-limb CT scans performed between August 1996 and February 2013 was performed. The CT scans of all patients with PFI and 30 randomly selected cases without a history of PFI (non-PFI) were included. The following measurements were performed on 1 proximal axial CT slice at the entrance of the trochlear groove and 1 slice 5 mm further distal: relative medial, central, and lateral trochlear height; trochlear depth; relative transverse trochlear shift; trochlear facet asymmetry; sulcus angle; and medial and lateral trochlear slope. Four investigators performed the measurements independently, and intraclass correlation coefficients (ICCs) were calculated for the entire study group, as well as for the PFI and non-PFI groups separately.

Results
In total, 66 cases (36 PFI cases) were included in the study. We found almost perfect inter-rater and intrarater agreement for the trochlear height on both axial CT slices (ICC, 0.831-0.977). For the other measurements, we found only fair reliability (ICC < 0.4) on the proximal CT slice, whereas on the distal CT slice, at least moderate reliability (ICC > 0.4) was observed. ICCs were lower for many parameters in the PFI group. Angular values were less reliable than linear values. In particular, measurements involving the medial facet (i.e., sulcus angle, medial trochlear slope, and trochlear facet asymmetry) were less reliable.

Conclusions
When interpreting quantitative parameters defining the trochlear morphology, one must taken into account the considerably lower reliability of angular parameters such as the commonly used sulcus angle compared with linear measurements. Radiologic measurements are less reliable in cases of PFI than in subjects without instability.

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

BACK

Delayed Anterior Cruciate Ligament Reconstruction Increases the Risk of Abnormal Prereconstruction Laxity, Cartilage, and Medial Meniscus Injuries

Cristiani, R., Janarv, P.-M., EngstrÖm, B., Edman, G., Forssblad, M., & Stålman, A.

https://doi.org/10.1016/j.arthro.2020.11.030

Purpose
To determine the association between a delay in anterior cruciate ligament reconstruction (ACLR), age, sex, body mass index (BMI) and cartilage injuries, meniscus injuries, meniscus repair, and abnormal prereconstruction laxity.

Methods
Patients who underwent primary ACLR at our institution from January 2005 to March 2017, with no associated ligament injuries, were identified. Logistic regression analyses were used to evaluate whether delay in ACLR, age, sex, and BMI were risk factors for cartilage and meniscus injuries, meniscus repair, and abnormal (side-to-side difference >5 mm) prereconstruction laxity.

Results
A total of 3976 patients (mean age 28.6 ± 10.6 years, range 10-61 years) were included. The risk of cartilage injury increased with a delay in ACLR (12-24 months: odds ratio [OR] 1.20; 95% confidence interval [CI] 1.05-1.29; P = .005; and > 24 months: OR 1.20; 95% CI 1.11-1.30; P < .001) and age ≥30 years (OR 2.27; 95% CI 1.98-2.60; P < .001). The risk of medial meniscus (MM) injury increased with a delay in ACLR (12-24 months: OR 1.20; 95% CI 1.07-1.29; P = .001; and >24 months: OR 1.22; 95% CI 1.13-1.30; P < .001), male sex (OR 1.16; 95% CI 1.04-1.30; P = .04) and age ≥30 years (OR 1.20; 95% CI 1.04-1.33; P = .008). The risk of lateral meniscus (LM) injury decreased with a delay in ACLR of >3 months and age ≥30 years (OR 0.75; 95% CI 0.66-0.85; P < .001), whereas it increased with male sex (OR 1.32; 95% CI 1.22-1.41; P < .001). MM repairs relative to MM injury decreased with a delay in ACLR (6-12 months: OR 0.70; 95% CI 0.54-0.92; P = .01; 12-24 months: OR 0.69; 95% CI 0.57-0.85; P < .001; >24 months: OR 0.61; 95% CI 0.52-0.72; P < .001) and age ≥30 years (OR 0.60; 95% CI 0.48-0.74; P < .001). LM repairs relative to LM injury only decreased with age ≥30 years (OR 0.34; 95% CI 0.26-0.45; P < .001). The risk of having abnormal knee laxity increased with a delay in ACLR of >6 months and MM injury (OR 1.52; 95% CI 1.16-1.97; P = .002), whereas it decreased with a BMI of ≥25 (OR 0.68; 95% CI 0.52-0.89; P = .006).

Conclusions
A delay in ACLR of >12 months increased the risk of cartilage and MM injuries, whereas a delay of >6 months increased the risk of abnormal prereconstruction laxity and reduced the likelihood of MM repair. To reduce meniscus loss and the risk of jeopardizing knee laxity, ACLR should be performed within 6 months after the injury.

Level of Evidence
Level III, retrospective therapeutic comparative study.

BACK

One-Stage Anatomical Revision Anterior Cruciate Ligament Reconstruction: Results According to Tunnel Overlaps

Ahn, J.-H., Son, D.-W., Jeong, H.-J., Park, D.-W., & Lee, I.-G.

https://doi.org/10.1016/j.arthro.2020.11.029

Purpose
To present clinical results according to tunnel overlap in 1-stage anatomical revision anterior cruciate ligament reconstruction (ACLR).

Methods
All patients who underwent revision ACLR performed by a single surgeon (J.H.A.) from 2012 to 2017 and were followed up for >24 months were retrospectively evaluated. The exclusion criteria were concomitant ligament injury, including medial collateral ligament injury, modified Outerbridge grade ≥3 cartilage lesion, and severe meniscus defects. Tunnel overlap was measured on 3-dimensionally reconstructed computed tomography images. Patients in the nonoverlapped femoral tunnel group (group NO, n = 52) were treated with new tunnel drilling that completely avoided previous tunnels, and those in the overlapped femoral tunnel group (group O, n = 41) were treated with a new tunnel that overlapped with previous tunnels. Clinical outcomes were evaluated using the subjective International Knee Documentation Committee (IKDC) and Lysholm scores. Knee joint stability was measured using the Lachman and pivot shift tests. Patients with femoral tunnel widening of ≥14 mm underwent 2-stage ACLR.

Results
The mean follow-up duration of 93 patients was 46.9 months (range, 24-97 months). All preoperative subjective and objective IKDC ($P<0.001$) and Telos stress test scores ($P = .016$) were significantly improved at the last follow-up. Forty-one patients had overlapping femoral tunnels, whereas 87 had overlapping tibial tunnels. At the last follow-up, subjective IKDC and Lysholm scores (73.6 ± 15.3 vs 74.9 ± 12.1, $P = .799$ and 80.0 ± 19.2 vs 81.44 ± 13.5, $P = .505$, respectively) and objective pivot shift (IKDC grade) in the Lachman test ($P = .183$ and $P = .450$, respectively) did not differ significantly between groups NO and O, respectively.

Conclusions
One-stage anatomical revision ACLR significantly improved the clinical results. Most tibial tunnels (94%) and approximately one-half (44%) of the femoral tunnels overlapped. The overlapped femoral tunnel group did not show inferior outcomes or stability.

Level of Evidence
Level III, cohort study.

BACK

Primary Anterior Cruciate Ligament Repair Using Suture Tape Augmentation: A Case Series of 29 Patients With Minimum 2-Year Follow-Up

Burton, Denver & Schaefer, Eliana & Shu, Henry & Bodendorfer, Blake & Argintar, Evan.

https://doi.org/10.1016/j.arthro.2020.11.034

Purpose
To evaluate clinical outcomes and patient-reported outcomes of patients who underwent primary anterior cruciate ligament (ACL) repair using suture tape augmentation.

Methods
Patients with a proximal tear of the ACL who underwent primary ACL repair with a minimum 2-year follow-up were included. The exclusion criteria included multiligamentous knee injuries, midsubstance tears, tibial avulsion fractures, and distal tears. Demographic characteristics, injury pattern, concomitant injury pattern, and patient-reported outcome measures were recorded. Patients were evaluated at a minimum 2-year follow-up for clinical success, defined as stability not requiring revision ACL reconstruction, and for patient-reported outcome measurements. Failure was defined as the need for revision surgery.

Results
The mean follow-up period was 2.8 ± 0.9 years. Thirty-five patients met the inclusion criteria, with an average age of 32.2 ± 7.2 years, and 2-year follow-up was obtained for 29 of these patients. Revision surgery was required in 2 of the 29 patients (6.9%); successful treatment was achieved in the remaining 93.1%. The Single Assessment Numeric Evaluation score and Knee Injury and Osteoarthritis Outcome Score for the 27 successfully treated patients were recorded, with 70.4% having Single Assessment Numeric Evaluation scores of 80 or greater.

Conclusions
This case series shows that primary surgical repair of proximal ACL tears using suture tape augmentation results in a low rate of revision surgery.

Level of Evidence
Level IV, prospective case series.

BACK

Knee Surgery, Sports Traumatology, Arthroscopy (KSSTA), Volume 29, Issue 4

High prevalence of a deep lateral femoral notch sign in patients with anterior cruciate ligament (ACL) and concomitant posterior root tears of the lateral meniscus.

Berthold, D.P., Muench, L.N., Herbst, E. et al.

https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06071-9.

Purpose
To determine the prevalence of a deep lateral femoral notch sign (LFNS) in magnetic resonance imaging (MRI) in patients with anterior cruciate ligament (ACL) and concomitant posterior root tears of the lateral meniscus (PLRT).

Methods
A retrospective chart review was conducted to identify all patients undergoing ACL reconstruction between 2016 and 2018. Based on the arthroscopic appearance of the lateral meniscus, patients were assorted to one of three groups: isolated ACL tear (ACL-Group), ACL tear with concomitant lateral meniscus tear not involving the posterolateral root (Meniscus-Group), and ACL tear with concomitant PLRT (PLRT-Group). Incidence and depth of a LFNS on preoperative MRI was compared between the three cohorts.

Results
115 patients (mean age: 29.5 ± 11.3 years) were included in the study, with 58 patients (50.4%) assorted to the ACL-Group, 24 patients (20.9%) to the Meniscus-Group, and 33 patients (28.7%) to the PLRT-Group. The prevalence of a LFNS was significantly higher in the PLRT-Group (39.4%), when compared to the ACL- (5.2%) or Meniscus-Groups (25.0%; $p < 0.001$, respectively). Additionally, logistic regression analysis demonstrated that patients with PLRT were 5.3 times more likely to have a LFNS as compared to those without a lateral root tear ($p < 0.001$).

Conclusion
In patients with ACL tears, the presence of a LFNS on preoperative MRI may be predictive for a PLRT. As the LFNS occurs in almost 40% of the patients with combined ACL tears and PLRT, the LFNS may be a useful secondary diagnostic finding in early MRI diagnostic. Identifying PLRT on MRI is clinically relevant, as it prevents misdiagnosis and facilitates surgical decision-making, thus avoiding subsequent delayed treatment.

Level of evidence
Level IV.

BACK

Placement of an anatomic tibial tunnel significantly improves the medial meniscus posterior extrusion at 90° of knee flexion following medial meniscus posterior root pullout repair.

Kamatsuki, Y., Furumatsu, T., Hiranaka, T. et al.

https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06070-w.

Purpose
The purpose of this study was to evaluate the influence of tibial tunnel position in pullout repair for a medial meniscus (MM) posterior root tear (MMPRT) on postoperative MM extrusion.

Methods
Thirty patients (median age 63 years, range 35–72 years) who underwent transtibial pullout repairs for MMPRTs were included. Three-dimensional computed tomography images of the tibial surface were evaluated using a rectangular measurement grid for assessment of tibial tunnel position and MM posterior root attachment. Preoperative and postoperative MM medial extrusion (MMME) and posterior extrusion (MMPE) at 10° and 90° knee flexion were measured using open magnetic resonance imaging.

Results
Tibial tunnel centers were located more anteriorly and more medially than the anatomic center (median distance 5.8 mm, range 0–9.3 mm). The postoperative MMPE at 90° knee flexion was significantly reduced after pullout repair, although there was no significant reduction in MMME or MMPE at 10° knee flexion after surgery. In the correlation analysis of the displacement between the anatomic center to the tibial tunnel center and improvements in MMME, and MMPE at 10° and 90° knee flexion, there was a significant positive correlation between percentage distance and improvement of MMPE at 90° knee flexion.

Conclusion
This study demonstrated that the nearer the tibial tunnel position to the anatomic attachment of the MM posterior root, the more effective the reduction in MMPE at 90° knee flexion. Our results emphasize that an anatomic tibial tunnel should be created in the MM posterior root to improve the postoperative MMPE and protect the articular cartilage in a knee flexion position. Placement of an anatomic tibial tunnel significantly improves the MMPE at 90° of knee flexion after MM posterior root pullout repair.

Level of evidence
IV.

BACK

Posterior cruciate ligament reconstruction with peroneus longus tendon versus hamstring tendon: a comparison of functional outcome and donor site morbidity.

Rhatomy, S., Abadi, M.B.T., Setyawan, R. et al.

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Purpose
This study aimed to evaluate the differences in clinical outcome and donor site morbidity between the Peroneus Longus Tendon (PLT) and Hamstring Tendon (HT) in single-bundle Posterior Cruciate Ligament (PCL) reconstruction.

Methods
Patients with an isolated PCL injury underwent single-bundle PCL reconstruction using consecutive sampling. Patients were allocated into two groups (PLT and HT) and prospectively observed. The tendon graft diameter was measured intraoperatively. Functional scores (IKDC, Lysholm, and modified Cincinnati scores) were recorded preoperatively and 2 years postoperatively. The thigh circumference and functional score according to the Foot and Ankle Disability Index (FADI) and American Orthopedic Foot and Ankle Society (AOFAS) were recorded to evaluate the morbidities in the ankle.

Results
Fifty-five patients (hamstring n = 27, peroneus n = 28) met the inclusion criteria. The diameter of the PLT graft (8.2 ± 0.6 mm) was comparable to that of the HT graft (8.3 ± 0.5 mm). Both groups had excellent postoperative knee functional outcome scores. The mean AOFAS and FADI scores were excellent, with no difference in thigh circumference between the groups.

Conclusion
PLT is a good choice as a graft in PCL reconstruction at the 2-year follow-up, with minimal donor site morbidity.

Level of evidence
II.

BACK

Steep medial tibial slope and prolonged delay to surgery are associated with bilateral medial meniscus posterior root tear.

Hiranaka, T., Furumatsu, T., Okazaki, Y. et al.

https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06079-1.

Purpose
Contralateral medial meniscus posterior root tear (MMPRT) can sometimes occur after primary surgeries for MMPRT and lead to unsatisfactory outcomes. The incidence rate and risk factors for contralateral MMPRT have not been well investigated, despite their clinical importance. Therefore, the incidence and predictors of bilateral MMPRT were aimed to be evaluated.

Methods
Fourteen patients with bilateral MMPRT (group B) and 169 patients with unilateral MMPRT (group U) were enrolled in this study. Sex, age, body mass index, time between injury and surgery, and medial tibial slope angle (MTSA) were compared between the groups. MTSA was measured using lateral radiographs.

Results
The incidence rate of bilateral MMPRT was 6.2% among all patients with MMPRTs. Multivariate logistic regression analysis showed that a prolonged time between injury and surgery (odds ratio [OR], 1.0; 95% confidence interval [CI] 1.00–1.01; $P < 0.05$) and steeper MTSA (OR, 1.85; 95% CI 1.21–2.64; $P < 0.01$) were significantly associated with the development of bilateral MMPRT. Receiver operating characteristic curve analysis showed that MTSA > 10.0° was associated with bilateral MMPRT, with a sensitivity of 93% and specificity of 69%.

Conclusion
A longer time between injury and surgery and steeper MTSA were risk factors for the development of bilateral MMPRT. Surgeons need to pay close attention to the contralateral knee in addition to the primary injured knees when treating knees with steep MTSA. Besides, early meniscal repair of primary MMPRT would be important to prevent the events of contralateral MMPRT.

Level of evidence
III.

BACK

Bone marrow aspirate concentration provided better results in cartilage regeneration to microfracture in knee of osteoarthritic patients.

Jin, QH., Chung, YW., Na, SM. et al.

https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06099-x.

Purpose
To determine whether microfracture with bone marrow aspirate concentrate (BMAC) improves functional outcome and cartilage regeneration better than microfracture alone in patients undergoing high tibial osteotomy (HTO) for medial unicompartmental osteoarthritis (OA).

Methods
Among 436 patients treated with HTO for medial unicompartmental OA with varus deformity between 2010 and 2016, clinical outcomes were retrospectively compared between the microfracture alone group (group I, 43 cases) and microfracture with BMAC augmentation group (group II, 48 cases). Of these, 64 patients underwent a second-look arthroscopic assessment. Clinical outcomes were compared based on the Knee Society Score (KSS), International Knee Documentation Committee (IKDC) subjective score, and Western Ontario and McMaster Universities Arthritis Index (WOMAC). Cartilage regeneration was assessed according to Koshino's staging system and the International Cartilage Repair Society (ICRS) Cartilage Repair Assessment (CRA) grading system.

Results
At the last follow-up, there were no significant intergroup differences in terms of KSS for pain and function ($p > 0.05$). Moreover, WOMAC scores were similar between the two groups ($p > 0.05$). Regarding second-look arthroscopy findings, according to Koshino's staging system, there was no significant intergroup difference in terms of defect coverage ($p = 0.187$). However, group II showed a significantly better mean CRA score than group I ($p = 0.035$).

Conclusion
There were no significant differences in clinical outcomes and cartilage regeneration between the groups. However, the CRA score was significantly higher with BMAC augmentation and microfracture than microfracture alone. Therefore, BMAC augmentation had a synergistic effect for a better cartilage regeneration, although studies with a longer follow-up might help to confirm whether microfracture with BMAC augmentation would ensure better clinical outcomes than microfracture alone for the treatment of knee OA.

BACK

The Rising Moon sign is specific and sensitive in the diagnosis of bucket handle tears of the medial meniscus.

Cerciello, S., Morris, B.J., Panni, A.S. et al.

https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06108-z.

Purpose
Bucket handle tears of the meniscus are common and can lead to locking, extension deficit and functional impairment. The diagnosis is determined by a combination of physical examination and imaging, but in some cases the diagnosis may be challenging since specific clinical tests are lacking. The aim of the present study was to assess the value of a new clinical test, the elective pain at the anterior aspect of the joint line (defined as the “Rising Moon sign”) in the diagnosis of bucket handle tears of the medial meniscus.

Methods
Forty patients treated for a bucket handle of the medial meniscus were enrolled as the study group and were compared to a matched group of 40 patients with a posterior horn tear of the medial meniscus and 50 healthy subjects. The following aspects were investigated in the groups: body mass index, extension deficit, pain at the posterior aspect of the joint line (PPJL), at the middle joint line (PMJL), at the anterior join line (PAJL) and at combined hyperflexion of the knee and external rotation of the foot (PHE). Pain at the anterior joint line (PAJL) was defined as the Rising Moon sign.

Results
In the bucket handle group the average flexion contracture was 12° (0–30°). The average PPJL was one (0–2), the average PMJL was 1.6 (0–3), PAJL was 2.5 (1–3) and PHE was 1.6 (1–2). In the posterior horn tear group the average flexion contracture was 0.9° (− 10 to 5°). The average PPJL was 2.2 (1–3), the average PMJL was 1.4 (0–3), PAJL was 0.6 (0–2) and PHE was 2.5 (1–3). The rising moon showed 95% sensitivity and 98% specificity in the diagnosis of bucket handle tears. In addition it showed a positive predictive value of 97.4% and negative predictive value of 96%. Finally it also demonstrated high inter-observer reliability (0.905).

Conclusions
The “Rising Moon” sign has shown to be highly predictive for bucket handle tears of the medial meniscus with very high specificity and sensitivity. In addition it is easy to perform with very high inter-observer reliability.

Level of evidence
Level IV.

BACK

Patient-reported evaluation on giving way is important for return to preinjury activity level after Anterior Cruciate Ligament reconstruction.

Ohsawa, T., Kimura, M. & Chikuda, H.

https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06111-4.

Purpose
The present study evaluated the rate of returning to the preinjury level of competitive sports after ACLR and influential factors.

Methods
After excluding composite ligament injury cases, 96 patients with a Tegner activity score of ≥ 6 who were managed between April 2015 and March 2016 and had been followed for ≥ 2 years were included in the present study. The patients were evaluated for instability, and the following data were collected: second-look arthroscopy findings, muscle strength, and International Knee Documentation Committee (IKDC) subjective score (follow-up rate: 88.1%).

Results
The rate of returning to the preinjury level of competitive sports was 62/96 (64.6%). Only the total IKDC subjective score (odds ratio, 1.052; 95% confidence interval 1.004–1.102; p = 0.035) and the subjectively evaluated item about giving way (odds ratio, 1.762; 95% confidence interval 1.066–2.911; p = 0.027) were independently associated with the returning to the preinjury level of competitive sports after ACLR in the logistic regression analysis.

Conclusion
The rate of returning to the preinjury level of competitive sports after ACLR was 64.6%, even if a good knee stability and healing status of the sutured meniscus were acquired after ACLR. The IKDC subjective score, especially the item about giving way, was significantly associated with the returning to the preinjury level of competitive sports. The factors assessed by patient-reported evaluations concerning giving way that may be related to functional performance, including brain activity, are important to consider to improve the rate of returning to the preinjury level of competitive sports.

Level of evidence
III.

BACK

Remnant preservation does not affect accuracy of tibial tunnel positioning in single-bundle ACL reconstruction.

Kosy, J.D., Walmsley, K., Gordon, E.A. et al.

https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06125-y.

Purpose
Remnant preservation, in anterior cruciate ligament (ACL) reconstruction, has potential biological advantages. However, graft positioning remains vital to functional outcome and the prevention of failure. The aim of this study was to investigate the accuracy and precision of tibial tunnel positioning in remnant preservation single-bundle hamstring reconstruction.

Methods
Fifty consecutive adult patients, with isolated ACL rupture, were recruited to a prospective study. Remnant preservation was performed in all cases where > 25% of the native ACL was present. Three-dimensional computer tomography was preformed 3–6 months post-operatively to assess tibial tunnel position (using a grid-based measurement). Accuracy and precision of this technique were assessed against published anatomical data in direct comparison with the group where remnant preservation could not be performed.

Results
Two patients withdrew following surgery. In the remaining groups (31 remnant preservation; 17 non-remnant preservation), no difference was demonstrated in tunnel position (40.4 ± 6.7% (anterior-to-posterior) and 47.4 ± 1.5% (medial-to-lateral) vs. 38.8 ± 4.9% and 46.7 ± 1.5%, respectively; n.s.), accuracy (6.1% vs. 4.8%; n.s.) or precision (3.9% vs. 2.8%; n.s.).

Conclusions
Remnant preservation can be safely performed without compromising tunnel position. Therefore, the potential benefits of this technique can be utilised, in clinical practice, without sacrificing the ability to optimize tibial tunnel positioning.

Level of evidence
III.

BACK

Anterolateral ligament reconstruction improves the clinical and functional outcomes of anterior cruciate ligament reconstruction in athletes.

Hamido, F., Habiba, A.A., Marwan, Y. et al.

https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06119-w.

Purpose
To compare the outcomes of anterior cruciate ligament (ACL) reconstruction with those of combined ACL and anterolateral ligament (ALL) reconstruction in ACL-deficient knees. The objective of this study was to improve knowledge regarding the treatment of ACL-deficient knees with combined ACL and ALL reconstruction. Combined ACL and ALL reconstruction has been hypothesized to result in better clinical and functional outcomes than isolated ACL reconstruction (ACLR).

Methods
One-hundred and seven adult male athletes with ACL tears and high-grade pivot shifts were randomized into two groups. Those in group A (n = 54) underwent ACLR, while those in group B (n = 53) underwent combined ACL and ALL reconstruction. The median age was 26 (18–40) and 24 (18–33) years in groups A and B, respectively, and the median follow-up was 60 (55–65) months. Physical examination findings, instrumented knee laxity tested using a KT-1000 arthrometer, and International Knee Documentation Committee Scale (IKDC) scores were used to evaluate the outcomes.

Results
One-hundred and two patients were available for follow-up: 52 in group A and 50 in group B. Postoperatively, the pivot shift was normal in 43 (82.7%) and 48 (96%) patients in groups A and B, respectively ($p < 0.001$). The median instrumented knee laxity was 2.5 ± 0.7 (1.2–6.1) mm in patients in group A and 1.2 ± 0.7 (1.2–3.2) mm in patients in group B ($p < 0.001$). Additionally, 44 (84.6%) patients in group A had normal IKDC scores and 3 (5.8%) had nearly normal scores, while 48 (96.0%) patients in group B had normal IKDC scores and 2 (4%) had nearly normal scores ($p < 0.001$).

Conclusion
Combined ACL and ALL reconstruction, compared with isolated ACLR resulted in favourable clinical and functional outcomes, as demonstrated by decreased rotational instability and instrumented knee laxity, a lower graft rupture rate and better postoperative IKDC scores.

Level of evidence
1

BACK

Extrusions do not affect degenerative morphologic changes in lateral meniscus allografts during midterm follow-ups.

Son, DW., Bin, SI., Kim, JM. et al.

https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06120-3.

Purpose
To investigate degenerative morphological changes in meniscus allograft after lateral meniscus allograft transplantation (MAT) based on extrusions.

Methods
Ninety-one patients who underwent lateral MAT were divided into extruded and non-extruded groups. Serial magnetic resonance imaging scans obtained 6 weeks, 1 year, and at the last follow-up (midterm, 3–7 years) post-surgery were evaluated retrospectively. Degenerative morphological changes at each time point in each group were compared using the postoperative meniscal width, thickness, and intrameniscal signal intensity (IMSI) at the anterior horn, mid-body, and posterior horn. The Lysholm scores and meniscal tears based on graft extrusion were also investigated.

Results
The mean age was 33.7 ± 11.1 years (64 men and 27 women). Fifty-three (58%) and 38 knees (42%) were classified into the non-extruded and extruded groups, respectively. The overall meniscal width of the mid-body decreased from 9.6 ± 1.3 to 6.5 ± 1.2 mm ($p < 0.01$), and IMSI of mid-body was increased from 1.2 ± 0.1 to 1.7 ± 0.1 ($p < 0.01$) during midterm follow-ups. No significant differences were observed between the meniscal width, thickness, and IMSI at the anterior horn (n.s.), mid-body (n.s.), and posterior horn (n.s.) of the two groups during the midterm follow-ups. The incidence of meniscus tears and Lysholm scores did not differ significantly between the groups during midterm follow-ups.

Conclusion
The overall meniscus width of mid-body decreased while the relative IMSI of mid-body increased during midterm follow-ups after lateral MAT. Meniscal allograft extrusions did not influence postoperative changes in meniscus width, thickness, and relative intrameniscal signal intensity.

Level of evidence
Level III

BACK

Clinical studies of single-stage combined ACL and PCL reconstruction variably report graft tensioning, fixation sequence, and knee flexion angle at time of fixation.

Fayed, A.M., Rothrauff, B.B., de Sa, D. et al.

https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06171-6.

Purpose
In single-stage ACL–PCL reconstruction, there is uncertainty regarding the order of graft tensioning and fixation, as well as the optimal knee flexion angle(s) for graft fixation. A systematic review of clinical studies of single-stage combined ACL–PCL reconstruction was performed to determine whether a particular fixation sequence and/or knee flexion angle is associated with superior outcomes.

Methods
A systematic review was performed according to PRISMA guidelines. All levels of evidence were included. All outcome measures were extracted, including physical examination values, radiographic measurements, and objective and subjective outcomes.

Results
Of the 19 included studies, 17 tensioned and fixed the PCL before the ACL. Only four studies reported the methods/forces used for graft tensioning. Across studies, the ACL was fixed at variable knee flexion angles, from full extension to 70°. Conversely, 3 studies fixed the PCL at a knee flexion angle < 45°, while the remaining 16 studies fixed the PCL at a flexion angle > 70°. Patient-reported outcomes were qualitatively similar between groups.

Conclusions
This systematic review found considerable variability in graft tension, fixation sequence, and knee flexion angle at the time of fixation, with insufficient evidence to support specific surgical practices. Most commonly, the PCL is fixed before the ACL graft, with fixation occurring at a knee flexion angle between 70° and 90° and near full extension, respectively. The methodology for quantifying the forces applied for graft tensioning is rarely described. Given this clinical equipoise, future studies should consistently report these surgical details. Furthermore, prospective, randomized studies on the treatment of multiligament knee injuries are needed to improve outcomes in patients.

Level of evidence
IV.

BACK

Arthroscopic reduction and internal fixation (ARIF) versus open reduction internal fixation (ORIF) to elucidate the difference for tibial side PCL avulsion fixation: a randomized controlled trial (RCT).

Sundararajan, S.R., Joseph, J.B., Ramakanth, R. et al.

https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06144-9

Purpose
To compare the clinical, radiological outcomes, economic and technical differences for ORIF by cancellous screw fixation versus ARIF by double-tunnel suture fixation for displaced tibial-side PCL avulsion fractures.

Methods
Forty patients with displaced tibial-sided PCL avulsions were operated upon after randomizing them into two groups (20 patients each in the open and arthroscopic group) and followed up prospectively. Assessment included duration of surgery, cost involved, pre- and post-operative functional scores, radiological assessment of union, and posterior laxity using stress radiography and complications.

Results
The mean follow-up period was 33 months (27–42) (open group) and 30 months (26–44) (arthroscopic group). The duration of surgery was significantly larger in the arthroscopic group (47.8 ± 17.9 min) as compared to the open group (33.4 ± 10.1 min). The costs involved were significantly higher in the arthroscopic group (p− 0.01). At final follow-up, knee function in the form of IKDC (International Knee Documentation Committee) evaluation (89.9 ± 4.8-open and 89.3 ± 5.9-arthroscopic) and Lysholm scores (94.2 ± 4.1-open and 94.6 ± 4.1-arthroscopic) had improved significantly with the difference (n.s.) between the two groups. The mean posterior tibial displacement was 5.7 ± 1.8 mm in the open group and 6.3 ± 3.1 mm in the arthroscopic group which was (n.s.). There were two non-unions and one popliteal artery injury in the arthroscopic group.

Conclusion
Both ARIF and ORIF for PCL avulsion fractures yield good clinical and radiological outcomes. However, ORIF was better than ARIF in terms of cost, duration of surgery, and complications like non-union and iatrogenic vascular injury.

Level of evidence
II.

BACK

Ankle microinstability: arthroscopic findings reveal four types of lesion to the anterior talofibular ligament's superior fascicle.

Vega, J., Malagelada, F. & Dalmau-Pastor, M.

https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06089-z

Purpose
ATFL's superior fascicle injury has been considered to be the underlying cause in cases of ankle microinstability. As its clinical diagnosis can be difficult, arthroscopic examination may be the only objective diagnostic tool. The purpose of this study was to determine what types of injuries to the ATFL's superior fascicle are associated with ankle microinstability, and to provide the reader with an arthroscopic classification of the types of microinstability affecting the ankle.

Methods
Ankle arthroscopy video records obtained during a four-year period from 232 patients with the diagnosis of ankle microinstability were reviewed. The characteristics of the ATFL's superior fascicle injury were identified, described and recorded along with any concomitant intra-articular pathology.

Results
Four different injury patterns were consistently seen affecting the ATFL's superior fascicle. These ranged from ligament attenuation associated with loss of tension (type I), through to partial detachment (type II) or total detachment (type III) from the fibula. Finally, a total or partial resorption of the ATFL's superior fascicle (type IV) was also observed. There was a statistically significant association between the type of injury identified and the rate of intra-articular pathology observed arthroscopically. Equally, the higher the type in the classification, the higher the rate of loose bodies, lateral talar OCD, deltoid "open book" tears, and anterior soft-tissue formation.

Conclusion
Different types of ATFL's superior fascicle injury can be observed in patients with ankle microinstability, ranging from ligament attenuation associated with a loss of tension (8.2%) to different degrees of partial (69.1%) and total (16.8%) ligament detachment from the fibula, or ligament remnant resorption (5.9%). As the type of injury progresses along with the proposed classification, the rate of intra-articular injuries also increases. The clinical relevance of this study is that a morphological ATFL's superior fascicle tear is recognized in patients with the diagnosis of ankle microinstability.

Level of evidence
IV.

BACK

All-inside endoscopic anatomic reconstruction leads to satisfactory functional outcomes in patients with chronic ankle instability.

Guillo, S., Odagiri, H., van Rooij, F. et al.

https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06130-1.

Purpose
Ankle sprain is a common injury that can be treated conservatively, though many injured patients do not seek treatment or are not adequately managed, both of which can lead to subsequent chronic ankle instability (CAI). The purpose of this study was to evaluate the functional scores and complication rates of an all-inside anatomic reconstruction technique to treat CAI at a minimum follow-up of 24 months.

Methods
The authors retrospectively collected the records of 41 patients that underwent all-inside endoscopic anatomic reconstruction of the ATFL and CFL including demographics, complications, satisfaction, American Orthopaedic Foot and Ankle Society (AOFAS) score, Karlsson score, and ankle activity score (AAS), at a minimum follow-up of 24 months.

Results
The study cohort, comprised 34 patients aged 35.6 ± 10.8 years, were assessed at 48.7 ± 19.0 months. AOFAS scores improved from 60.3 ± 11.9 to 94.3 ± 6.2 postoperatively. Karlsson scores improved from 49.0 ± 10.9 to 87.2 ± 10.1 postoperatively. Thirty-three (97%) patients returned to the same AAS (5.6 ± 3.1) and rated their overall satisfaction ≥ 7. One patient (3%) was reoperated to treat a hematoma, while five patients (15%) were reoperated to remove the cortical fixation device that caused discomfort.

Conclusion
The novel all-inside endoscopic technique for anatomic reconstruction of the ATFL and CFL grants satisfactory functional outcomes at a minimum of 24 months, and the improvements in AOFAS and Karlsson scores compared favourably to those reported for other techniques in the literature.

Level of evidence
IV.

BACK

Clinical outcomes after revision hip arthroscopy in patients with femoroacetabular impingement syndrome (FAIS) are inferior compared to primary procedures. Results from the Danish Hip Arthroscopy Registry (DHAR).

Mygind-Klavsen, B., Nielsen, T.G., Lund, B. et al.

https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06135-w.

Purpose
As many as 10% of primary hip arthroscopies end up with a revision arthroscopy procedure when treating patients suffering from femoroacetabular impingement syndrome (FAIS). In general, revision procedures are indicated because of residual impingement, but only a few studies present outcome data from revision hip arthroscopy after failed FAIS surgical treatment. The purpose of this study was to evaluate clinical outcomes after revision hip arthroscopy in a FAIS cohort and compare outcomes with a primary FAIS hip arthroscopy cohort and describe potential causes of failure after the primary hip arthroscopy. It was hypothesized that subjective outcomes improve after revision hip arthroscopy although outcomes were expected to be inferior to primary hip arthroscopic outcomes.

Methods
Three-hundred and thirty-one arthroscopic revision hip FAIS patients were included from the Danish Hip Arthroscopy Registry (DHAR). Patient-related outcome measures (PROM's), Copenhagen Hip and Groin Outcome Scores (HAGOS), Hip Sports Activity Scale (HSAS), EQ-5D and Numeric Rating Scale (NRS) pain, were assessed in the study cohort prior to the primary procedure and at revision and at follow-up one year after the revision procedure. These data were compared with 4154 primary hip arthroscopic FAIS patients.

Results
One-year after revision surgery, mean follow-up (in months ± SD): 12.3 ± 1.6, significant improvements ($p < 0.05$) in all PROMs was demonstrated, but FAIS patients in the primary hip arthroscopic cohort demonstrated significantly higher outcomes, in all PROMs, when compared at one-year follow-up. Scar tissue, residual osseous impingement and insufficient healing of the labral repair were reported as the main reasons for revision surgery. The conversion to total hip arthroplasty was low (6.4%).

Conclusion
Revision hip arthroscopy in FAIS patients improves subjective outcomes significantly, although they are poorer than after primary FAIS hip arthroscopy. Main reasons for revision arthroscopy was scar tissue, residual femoroacetabular impingement and insufficient healing of labral repair.

Level of evidence
Level III.

BACK

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Change in Posterior Tibial Slope in Skeletally Immature Patients With Anterior Cruciate Ligament Injury: A Case Series With a Mean 9 Years' Follow-up

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Background: Increased lateral posterior tibial slope (LPTS) is associated with increased rates of anterior cruciate ligament (ACL) injury and failure of ACL reconstruction. It is unknown if ACL deficiency influences the developing proximal tibial physis and slope in skeletally immature patients through anterior tibial subluxation and abnormal force transmission.

Purpose: To assess the natural history of LPTS in skeletally immature patients with an ACL-injured knee.

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

Methods: A total of 38 participants from a previous study on nonoperative management of ACL injury in skeletally immature patients were included. During the initial study, bilateral knee magnetic resonance imaging (MRI) was performed within 1 year of enrollment and again at final follow-up. All patients were younger than 13 years at the time of enrollment, and final follow-up occurred a mean 10 years after the injury. MRI scans were retrospectively reviewed by 2 reviewers to determine bilateral LPTS for each patient and each time point. Linear mixed models were used to assess LPTS differences between knees, change over time, and association with operational status. Subgroup analyses were performed for patients who remained nonoperated throughout the study.

Results: A total of 22 patients had ACL reconstruction before final follow-up and 16 remained nonoperated. In the entire study population, the mean LPTS was higher in the injured knee than in the contralateral knee at final follow-up by 2.0° ($P < .001$; 95% CI, 1.3°–2.6°). The mean LPTS increased significantly in the injured knee by 0.9° ($P = .042$; 95% CI, 0.03°–1.7°), while the mean LPTS decreased in the contralateral knee by 0.4° ($P = .363$; 95% CI, –0.8° to 0.4°). A significant difference in LPTS was also observed in the nonoperated subgroup. No significant association was observed between LPTS and operational status.

Conclusion: Lateral posterior tibial slope increased more in the ACL-injured knee than in the contralateral uninjured knee in a group of skeletally immature patients. Lateral posterior tibial slope at baseline was not associated with the need for surgical reconstruction over the study period.

BACK

Bone Marrow Stimulation for Osteochondral Lesions of the Talus: Are Clinical Outcomes Maintained 10 Years Later?

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Background: Arthroscopic bone marrow stimulation (BMS) is considered the first-line treatment for osteochondral lesions of the talus (OLTs). However, the long-term stability of the clinical success of BMS remains unclear.

Purpose: To investigate the long-term clinical outcomes among patients who underwent BMS for OLT and to identify prognostic factors for the need for revision surgery.

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

Methods: A retrospective analysis was performed on 202 ankles (189 patients) that were treated with BMS for OLT and had a minimum follow-up of 10 years. The visual analog scale for pain, American Orthopaedic Foot & Ankle Society ankle-hindfoot score, and the Foot and Ankle Outcome Score (FAOS) were assessed by repeated measures analysis of variance. Prognostic factors associated with revision surgery were evaluated with Cox proportional hazard regression models and log-rank tests.

Results: The mean lesion size was 105.32 mm2 (range, 19.75-322.79); 42 ankles (20.8%) had large lesions (≥150 mm2). The mean visual analog scale for pain improved from 7.11 ± 1.73 (mean ± SD) preoperatively to 1.44 ± 1.52, 1.46 ± 1.57, and 1.99 ± 1.67 at 1, 3 to 6, and ≥10 years, respectively, after BMS ($P < .001$). The mean ankle-hindfoot score also improved, from 58.22 ± 13.57 preoperatively to 86.88 ± 10.61, 86.17 ± 10.23, and 82.76 ± 11.65 at 1, 3 to 6, and ≥10 years after BMS ($P < .001$). The FAOS at the final follow-up was 82.97 ± 13.95 for pain, 81.81 ± 14.64 for symptoms, 83.49 ± 11.04 for activities of daily living, 79.34 ± 11.61 for sports, and 78.71 ± 12.42 for quality of life. Twelve ankles underwent revision surgery after a mean 53.5 months. Significant prognostic factors associated with revision surgery were the size of the lesion (preoperative magnetic resonance imaging measurement ≥150 mm2; $P = .014$) and obesity (body mass index ≥25; $P = .009$).

Conclusion: BMS for OLT yields satisfactory clinical outcomes at a mean follow-up of 13.9 years. The success of the surgery may depend on the lesion size and body mass index of the patient.

BACK

Effect of Early Residual Laxity After Anterior Cruciate Ligament Reconstruction on Long-term Laxity, Graft Failure, Return to Sports, and Subjective Outcome at 25 Years

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Background: In spite of supposedly successful surgery, slight residual knee laxity may be found at follow-up evaluations after anterior cruciate ligament reconstruction (ACLR), and its clinical effect is undetermined.

Purpose: To investigate whether a 3- to 5-mm increase in anterior translation 6 months after ACLR affects the risk of graft failure, rate of return to sports, and long-term outcome.

Study Design: Cohort study; Level of evidence, 2.

Methods: From a cohort of 234 soccer, team handball, and basketball players undergoing ACLR using bone–patellar tendon–bone graft, 151 athletes were included who attended 6-month follow-up that included KT-1000 arthrometer measures. A tight graft was defined as <3-mm side-to-side difference between knees (n = 129), a slightly loose graft as 3 to 5 mm (n = 20), and a loose graft as >5 mm (n = 2). Graft failure was defined as ACL revision surgery, >5-mm side-to-side difference, or anterolateral rotational instability 2+ or 3+ at 2-year follow-up. Finally, a 25-year evaluation was performed, including a clinical examination and questionnaires.

Results: The rate of return to pivoting sports was 74% among athletes with tight grafts and 70% among those with slightly loose grafts. Also, return to preinjury level of sports was similar between those with slightly loose and tight grafts (40% vs 48%, respectively), but median duration of the sports career was longer among patients with tight grafts: 6 years (range, 1-25 years) vs 2 years (range, 1-15 years) (P = .01). Five slightly loose grafts (28%) and 6 tight grafts (5%) were classified as failures after 2 years (P = .002). Thirty percent (n = 6) of patients with slightly loose grafts and 6% (n = 8) with tight grafts had undergone revision (P = .004) by follow-up (25 years, range, 22-30 years). Anterior translation was still increased among the slightly loose grafts as compared with tight grafts at long-term follow-up (P < .05). In patients with tight grafts, 94% had a Lysholm score ≥84 after 24 months and 58% after 25 years, as opposed to 78% (P = .02) and 33% (P = .048), respectively, among patients with slightly loose grafts.

Conclusion: A slightly loose graft at 6 months after ACLR increased the risk of later ACL revision surgery and/or graft failure, reduced the length of the athlete's sports career, caused permanent increased anterior laxity, and led to an inferior Lysholm score.

BACK

Aseptic Revision and Reoperation Risks After Meniscectomy at the Time of Anterior Cruciate Ligament Reconstruction

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Background: An intact meniscus is considered a secondary stabilizer of the knee after anterior cruciate ligament reconstruction (ACLR). While loss of the meniscus can increase forces on the anterior cruciate ligament graft after reconstruction, it is unclear whether this increased loading affects the success of the graft after ACLR.

Purpose: To identify the risk of subsequent knee surgery when meniscectomy, either partial or total, is performed at the time of index ACLR.

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

Methods: We conducted a matched cohort study using data from the Kaiser Permanente Anterior Cruciate Ligament Reconstruction Registry. Patients were identified who had a primary ACLR performed between January 1, 2005 and December 31, 2016, with up to 12 years of follow-up. The study sample comprised patients with ACLR who had a lateral meniscectomy (n = 2581), medial meniscectomy (n = 1802), or lateral and medial meniscectomies (n = 666). For each meniscectomy subgroup, patients with ACLR alone were matched to patients with a meniscectomy on a number of patient and procedure characteristics. After the application of matching, Cox proportional hazards regression was used to evaluate the risk of aseptic revision, while competing risks regression was used to evaluate the risk of cause-specific ipsilateral reoperation between meniscectomy and ACLR alone. Analysis was performed for each meniscectomy subgroup.

Results: After the application of matching, we failed to observe a difference in aseptic revision risk for patients with ACLR and a meniscectomy—lateral (hazard ratio [HR], 0.80; 95% CI, 0.63-1.02), medial (HR, 0.95; 95% CI, 0.70-1.29), or both (HR, 1.25; 95% CI, 0.77-2.04)—as compared with ACLR alone. When compared with patients who had ACLR alone, patients with a lateral meniscectomy had a higher risk for subsequent lateral meniscectomy (HR, 1.89; 95% CI, 1.18-3.02; P = .008), and those with a medial meniscectomy had a lower risk for manipulation under anesthesia (HR, 0.13; 95% CI, 0.02-0.92; P = .041).

Conclusion: No difference in aseptic revision risk was observed for patients undergoing primary ACLR between groups with and without meniscectomy at the time of index surgery. Partial lateral meniscectomy at the time of index ACLR did associate with a higher risk of subsequent lateral meniscectomy.

BACK

Hip Arthroscopy Versus Physical Therapy for the Treatment of Symptomatic Acetabular Labral Tears in Patients Older Than 40 Years: A Randomized Controlled Trial

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Background: Previous observational studies have suggested poor results of arthroscopic surgery for the treatment of acetabular labral tears in patients older than 40 years.

Purpose: To compare hip arthroscopy versus nonoperative management for symptomatic labral tears in patients older than 40 years who have limited radiographic osteoarthritis.

Study Design: Randomized controlled trial; Level of evidence, 1.

Methods: In this single-surgeon, parallel randomized controlled trial, patients older than 40 years who had symptomatic, MRI-confirmed labral tears and limited radiographic osteoarthritis (Tönnis grades 0-2) were randomized 1:1 to arthroscopic surgery with postoperative physical therapy (SPT) or physical therapy alone (PTA) using an electronic randomization program. PTA patients who achieved unsatisfactory improvement were permitted to cross over to SPT after completing ≥14 weeks of physical therapy. The primary outcomes were International Hip Outcome Tool (iHOT-33) and modified Harris Hip Score (mHHS) at 12 months after randomization, and secondary outcomes included other patient-reported outcome measures and the visual analog scale. Outcomes were assessed at baseline and at 3, 6, and 12 months after randomization. Primary analysis was performed on an intention-to-treat basis using linear mixed-effect models. Sensitivity analyses included modified as-treated analysis and treatment-failure analysis. Due to infeasibility, patients and health care providers were both unblinded.

Results: The study enrolled 90 patients (46 [51.1%] SPT; 44 [48.9%] PTA); of these, 81 patients (42 [51.9%] SPT; 39 (48.1%) PTA) completed 12-month follow-up. A total of 28 of the 44 PTA patients crossed over to SPT within the study period (63.6% crossover). Intention-to-treat analysis revealed significantly greater iHOT-33 scores (+12.11; P = .007) and mHHS scores (+6.99 points; P = .04) in the SPT group than the PTA group at 12 months. Modified as-treated analysis revealed that these differences exceeded the minimal clinically important difference of 10.0 points (SPT-PTA iHOT-33, +11.95) and 8.0 points (SPT-PTA mHHS, +9.76), respectively.

Conclusion: In patients older than 40 years with limited osteoarthritis, arthroscopic acetabular labral repair with postoperative physical therapy led to better outcomes than physical therapy alone. Thus, age over 40 years should not be considered a contraindication to arthroscopic acetabular labral repair.

BACK

Cutting, Impingement, Contact, Endurance, Flexibility, and Asymmetric/Overhead Sports: Is There a Difference in Return-to-Sport Rate After Arthroscopic Femoroacetabular Impingement Surgery? A Systematic Review and Meta-analysis

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Background: Previous studies have established a classification of sports based on hip mechanics: cutting, impingement, contact, endurance, flexibility, and asymmetric/overhead. No previous review has compared the outcomes of hip arthroscopy for femoroacetabular impingement syndrome (FAIS) using this classification.

Purpose: To determine whether the rate of return to sport differs among cutting, impingement, contact, endurance, flexibility, and asymmetric/overhead athletes who undergo hip arthroscopy for FAIS. We also aimed to identify differences in patient characteristics, intraoperative procedures performed, and time to return to play among the 6 sport categories.

Study Design: Systematic review and meta-analysis.

Methods: Three electronic databases were searched for eligible articles. Two reviewers independently screened the titles, abstract, and full-text articles using prespecified criteria. Eligible articles were those that reported the rate of return to sport (defined by the number of hips) after hip arthroscopy for FAIS in athletes of all levels. Data collected were patient age, sex, body mass index, type of sport, rate and time to return to sport, and intraoperative procedures performed. A mixed effects model was used for meta-analysis.

Results: A total of 29 articles and 1426 hip arthroscopy cases were analyzed with 185 cutting, 258 impingement, 304 contact, 207 endurance, 116 flexibility, and 356 asymmetric/overhead athletes. The mean age was similar among the 6 subgroups (P = .532), but the proportion of female athletes was significantly higher in flexibility, endurance, and asymmetric/overhead sports as compared with impingement and contact athletes. Flexibility athletes had the highest rate of return to sport after hip arthroscopy for FAIS (94.8%), whereas contact athletes had the lowest rate (88%). The longest mean ± SD time (8.5 ± 1.9 months) to return to sport was reported in cutting sports, while endurance athletes returned faster than the rest (5.4 ± 2.6 months). The difference in rate and time to return to sport, as well as the intraoperative procedure performed, did not reach statistical significance among the 6 subgroups. There was evidence of publication bias and study heterogeneity, and the mean Methodological Index for Non-randomized Studies score was 13 ± 2.6.

Conclusion: Flexibility athletes had the highest rate of return to sport after hip arthroscopy for FAIS, while endurance athletes returned the fastest. The difference in rate and time to return to sport and intraoperative procedures performed did not reach statistical significance among the 6 subgroups. These results are limited by the evidence of publication bias and should be interpreted with caution. Laboratory-based studies are necessary to validate the classification of sports based on hip mechanics

BACK

Miscellaneous

Arthroscopy, Volume 37, Issue 4

Cost of Arthroscopic Rotator Cuff Repairs Is Primarily Driven by Procedure-Level Factors: A Single-Institution Analysis of an Ambulatory Surgery Center

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https://doi.org/10.1016/j.arthro.2020.11.033

Purpose
To identify intraoperative drivers of cost associated with arthroscopic rotator cuff repairs (RCRs) through analysis of an institutional database.

Methods
This was a single-institution retrospective review of arthroscopic RCRs performed at an ambulatory surgical center between November 2016 and July 2019. Patient-level factors analyzed included age, sex, insurance type (private, Medicare, Medicaid, self-pay, and other government), American Society of Anesthesiologists grade (I, II, III, and missing), and Charlson comorbidity index (0, 1, 2, and ≥3). Procedure-level factors included use of biologics (decellularized dermal allograft or bioinductive healing implant), anesthesia type (regional block, monitored anesthesia care, or general), number of anchors and sutures, additional procedures (biceps tenodesis, distal clavicle resection, subacromial decompression), and operative time. Multivariate linear regression analysis was used to identify factors significantly associated with higher or lower charges.

Results
A total of 712 arthroscopic RCRs were included. The risk-adjusted operative charges were $19,728 (95% confidence interval $16,543 to $22,913). The above factors predicted nearly 65% of the variability in operative charges. The only patient-level factor significantly associated with lower charges was female sex (– $1,339; P = .002). Procedure-level factors significantly associated with higher charges were use of biologics (+ $17,791; P < .001), concurrent open biceps tenodesis (+ $4,027; P < .001), distal clavicle resection (+ $2,266; P = .039), use of regional block (+ $1,256; P = .004), number of anchors (+ $2,245/anchor; P < .001), and increasing operative time ($26/min). Other factors had no significant association.

Conclusions
Procedural factors are the most significant drivers of operative cost in arthroscopic RCRs, such as quantity and type of implants; additional procedures such as biceps tenodesis and distal clavicle resection; and perioperative conditions such as type of anesthesia and total operating room time. Overall, patient-level factors were not shown to correlate well with operative costs, other than lower charges with female sex.

Level of Evidence
IV, economic study.

BACK

A Proficiency-Based Progression Simulation Training Curriculum to Acquire the Skills Needed in Performing Arthroscopic Bankart and Rotator Cuff Repairs—Implementation and Impact

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Purpose
To investigate the impact of a proficiency-based progression (PBP) curriculum employed to teach trainees in the skills needed to demonstrate proficiency for an arthroscopic Bankart repair (ABR) and an arthroscopic rotator cuff repair (ARCR) by objectively comparing pre- and immediate postcourse performances.

Methods
In a prospective study, 16 arthroscopy/sports medicine fellows and 2 senior residents (complete group: N = 18) were randomly assigned to perform a precourse cadaveric ABR (Bankart subgroup: N = 6), ARCR (cuff subgroup: N = 6), or basic skills on a shoulder simulator (N = 6). After completing a PBP training curriculum, all 18 registrants performed both an ABR and ARCR scored in real time by trained raters using previously validated metrics.

Results
The Bankart subgroup made 58% fewer objectively assessed errors at the completion of the course than at baseline (P = .004, confidence interval –1.449 to –0.281), and performance variability was substantially reduced (standard deviation = 5.89 vs 2.81). The cuff subgroup also made 58% fewer errors (P = .001, confidence interval –1.376 to 0.382) and showed a similar reduction in performance variability (standard deviation = 5.42 vs 2.1). Only one subject's precourse baseline performance met the proficiency benchmark compared with 89% and 83% of the all registrants on the final ABR and ARCR cadaveric assessments, respectively.

Conclusions
The results of this study reject the null hypothesis. They demonstrate that the implementation of a PBP simulation curriculum to train the skills necessary to perform arthroscopic Bankart and rotator cuff repairs results in a large and statistically significant improvement in the trainee's ability to meet the 2 related performance benchmarks. Proficiency was demonstrated by 89% and 83% of the trainees for an ABR and an ARCR, respectively, in a two- and one-half day course.

Clinical Relevance
Surgical training employing a PBP curriculum is efficient, effective, and has the potential to improve patient safety.

BACK

Pain Management Strategies After Anterior Cruciate Ligament Reconstruction: A Systematic Review With Network Meta-analysis

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Purpose
To systematically review randomized controlled trials (RCTs) evaluating various pain control interventions after anterior cruciate ligament reconstruction (ACLR) to determine the best-available evidence in managing postoperative pain and to optimize patient outcomes.

Methods
A systematic review of the literature was performed based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) guidelines. A study was included if it was an RCT evaluating an intervention to reduce postoperative pain acutely after ACLR in one of the following areas: (1) nerve blocks, (2) nerve block adjuncts, (3) intra-articular injections, (4) oral medications, (5) intravenous medications, (6) tranexamic acid, and (7) compressive stockings and cryotherapy. Quantitative and qualitative statistics were carried out, and network meta-analysis was performed where applicable.

Results
Overall, 74 RCTs were included. Across 34 studies, nerve blocks were found to significantly reduce postoperative pain and opioid use, but there was no significant difference among the various nerve blocks in the network meta-analysis. Intra-articular injections consisting of bupivacaine and an adjunct were found to reduce reported postoperative pain scores up to 12 hours after ACLR, with significantly lower postoperative opioid use.

Conclusions
Nerve blocks and regional anesthesia are the mainstay treatment of postoperative pain after ACLR, with the commonly used nerve blocks being equally efficacious. Intra-articular injections consisting of bupivacaine and an adjunct were found to reduce reported postoperative pain scores up to 12 hours after ACLR, with significantly lower postoperative opioid use. There was promising evidence for the use of some oral and intravenous medications, tranexamic acid, and nerve block adjuncts, as well as cryotherapy, to control pain and reduce postoperative opioid use.

Level of Evidence
Level II, systematic review and meta-analysis of RCTs.

BACK

Tranexamic Acid Use in Knee and Shoulder Arthroscopy Leads to Improved Outcomes and Fewer Hemarthrosis-Related Complications: A Systematic Review of Level I and II Studies

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https://doi.org/10.1016/j.arthro.2020.11.051

Purpose
To systematically review the literature to compare the efficacy and safety of tranexamic acid (TXA) as a means to minimize hemarthrosis-related complications after arthroscopic procedures of the knee, hip, and shoulder.

Methods
A systematic review according to Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines was performed by searching PubMed, Cochrane Library, and Embase databases to locate randomized controlled trials comparing the clinical outcomes and postoperative complications of patients undergoing arthroscopy with and without TXA. Search terms used were “tranexamic acid,” “arthroscopy,” “knee,” “hip,” and “shoulder.” Patients were evaluated based on early (<6 weeks) postoperative signs of hemarthrosis using the Coupens and Yates classification, postoperative complications (myocardial infarction, stroke, venous thromboembolism events), range of motion (ROM), and patient-reported outcome scores (Visual analog scale, Subjective International Knee Documentation Committee, Lysholm, and Tegner activity scores).

Results
Five studies (2 level I and 3 level II) met inclusion criteria, including a total of 299 patients undergoing arthroscopy with TXA and 299 patients without TXA. The average follow-up duration for all patients was 43.9 days. Procedures performed were partial meniscectomy, anterior cruciate ligament reconstruction, and rotator cuff repair. No studies evaluating TXA use in hip arthroscopy were identified. Coupens-Yates hemarthrosis grades significantly improved in the TXA groups across all studies. Three studies found TXA patients to experience significantly less postoperative pain at latest follow-up, 1 study found TXA patients to have significantly better postoperative Lysholm scores, and 1 study found TXA patients to have significantly more ROM at latest follow-up compared with non-TXA patients ($P < .05$).

Conclusion
Patients undergoing arthroscopy, particularly arthroscopic meniscectomy, arthroscopic-assisted anterior cruciate ligament reconstruction, and arthroscopic rotator cuff repair, with TXA can be expected to experience improved outcomes and less hemarthrosis-related complications in the early postoperative period compared with non-TXA patients.

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

BACK

American Journal of Sports Medicine (AJSM), Volume 49, Issue 4

Association Between Radiological Evidence of Kaplan Fiber Injury, Intraoperative Findings, and Pivot-Shift Grade in the Setting of Acute Anterior Cruciate Ligament Injury

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Background: Biomechanical studies have suggested that the Kaplan fibers (KFs) of the iliotibial band play a role in controlling anterolateral rotation of the knee. There is a paucity of clinical information on whether injury to the KF in the setting of anterior cruciate ligament (ACL) rupture contributes to increased rotatory laxity of the knee.

Purpose/Hypothesis: The purpose was to evaluate the association among radiological evidence of KF injury, intraoperative arthroscopic findings, and grade of pivot shift at the time of ACL reconstruction (ACLR). It was hypothesized that KF injury would be associated with increased injury to the lateral compartment of the knee and a higher grade of pivot shift.

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

Methods: A retrospective magnetic resonance imaging (MRI) analysis was conducted on 267 patients with ACL-injured knees who underwent primary ACLR. Patients who had MRI and surgery within 60 days of injury were included (mean age, 23.6 years); there were 158 (59.2%) male patients. MRI was performed using standard knee protocols, and diagnostic criteria were applied to identify KF injury. Associations were made among MRI findings, intraoperative findings, and grade of pivot shift with the patient examined under anesthesia at the time of ACLR. A comparison was made between patients with and without radiological evidence of KF injury.

Results: The prevalence of KF injury was 17.6% (47/267 patients). Arthroscopic evidence of lateral meniscal injury was associated with KF injury (KF intact, 31%; KF injured, 55%; P = .010). The majority of patients in the intact and injured KF groups had a grade 2 pivot shift (75% and 70%, respectively). A minority had grade 3 pivot shift: 5% in the intact group versus 6.4% in the injured group. There was no association between radiological evidence of KF injury and pivot-shift grade (P = .600).

Conclusion: In acute ACL injury, KF injuries were not very common (17.6%), and the rate of grade 3 pivot shift was low (5.2%). When present, KF injuries were not associated with a higher-grade pivot shift. However, there was an association between KF injury and lateral meniscal tears identified at the time of ACLR. The role of KFS in controlling anterolateral rotatory laxity in the acute ACL injury in the clinical setting may be less evident when compared with the biomechanical setting.

BACK

Donor-Specific Human Leukocyte Antigen Antibody Formation After Allograft Glenoid Reconstruction Occurs But Does Not Impact Clinicoradiographic Outcomes

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Background: Recurrent shoulder instability is a prevalent condition, with glenoid bone loss as a common cause. Arthroscopic repair using distal tibial allografts provides long-lasting treatment by restoring glenoid surface area and presumably avoids risks of sensitization against donor human leukocyte antigen (HLA). Two case studies have challenged this assumption, suggesting that small bone allografts are able to induce host adaptive immune responses to donor HLA. The incidence of small bone allograft HLA sensitization and its effects on resorption and patient outcomes are unclear.

Purpose/Hypothesis: The purpose was to assess the rate of sensitization against donor HLA after distal tibial allograft procedures for shoulder instability due to glenoid bone loss and to find whether HLA sensitization negatively affects patient-reported and radiographic outcomes. We hypothesized that sensitized patients would have worse radiographic and self-reported outcomes compared with nonsensitized patients.

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

Methods: A total of 71 patients with a mean age of 28.85 years (range, 13.58-61.31 years) were enrolled, with 58 patients submitting sufficient pre- and postoperative blood samples for HLA antibody testing. In patients who developed HLA antibodies postoperatively, donor HLA typing was used to confirm donor-specific sensitization. Pre- and postoperative computerized tomography scans (0.9 ± 0.8 years follow-up) were used to grade resorption based on the modified Zhu resorption grade classification (ie, grade 0 = no resorption; grade 1 = less than 25% resorption; grade 2 = between 25% and 50% resorption; and grade 3 = larger than 50% resorption). The Western Ontario Shoulder Instability Index outcome scores were obtained preoperatively and at regular postoperative appointments. Resorption and outcome data were compared between sensitized and nonsensitized patients using the Fisher exact test, independent 2-tailed Student t tests, and the Wilcoxon rank-sum test to determine the effect of HLA sensitization on radiographic and patient-reported outcomes.

Results: A total of 7 (12.1%) patients with sufficient HLA samples were sensitized against donor HLA postoperatively. Sensitized patients did not have significantly higher rates of resorption (21.9% vs 14.3%, 21.9% vs 28.6%, 43.8% vs 28.6%, and 12.5% vs 28.6% for respective resorption grades 0-3; $P = .67$; $\alpha = .05$). Self-reported outcomes were not statistically significant between sensitized and nonsensitized patients (24.9 ± 27.61 vs 40.16 ± 18.99; $P = .37$; $\alpha = .05$) and did not differ significantly based on resorption grade (47.4 ± 0.0 vs 55.2 ± 18.8, 30.4 ± 15.8 vs 39.9 ± 20.9, 41.2 ± 0.0 vs 39.1 ± 13.1, and -24.9 ± 0 vs 24.4 ± 19.6 for resorption grades 0-3; $P > .05$; $\alpha = .05$).

Conclusion: Sensitization against donor HLA after small bone graft allografting was not previously considered but has been brought to light as a possibility. Aside from potential complications for future organ transplants, HLA sensitization does not introduce a risk for adverse outcomes or higher grades of resorption compared with nonsensitized patients after small bone allografting for shoulder instability.

BACK

The Role of Psychological Readiness in Return to Sport Assessment After Anterior Cruciate Ligament Reconstruction

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Background: Knowledge about the predictive value of return to sport (RTS) test batteries applied after anterior cruciate ligament reconstruction (ACLR) is limited. Adding assessment of psychological readiness has been recommended, but knowledge of how this affects the predictive ability of test batteries is lacking.

Purpose: To examine the predictive ability of a RTS test battery on return to preinjury level of sport and reinjury when evaluation of psychological readiness was incorporated.

Study Design: Cohort study; Level of evidence, 2.

Methods: A total of 129 patients were recruited 9 months after ACLR. Inclusion criteria were age ≥16 years and engagement in sports before injury. Patients with concomitant ligamentous surgery or ACL revision surgery were excluded. Baseline testing included single-leg hop tests, isokinetic strength tests, the International Knee Documentation Committee (IKDC) Subjective Knee Form 2000, a custom-made RTS questionnaire, and the Anterior Cruciate Ligament-Return to Sport after Injury (ACL-RSI) scale. The RTS criteria were IKDC 2000 score ≥85% and ≥85% leg symmetry index on hop and strength test. At a 2-year follow-up evaluation, further knee surgery and reinjuries were registered and the RTS questionnaire was completed again. Regression analyses and receiver operating characteristic analyses were performed to study the predictive ability of the test battery.

Results: Out of the 103 patients who completed the 2-year follow-up, 42% returned to their preinjury level of sport. ACL-RSI 9 months after surgery (odds ratio [OR], 1.03) and age (OR, 1.05) predicted RTS. An ACL-RSI score <47 indicated that a patient was at risk of not returning to sport (area under the curve 0.69; 95% CI, 0.58-0.79), with 85% sensitivity and 45% specificity. The functional tests did not predict RTS. Six patients sustained ACL reinjuries and 7 underwent surgery for other knee complaints/injuries after RTS testing. None of the 29 patients who passed all RTS criteria, and were therefore cleared for RTS, sustained a second knee injury.

Conclusion: ACL-RSI and age were predictors of 2-year RTS, while functional tests were not informative. Another main finding was that none of the patients who passed the 85% RTS criteria sustained another knee injury.

BACK