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Content
November 2021

Upper extremity

Journal of arthroscopy
Volume 37, Issue 11

- Postoperative Pain Control After Arthroscopic Rotator Cuff Repair: Arthroscopy-Guided Continuous Suprascapular Nerve Block Versus Ultrasound-Guided Continuous Interscalene Block
- Postoperative Stiffness and Pain After Arthroscopic Labral Stabilization: Consider Anchor Arthropathy

Journal of shoulder and elbow surgery (JSES)
Volume 30, Issue 11

- Multimodal nonopioid pain protocol provides equivalent pain control versus opioids following arthroscopic shoulder labral surgery: a prospective randomized controlled trial.
- Multimodal nonopioid pain protocol provides equivalent pain control versus opioids following arthroscopic shoulder labral surgery: a prospective randomized controlled trial.
- Does statin-treated hyperlipidemia affect rotator cuff healing or muscle fatty infiltration after rotator cuff repair?
- Early repair of traumatic rotator cuff tears improves functional outcomes.
- Nontendinous healing after repairing of retracted rotator cuff tear: an imaging study.
- Changes in shoulder muscle activities and glenohumeral motion after rotator cuff repair: an assessment using ultrasound real-time tissue elastography.
- Rotator cuff repair vs. nonoperative treatment: a systematic review with meta-analysis.
- Risk factors affecting rotator cuff retear after arthroscopic repair: a meta-analysis and systematic review.
- Clinical outcomes and temporal changes in the range of motion following superior capsular reconstruction for irreparable rotator cuff tears: comparison based on the Hamada classification, presence or absence of shoulder pseudoparalysis, and status of the subscapularis tendon.
- Mid-term results of arthroscopically assisted latissimus dorsi transfer for irreparable posterosuperior rotator cuff tears.

American Journal of Sports Medicine (AJSM)
Volume 49, Issue 14

- Minimum 10-Year Clinical Outcomes After Arthroscopic 270° Labral Repair in Traumatic Shoulder Instability Involving Anterior, Inferior, and Posterior Labral Injury
- Arthroscopic Revision Rotator Cuff Repair: The Role of Previously Neglected Subscapularis Tears
- Biceps Tenodesis as an Attractive Alternative to Superior Labral Anterior-Posterior (SLAP) Repair for Type II SLAP Lesions in Active-Duty Military Patients Younger Than 35 Years

Lower extremity

Arthroscopy
Volume 37, issue 11

- Endoscopic Proximal Hamstring Repair Is Safe and Efficacious With High Patient Satisfaction at a Minimum of 2-Year Follow-Up

BACK

- Degenerative Medial Meniscus Tear With a Displaced Flap Into the Meniscotibial Recess and Tibial Peripheral Reactive Bone Edema Presents Good Results With Arthroscopic Surgical Treatment

Knee Surgery, Sports Traumatology, Arthroscopy (KSSTA)
Volume 29, Issue 11

- Satisfactory long-term clinical outcomes after bone marrow stimulation of osteochondral lesions of the talus.
- A high rate of talocalcaneal interosseous ligament tears was found in chronic lateral ankle instability with sinus tarsi pain.
- Postoperative pain and infection are the most frequent reasons for legal action after knee arthroscopy: a 5-year review based on two private insurance French companies after arthroscopy.
- Typical MRI-pattern suggests peak maturation of the ACI graft 2 years after third-generation ACI: a systematic review.
- An arthroscopic repair technique for proximal anterior cruciate tears in children to restore active function and avoid growth disturbances.
- Suture tape augmentation ACL repair, stable knee, and favorable PROMs, but a re-rupture rate of 11% within 2 years.
- Accurate placement of a tibial tunnel significantly improves meniscal healing and clinical outcomes at 1 year after medial meniscus posterior root repair.
- Clinical outcomes of rectangular tunnel technique in posterior cruciate ligament reconstruction were comparable to the results of conventional round tunnel technique.
- Anatomic double-bundle anterior cruciate ligament reconstruction could not achieve sufficient control of pivot-shift when accompanying tibial tunnel coalition.
- Remnant preservation provides good clinical outcomes after anterior cruciate ligament reconstruction.
- Leaving the stable ramp lesion unrepaired does not negatively affect clinical and functional outcomes as well as return to sports rates after ACL reconstruction.
- Chronological changes in cross-sectional area of the bone-patellar tendon-bone autograft after anatomic rectangular tunnel ACL reconstruction.
- Lateral posterior tibial slope and length of the tendon within the tibial tunnel are independent factors to predict tibial tunnel widening following anatomic anterior cruciate ligament reconstruction.
- An accelerated 6-week return to full weight bearing after matrix-induced autologous chondrocyte implantation results in good clinical outcomes to 5 years post-surgery.
- Joint effusion at 6 months is a significant predictor of joint effusion 1 year after anterior cruciate ligament reconstruction.
- Combined posterolateral knee reconstruction: ACL-based injuries perform better compared to PCL-based injuries.
- There are differences in knee stability based on lateral extra-articular augmentation technique alongside anterior cruciate ligament reconstruction.
- Knee laxity and functional knee outcome after contralateral ACLR are comparable to those after primary ACLR.
- ACL Study Group survey reveals the evolution of anterior cruciate ligament reconstruction graft choice over the past three decades.
- The majority of athletes fail to return to play following anterior cruciate ligament reconstruction due to reasons other than the operated knee.
- Increased posterior tibial slope results in increased incidence of posterior lateral meniscal root tears in ACL reconstruction patients.

BACK

American Journal of Sports Medicine (AJSM)
Volume 49, Issue 14

- Early Operative Versus Delayed Operative Versus Nonoperative Treatment of Pediatric and Adolescent Anterior Cruciate Ligament Injuries: A Systematic Review and Meta-analysis
- Tranexamic Acid in Anterior Cruciate Ligament Reconstruction: A Systematic Review and Meta-analysis
- Can We Eliminate Opioids After Anterior Cruciate Ligament Reconstruction? A Prospective, Randomized Controlled Trial
- Graft Survivorship After Anterior Cruciate Ligament Reconstruction Based on Tibial Slope
- Differences in Baseline Characteristics and Outcome Among Responders, Late Responders, and Never-Responders After Anterior Cruciate Ligament Reconstruction
- Femoral and Tibial Bony Risk Factors for Anterior Cruciate Ligament Injuries Are Present in More Than 50% of Healthy Individuals
- Regional Differences in Anterior Cruciate Ligament Signal Intensity After Surgical Treatment
- The Reliability of 3-T Magnetic Resonance Imaging to Identify Arthroscopic Features of Meniscal Tears and Its Utility to Predict Meniscal Tear Reparability
- One Bony Morphology, Two Pathologic Entities: Sex-Based Differences in Patients With Borderline Hip Dysplasia Undergoing Hip Arthroscopy
- Equality in Hip Arthroscopy Outcomes Can Be Achieved Regardless of Patient Socioeconomic Status
- Labral Tear Management in Patients Aged 40 Years and Older Undergoing Primary Hip Arthroscopy: A Propensity-Matched Case-Control Study With Minimum 2-Year Follow-up
- Fascia Iliaca Block for Postoperative Pain Control After Hip Arthroscopy: A Systematic Review of Randomized Controlled Trials

Miscellaneous

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BACK

Upper extremity

Arthroscopy, Volume 37, Issue 11, P3229-3237

Postoperative Pain Control After Arthroscopic Rotator Cuff Repair: Arthroscopy-Guided Continuous Suprascapular Nerve Block Versus Ultrasound-Guided Continuous Interscalene Block

Kim, H., Kim, H.-J., Lee, E.-S., Lee, S., Park, J. H., Kim, H., … Koh, K. H.

https://doi.org/10.1016/j.arthro.2021.04.067

Purpose
To compare the clinical efficacy and safety of arthroscopy-guided continuous suprascapular nerve block and ultrasound-guided continuous interscalene block in postoperative analgesia in patients undergoing arthroscopic rotator cuff repair.

Methods
A prospective study was performed between March and November 2020. In total, 76 patients were enrolled and divided into 2 groups: in the 38 patients of group 1 (arthroscopy-guided continuous suprascapular nerve block), an indwelling catheter was introduced via the Neviaser portal under arthroscopic view before closing the portal at the end of the surgery; and in the 38 patients of group 2 (ultrasound-guided continuous interscalene block), an indwelling catheter was inserted and directed toward the interscalene brachial plexus prior to the surgery under ultrasound guidance. The primary outcome was the pain score measured by the visual analog scale at postoperative 24 hours during admission. Comparisons were conducted at different time points (postoperative 4, 8, 24, and 48 hours). The secondary outcome was any of these events: neurologic complications, such as sensory/motor change in the upper extremities; hemidiaphragmatic paresis; dyspnea; dysphonia; and Horner's syndrome. Opioid usage until postoperative 3 weeks was compared between the groups.

Results
The visual analog scale scores in groups 1 and 2 were comparable at each postoperative time point (analysis of variance, P = .919; trends, P = .132). Neurologic deficits were more common in group 2 than in group 1 (8 vs 32 patients, P < .001). Decreased excursion of the diaphragm was more common in group 2 (partial or complete paresis of the hemidiaphragm: 1 vs 29 patients, P < .001). Opioid consumption was similar in both groups (morphine milligram equivalents per kilogram; 1.75 vs 1.55, P = .195).

Conclusions
Our findings show that arthroscopy-guided continuous suprascapular nerve block is not inferior to ultrasound-guided continuous interscalene block for postoperative pain control after arthroscopic rotator cuff repair while showing fewer temporary neurologic complications.

Level of Evidence
Level II, prospective cohort study, interventional study.

BACK

Postoperative Stiffness and Pain After Arthroscopic Labral Stabilization: Consider Anchor Arthropathy

Waltz, R. A., Wong, J., Peebles, A. M., Golijanin, P., Ruzbarsky, J. J., Arner, J. W., … Provencher, M. T.

https://doi.org/10.1016/j.arthro.2021.05.016

Purpose
To describe the key clinical, imaging, and arthroscopic characteristics of anchor arthropathy after arthroscopic shoulder stabilization procedures and, secondarily, to define risk factors for the development of anchor-induced arthropathy.

Methods
A total of 23 patients who underwent revision arthroscopic shoulder surgery and were diagnosed with glenohumeral arthropathy were retrospectively identified from prospectively collected data registries between January 2000 and May 2018. Data included initial diagnosis and index procedure performed, presenting arthropathy symptoms including duration, and examination findings before revision surgery. Pre-revision imaging was used to assess presence of glenohumeral osteoarthritis and chondromalacia, anchors/sutures, loose bodies, and labral pathology. The same parameters were recorded intraoperatively during revision surgery. Descriptive statistics were performed for demographic data and means with standard deviations were calculated for continuous data. A McNemar–Bowker test was used to analyze marginal homogeneity between preoperative imaging and intraoperative findings.

Results
Mean age at presentation was 33.4 ± 11.7 years (range 16-59, 17 male patients; 6 female patients). More than one half (13/23) developed symptoms within 10 months after index arthroscopic procedure (mean 32.2 ± 59.9 months, range <1 to 165.2 months) with 87% presenting with pain and 100% presenting with loss of motion on examination. Plain radiographs demonstrated humeral osteoarthritis in 57% (13/23) of patients, magnetic resonance imaging (MRI) revealed recurrent labral pathology in 19 of 23 (83%) patients, potential proud implants in 12 of 23 (52%), and loose bodies in 12 of 23 (52%). Intraoperatively, all had evidence of osteoarthritis; 22 of 23 (96%) had prominent implants. Humeral head chondromalacia was present in 21 of 23 patients (91%), the majority of which was linear stripe wear, and 6 of 23 (26%) had severe global glenohumeral osteoarthritis. Statistical analysis revealed a 54.5% (95% confidence interval 0.327-0.749) sensitivity of MRI identification of proud implants with a specificity of 100% (95% confidence interval 0.055-1). The ability of MRI to accurately assess chondromalacia of the humeral head (P = .342) or glenoid (P = .685) was not statistically significant.

Conclusions
Anchor arthropathy is characterized by symptoms of pain and stiffness on examination and in many cases develops early after stabilization surgery (<10 months). Implants were implicated in the majority of cases of humeral head chondromalacia. MRI scans may produce false-negative identification of proud implants and can be a poor predictor of the severity of chondromalacia and intra-articular pathology; thus, a high index of clinical suspicion is necessary in patients with motion loss and pain postoperatively.

Level of Evidence
Level IV, case series.

BACK

Journal of Shoulder and elbow surgery, November 2021, volume 30, issue 11, pages 2445 - 2454.

Multimodal nonopioid pain protocol provides equivalent pain control versus opioids following arthroscopic shoulder labral surgery: a prospective randomized controlled trial.

Jildeh, T.R., Khalil, L.S., Abbas M.J., et al.

DOI: https://doi.org/10.1016/j.jse.2021.07.008

Background
This study aimed to compare postoperative pain and patient satisfaction in patients undergoing primary arthroscopic labral surgery managed with either a nonopioid alternative pain regimen or a traditional opioid pain regimen.

Methods
Sixty consecutive patients undergoing primary arthroscopic shoulder labral surgery were assessed for participation. In accordance with the Consolidated Standards of Reporting Trials (CONSORT) 2010 statement, a prospective randomized controlled trial was performed. The 2 arms of the study were a multimodal nonopioid analgesic protocol as the experimental group and a standard opioid regimen as the control group. The primary outcome was postoperative pain scores (on a visual analog scale [VAS]) for the first 10 days postoperatively. Secondary outcomes included patient satisfaction, patient-reported outcomes, and complications. Randomization was performed with a random number generator, and all data were collected by blinded observers. Patients were not blinded.

Results
Twelve patients did not meet the inclusion criteria or declined to participate. Thus, 48 patients were included in the final analysis: 24 in the nonopioid group and 24 in the opioid group. There was no significant difference in VAS or PROMIS (Patient-Reported Outcomes Measurement Information System) scores between patients in the 2 cohorts on any postoperative day ($P > .05$). When we controlled for confounding factors with repeated-measures mixed models, the nonopioid cohort reported significantly lower VAS and PROMIS (Patient-Reported Outcomes Measurement Information System) Pain Interference scores ($P < .01$) at all time points. No difference was found in reported adverse events (constipation, diarrhea, drowsiness, nausea, and upset stomach) between cohorts at any time point ($P > .05$).

Conclusion
This study found that a multimodal nonopioid pain regimen provided, at the minimum, equivalent pain control, an equivalent adverse reaction profile, and equivalent patient satisfaction when compared with a standard opioid-based regimen following arthroscopic shoulder labral surgery.

Level of evidence
Level I, Randomized Controlled Trial

BACK

Multimodal nonopioid pain protocol provides equivalent pain control versus opioids following arthroscopic shoulder labral surgery: a prospective randomized controlled trial.

Kukkonen, J., Ryösä, A., Joukainen, A., et al.

DOI: https://doi.org/10.1016/j.jse.2021.03.133

Background
Nontraumatic rotator cuff tear is a common shoulder problem that can be treated either conservatively or operatively. In the previous publications of the 1- and 2-year results of this trial, we found no significant between-group clinical differences. The aim of this study was to investigate the differences in mid-term clinical and radiologic outcomes in patients older than 55 years.

Materials and methods
One hundred eighty shoulders with symptomatic, nontraumatic supraspinatus tears were randomly assigned to 1 of the 3 cumulatively designed treatment groups: physiotherapy (group 1); acromioplasty and physiotherapy (group 2); and rotator cuff repair, acromioplasty, and physiotherapy (group 3). The change in the Constant score was the primary outcome measure. The secondary outcome measures were the change in the visual analog scale score for pain and patient satisfaction. Radiologic analysis included evaluation of glenohumeral osteoarthritis (OA) and rotator cuff tear arthropathy (CTA).

Results
A total of 150 shoulders (mean age, 71 years) were available for analysis after a mean follow-up period of 6.2 years. The mean sagittal tear size of the supraspinatus tendon tear at baseline was 10 mm in all groups (P = .33). During follow-up, 8 shoulders in group 1 and 2 shoulders in group 2 crossed over to rotator cuff repair. The mean baseline Constant score was 57.1, 58.2, and 58.7 in groups 1, 2, and 3, respectively (P = .85). There were no significant differences (P = .84) in the mean change in the Constant score: 18.5 in group 1, 17.9 in group 2, and 20.0 in group 3. There were no statistically significant differences in the change in the visual analog scale pain score (P = .74) and patient satisfaction (P = .83). At follow-up, there were no statistically significant differences in the mean progression of glenohumeral OA (P = .538) or CTA (P = .485) among the groups. However, the mean progression of glenohumeral OA from baseline to follow-up was statistically significant in the trial population (P = .0045).

Conclusions
On the basis of this study, operative treatment is no better than conservative treatment regarding small, nontraumatic, single-tendon supraspinatus tears in patients older than 55 years. Operative treatment does not protect against degeneration of the glenohumeral joint or CTA. Conservative treatment is a reasonable option for the primary initial treatment of these tears.

Level of evidence
Level II, Randomized Controlled Trial

BACK

Does statin-treated hyperlipidemia affect rotator cuff healing or muscle fatty infiltration after rotator cuff repair?

Amit, P., Kuiper, J.H., James, S., et al.

DOI: https://doi.org/10.1016/j.jse.2021.05.014

Background
Hyperlipidemia is linked to poor tendon-to-bone healing and progression of fatty infiltration after rotator cuff repair. Statins effectively treat hyperlipidemia, but it is unknown if they have any potential detrimental effects following rotator cuff repair. The aim of this study was to evaluate the effect of statins on rotator cuff healing and fatty infiltration following repair.

Methods
A total of 77 patients undergoing arthroscopic rotator cuff repair were recruited prospectively, 38 patients who were prescribed a statin for hyperlipidemia (statin group) and 39 patients who were not taking a statin (control group). Patients who did not have both preoperative and 1-year postoperative magnetic resonance imaging (MRI) scans were excluded from the study. Patient-reported outcome measures, namely the Western Ontario Rotator Cuff (WORC) index, Constant-Murley score, American Shoulder and Elbow Surgeons (ASES) score, and Disabilities of the Arm, Shoulder and Hand (DASH) score, were collected preoperatively and at 1 year. Fatty infiltration was assessed on MRI according to the Goutallier grade preoperatively and at 12 months; rotator cuff healing was assessed at 12 months according to the Sugaya classification. Following propensity score weighting to adjust for baseline imbalances, 12-month outcomes were compared between the 2 groups.

Results
At 12 months, all patient-reported outcome measures had improved significantly compared with baseline (WORC score, 85.9 vs. 32.5, $P < .001$; ASES score, 87.3 vs. 37.5, $P < .001$; Constant-Murley score, 77 vs. 31, $P < .001$; and DASH score, 13.6 vs. 61.4, $P < .001$). There was no significant difference in postoperative scores in the statin group vs. the control group (WORC score, 84.9 vs. 89.6, $P = .94$; ASES score, 87.5 vs. 86.6, $P = .40$; Constant-Murley score, 77 vs. 81, $P = .90$; and DASH score, 14.4 vs. 11.4, $P = .14$), and for 3 of these scores, the 95% confidence intervals excluded a clinically meaningful difference. Similarly, rotator cuff healing at 12 months and Goutallier fatty infiltration grades were comparable between the 2 groups. Retears were seen in 6 patients (15.8%) in the statin group and 8 (20.5%) in the control group. Progression of fatty infiltration was seen in 4 patients (10.5%) in the statin and 4 (10.3%) in the control group. Statin use did not demonstrate a significant association with either retear risk ($P = .41$) or progression of fatty atrophy ($P = .69$).

Conclusion
Patient-reported outcomes, rotator cuff retear rate, and fatty infiltration on MRI at 12 months after rotator cuff repair in patients with hyperlipidemia treated with statins are similar to those in a control group.

Level of evidence
Level II, Prospective Cohort Design

BACK

Early repair of traumatic rotator cuff tears improves functional outcomes.

Gutman M.J., Joyce, C.D., Patel, M.S., et al.

DOI: https://doi.org/10.1016/j.jse.2021.03.134

Background
The impact of surgical timing on outcomes involving traumatic rotator cuff tears (RCTs) remains uncertain. The purpose of this study was to determine how functional outcomes are affected by surgical timing in traumatic RCTs.

Methods
We performed a retrospective review of patients with repair of traumatic full-thickness RCTs. Preoperative magnetic resonance imaging scans were evaluated by 2 blinded reviewers to measure RCT area and muscular atrophy. Functional outcomes were assessed via the American Shoulder and Elbow Surgeons (ASES) score, Single Assessment Numeric Evaluation (SANE) score, Simple Shoulder Test score, and visual analog scale (VAS) pain score. Patients were divided into 4 groups based on the time from injury to surgery: 0-2 months (group 1), 2-4 months (group 2), 4-6 months (group 3), and 6-12 months (group 4). Multivariate analysis was performed to assess the impact of surgical timing on functional outcomes. A subanalysis was performed to assess outcomes in patients who underwent surgery within 3 weeks of injury.

Results
The study included 206 patients (150 men and 56 women) with a mean age of 60.0 ± 9.7 years and a minimum of 24 months' clinical follow-up (mean, 35.5 months; range, 24-54.4 months). The average tear area was 8.4 ± 6.3 cm2 in group 1 (66 patients), 5.8 ± 5.1 cm2 in group 2 (76 patients), 5.1 ± 4.6 cm2 in group 3 (29 patients), and 3.7 ± 3.1 cm2 in group 4 (35 patients) ($P < .001$). There were significant differences between the 4 cohorts in the final postoperative ASES score ($P = .030$) and VAS pain score ($P = .032$). The multivariate regression demonstrated that patients who underwent surgery within 4 months of injury had estimated improvements of 10.3 points in the ASES score ($P = .008$), 1.8 points in the Simple Shoulder Test score ($P = .001$), 8.6 points in the SANE score ($P = .033$), and 0.93 points in the VAS pain score ($P = .028$) compared with patients who underwent surgery later. The subanalysis demonstrated that patients who underwent surgery within 3 weeks of injury ($n = 13$) had significantly better VAS ($P = .003$), ASES ($P = .008$), and SANE ($P = .019$) scores than patients who underwent surgery at between 3 weeks and 4 months after injury ($n = 129$).

Conclusions
This study demonstrates that surgical repair of traumatic RCTs results in significant improvements in functional outcomes for all patients; however, patients who undergo surgery within 3 weeks can expect the best functional outcomes, with a drop in function in patients who undergo surgery >4 months after injury.

Level of evidence
Level III, Retrospective Cohort Comparison

BACK

Nontendinous healing after repairing of retracted rotator cuff tear: an imaging study.

Youn, S.M., Rhee, Y.G., Rhee, S.M.

DOI: https://doi.org/10.1016/j.jse.2021.04.026

Background
Follow-up magnetic resonance imaging (MRI) after rotator cuff repair can sometimes demonstrate healing with nontendinous tissue that extends from the footprint to the retracted tendon end, which is inferred as fibrous tissue formation. The aim was to investigate this particular finding and its significance.

Methods
There were 494 eligible cases of healed supero-posterior medium-sized to massive rotator cuff repairs, after the exclusion of retears. A retrospective review was performed for the 3 groups that were divided according to their MRI appearances of healing: type I described the direct healing of the tendon to the footprint, whereas type II demonstrated the distinctive continuity of nontendinous tissue from the footprint to the retracted tendinous portion, and type III also showed a similar appearance but with obvious thinning of the tissue, without any evidence of defect confirmed on the routine outpatient ultrasonograph.

Results
Only 108 of 494 patients (21.9%) demonstrated type I healing, whereas the signs of nontendinous healing were evident for the rest, with the 116 patients (23.5%) being classified as type III with attenuation. Comparing the preoperative tendon retraction, 34.8% and 37.2% of the Patte stages 2 and 3, respectively, resulted in type III healing, which were significantly higher compared with that of stage 1 (15.3%, $P < .001$). Type III healing had the highest average preoperative Goutallier grades. The average postoperative visual analog scale and the American Shoulder and Elbow Surgeons (ASES) scores have improved significantly for all 3 groups ($P < .05$), with the ASES score being 86.1±15.9 for type I, 93.7±36.1 for type II, and 87.8±15.1 for type III without significant differences between the groups ($P = .3$).

Conclusions
Only a fifth of the rotator cuff repairs led to a direct healing to the footprint, and the rest healed with MRI appearance of nontendinous tissue formation bridging the retracted tendinous portion and the footprint. These MRI appearances did not represent the true tendinous tissue formation between the torn end of the tendon and the bone after healing. Such appearances did not seem to affect the clinical outcomes.

Level of evidence
Level IV, Case Series

BACK

Changes in shoulder muscle activities and glenohumeral motion after rotator cuff repair: an assessment using ultrasound real-time tissue elastography.

Ishikawa, H., Muraki, T., Morise, S., et al.

DOI: https://doi.org/10.1016/j.jse.2021.04.013

Background
Although rotator cuff repair is performed to restore the function of the rotator cuff muscles and glenohumeral (GH) joint motion, little has been known regarding the recovery process. The purpose of this study was (1) to investigate changes over time in activities of the supraspinatus and deltoid muscles assessed by ultrasound real-time tissue elastography (RTE) after rotator cuff repair and (2) to determine contributions of the activities of these muscles to the GH joint motion.

Methods
Twenty patients after rotator cuff repair and 13 control participants were enrolled in this study. Elasticity of the supraspinatus and middle deltoid muscles were measured at rest and 30° of humerothoracic elevation in the scapular plane (scaption) by using RTE. The elasticity at 30° of scaption was normalized to that at rest in each muscle to quantify their muscle activities. In addition, the supraspinatus-to-middle deltoid (SSP/MD) ratio for the normalized elasticity was calculated. The GH elevation angle was measured with a digital inclinometer, which was calculated by subtracting the scapular upward rotation angle from 30° of scaption. For patients after rotator cuff repair, all measurements were performed at 6 weeks, 8 weeks, 3 months, and 6 months after surgery. Rotator cuff integrity was examined with magnetic resonance imaging at 6 months after surgery.

Results
Fifteen of 20 patients who remained intact at 6 months after surgery completed this study. The supraspinatus activity at 6 weeks was significantly smaller than that at 3 months ($P = .006$) and 6 months ($P = .010$). There was no significant difference in the supraspinatus activity between the patients at 3 months and the control participants ($P = .586$). The middle deltoid activity at 6 weeks was significantly greater than that at 6 months ($P = .003$). There was positive correlation between GH elevation angle and the activity of the supraspinatus relative to the deltoid at 6 weeks ($r = 0.75$, $P = .001$) and 8 weeks ($r = 0.53$, $P = .041$).

Conclusion
The supraspinatus activity increased from 6 weeks to 3 months after surgery. The supraspinatus activity at 3 months after surgery was the same level as that in healthy individuals. On the other hand, the deltoid activity decreased from 6 weeks to 6 months after surgery. The increase in activity of the supraspinatus relative to the deltoid was likely to be related to the increase in GH elevation during postoperative at 8 weeks.

Level of evidence
Level IV, Case Series

BACK

Rotator cuff repair vs. nonoperative treatment: a systematic review with meta-analysis.

Brindisino, F., Salomon, M., Giagio, S., et al.

DOI: https://doi.org/10.1016/j.jse.2021.04.040

Background
Rotator cuff (RC) tears have been widely studied as many treatment strategies have been recommended. However, optimal management for patients with RC tears is still unclear.

Purpose
The main aim of this systematic review was to analyze randomized controlled trials using meta-analysis to compare repair to conservative treatments for patients with any type of RC tear.

Methods
MEDLINE, Cochrane Library (CENTRAL database), PEDro, and Scopus databases were used. Two independent reviewers selected randomized controlled trials that compared surgical to conservative treatments for RC tear patients. The studies included were assessed using Cochrane Risk of Bias 2 tools, and the Grading of Recommendations Assessment, Development and Evaluation (GRADE) system was used to evaluate the certainty of evidence and to summarize the study conclusions.

Results
Six trials were included. Pooled results showed improvement in function and pain perception in favor of the repair group at 6 months (mean difference 1.26, 95% CI –2.34, 4.85, P = .49; and –0.59, 95% CI –0.84, –0.33, P < .001, respectively), at 12 months (mean difference 5.25, 95% CI 1.55, 8.95, P = .005, for function; and –0.41, 95% CI –0.70, –0.12, P = .006, for pain) and at 24 months (mean difference 5.57, 95% CI 1.86, 9.29, P = .003, for function; and –0.92, 95% CI –1.31, –0.52, P < .001, for pain) in RC tear patients. However, these differences did not reach the minimum clinically important difference. The certainty of evidence ranged from low to moderate because of imprecision in the studies included.

Conclusions
Overall analysis showed that in patients with RC tear, repair compared with conservative treatment could result in increased pain reduction and functional improvement at 6, 12, and 24 months. Even if these effects were often statistically significant, their clinical relevance was limited. Moreover, the certainty of body of evidence ranged from low to moderate.

Level of evidence
Level II, Meta-analysis

BACK

Risk factors affecting rotator cuff retear after arthroscopic repair: a meta-analysis and systematic review.

Zhao, J., Luo, M., Pan, J., et al.

DOI: https://doi.org/10.1016/j.jse.2021.05.010

Background
Retear after arthroscopic rotator cuff repair (ARCR) consistently challenges medical staff and patients, and the incidence of retear after surgery is 10%-94%. The purpose of this study was to identify the risk factors that cause retear after ARCR and provide theoretical guidance for clinical intervention to reduce the occurrence of postoperative rotator cuff retear.

Methods
The protocol for this meta-analysis was registered with PROSPERO (CRD42021225088). PubMed, Web of Science, and Embase were searched for observational studies on risk factors for rotator cuff retear after arthroscopic repair. Meta-analytical methods were used to determine the odds ratio or weighted mean difference of potential risk factors related to postoperative rotator cuff retear. Stata 15.1 was used to quantitatively evaluate the publication bias of the statistical results.

Results
Fourteen studies from 6 countries with a total of 5693 patients were included. The meta-analysis revealed that the risk factors for retear after rotator cuff repair were age, body mass index, diabetes, subscapularis and infraspinatus fatty infiltration, symptom duration, bone mineral density, tear length, tear width, tear size area, amount of retraction, critical shoulder angle, acromiohumeral interval, distance from the musculotendinous junction to the glenoid, operative duration, biceps procedure, and postoperative University of California Los Angeles shoulder score.

Conclusion
These findings can help clinical medical staff identify patients who are prone to retear early after arthroscopic repair and develop targeted prevention and treatment strategies for modifiable risk factors, which are of great significance for reducing the occurrence of rotator cuff retear after ARCR.

Level of evidence
Level IV, Meta-Analysis

BACK

Clinical outcomes and temporal changes in the range of motion following superior capsular reconstruction for irreparable rotator cuff tears: comparison based on the Hamada classification, presence or absence of shoulder pseudoparalysis, and status of the subscapularis tendon.

Takayama, K., Yamada, S., Kobori, Y.

DOI: https://doi.org/10.1016/j.jse.2021.04.019

Background
Superior capsular reconstruction (SCR) has recently gained popularity as a surgical solution for patients with massive rotator cuff tears or shoulder pseudoparalysis (PPS). Good clinical outcomes have been reported after SCR; however, the factors that influence its clinical outcomes remain unclear. Therefore, in this study, we aimed to clarify the factors influencing postoperative outcomes after SCR using tensor fascia lata graft, for which we evaluated the Hamada grade, patients with or without PPS, and the status of the subscapularis tendon (SSC).

Methods
In total, 54 consecutive patients with irreparable rotator cuff tears or PPS who underwent SCR between June 2014 and October 2018 were included. The enrolled patients were grouped and compared as follows: (1) Hamada grade 2 (11 patients) and Hamada grade 3 (43 patients) and (2) non-PPS (22 patients), moderate PPS (16 patients), and severe PPS (16 patients). For subanalysis, the 32 PPS patients were divided into 3 groups: intact SSC (11 patients), repairable SSC (16 patients), and irreparable SSC (5 patients). To assess shoulder function, the American Shoulder and Elbow Surgeons (ASES) score was evaluated before surgery and at 24 months postoperatively; shoulder range of motion was evaluated at 2, 3, 4, 5, 6, 8, 10, 12, and 24 months postoperatively.

Results
No significant differences in postoperative ASES scores and shoulder range of motion were observed between the Hamada grade 2 and grade 3 groups or between the non-PPS, moderate PPS, and severe PPS groups. However, significant differences in postoperative shoulder elevation and ASES scores were observed between the intact SSC and irreparable SSC groups ($P = .006$) and between the repairable SSC and irreparable SSC groups ($P = .003$).

Conclusions
This study demonstrated that the status of the SSC, rather than the Hamada grade or the presence or absence of PPS, influences the clinical outcomes after SCR. Therefore, reparability or intactness of the SSC is an important factor in considering the surgical indication for SCR.

Level of evidence
Level III, Retrospective Case-Control Design

BACK

Mid-term results of arthroscopically assisted latissimus dorsi transfer for irreparable posterosuperior rotator cuff tears.

Waltenspül, M., Jochum, B., Filli, L., et al.

DOI: https://doi.org/10.1016/j.jse.2021.03.149

Background
With progress in arthroscopic surgery, latissimus dorsi transfer for irreparable posterosuperior rotator cuff tears (RCTs) has become a reliable all-arthroscopic or arthroscopically assisted procedure. The mid-term results of arthroscopically assisted latissimus dorsi transfer (aLDT) are scarce in the literature. The purpose of this study was to report our clinical and radiographic mid-term results of aLDT for irreparable posterosuperior RCTs.

Methods
Thirty-one consecutive patients with a mean age of 55.5 years (range, 38-73 years) at the time of aLDT were evaluated after a mean of 3.5 years (range, 2-5 years). All patients had irreparable, full-thickness tears of at least the complete supraspinatus, with or without infraspinatus tendons, and 12 patients (39%) had undergone previous rotator cuff repair (RCR). A concomitant upper-third subscapularis repair was needed at the time of aLDT in 7 patients (23%). Mid-term results were assessed clinically and radiographically (including magnetic resonance imaging).

Results
At final follow-up, 4 patients with failure (13%) had undergone revision to reverse total shoulder arthroplasty (RTSA) essentially for untreatable pain. Patients with revision to RTSA had significantly higher preoperative pain levels (Constant pain score, 6 points vs. 11 points; P = .032) and lower Constant activity scores (2 points vs. 5 points, P = .017) than the remaining 27 patients. Patients with failed previous RCRs had significantly inferior results compared with patients without previous repair (mean Subjective Shoulder Value, 67% vs. 88%; P = .035). For the 27 patients without revision, the mean relative Constant score improved from 63% to 76% (P = .032), the Constant pain score, from 10.5 to 12.7 points (P = .012), and the Subjective Shoulder Value, from 43% to 77% (P < .001). Significant progression of glenohumeral arthropathy by 2 or more grades according to the Hamada classification was observed in 13 of the 27 patients (48%), but there was no significant difference in clinical outcomes between the patients with arthropathy (n = 13) and those without it (n = 14, P = .923).

Conclusions
The mid-term results of aLDT for irreparable posterosuperior RCTs were associated with significant improvements in objective and subjective outcome measures. The failure rate leading to conversion to RTSA was relatively high in this cohort. The failures were associated with unusually intense pain in low-demand individuals and/or revision of failed RCR. Long-term results of aLDT are needed to evaluate the effect of this procedure on the progression of osteoarthritis.

BACK

American Journal of Sports Medicine (AJSM), Volume 49, Issue 14

Minimum 10-Year Clinical Outcomes After Arthroscopic 270° Labral Repair in Traumatic Shoulder Instability Involving Anterior, Inferior, and Posterior Labral Injury

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https://doi.org/10.1177/03635465211053632

Background: Current literature reports highly satisfactory short- and midterm clinical outcomes in patients with arthroscopic 270° labral tear repairs. However, data remain limited on long-term clinical outcomes and complication and redislocation rates in patients with traumatic shoulder instability involving anterior, inferior, and posterior labral injury.

Purpose: To investigate, at a minimum follow-up of 10 years, the clinical outcomes, complications, and recurrent instability in patients with 270° labral tears involving the anterior, inferior, and posterior labrum treated with arthroscopic stabilization using suture anchors.

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

Methods: A retrospective outcomes study was completed for all patients with a minimum 10-year follow-up who underwent arthroscopic 270° labral tear repairs with suture anchors by a single surgeon. Outcome measures included pre- and postoperative Rowe score, American Shoulder and Elbow Surgeons (ASES) score, Simple Shoulder Test, visual analog scale for pain, and Single Assessment Numeric Evaluation (SANE). Western Ontario Shoulder Instability Index (WOSI) scores were collected postoperatively. Complication data were collected, including continued instability, subluxation or dislocation events, and revision surgery. Failure was defined as any cause of revision surgery.

Results: In total, 21 patients (mean ± SD age, 27.1 ± 9.6 years) with 270° labral repairs were contacted at a minimum 10-year follow-up. All outcome measures showed statistically significant improvements as compared with those preoperatively: Rowe (53.9 ± 11.4 to 88.7 ± 8.9; P = .005), ASES (72.9 ± 18.4 to 91.8 ± 10.8; P = .004), Simple Shoulder Test (8.7 ± 2.4 to 11.2 ± 1.0; P = .013), visual analog scale (2.5 ± 2.6 to 0.5 ± 1.1; P = .037), and SANE (24.0 ± 15.2 to 91.5 ± 8.3; P = .043). The mean postoperative WOSI score at minimum follow-up was 256.3 ± 220.6. Three patients had postoperative complications, including a traumatic subluxation, continued instability, and a traumatic dislocation, 2 of which required revision surgery (14.2% failure rate).

Conclusion: Arthroscopic repairs of 270° labral tears involving the anterior, inferior, and posterior labrum have highly satisfactory clinical outcomes at 10 years, with complication and redislocation rates similar to those reported at 2 years. This suggests that repairs of extensile labral tears are effective in restoring and maintaining mechanical stability of the glenohumeral joint in the long term.

BACK

Arthroscopic Revision Rotator Cuff Repair: The Role of Previously Neglected Subscapularis Tears

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First Published October 15, 2021; pp. 3952–3958

https://doi.org/10.1177/03635465211047485

Background: Concomitant full-thickness tear of the subscapularis tendon is often neglected during primary posterosuperior rotator cuff repair, and its significance has not been investigated by any previous clinical study.

Purpose: To investigate (1) the clinical and radiological outcomes of revision arthroscopic rotator cuff repair and (2) the number of neglected concomitant subscapularis full-thickness tears in the revision of posterosuperior rotator cuff retears and their structural integrity after repair.

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

Methods: This study retrospectively examined 58 patients who underwent arthroscopic rotator cuff revision for a retear of a previously repaired posterosuperior rotator cuff. Preoperative and postoperative functional scores and active range of motion (ROM) were assessed. The initial and most recent follow-up magnetic resonance imaging scans before revision and arthroscopic findings at the time of primary repair were reviewed to determine whether the concomitant subscapularis tear was newly developed or preexisting. Final confirmation of the tendon's full-thickness tear was made during the revision procedure.

Results: At final follow-up, mean functional shoulder scores and ROM improved significantly compared with the preoperative values ($P < .001$). Among the 58 revision cases, 25 (43.1%) had a neglected full-thickness tear of the subscapularis tendon. The fatty infiltration grade of the neglected subscapularis tear progressed from a mean of 1.1 before primary repair to a mean of 1.6 before revision, and the change indicated statistically significant deterioration ($P < .001$). Despite clinical improvement after revision surgery, the retear rate was considerable in the re-repaired cuff tendons (37.9%) as well as for the repaired concomitant subscapularis tears (24%).

Conclusion: Among revision rotator cuff repairs, 43.1% had neglected subscapularis tears, and fatty infiltration of these initially neglected subscapularis tendons showed further progression at the time of revision. The retear rate after the repair of neglected subscapularis tears was higher than expected. Thus, detecting and treating subscapularis tear via meticulous preoperative evaluation and thorough inspection during primary arthroscopy are essential.

BACK

Biceps Tenodesis as an Attractive Alternative to Superior Labral Anterior-Posterior (SLAP) Repair for Type II SLAP Lesions in Active-Duty Military Patients Younger Than 35 Years

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First Published October 21, 2021; pp. 3945–3951

https://doi.org/10.1177/03635465211049373

Background: Biceps tenodesis has been suggested as a superior surgical technique compared with isolated labral repair for superior labral anterior-posterior (SLAP) tears in patients older than 35 years. The superiority of this procedure in younger patients, however, is yet to be determined.

Purpose: To compare the outcomes of arthroscopic SLAP repair with those of arthroscopic-assisted subpectoral biceps tenodesis for type II SLAP tears in active-duty military patients younger than 35 years.

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

Methods: Preoperative and postoperative evaluations with a minimum 5-year follow-up including the visual analog scale (VAS), the Single Assessment Numeric Evaluation (SANE), and the American Shoulder and Elbow Surgeons (ASES) shoulder score were administered, and scores were compared between 2 groups of patients younger than 35 years. One group included 25 patients who underwent SLAP repair, and the second group included 23 patients who underwent arthroscopic-assisted subpectoral biceps tenodesis.

Results: The preoperative patient age (P = .3639), forward flexion (P = .8214), external rotation (P = .5134), VAS pain score (P = .4487), SANE score (P = .6614), and ASES score (P = .6519) did not vary significantly between the 2 study groups. Both groups demonstrated statistically significant increases in function as measured by the ASES and SANE and decreases in pain as measured by the VAS at a minimum of 5 years postoperatively. Also at a minimum of 5 years postoperatively, patients in the tenodesis group had lower pain (1.3 vs 2.6, respectively; P = .0358) and higher SANE (84.0 vs 63.3, respectively; P = .0001) and ASES (85.7 vs 75.4, respectively; P = .0342) scores compared with those in the repair group. Failure rate was 20.0% in the repair group versus 0.0% in the tenodesis group (P = .0234).

Conclusion: Active-duty military patients younger than 35 years with type II SLAP tears had more predictable improvement in pain, better functional outcomes, and lower failure rates after biceps tenodesis compared with SLAP repair for type II SLAP tears. Overall, the results of this study indicate that arthroscopic- assisted subpectoral biceps tenodesis is superior to arthroscopic SLAP repair for the treatment of type II SLAP tears in military patients younger than 35 years.

BACK

Lower Extremity

Arthroscopy, Volume 37, Issue 11, P3275-3285

Endoscopic Proximal Hamstring Repair Is Safe and Efficacious With High Patient Satisfaction at a Minimum of 2-Year Follow-Up

Fletcher, A. N., Pereira, G. F., Lau, B. C., & Mather, R. C.

https://doi.org/10.1016/j.arthro.2021.03.067

Purpose
To evaluate the short-term outcomes of endoscopic proximal hamstring repair including clinical outcomes, patient-reported outcomes, and complications.

Methods
A retrospective analysis was performed on consecutive patients who underwent endoscopic proximal hamstring repair from 2013–2018 by a senior sports medicine orthopaedic surgeon. Demographic, operative, clinical data, complications, and patient-reported outcomes were collected and analyzed including the International Hip Outcome Tool-12 (iHOT-12), Single Assessment Numeric Evaluation (SANE), modified Harris Hip Score (mHHS), and the Hip Outcome Score activities of daily living scale (HOS-ADL).

Results
Thirty patients were included with a minimum 24.0- and average 44.0-month follow-up. The average age was 52.0 years (standard deviation [SD], 14.2), and 80.0% (n = 24) were women. Most patients presented with a history of refractory insertional tendinosis (83.3%, n = 25) and an average of 34.0 months of symptoms prior to surgical intervention. Two-year patient-reported outcomes were clinically acceptable with a postoperative iHOT-12 of 81.9 (SD, 21.1), SANE 78.8% (SD, 20.0), mHHS 89.6 (SD 13.4), and HOS-ADLs 87.2% function (SD, 15.9). Nine patients (30%) had available preoperative iHOT-12 scores. Among these patients, the mean increase in iHOT-12 was 46.3 (P = .0005; n = 9). Eighty percent (n = 24) of patients achieved the iHOT-12 patient acceptability symptomatic state. Complications (3%) included 1 atraumatic rerupture. Four patients participated in an organized sport and 18 in recreational sport with a return to play of 100% and 72.2%, respectively. All patients returned to work. Some 76.7% (n = 23) of patients reported return to their baseline level of physical activity, and 73.3% (n=22) of patients reported complete resolution of pain at last follow-up. There was a 90.0% (n=27) satisfaction rate.

Conclusions
Short-term follow-up for endoscopic proximal hamstring repair shows high patient satisfaction (90.0%) and clinically significant patient-reported outcomes with minimal residual pain and a low complication rate (3%).

Level of Evidence
IV, retrospective case series.

BACK

Degenerative Medial Meniscus Tear With a Displaced Flap Into the Meniscotibial Recess and Tibial Peripheral Reactive Bone Edema Presents Good Results With Arthroscopic Surgical Treatment

Helito, C. P., Partezani Helito, P. V., Sobrado, M. F., Giglio, P. N., Guimaraes, T. M., Pécora, J. R., … Berg, B. V.

https://doi.org/10.1016/j.arthro.2021.04.033

Purpose
To report the arthroscopic treatment results of a degenerative medial meniscus tear with a displaced flap into the meniscotibial recess, tibial peripheral reactive bone edema, and focal knee medial pain. As a secondary objective, we propose to identify possible factors associated with a good or poor prognosis of the surgical treatment of this lesion.

Methods
From 2012 to 2018, patients who had this specific meniscus pathology and underwent arthroscopic surgical treatment were retrospectively evaluated. Patients with Kellgren-Lawrence (KL) classification greater than 2 were excluded. KL classification, the presence of an Outerbridge grade III/V chondral lesion of the medial compartment, limb alignment, body mass index, and smoking were evaluated. The subjective outcomes included the International Knee Documentation Committee score, improvement in the pain reported by patients, and the Global Perceived Effect (GPE) scale score.

Results
A total of 69 patients were evaluated. The mean age was 58.6 ± 7.1 years. The follow-up time was 48.7 ± 20.8 months. Fifty-five (79.7%) patients reported pain improvement. The postoperative International Knee Documentation Committee was 62.6 ± 15.4, and the mean GPE was 2.3 ± 2.6. Fourteen patients (20.3%) showed no improvement in pain, and 7 patients (10.2%) presented complications. Groups that improved (GPE > 0) and did not improve (GPE < 0) did not present differences regarding age, sex, follow-up time, chondral lesions, or body mass index. Patients without improvement had a greater incidence of smoking (P = .001), varus alignment (P = .008), and more advanced KL classification (P < .001). In the multivariate analysis based on the GPE score, KL classification (P = .038) and smoking (P = .003) were significant.

Conclusions
Arthroscopic surgical treatment of degenerative medial meniscal tears with a meniscal flap displaced into the meniscotibial recess and adjacent focal bone edema in the tibia shows good results in approximately 80% of cases. Smoking and KL grade 2 were factors associated with poor prognosis of surgical treatment.

Level of Evidence
Level IV (case series).

BACK

Knee Surgery, Sports Traumatology, Arthroscopy, November 2021, volume 29, issue 11, pages 3525–3533.

Satisfactory long-term clinical outcomes after bone marrow stimulation of osteochondral lesions of the talus.

Rikken, Q.G.H., Dahmen, J., Stufkens, S.A.S. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06630-8.

Purpose
The purpose of the present study was to evaluate the clinical and radiological outcomes of arthroscopic bone marrow stimulation (BMS) for the treatment of osteochondral lesions of the talus (OLTs) at long-term follow-up.

Methods
A literature search was conducted from the earliest record until March 2021 to identify studies published using the PubMed, EMBASE (Ovid), and Cochrane Library databases. Clinical studies reporting on arthroscopic BMS for OLTs at a minimum of 8-year follow-up were included. The review was performed according to the PRISMA guidelines. Two authors independently conducted the article selection and conducted the quality assessment using the Methodological index for Non-randomized Studies (MINORS). The primary outcome was defined as clinical outcomes consisting of pain scores and patient-reported outcome measures. Secondary outcomes concerned the return to sport rate, reoperation rate, complication rate, and the rate of progression of degenerative changes within the tibiotalar joint as a measure of ankle osteoarthritis. Associated 95% confidence intervals (95% CI) were calculated based on the primary and secondary outcome measures.

Results
Six studies with a total of 323 ankles (310 patients) were included at a mean pooled follow-up of 13.0 (9.5–13.9) years. The mean MINORS score of the included studies was 7.7 out of 16 points (range 6–9), indicating a low to moderate quality. The mean postoperative pooled American Orthopaedic Foot and Ankle Society (AOFAS) score was 83.8 (95% CI 83.6–84.1). 78% (95% CI 69.5–86.8) participated in sports (at any level) at final follow-up. Return to preinjury level of sports was not reported. Reoperations were performed in 6.9% (95% CI 4.1–9.7) of ankles and complications related to the BMS procedure were observed in 2% (95% CI 0.4–3.0) of ankles. Progression of degenerative changes was observed in 28% (95% CI 22.3–33.2) of ankles.

Conclusion
Long-term clinical outcomes following arthroscopic BMS can be considered satisfactory even though one in three patients show progression of degenerative changes from a radiological perspective. These findings indicate that OLTs treated with BMS may be at risk of progressing towards end-stage ankle osteoarthritis over time in light of the incremental cartilage damage cascade. The findings of this study can aid clinicians and patients with the shared decision-making process when considering the long-term outcomes of BMS.

Level of evidence
Level IV.

BACK

A high rate of talocalcaneal interosseous ligament tears was found in chronic lateral ankle instability with sinus tarsi pain.

Song, W.T., Lee, J., Lee, J.H. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06651-3

Purpose
To evaluate the arthroscopic findings of subtalar joints, including interosseous talocalcaneal ligament (ITCL) tear, in patients with chronic lateral ankle instability (CLAI) and sinus tarsi pain.

Methods
A total of 118 ankles (109 patients) having CLAI with sinus tarsi pain who had undergone subtalar arthroscopy and lateral ankle ligament surgery were evaluated. The medical records, radiologic images, and the arthroscopic images and videos were reviewed. ITCL tears were classified into 4 grades: grade 0 (no tear), grade 1 (mild), grade 2 (moderate), and grade 3 (severe). The efficacy of magnetic resonance imaging (MRI) in diagnosing ITCL tears was also evaluated by comparing preoperative official readings of MRI to arthroscopic findings. The pre- and postoperative functional scores were also assessed.

Results
The overall tear rate of ITCL was 107/118 (90.7%). There were 29 ankles (23.6%) with grade 1, 42 ankles (35.6%) with grade 2, and 36 ankles (30.5%) with grade 3 tears. Isolated lateral ankle instability (LAI) was diagnosed in 43 ankles (36.4%), subtalar instability (STI) in 30 ankles (25.4%), and LAI with STI in 45 ankles (38.1%). There was a statistically significant relationship between the ITCL tear grade and the final diagnosis. ITCL tear was confirmed or suspected in 81 ankles (68.6%) on preoperative MRI. Pain Visual Analog Score and functional outcome scores including the American Orthopaedic Foot & Ankle Society and Karlsson–Peterson scores showed significant improvement after the surgery.

Conclusion
A high rate (90.7%) of ITCL tears was noted in CLAI patients with sinus tarsi pain. ITCL damage may play an important role in subtalar instability in patients with CLAI and sinus tarsi pain. Subtalar arthroscopic evaluation for ITCL tear is important for correct diagnosis for CLAI with sinus tarsi pain.

Level of evidence
IV.

BACK

Postoperative pain and infection are the most frequent reasons for legal action after knee arthroscopy: a 5-year review based on two private insurance French companies after arthroscopy.

Rougereau, G., Kavakelis, T., Sailhan, F. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06586-9

Purpose
The objective of this study was to determine the reasons for complaints and describe the judicial means upstream of France's courts following arthroscopy.

Methods
This is a retrospective observational study including all compensation records related to arthroscopic surgery, collected from the two leading French insurance organizations: MACSF and Branchet companies, from 2014 to 2018. Three medical experts performed the protocol and analysis.

Results
Finally, 247 procedures were included. The most common motives were: the appearance or persistence of pain (43.7%), postoperative infection (29.1%), technical errors (10.5%), nerve damage (5.7%), arterial lesions (2.8%), side errors (2.4%). Knee arthroscopies were more at risk of legal action for infection ($p = 0.0006$), and for disappointing results or persistent pain ($p = 0.001$). The first recourse was the conciliation and compensation commission (CCI) in 136 cases (55.1%), the civil court (TGI) in 88 cases (35.6%) and amicable settlement in 23 cases (9.3%). The mean time between surgery and the complaint was 32.8 ± 25.7 months, and was shorter in the case of an amicable procedure ($p < 0.001$). The lawsuit's mean duration was 15.6 ± 11.2 months, but longer in case of civil proceedings ($p < 0.0001$). The experts found no negligence in 81.8% of cases ($n = 202$). Infections were the leading cause of recourse to the conciliation and compensation commission ($p < 0.0001$), while technical errors were the main reason for complaints settled in an amicable procedure ($p = 0.035$). It was found more proven negligence in case of amicable procedures ($p < 0.0001$). The mean amount of compensation was 60,968.45€. No significant difference could be found regarding the median values of compensation between the reason of complaint. The amount of compensation was higher in civil court proceedings than in any others ($p = 0.02$).

Conclusion
The main reasons for arthroscopy litigation in France are reported in this study, specifying how they are managed upstream of possible legal proceedings. The knee is the main joint involved. Patient information, close follow-up associated with early and appropriate management of complications are the main ways to reduce complaints.

Level of evidence
IV.

BACK

Typical MRI-pattern suggests peak maturation of the ACI graft 2 years after third-generation ACI: a systematic review.

Iordache, E., Robertson, E.L., Hirschmann, A. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06339-0

Purpose
The purpose of the present article was (1) to systematically review the current literature and (2) to collect data regarding the postoperative magnetic resonance imaging (MRI) appearance of third-generation autologous chondrocyte implantation (ACI) grafts and (3) to provide an overview of imaging findings at various postoperative time points.

Methods
A systematic review of the literature in Medline (Pubmed) and Embase was performed using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. Articles which reported the post-operative MRI morphological outcomes following the use of third-generation ACI for treatment of knee cartilage lesions were included. All MRI results were allocated to six different time intervals: ≤ 3 months, > 3–6 months, > 6 months–1 year, > 1 year–2 years, > 2–5 years and > 5 years after surgery.

Results
A total of 22 studies were included and the study populations ranged from 13 to 180 patients adding up to a total of 951 patients. Parameters such as defect fill, border integration, surface contour, graft morphology and integrity of the subchondral lamina all improve gradually with a peak two years following surgery suggesting complete graft maturation at this time point. After this peak, a statistically insignificant decline is noted for most of the parameters. Signal intensity was found to gradually shift from hyperintense to isointense in the first 36 months and to hypointense later on. Contrarily, subchondral bone edema is not only a postoperative feature of the procedure but also can reappear or persist up to ten years after surgery. As graft failures can appear after two years, consequently, the MRI composite score is also affected.

Conclusion
Recurring patterns in postoperative MRI appearance were observed in certain parameters including defect filling, graft signal intensity and structure, border integration of the graft while parameters like subchondral bone tend to be unpredictable. Given the heterogenous findings in terms of clinical correlation, and relating that aspect to the patterns found in this review, an MRI is justified at three months, one year, two years and five years after surgery, unless the clinical symptomatology and individual patient needs dictate otherwise.

Level of evidence
IV.

BACK

An arthroscopic repair technique for proximal anterior cruciate tears in children to restore active function and avoid growth disturbances.

Turati, M., Rigamonti, L., Zanchi, N. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06367-w.

Purpose
The aim of this study was to assess midterm clinical outcomes in Tanner 1–2 patients with proximal anterior cruciate ligament (ACL) tears following arthroscopic-surgical repair using an absorbable or an all-suture anchor.

Methods
Fourteen (9.2 ± 2.9 years-old) of 19 skeletally immature patients reached the 2 years of clinical follow-up. Physical examinations included the Lachman test, Pivot-shift test, One-leg Hop test, Pedi-IKDC as well as Lysholm and Tegner activity scores; knee stability was measured with a KT-1000 arthrometer. Overall re-rupture rates were also evaluated in all operated patients.

Results
At 2 years post-surgery, the Lysholm score was 93.6 ± 4.3 points, and the Pedi-IKDC score was 95.7 ± 0.1. All patients returned to the same sport activity level as prior to ACL lesion within 8.5 ± 2.9 months, with one exception who reported a one-point reduction in their Tegner Activity score. No leg-length discrepancies or malalignments were observed. Four patients presented grade 1 Lachman scores, and of these, three presented grade 1 (glide) score at Pivot-shift; clinical stability tests were negative for all other patients. Anterior tibial shift showed a mean side-to-side difference of 2.2 mm (range 1–3 mm). The One-leg Hop test showed lower limb symmetry (99.9% ± 9.5) with the contralateral side. Overall, 4 out of 19 patients presented a re-rupture of the ACL with a median time between surgery and re-rupture of 3.9 years (range 1–7).

Conclusion
This surgical technique efficiently repairs proximal ACL tears, leading to a restoration of knee stability and a quick return to an active lifestyle, avoiding growth plate disruption.

Level of evidence
IV.

BACK

Suture tape augmentation ACL repair, stable knee, and favorable PROMs, but a re-rupture rate of 11% within 2 years.

Heusdens, C.H.W., Blockhuys, K., Roelant, E. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06399-2

Purpose
The aim of this study is to investigate clinical and magnetic resonance imaging (MRI) outcomes after anterior cruciate ligament (ACL) repair using the suture tape augmentation (STA) technique.

Methods
This prospective interventional case series included 35 patients who underwent STA ACL repair and were all followed up for 2 years. The ACL rupture was between 4 and 12 weeks old and per-operatively confirmed repairable. The International Knee Documentation Committee (IKDC), and Lysholm and Tegner scores were collected together with return to work (RTW), return to sport (RTS), re-rupture, and re-intervention rate. Lachman testing was performed and ACL healing was evaluated on MRI using a grading scale based on the ACL's morphology and signal intensity with grade 1 representing good ACL healing and grade 3 representing poor ACL healing.

Results
The number of patients who returned to their pre-rupture level for IKDC, Lysholm, and Tegner scores at 2 years of follow-up are 17/26 (65.4%), 13/25 (52.0%), and 18/27 (66.7%) patients, respectively. Median RTW and RTS periods were 5.5 weeks (range 0–32 weeks) and 6 months (range 2–22 months), respectively. The Lachman side-to-side difference decreased significantly ($P < 0.001$) to less than 3 mm after surgery and remained stable. Four patients [11.4%, 95% CI (3.2, 26.7)] suffered from a re-rupture and three other patients [8.6%, 95% CI (1.8, 23.1)] needed a re-intervention for another reason than re-rupture. MRI follow-up of 31 patients showed overall grade 1 ACL healing in 14 (45.2%) patients, grade 2 ACL healing in 11 (35.5%) patients, and grade 3 ACL healing in 6 (19.4%) patients. A higher risk of re-rupture was associated with grade 3 ACL healing at 6 months post-operatively and a pre-operative Tegner score of ≥ 7.

Conclusion
This study shows that treatment of the acute, repairable ACL with the STA technique leads to a stable knee and favorable patient-reported outcome measures (PROMs). However, the re-rupture rate of 11.4% within the 2-year follow-up is a concern.

Level of evidence
IV.

BACK

Accurate placement of a tibial tunnel significantly improves meniscal healing and clinical outcomes at 1 year after medial meniscus posterior root repair.

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

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06376-9

Purpose
A medial meniscus posterior root tear results in the loss of meniscal circumferential hoop stress and causes a pathological posteromedial extrusion of the medial meniscus. Although creating a tibial tunnel in the anatomic place improves postoperative medial meniscus posterior extrusion, no studies have evaluated the relationship between tibial tunnel position and clinical outcomes. This study aimed to evaluate how tibial tunnel positioning of medial meniscus posterior root pullout repair affects meniscal healing status and clinical outcomes.

Methods
Sixty-two patients with 64 medial meniscus posterior root tears (mean age 62.8 ± 7.9 years) who had undergone pullout repairs and second-look arthroscopies were included. All 62 patients were Lachman test negative. Three-dimensional computed tomography images of the tibial surface were evaluated using a rectangular measurement grid to assess the tibial tunnel centre and medial meniscus posterior root attachment centre. Spearman's rank correlation analysis was undertaken to determine displacement distance from the medial meniscus posterior root attachment centre to the tibial tunnel centre and a meniscal healing score, as well as clinical outcomes at 1 year post-repair.

Results
Tibial tunnel centres were located more anteriorly and medially than the medial meniscus posterior root attachment centre (mean distance 5.0 ± 2.2 mm). The mean meniscal healing score was 6.7 ± 1.8 of 10 possible points. The 1-year postoperative clinical scores showed significant improvement compared with preoperative scores for all the items. There was a significant negative correlation in the absolute distance between the medial meniscus posterior root attachment centre and the tibial tunnel centre with the meniscal healing score ($\rho = -0.39$, $p = 0.002$). Furthermore, there were significant positive correlations between the distance between the medial meniscus posterior root attachment centre and the tibial tunnel centre in the mediolateral direction and patient-based clinical outcomes ($\rho = 0.25–0.43$, $p < 0.05$).

Conclusion
Accurate placement of a tibial tunnel, especially in the mediolateral direction, significantly improved meniscal healing and clinical outcomes at 1 year following medial meniscus posterior root repair. Surgeons should create a medial meniscus posterior root tibial tunnel at the anatomic attachment with particular attention to the mediolateral position.

Level of evidence
Level IV.

BACK

Clinical outcomes of rectangular tunnel technique in posterior cruciate ligament reconstruction were comparable to the results of conventional round tunnel technique.

Kim, S.H., Kim, WS., Kim, BS. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06381-y

Purpose
To compare clinical outcomes between the conventional round and rectangular tunnel techniques in single-bundle posterior cruciate ligament (PCL) reconstruction.

Methods
Twenty-seven and 108 patients who underwent PCL reconstructions using a rectangular dilator (Group 1) and rounded tunnel reamer (Group 2), respectively, were included. The exclusion criteria were having a concomitant fracture, osteotomy, subtotal or total meniscectomy, and no remnant PCL tissue. A 4:1 propensity score matching was performed. The knee laxity on stress radiography, International Knee Documentation Committee Subjective Knee Evaluation score, Tegner activity score and Orthopädische Arbeitsgruppe Knie score were evaluated.

Results
No significant differences were found between the groups in terms of clinical scores. (n.s.) The mean posterior translations were also not significantly different between the Group 1 and 2 (3.6 ± 2.8 and 3.8. ± 3.1 mm, respectively; n.s.). However, 3 patients (11.1%) in Group 1 and 15 patients (13.8%) in Group 2 showed posterior translation of > 5 mm. The combined posterolateral corner sling technique was performed for 27 patients (100%) in Group 1 and for 96 patients (88.9%) in Group 2. We found no significant difference in rotational stability at the final follow-up. One patient was found to have a femoral condyle fracture during rectangular femoral tunnel establishment, which was healed after screw fixation, without laxity, during follow-up. The intra- and inter-observer reliabilities of the radiological measurements ranged from 0.81 to 0.89.

Conclusion
Arthroscopic anatomical remnant-preserving PCL reconstruction using a rectangular dilator showed satisfactory clinical results and stability as compared with PCL reconstruction using a conventional rounded reamer. Rectangular tunnel technique in PCL reconstruction could be a good treatment option with theoretical advantage to be anatomic.

Level of evidence
Level IV.

BACK

Anatomic double-bundle anterior cruciate ligament reconstruction could not achieve sufficient control of pivot-shift when accompanying tibial tunnel coalition.

Nukuto, K., Hoshino, Y., Yamamoto, T. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06383-w

Purpose
To evaluate the effect of tibial tunnel coalition on knee rotatory laxity and clinical outcomes after double-bundle (DB) anterior cruciate ligament (ACL) reconstruction.

Methods
Forty-one patients who underwent anatomic DB ACL reconstruction were included prospectively. Three-dimensional computed tomography of the knee joint was obtained at approximately 1 year postoperatively to determine if tunnel coalition occurred. After excluding seven cases of femoral tunnel coalition, two groups were established based on the existence of a tibial tunnel coalition. The pivot-shift test was quantitatively evaluated on the basis of tibial acceleration preoperatively and at 1 year postoperatively. Two subjective scores, the International Knee Documentation Committee (IKDC) subjective and Lysholm scores, were also collected. The pivot-shift measurement and subjective scores were compared between the ACL-reconstructed knees with and without tibial tunnel coalition. The independent t test, Pearson's chi-square test, and Student t tests were used in data analysis.

Results
Twenty-one knees had tibial tunnel coalition (group C), whereas 13 knees did not have tunnel coalition(group N). Pivot-shift was significantly diminished postoperatively in both groups on the basis of the clinical examination and quantitative evaluations ($p < 0.05$). However, there was a small but significant difference in tibial acceleration demonstrating larger pivot-shift in group C (1.0 ± 0.6 m/s2) than in group N (0.5 ± 0.3 m/s2, $p < 0.05$). No significant difference was observed in the IKDC subjective and Lysholm scores (both n.s.).

Conclusion
When the tibial tunnel coalition occurs after DB ACL reconstruction, knee rotatory laxity may not be restored in ACL-reconstructed knees, as expected in those without tunnel coalition. It is recommended that two tibial tunnels should be created separately when performing DB-ACL reconstruction to achieve better control of rotatory knee laxity.

Level of evidence
III.

BACK

Remnant preservation provides good clinical outcomes after anterior cruciate ligament reconstruction.

Huang, H., Nagao, M., Nishio, H. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06406-6

Purpose
To evaluate the association of remnant preservation (RP) and non-RP (NRP) with patient-reported outcome measures and subsequent graft rupture at a minimum 2-year follow-up after anterior cruciate ligament (ACL) reconstruction.

Methods
Patients in this retrospective study underwent primary isolated ACL reconstruction by the RP or NRP technique with a four- to five-strand hamstring tendon graft. Multivariate linear or logistic regression and Cox regression analyses were performed to compare the physical and psychological outcomes by the International Knee Documentation Committee subjective knee form (IKDC-SKF) and the Japanese Anterior Cruciate Ligament questionnaire 25 (JACL-25), respectively; satisfaction rate; and prognosticators of graft rupture.

Results
In total, 120 patients (mean age, 30.6 ± 12.7 years; 54 RP, 66 NRP) with a mean follow-up of 3.2 ± 1.6 years were enrolled in this study. At the latest postoperative follow-up, the RP group showed a mean IKDC-SKF score of 92.3 ± 8.5 and mean JACL-25 score of 13.2 ± 11.2, while these scores in the NRP group were 86.4 ± 12.2 and 24.4 ± 19.5, respectively (P = 0.016 and 0.007, respectively). No significant differences were found in the return-to-sports rate (RP vs. NRP, 79.5% vs. 67.5%) or satisfaction rate (RP vs. NRP, 89.2% vs. 74.4%) (n.s.); however, a significant difference was found in the rate of return to the preinjury sports level (RP vs. NRP, 64.1% vs. 37.5%; P = 0.014). The graft rupture rate was significantly higher in the NRP than RP group (9/66 vs. 1/54; hazard ratio 9.29; 95% confidence interval 1.04–82.81). Younger age (≤ 18 years) was the other important risk factor for graft rupture (hazard ratio 8.67; 95% confidence interval 2.02–37.13).

Conclusion
Patients who underwent ACL reconstruction with the RP technique obtained somewhat better physical and psychological results than those who underwent ACL reconstruction with the NRP technique. With respect to clinical relevance, patients treated with the RP technique may obtain better outcomes in terms of graft rupture and return to the preinjury sports level than those treated with the NRP technique, but with no differences in overall return to sports or satisfaction.

Level of evidence
IV.

BACK

Leaving the stable ramp lesion unrepaired does not negatively affect clinical and functional outcomes as well as return to sports rates after ACL reconstruction.

Albayrak, K., Buyukkuscu, M.O., Kurk, M.B. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06402-w

Purpose
To evaluate the effects of untreated stable ramp lesions on clinical and functional outcomes, return to sports rates, and complications of patients who underwent anterior cruciate ligament reconstruction.

Methods
A total of 879 patients with anterior cruciate ligament rupture were evaluated. Of these, 66 patients [33 patients with anterior cruciate ligament rupture and stable medial meniscal ramp lesion (ramp + group) and 33 patients with isolated anterior cruciate ligament rupture (ramp − group)] with a minimum 3-year of follow-up were included. Stable ramp lesions were not repaired in the ramp + group. Preoperative and postoperative Lachman and pivot-shift grades, Lysholm knee scores, International Knee Documentation Committee score and 12-Item Short Form Health Survey score were compared between groups. The return to sports rates, level of return to sports, time to return to sports and complications were compared.

Results
The mean patient age was 27.8 ± 7.2 years. The mean follow-up period was 47.3 ± 9.4 months. There were no significant differences between groups regarding preoperative and postoperative Lachman and pivot-shift grades, 12-Item Short Form Health Survey mental and physical component summary scores, Lysholm and International Knee Documentation Committee scores, and complication rates (n.s.). Although the return to sports rates (84.8% vs 90.1%) and the level of the return to sports (return to preinjury level: 75% vs 78%) were similar between groups (n.s.), the time to return to sports was significantly longer for patients with ramp lesions (11.1 ± 4.0 vs. 8.7 ± 2.5 months, p = 0.007).

Conclusion
Leaving the stable ramp lesion unrepaired does not negatively affect clinical and functional outcomes as well as return to sports rates after ACL reconstruction. However, the time to return to sports is prolonged in patients with ramp lesions In clinical practice, surgeons should be aware that repairing stable ramp lesions is not an absolute necessity and will not affect return to sport rates.

Level of evidence
Level III.

BACK

Chronological changes in cross-sectional area of the bone-patellar tendon-bone autograft after anatomic rectangular tunnel ACL reconstruction.

Kinugasa, K., Hamada, M., Yonetani, Y. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06404-8

Purpose
The purpose of this study was to evaluate the change in cross-sectional area (CSA) of bone-patellar tendon-bone (BTB) autografts up to 5 years after the anatomic rectangular tunnel (ART) anterior cruciate ligament reconstruction (ACLR). The changing pattern in CSA might be a potential indicator of the graft remodeling process.

Methods
Ninety-six (62 males, 34 females, mean age 27.0 years) patients were enrolled in this study with a total of 220 MRI scans after ART BTB ACLR to evaluate the CSA of the ACL autografts. The patients with first time unilateral ACLR that consented to undergo MRI evaluations at postoperative periods were included in this study. Intraoperatively, the CSA of the graft was measured directly using a custom-made area micrometer at the midpoint of the graft. Postoperatively, using an oblique axial slice MRI that was perpendicular to the long axis of the graft, the CSA of the graft was measured with digital radiology viewing program “SYNAPSE” at the midpoint of the graft. The postoperative MRI scans were classified into seven groups according to the period from ACLR to MRI evaluation: Group 0–2 months (m.), Group 3–6 m., Group 7–12 m., Group 1–2 years (y.), Group 2–3 y., Group 3–4 y., and Group 4 y.-. The percent increase of the CSA was calculated by dividing the postoperative CSA by the intraoperative CSA.

Results
The postoperative CSA was significantly larger than the intraoperative CSA in each group, with the exception of Group 0–2 m. The mean percent increase of the CSA in Group 0–2 m., 3–6 m., 7–12 m., 1–2 y., 2–3 y., 3–4 y., 4 y.- was 101.8 ± 18.2, 188.9 ± 27.4, 190.9 ± 43.7, 183.3 ± 28.9, 175.2 ± 27.9, 163.9 ± 19.8, 164.5 ± 25.4% respectively. The percent increase in Group 3–6 m., 7–12 m., 1–2 y., 2–3 y., 3–4 y., and 4 y.- was significantly greater than that in Group 0–2 m.

Conclusions
The CSA of the BTB autografts after the ART BTB ACLR increases rapidly by 3–6 months after ACLR, reached a maximum value of 190% at around 1 year, decreases gradually after that, and reaches a plateau at around 3 years. The current study might help clinicians to estimate an individual BTB autograft's remodeling stages when considering returning patients to sports.

Level of evidence
IV

BACK

Lateral posterior tibial slope and length of the tendon within the tibial tunnel are independent factors to predict tibial tunnel widening following anatomic anterior cruciate ligament reconstruction.

Nakazato, K., Taketomi, S., Inui, H. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06419-1

Purpose
This study aimed to conduct a multivariate analysis to identify independent factors that predict tibial tunnel widening (TW) after anatomical anterior cruciate ligament (ACL) reconstruction using bone–patellar tendon–bone (BPTB) grafts.

Methods
In total, 103 patients who underwent ACL reconstructions using BPTB grafts were included. Tunnel aperture area was measured using three-dimensional computed tomography 1 week and 1 year postoperatively, and the tibial TW was calculated. The patients were divided into group S comprising 58 patients who had tibial TW < 30% and group L comprising 45 patients who had tibial TW > 30%, retrospectively. Using univariate analyses, age, gender, body mass index, Tegner activity scale, the time between injury and surgery, tibial tunnel location, tibial tunnel angle, medial posterior tibial slope, lateral posterior tibial slope, and length of the tendon in the tibial tunnel were compared between two groups. Multivariate regression analysis was conducted to reveal the independent risk factors for the tibial TW among preoperative demographic factors and radiographic parameters that correlated with the tibial TW in the univariate analyses.

Results
Compared with those at 1 week postoperatively, mean tibial tunnel aperture areas were increased by 30.3% ± 26.8% when measured at 1 year postoperatively. The lateral posterior tibial slope was significantly larger ($p < 0.001$), and the length of the tendon within the tibial tunnel was significantly longer in group L than that in group S ($p = 0.03$) in the univariate analyses. Multivariate regression analysis showed that the increase in lateral posterior tibial slope ($p = 0.001$) and the length of the tendon within the tibial tunnel ($p = 0.03$) were predictors of the tibial TW.

Conclusions
This study showed that increased lateral posterior tibial slope and a longer tendinous portion within the tibial tunnel were independent factors that predicted the tibial TW following anatomical ACL reconstruction with a BPTB graft.

Level of evidence
III.

BACK

An accelerated 6-week return to full weight bearing after matrix-induced autologous chondrocyte implantation results in good clinical outcomes to 5 years post-surgery.

Ebert, J.R., Fallon, M., Wood, D.J. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06422-6

Purpose
To investigate the mid-term outcomes of an accelerated return to full weight bearing (WB) after matrix-induced autologous chondrocyte implantation (MACI).

Methods
This randomized study allocated 35 patients (37 knees) to a 6 week (n = 18) or 8 week (n = 19) return to full WB after MACI. Patients were evaluated pre-operatively and at 1, 2 and minimum 5 years (range 5.5–7 years), using the KOOS, SF-36, visual analogue pain scale, 6-min walk test and active knee range of motion (ROM). Peak isokinetic knee extensor and flexor strength was assessed, with limb symmetry indices (LSIs) calculated. Magnetic resonance imaging (MRI) was undertaken to evaluate the repair tissue, and an MRI composite score was calculated.

Results
While no group differences (n.s.) were observed, significant improvement was observed for all patient-reported outcome measures ($p < 0.05$), 6-min walk distance ($p = 0.040$), active knee flexion ($p = 0.002$) and extension ($p < 0.0001$) ROM, and the LSI for peak knee extensor strength ($p < 0.0001$). At final review, 87.5% (6 weeks) and 82.4% (8 weeks) of patients were satisfied overall. A non-significant decline (n.s.) was observed for the MRI composite score from 1-year post-surgery to final review, with no significant MRI-based differences (n.s.) between groups. At final review, two grafts (6-week n = 1, 8-week n = 1) demonstrated MRI-based graft failure, while an additional patient had progressed toward knee arthroplasty (8.1% failure rate at minimum 5 years).

Conclusions
The 6-week return to full WB after MACI provided comparable clinical and MRI-based outcomes beyond 5 years post-surgery, without jeopardizing the graft. This 6-week WB protocol is faster than those previously proposed and studied.

Level of Evidence
II.

BACK

Joint effusion at 6 months is a significant predictor of joint effusion 1 year after anterior cruciate ligament reconstruction.

Ogura, T., Asai, S., Akagi, R. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06433-x

Purpose
This study aimed to assess the risk factors for prolonged joint effusion in patients undergoing double-bundle anterior cruciate ligament reconstruction (ACLR).

Methods
In total, 160 patients who underwent primary ACLR using autograft hamstring between 2015 and 2018 were retrospectively reviewed. Joint effusion was defined as any grade ≥ 2 (range, 0–3) according to the MRI Osteoarthritis Knee Score (MOAKS). Univariate and multivariate logistic regression analyses were performed.

Results
The median age of the patients was 25 years (range 14–68 years) at the time of the surgery; there were 89 women and 71 men. At 1 year, 46 (28.8%) patients experienced knee joint effusion, as defined by the MOAKS. Univariate analysis revealed that age, preoperative Kellgren–Lawrence (K–L) grade, and joint effusion at 6 months were significantly associated with joint effusion at 1 year. In the multivariate analysis, joint effusion at 6 months was significantly associated with joint effusion at 1 year (odds ratio, 68.0; 95% confidence interval, 22.1–209.4). No significant difference in the Lysholm scores was observed between patients with and without joint effusion at 1 year (n.s.).

Conclusions
Joint effusion at 6 months was significantly associated with joint effusion 1 year after ACLR.

Level of evidence
III.

BACK

Combined posterolateral knee reconstruction: ACL-based injuries perform better compared to PCL-based injuries.

Lutz, P.M., Merkle, M., Winkler, P.W. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06409-3

Purpose
To compare post-operative physical activity and return to work after combined posterolateral corner (PLC) reconstruction (PLC-R) in anterior cruciate ligament (ACL)- or posterior cruciate ligament (PCL)-based injuries.

Methods
Patients aged > 18 years undergoing PLC-R using the Larson technique combined with either ACL or PCL reconstruction were included. Outcome was evaluated retrospectively after a minimum follow-up of 24 months using Tegner Activity Scale, Activity Rating Scale (ARS), Knee Injury and Osteoarthritis Outcome Score (KOOS), work intensity according to REFA classification, and a questionnaire about type of occupation and time to return to work.

Results
A total of 32 patients (11 ACL-based injuries and 21 PCL-based injuries) were included. Mean follow-up was 56 ± 26 months in the ACL-based injury group and 59 ± 24 months in the PCL-based injury group. All patients in the ACL-based injury group and 91% of patients in the PCL-based injury group returned to sports activities. Comparing pre- and post-operative values, a significant deterioration of the Tegner Activity Scale and ARS was observed in the PCL-based injury group, whereas no significant change was observed in the ACL-based injury group. KOOS subscales were generally higher in the ACL-based injury with significant differences in the subscale sports and recreational activities. Patients with ACL-based injuries returned to work significantly earlier compared to patients with PCL-based injuries (11 ± 4 weeks vs. 21 ± 10 weeks, $p < 0.05$).

Conclusion
High rates of return to sports and work can be expected after combined PLC-R in both ACL- and PCL-based injuries. However, deterioration of sports ability must be expected in PCL-based injuries. ACL-based injuries led to superior patient-reported outcomes and an earlier return to work, as compared to PCL-based injuries.

Level of evidence
Level IV.

BACK

There are differences in knee stability based on lateral extra-articular augmentation technique alongside anterior cruciate ligament reconstruction.

Hurley, E.T., Bloom, D.A., Hoberman, A. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06416-4

Purpose
The purpose of the current study is to systematically review and network meta-analyze the current evidence in the literature to ascertain if there is a superior lateral extra-articular augmentation technique in conjunction with anterior cruciate ligament (ACL) reconstruction (ACL.R) with respect to knee stability, re-rupture rates and functional outcomes.

Methods
The literature search was performed based on the PRISMA guidelines. Cohort studies comparing ACL.R to ACL.R + lateral extra-articular augmentation were included. Lateral extra-articular techniques included were anterolateral ligament reconstruction (ALL.R), Cocker-Arnold, Lemaire, Losee, Maraccaci, and McIntosh. Clinical outcomes were compared between ACL.R alone and the different lateral extra-articular augmentation techniques using a frequentist approach to network meta-analysis, with statistical analysis performed using R. The treatment options were ranked using the P-Score.

Results
Twenty-eight studies with a total of 2990 patients were included. ACL.R + Cocker-Arnold technique had the highest P-Score for ACL re-ruptures and residual pivot-shift. ACL.R + Cocker-Arnold, Lemaire, and ALL.R all significantly reduced the rate of ACL re-rupture, and residual pivot-shift, compared to ACL.R alone. There was no significant difference between any of the lateral extra-articular augmentation techniques and ACL.R alone. ALL.R had the highest P-Score for return to play, and return to play at pre-injury level.

Conclusion
This study established that ACL.R + Cocker-Arnold, Lemaire and ALL.R resulted in significantly lower ipsilateral ACL re-ruptures, as well as reduced pivot-shift, compared to ACL.R alone. Whereas, the other lateral extra-articular augmentation techniques did not reduce pivot-shift and re-rupture. Additionally, functional outcomes and return to play were comparable between those who underwent ACL.R and lateral extra-articular augmentation and ACL.R alone.

Level of evidence
III.

BACK

Knee laxity and functional knee outcome after contralateral ACLR are comparable to those after primary ACLR.

Cristiani, R., Viheriävaara, S., Janarv, PM. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06417-3

Purpose
To evaluate and compare knee laxity and functional knee outcome between primary and contralateral anterior cruciate ligament (ACL) reconstruction.

Methods
Patients who underwent primary and subsequent contralateral ACL reconstruction (ACLR) at Capio Artro Clinic, Stockholm, Sweden, from 2001 to 2017, were identified in our local database. The inclusion criteria were: the same patients who underwent primary and contralateral hamstring tendon or bone-patellar tendon-bone autograft ACLR and no associated ligament injuries. The KT-1000 arthrometer, with an anterior tibial load of 134 N, was used to evaluate knee laxity preoperatively and 6 months postoperatively. The Knee injury and Osteoarthritis Outcome Score (KOOS) was collected preoperatively and at the 1-year follow-up.

Results
A total of 326 patients with isolated primary and contralateral ACLR met the inclusion criteria (47.9% males; mean age at primary ACLR 23.9 ± 9.4 years and contralateral ACLR 27.9 ± 10.1 years). The arthrometric laxity measurements were available for primary and contralateral ACLR for 226 patients. The mean preoperative and postoperative anterior tibial translation (ATT), as well as the mean ATT reduction from preoperatively to postoperatively, did not differ significantly between primary and contralateral ACLR. The KOOS was available for primary and contralateral ACLR for 256 patients. No significant differences were found preoperatively and at the 1-year follow-up between primary and contralateral ACLR for any of the five KOOS subscales.

Conclusion
The findings in this study showed that anterior knee laxity and functional knee outcome after contralateral ACLR are comparable to those after primary ACLR. It is important for clinicians to counsel patients about their expectations after contralateral ACLR. This study shows that the results after contralateral ACLR in terms of knee laxity and functional knee outcome are predictable and likely to be comparable to those after primary ACLR.

Level of evidence
Level III.

BACK

ACL Study Group survey reveals the evolution of anterior cruciate ligament reconstruction graft choice over the past three decades.

Arnold, M.P., Calcei, J.G., Vogel, N. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06443-9

Purpose
Anterior cruciate ligament reconstruction (ACLR) aims to restore knee function and stability, allowing patients to return to the activities they enjoy and minimize further injury to the meniscus and cartilage and their ultimate progression to osteoarthritis. This study aims to present the evolution of graft choice over the last three decades according to members of the ACL Study Group (SG).

Methods
Prior to the January 2020 ACL SG biannual meeting, a survey was administered consisting of 87 questions and 16 categories, including ACLR graft choice. A similar questionnaire has been administered prior to each meeting and survey results from the past 14 meetings (1992 through 2020, excluding 1994) are included in this work. Survey responses are reported as frequencies in percentages to quantify changes in practice over the surgery period.

Results
In 1992, the most frequent graft choice for primary ACLR was bone-patellar tendon-bone (BTB) autograft, at nearly 90%. Hamstring tendon (HT) autografts have increased in popularity, currently over 50%, followed by just under 40% BTB autograft. Recently, quadriceps tendon (QT) autograft has increased in popularity since 2014.

Conclusion
Autograft (HT, BTB, QT) is an overwhelming favorite for primary ACLR over allograft. The preference for HT autograft increased over the study period relative to BTB autograft, with QT autograft gaining in popularity in recent years. Graft selection should be individualized for each patient and understanding the global trends in graft choice can help orthopaedic surgeons discuss graft options with their patients and determine the appropriate graft for each case.

Level of evidence
Level V

BACK

The majority of athletes fail to return to play following anterior cruciate ligament reconstruction due to reasons other than the operated knee.

Toale, J.P., Hurley, E.T., Hughes, A.J. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06407-5

Purpose
The purpose of this study is to evaluate the reasons why athletes do not return to play (RTP) following anterior cruciate ligament (ACL) reconstruction from a large single-centre database.

Methods
The institutional ACL registry was screened for patients that had undergone a primary ACLR and had RTP status reported at 24-month follow-up. The reasons that patients were unable to RTP at 24 months were evaluated. The ACL-Return to Sport Index (ACL-RSI) was evaluated at baseline and 24-month follow-up to evaluate psychological ability to RTP.

Results
At 2 years, 1140 patients returned to play, and 222 had not returned to play. The most common reasons athletes were unable to return was fear of reinjury (27.5%), lack of confidence in performance on return (19.4%) and external life factors (16.6%), i.e. work commitments and family reasons. Other reasons for athletes not returning to play were residual knee pain (10%) and subsequent injury (5%). The ACL-RSI score was significantly lower at diagnosis (40.3 vs. 49.3; $p = 0.003$) and 2 years (41.8 vs. 78.7; $p < 0.0001$) in athletes who did not return to play vs. those that did RTP.

Conclusion
The majority of patients that report they have not returned to play do so due to external life and psychological factors associated with their injury, including fear of reinjury and lack of confidence in performance. A small minority of patients were unable to return due to residual knee symptoms or reinjury. Pre-operative psychological assessment and intervention may identify those less likely to RTP and provide an opportunity for targeted interventions to further improve RTP outcomes.

Level of evidence
III.

BACK

Increased posterior tibial slope results in increased incidence of posterior lateral meniscal root tears in ACL reconstruction patients.

Bernholt, D., DePhillipo, N.N., Aman, Z.S. et al.

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06456-4

Purpose
While the association with acute anterior cruciate ligament (ACL) tears has been established, other risk factors and associated pathologies which occur with a concomitant lateral meniscal posterior root tear (LMPRT) are not well defined. The purpose of this study was to compare the risk factors and concomitant pathologies between patients with LMPRT and patients without LMPRTs in the setting of a primary ACL tear.

Methods
Patients with a LMPRT identified at the time of primary ACL reconstruction by a single surgeon were identified. These patients were matched by age and sex to patients undergoing primary ACL reconstruction who were not found to have lateral meniscus root tears (control group) in a 1:1 ratio. Lateral posterior tibial slope (PTS), medial PTS, lateral femoral condyle height and depth, lateral tibial plateau depth, and lateral tibial plateau subluxation were measured on MRI. Anteroposterior full-limb alignment radiographs were used to measure the medial proximal tibia angle (MPTA), the mechanical lateral distal femoral angle (mLDFA), and the mechanical weightbearing axis for the injured extremity.

Results
One-hundred three patients were included in both the LMPRT group and the matched control group. Patients with a LMPRT had a significantly steeper lateral PTS (9.1° vs. 7.0°, $p = 0.001$), a steeper medial PTS (7.0° vs. 6.0°, $p = 0.03$), and a greater lateral-to-medial slope asymmetry (2.0° vs. 1.0°, $p = 0.001$). There were no differences in lateral femoral condyle depth or height, lateral tibial plateau depth, lateral tibial plateau subluxation, MPTA, mLDFA, or mechanical weightbearing axis between groups. There was a significantly increased incidence of medial meniscus ramp lesions in patients with lateral meniscus posterior root tears compared with controls (34.0% vs. 15.5%, odds ratio: 2.8, $p = 0.002$). There were no associations with concomitant ligament injuries, medial meniscus root tears, or non-ramp tears based on case/control grouping.

Conclusion
In conclusion, LMPRTs in the setting of primary ACL injuries were associated with significantly increased lateral and medial PTSs, and increased asymmetry between lateral and medial PTSs. In addition, clinicians should be aware of the increased incidence of concurrent medial meniscal ramp lesions in patients with LMPRTs. Knowledge of these associations helps guide clinical decision-making and counselling of patients in the setting of ACL tears with concomitant LMPRTs.

Level of evidence
IV.

BACK

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Early Operative Versus Delayed Operative Versus Nonoperative Treatment of Pediatric and Adolescent Anterior Cruciate Ligament Injuries: A Systematic Review and Meta-analysis

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Background: Treatment options for pediatric and adolescent anterior cruciate ligament (ACL) injuries include early operative, delayed operative, and nonoperative management. Currently, there is a lack of consensus regarding the optimal treatment for these injuries.

Purpose/Hypothesis: The purpose was to determine the optimal treatment strategy for ACL injuries in pediatric and adolescent patients. We hypothesized that (1) early ACL reconstruction results in fewer meniscal tears than delayed reconstruction but yields no difference in knee stability and (2) when compared with nonoperative management, any operative management results in fewer meniscal tears and cartilage injuries, greater knee stability, and higher return-to-sport rates.

Study Design: Systematic review and meta-analysis; Level of evidence, 4.

Methods: A systematic search of databases was performed including PubMed, Embase, and Cochrane Library using PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines. Inclusion criteria were a pediatric and adolescent patient population (≤19 years old at surgery), the reporting of clinical outcomes after treatment of primary ACL injury, and original scientific research article. Exclusion criteria were revision ACL reconstruction, tibial spine avulsion fracture, case report or small case series (<5 patients), non–English language manuscripts, multiligamentous injuries, and nonclinical studies.

Results: A total of 30 studies containing 50 cohorts and representing 1176 patients met our criteria. With respect to nonoperative treatment, knee instability was observed in 20% to 100%, and return to preinjury level of sports ranged from 6% to 50% at final follow-up. Regarding operative treatment, meta-analysis results favored early ACL reconstruction over delayed reconstruction (>12 weeks) for the presence of any meniscal tear (odds ratio, 0.23; P = .006) and irreparable meniscal tear (odds ratio, 0.31; P = .001). Comparison of any side-to-side differences in KT-1000 arthrometer testing did not favor early or delayed ACL reconstruction in either continuous mean differences (P = .413) or proportion with difference ≥3 mm (P = .181). Return to preinjury level of competition rates for early and delayed ACL reconstruction ranged from 57% to 100%.

Conclusion: Delaying ACL reconstruction in pediatric or adolescent patients for >12 weeks significantly increased the risk of meniscal injuries and irreparable meniscal tears; however, early and delayed operative treatment achieved satisfactory knee stability. Nonoperative management resulted in high rates of residual knee instability, increased risk of meniscal tears, and comparatively low rates of return to sports.

BACK

Tranexamic Acid in Anterior Cruciate Ligament Reconstruction: A Systematic Review and Meta-analysis

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Background: Hemarthrosis after anterior cruciate ligament (ACL) reconstruction procedures can delay rehabilitation and have toxic effects on the cartilage and synovium. Tranexamic acid is widely used in adult reconstruction procedures; however, its use in ACL reconstruction is a novel topic of study.

Purpose: To analyze the available literature on hemarthrosis, pain, functional outcomes, and complications after administration of tranexamic acid in ACL reconstruction procedures.

Study Design: Meta-analysis.

Methods: A literature search was performed to retrieve randomized controlled trials examining the use of tranexamic acid at the time of ACL reconstruction procedures. The studied outcomes included postoperative joint drain output, hemarthrosis grade, visual analog scale scores for pain, range of motion, Lysholm score, postoperative rates of deep venous thrombosis, and pulmonary embolism. Outcomes were pooled to perform a meta-analysis.

Results: Five prospective randomized controlled trials met inclusion criteria for analysis. Four studies administered intravenous tranexamic acid in bolus or infusion form before ACL reconstruction, while 2 studies administered tranexamic acid via intra-articular injection. Specifically, tranexamic acid was administered intravenously (preoperative 15-mg/kg bolus 10 minutes before tourniquet inflation with or without 10 mg/kg/h for 3 hours postoperatively) or intra-articularly (10 mL [100 mg/mL] intraoperatively), and 1 study consisted of tranexamic acid administration in combined intravenous and intra-articular forms (15-mg/kg bolus 10 minutes before tourniquet inflation and intra-articular 3 g 10 minutes before tourniquet deflation). Tranexamic acid use in ACL reconstruction cases resulted in a mean reduction of 61.5 mL in postoperative drain output at 24 hours (95% CI, –95.51 to −27.46; P = .0004), lower hemarthrosis grade (P < .00001), improved Lysholm scores, and reduction in visual analog scale scores for pain (−1.96 points; 95% CI, −2.19 to −1.73; P < .00001) extending to postoperative week 6. Range of motion was improved in the immediate postoperative period, and the need for joint aspiration within 2 weeks was reduced (P < .001). There was no difference in venous thromboembolic event rate between the experimental and control groups.

Conclusion: The use of intravenous tranexamic acid in ACL reconstruction surgery results in reduced joint drain output and hemarthrosis and improved pain scores and range of motion in the initial postoperative period without increased complications or thromboembolic events.

BACK

Can We Eliminate Opioids After Anterior Cruciate Ligament Reconstruction? A Prospective, Randomized Controlled Trial

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Background: Multimodal pain protocols have been effective for postsurgical pain control; however, no published protocol has been effective in eliminating opioid consumption.

Purpose: To compare a multimodal nonopioid pain protocol versus traditional opioid medication for postoperative pain control in patients undergoing anterior cruciate ligament reconstruction (ACLR).

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

Methods: A total of 90 patients undergoing primary ACLR were assessed for participation. We performed a prospective, randomized controlled trial in accordance with the CONSORT (Consolidated Standards of Reporting Trials) 2010 statement. The study arms were a multimodal nonopioid analgesic protocol (acetaminophen, ketorolac, diazepam, gabapentin, and meloxicam) and a standard opioid regimen (hydrocodone-acetaminophen), and the primary outcome was postoperative visual analog scale (VAS) pain scores for 10 days. Secondary outcomes included patient-reported outcomes, complications, and satisfaction. The observers were blinded, and the patients were not blinded to the intervention.

Results: A total of 9 patients did not meet inclusion criteria, and 19 patients declined participation. Thus, 62 patients were analyzed, with 28 patients randomized to the opioid group and 34 to the multimodal nonopioid group. Patients receiving the multimodal nonopioid pain regimen demonstrated significantly lower VAS scores compared with patients who received opioid pain medication ($P < .05$). Patients were administered the Patient-Reported Outcomes Measurement and Information System Pain Interference Short Form, and no significant difference was found in patients' preoperative scores (opioid group, 58.6 ± 7.9; multimodal nonopioid group, 57.5 ± 7.4; $P = .385$) and 1-week postoperative scores (opioid group, 66.3 ± 8.2; multimodal nonopioid group, 61.4 ± 8.8; $P = .147$). When we adjusted for possible confounders (age, sex, body mass index, graft type), no significant differences in pain control were found between the 2 groups. The most common adverse effects for both groups were drowsiness and constipation, with no difference between the groups. All patients in the multimodal nonopioid group reported satisfactory pain management.

Conclusions: A multimodal nonopioid pain protocol provided at least equivalent pain control compared with traditional opioid analgesics in patients undergoing ACLR. Minimal side effects, which did not differ between groups, were noted, and all patients reported satisfaction with their pain management.

BACK

Graft Survivorship After Anterior Cruciate Ligament Reconstruction Based on Tibial Slope

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Background: Increased tibial slope (TS) is believed to be a risk factor for anterior cruciate ligament (ACL) tears. Increased TS may also promote graft insufficiency after ACL reconstruction.

Purpose: To delineate the relationship between TS and single as well as multiple graft insufficiencies after ACL reconstruction.

Study Design: Cohort study; Level of evidence 3.

Methods: We retrospectively identified 519 patients who had sustained ACL graft insufficiency after primary or revision ACL reconstruction (1 graft insufficiency, group A; 2 graft insufficiencies, group B; and ≥3 graft insufficiencies, group C). In addition, a subgroup analysis was conducted in 63 patients who received all surgical interventions by 2 specialized high-volume, single-center ACL surgeons. TS was measured by an observer with >10 years of training using lateral knee radiographs, and intrarater reliability was performed. Multiple logistic and univariate Cox regression was used to assess the contribution of covariates (TS, age, sex, and bilateral ACL injury) on repeated graft insufficiency and graft survival.

Results: The study included 347 patients, 119 female and 228 male, who were 24 ± 9 years of age at their first surgery (group A, n = 260; group B, n = 62; group C, n = 25). Mean TS was 9.8°± 2.7° (range, 3°-18°). TS produced the highest adjusted odds ratio (1.73) of all covariates for repeated graft insufficiency. A significant correlation was found between TS and the number of graft insufficiencies (r = 0.48; P < .0001). TS was significantly lower in group A (9.0°± 2.3°) compared with group B (12.1°± 2.5°; P < .0001) and group C (12.0°± 2.6°; P < .0001). A significant correlation was seen between the TS and age at index ACL tear (r = −0.12; P = .02) as well as time to graft insufficiency (r = −0.12; P = .02). A TS ≥12° had an odds ratio of 11.6 for repeated ACL graft insufficiency.

Conclusion: The current results indicate that patients with a markedly increased TS were at risk of early and repeated graft insufficiency after ACL reconstruction. Because the TS is rarely accounted for in primary and revision ACLR, isolated soft tissue procedures only incompletely address recurrent graft insufficiency in this subset of patients.

BACK

Differences in Baseline Characteristics and Outcome Among Responders, Late Responders, and Never-Responders After Anterior Cruciate Ligament Reconstruction

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Background: Loss to follow-up in registry studies might affect generalizability and interpretation of results.

Purpose: To evaluate the effect of nonresponder bias in our anterior cruciate ligament (ACL) registry.

Study Design: Case-control study; Level of evidence, 3.

Methods: A total of 2042 patients with ACL reconstruction in the Hospital for Special Surgery ACL Registry between 2009 and 2013 were included in the study. Patients who completed the patient-reported outcome measures at 2 or 5 years were considered responders (n = 808). Baseline data and patient characteristics were compared between responders and nonresponders (n = 1234). Both responders and nonresponders were contacted and invited to complete the International Knee Documentation Committee (IKDC) and Marx scores electronically and respond to questions regarding return to sports and subsequent surgeries. Nonresponders who completed the questionnaires after reminders were considered late responders. The remaining nonresponders were considered never-responders. The late responders (n = 367) completed the questionnaires after a mean follow-up of 7.8 years (range, 6.7-9.6 years), while follow-up for the responders was 6.8 years (range, 5.0-9.7 years). Responders and late responders were then compared in terms of differences in IKDC and Marx scores from baseline to final follow-up.

Results: Nonresponders were younger (28.5 vs 31.5 years; P < .001) and more often male (60% vs 53%; P = .003) compared with responders. Responders had a higher level of education and were more likely to be White (79% vs 74%; P = .04). There were no substantial differences in patient characteristics or baseline IKDC and Marx scores between the late responders and never-responders. There were no statistically significant differences in patient-reported outcomes, return to sports, or subsequent surgeries between responders and late responders at a mean follow-up time of 8.8 years (range, 6.7-9.7 years). Repeat email reminders and telephone calls increased response rate by 18% (from 40% to 58%).

Conclusion: There was no difference in clinical outcome as evaluated using IKDC and Marx scores between responders and late responders.

BACK

Femoral and Tibial Bony Risk Factors for Anterior Cruciate Ligament Injuries Are Present in More Than 50% of Healthy Individuals

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Background: Anterior cruciate ligament (ACL) injuries are multifactorial events that may be influenced by morphometric parameters. Associations between primary ACL injuries or graft ruptures and both femoral and tibial bony risk factors have been well described in the literature.

Purpose: To determine values of femoral and tibial bony morphology that have been associated with ACL injuries in a reference population. Further, to define interindividual variations according to participant demographics and to identify the proportion of participants presenting at least 1 morphological ACL injury risk factor.

Study Design: Cross-sectional study; Level of evidence, 3.

Methods: Computed tomography scans of 382 healthy participants were examined. The following bony ACL risk factors were analyzed: notch width index (NWI), lateral femoral condylar index (LFCI), medial posterior plateau tibial angle (MPPTA), and lateral posterior plateau tibial angle (LPPTA). The proportion of this healthy population presenting with at least 1 pathological ACL injury risk factor was determined. A multivariable logistic regression model was constructed to determine the influence of demographic characteristics.

Results: According to published thresholds for ACL bony risk factors, 12% of the examined knees exhibited an intercondylar notch width <18.9 mm, 25% had NWI <0.292, 62% exhibited LFCI <0.67, 54% had MPPTA <83.6°, and 15% had LPPTA <81.6°. Only 14.4% of participants exhibited no ACL bony risk factors, whereas 84.5% had between 2 and 4 bony risk factors and 1.1% had all bony risk factors. The multivariate analysis demonstrated that only the intercondylar notch width ($P < .0001$) was an independent predictor according to both sex and ethnicity; the LFCI ($P = .012$) and MMPTA ($P = .02$) were independent predictors according to ethnicity.

Conclusion: The precise definition of bony anatomic risk factors for ACL injury remains unclear. Based on published thresholds, 15% to 62% of this reference population would have been considered as being at risk. Large cohort analyses are required to confirm the validity of previously described morphological risk factors and to define which participants may be at risk of primary ACL injury and reinjury after surgical reconstruction.

BACK

Regional Differences in Anterior Cruciate Ligament Signal Intensity After Surgical Treatment

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Background: Magnetic resonance–based measurements of signal intensity have been used to track healing of surgically treated anterior cruciate ligaments (ACLs). However, it is unknown how the signal intensity values in different regions of the ligament or graft change during healing.

Hypotheses: (1) Normalized signal intensity of the healing graft or repaired ACL is heterogeneous; (2) temporal changes in normalized signal intensity values differ among the tibial, middle, and femoral regions; and (3) there are no differences in regional normalized signal intensity values 2 years postoperatively among grafts, repaired ACLs, and contralateral native ACLs.

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

Methods: Magnetic resonance imaging scans were analyzed from patients in a trial comparing ACL reconstruction (n = 35) with bridge-enhanced ACL repair (n = 65). The ACLs were segmented from images acquired at 6, 12, and 24 months postoperatively and were partitioned into 3 sections along the longitudinal axis (femoral, middle, and tibial). Linear mixed modeling was used to compare location-specific differences in normalized ligament signal intensity among time points (6, 12, and 24 months) and groups (ACL reconstruction, repair, and contralateral native ACL).

Results: For grafts, the middle region had a higher mean normalized signal intensity when compared with the femoral region at all time points ($P < .01$) but compared with the tibial region only at 6 months ($P < .01$). For repaired ACLs, the middle region had a higher mean normalized signal intensity versus the femoral region at all time points ($P < .01$) but versus the tibial region only at 6 and 12 months ($P < .04$). From 6 to 24 months, the grafts showed the greatest reduction in normalized signal intensity in the femoral and middle regions (vs tibial regions; $P < .01$), while there were no regional differences in repaired ACLs. At 2 years after surgery, repaired ACLs had a lower normalized signal intensity in the tibial region as compared with reconstructed grafts and contralateral native ACLs ($P < .01$).

Conclusion: The results suggest that graft remodeling is location specific. Repaired ACLs were more homogeneous, with lower or comparable normalized signal intensity values at 2 years as compared with the contralateral native ACL and reconstructed grafts.

BACK

The Reliability of 3-T Magnetic Resonance Imaging to Identify Arthroscopic Features of Meniscal Tears and Its Utility to Predict Meniscal Tear Reparability

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Background: The ability to predict meniscus tear reparability based on preoperative magnetic resonance imaging (MRI) is desirable for postoperative planning; however, the accuracy of predictive methods varies widely within the orthopaedic and radiology literature.

Purpose/Hypothesis: The purpose was to determine if the higher resolution offered by 3-T MRI improves the accuracy of predicting reparability compared with previous investigations using 1.5-T MRI. Our hypothesis was that a higher field strength of 3-T MRI would result in improved reliability assessments and predictions of meniscus tear reparability compared with previous studies utilizing a 1.5-T MRI platform.

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

Methods: A total of 44 patients who underwent meniscus repair were matched by age, sex, and body mass index to 43 patients who underwent partial meniscectomy. Overall, 2 orthopaedic surgeons and 2 musculoskeletal radiologists independently and blindly reviewed the preoperative MRI scans for all 87 patients. For each meniscus tear, reviewers evaluated the following criteria: tear pattern, tear length, tear distance from the meniscocapsular junction, tear thickness, and integrity of any inner meniscal fragment. The resultant data were then applied to 5 different approaches for predicting meniscal reparability.

Results: The accuracy for all examined prediction methods was poor, ranging from 55% (3-point method) to 72% (classification tree method) among all reviewers. Interobserver reliability for examined criteria was also poor, with kappa values ranging from 0.07 (inner meniscal fragment status) to 0.40 (tear pattern).

Conclusion: MRI continues to be a poor predictor of meniscus tear reparability as assessed by arthroscopic criteria, even when using higher resolution 3-T scanners. Interobserver reliability in this setting can be poor, even among experienced clinicians.

BACK

One Bony Morphology, Two Pathologic Entities: Sex-Based Differences in Patients With Borderline Hip Dysplasia Undergoing Hip Arthroscopy

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Background: Sex-based differences have been largely uncharacterized for patients with borderline hip dysplasia (BHD) undergoing hip arthroscopy.

Purpose: To evaluate for sex-based differences in clinical and pathologic characteristics as well as surgical outcomes in patients with BHD undergoing hip arthroscopy.

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

Methods: Between January 2011 and December 2018, data were prospectively collected on all patients with BHD undergoing primary hip arthroscopy. Patients were included if they had preoperative and minimum 2-year postoperative scores for the modified Harris Hip Score (mHHS), Non-arthritic Hip Score (NAHS), and visual analog scale for pain. Patients with previous ipsilateral hip conditions or surgery, Tönnis grade >1, lateral center-edge angle <18° or >25°, or workers' compensation status were excluded. Patients were then divided by sex and propensity score matched in a 1:1 ratio for body mass index, age, and Tönnis grade. The rates of patients who achieved the minimal clinically important difference were recorded for the mHHS and NAHS. The rates of achieving the patient acceptable symptomatic state for the mHHS were calculated.

Results: A total of 344 hips met the inclusion criteria, and 317 hips (92%) had adequate follow-up. Propensity score matching created cohorts of 109 male and 109 female patients. Male patients had significantly higher preoperative average alpha angles (69.79° vs 58.17°, P < .001), more often requiring a femoroplasty (97.2% vs 83.5%, P < .001), and had higher rates of complex labral tearing (50.5% vs 33.0%, P < .001). Male patients also had higher rates of grade 3 and 4 acetabular labral articular disruption (62.4% vs 19.3%, P < .001) and higher rates of grade 3 and 4 acetabular cartilage injury (59.6% vs 20.2%, P < .001) requiring a microfracture more frequently (32.1% vs 7.3%, P < .001). Female patients more typically had painful internal snapping requiring iliopsoas fractional lengthening (60.6% vs 32.1%, P < .001). Female patients also underwent capsular plication more regularly to address hip instability (79.8% vs 45.9%, P < .001). Male and female patients showed significant improvements in all outcome scores after surgery (P < .001). Female patients achieved the minimal clinically important difference for the NAHS at higher rates (85.3% vs 71.6%, P = .020).

Conclusion: Female and male patients with BHD who underwent hip arthroscopy achieved favorable outcomes but had notably dissimilar pathology. Hence, although they share similar acetabular bony morphology, male and female patients with BHD may represent 2 very different pathologic entities.

BACK

Equality in Hip Arthroscopy Outcomes Can Be Achieved Regardless of Patient Socioeconomic Status

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Background: Access to quality health care and treatment outcomes can be affected by patients' socioeconomic status (SES).

Purpose: To evaluate the effect of patient SES on patient-reported outcome measures (PROMs) after arthroscopic hip surgery.

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

Methods: Demographic, radiographic, and intraoperative data were prospectively collected and retrospectively reviewed on all patients who underwent hip arthroscopy for femoroacetabular impingement syndrome (FAIS) and labral tear between February 2008 and September 2017 at one institution. Patients were divided into 4 cohorts based on the Social Deprivation Index (SDI) of their zip code. SDI is a composite measure that quantifies the level of disadvantage in certain geographical areas. Patients had a minimum 2-year follow-up for the modified Harris Hip Score (mHHS), Nonarthritic Hip Score (NAHS), International Hip Outcome Tool—12, and visual analog scale (VAS) for both pain and satisfaction. Rates of achieving the minimal clinically important difference (MCID) and patient acceptable symptom state (PASS) were calculated for the mHHS, NAHS, and VAS pain score. Rates of secondary surgery were also recorded.

Results: A total of 680 hips (616 patients) were included. The mean follow-up time for the entire cohort was 30.25 months. Division of the cohort into quartiles based on the SDI national averages yielded 254 hips (37.4%) in group 1, 184 (27.1%) in group 2, 148 (21.8%) in group 3, and 94 (13.8%) in group 4. Group 1 contained the most affluent patients. There were significantly more men in group 4 than in group 2, and the mean body mass index was greater in group 4 than in groups 1 and 2. There were no differences in preoperative radiographic measurements, intraoperative findings, or rates of concomitant procedures performed. All preoperative and postoperative PROMs were similar between the groups, as well as in the rates of achieving the MCID or PASS. No differences in the rate of secondary surgeries were reported.

Conclusion: Regardless of SES, patients were able to achieve significant improvements in several PROMs after hip arthroscopy for FAIS and labral tear at the minimum 2-year follow-up. Additionally, patients from all SES groups achieved clinically meaningful improvement at similar rates.

BACK

Labral Tear Management in Patients Aged 40 Years and Older Undergoing Primary Hip Arthroscopy: A Propensity-Matched Case-Control Study With Minimum 2-Year Follow-up

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Background: Previous literature has suggested that primary acetabular labral reconstruction leads to lower secondary surgery rates than does labral repair for patients aged ≥40 years.

Purpose: To report minimum 2-year patient-reported outcome (PRO) scores, survivorship, and secondary surgeries in patients aged ≥40 years who underwent primary hip arthroscopy with labral reconstruction compared with a propensity-matched primary labral repair group.

Study Design: Case-control study; Level of evidence, 3.

Methods: Data were prospectively collected and retrospectively reviewed for patients who underwent a primary hip arthroscopy for femoroacetabular impingement syndrome between January 2014 and June 2018. Patients aged ≥40 years who underwent a labral reconstruction or a labral repair and had preoperative and minimum 2-year PROs for the modified Harris Hip Score, Nonarthritic Hip Score, and visual analog scale (VAS) for pain were included. Patients with previous ipsilateral hip conditions and surgery, Tönnis grade >1, hip dysplasia, or workers' compensation status were excluded. Patients in the reconstruction group were propensity matched 1:2 to patients in the repair group based on age, sex, and body mass index. Secondary surgeries and achievement of the minimal clinically important difference (MCID), patient acceptable symptom state (PASS), and maximum outcome improvement (MOI) were recorded.

Results: A total of 53 and 106 hips were included in the labral reconstruction and repair groups, respectively. The average follow-up time was 37.6 months. The average ages for the reconstruction and repair groups were 48.01 ± 5.4 years and 48.61 ± 6.0 years, respectively. Both groups achieved significant improvements in all PROs at a minimum of 2 years, with similar achievements of MCID, PASS, and MOI, and comparable secondary surgery rates.

Conclusion: Patients aged ≥40 years who received primary labral repair and primary labral reconstruction achieved similar significant improvements in all PROs, VAS pain, and patient satisfaction at the minimum 2-year follow-up, with comparable rates of secondary surgeries and achieving MCID, PASS, and MOI. Based on these findings, labral repair remains the gold standard treatment for viable labrum in this population group, while reconstruction is a useful alternative for irreparable labrum.

BACK

Fascia Iliaca Block for Postoperative Pain Control After Hip Arthroscopy: A Systematic Review of Randomized Controlled Trials

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Background: Various analgesic modalities have been used to improve postoperative pain in patients undergoing hip arthroscopy.

Purpose: To systematically review the literature to compare the efficacy of the fascia iliaca block (FIB) with that of other analgesic modalities after hip arthroscopy in terms of postoperative pain scores and analgesic consumption.

Study Design: Systematic review.

Methods: A systematic review was performed by searching PubMed, the Cochrane Library, and Embase up to April 2020 to identify randomized controlled trials that compared postoperative pain and analgesic consumption in patients after hip arthroscopy with FIB versus other pain control modalities. The search phrase used was “hip arthroscopy fascia iliaca randomized.” Patients were evaluated based on postoperative pain scores and total postoperative analgesic consumption.

Results: Five studies (3 level 1, 2 level 2) were identified that met inclusion criteria, including 157 patients undergoing hip arthroscopy with FIB (mean age, 38.3 years; 44.6% men) and 159 patients among the following comparison groups: lumbar plexus block (LPB), intra-articular ropivacaine (IAR), local anesthetic infiltration (LAI), saline placebo, and a no-block control group (overall mean age, 36.2 years; 36.5% men). No significant differences in pain scores were reported in the postanesthesia care unit (PACU) between the FIB and LPB (3.4 vs 2.9; P = .054), IAR (7.7 vs 7.9; P = .72), control group (no FIB: 4.1 vs 3.8; P = .76); or saline placebo (difference, –0.2 [95% CI, –1.1 to 0.7]). One study reported significantly higher pain scores at 1 hour postoperation in the FIB group compared with the LAI group (5.5 vs 3.4; P = .02). Another study reported significantly greater total analgesic consumption (in morphine equivalent dosing) in the PACU among the FIB group compared with the LPB group (20.8 vs 17.0; P = .02). No significant differences were observed in total PACU analgesic consumption between FIB and other analgesic modalities.

BACK

Miscellaneous

BACK