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4B Arthroscopy founders: D.P. ter Meulen, B. Lubberts

Contact 4@erasmusmc.nl

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Arthroscopy, Volume 41, Issue 2

Lower Risk of Postoperative Complications and Rotator Cuff Retear Associated With Semaglutide Use in Patients with Type II Diabetes Mellitus Undergoing Arthroscopic Rotator Cuff Repair

A.E. Seddio, J. Moran

DOI: https://doi.org/10.1016/j.arthro.2024.09.057

Purpose: To investigate the potential impact of preoperative semaglutide use (the active agent in Ozempic and Wegovy) on 90-day postoperative outcomes and 2-year rotator cuff retear after arthroscopic rotator cuff repair (ARCR) in patients with type II diabetes mellitus (T2DM).

Methods: Patients with T2DM undergoing primary ARCR were identified from the PearlDiver database using administrative billing codes. Exclusion criteria included patients <18 years old; previous RCR; concurrent nonrotator cuff−related arthroscopic shoulder procedures; any traumatic, neoplastic, or infectious diagnoses within 90 days before surgery; and <90-days follow-up. Patients with T2DM using semaglutide within 1 year of ARCR ([+]semaglutide) were matched 1:4 with patients with T2DM who did not ([−]semaglutide) by age, sex, Elixhauser Comorbidity Index, diabetes complications, obesity, tobacco, insulin, and metformin use. Occurrence of any adverse events (AAE), severe adverse events (SAE), and minor adverse events (MAE) within 90 days were compared by multivariable logistic regression. The 2-year retear was assessed by Kaplan-Meier survival analysis and compared by log-rank test.

Results: There were 1,094 ARCR (+)semaglutide and 4,110 ARCR (−)semaglutide patients meeting inclusion criteria after matching. The incidence of AAE for the ARCR (−)semaglutide versus ARCR (+)semaglutide patients was 27.4% versus 11.0%, SAE was 10.5% versus 3.5%, and MAE was 22.0% versus 8.5%, respectively ($P < .001$ for all). ARCR (−)semaglutide patients had a greater odds ratio of AAE (3.65, $P < .001$) and SAE (3.62, $P < .001$), including surgical-site infection (2.22, $P = .049$), venous thromboembolism (3.10, $P < .001$), sepsis (3.87, $P < .001$), and cardiac events (3.96, $P < .001$), as well as greater odds of MAE (3.59, $P < .001$), including urinary tract infection (3.27), pneumonia (3.88), acute kidney injury (3.91), and emergency department visits (2.51) ($P < .001$ for all). In addition, (−)semaglutide patients revealed greater 2-year retear vs (+)semaglutide patients (18.3% vs 12.5%, respectively) ($P < .001$).

Conclusions: Preoperative semaglutide use for patients with T2DM undergoing ARCR was associated with decreased odds of minor and serious 90-day adverse events and lower 2-year rotator cuff retear.

Level of Evidence: Level III, retrospective comparative study

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Arthroscopic Surgery Combined With Platelet-Rich Plasma Does Not Significantly Improve Pain, Function, Complications, and Retear Rate Compared With Arthroscopic Surgery Alone for Full-Thickness Rotator Cuff Tears: A Systematic Review and Meta-analysis

X. Xue, C. Xiao

DOI: https://doi.org/10.1016/j.arthro.2024.03.024

Purpose: To evaluate the effectiveness and safety of arthroscopic surgery combined with platelet-rich plasma (PRP) compared with arthroscopic surgery alone in the treatment of patients with full-thickness rotator cuff tears.

Methods: The Cochrane Library, PubMed, Embase, Scopus, EBSCO, Web of Science, China National Knowledge Infrastructure, and Wanfang Database were systematically searched from inception to November 2023. Subject words combined with free words were used to collect randomized controlled trials focusing on arthroscopic surgery combined with PRP in the treatment of full-thickness rotator cuff tears. The assessment of evidence quality employed the Cochrane Collaboration risk of bias tool, and data analysis was performed using RevMan 5.3 software.

Results: A total of 9 studies with 537 patients were included. The meta-analysis revealed that compared with the arthroscopic surgery alone group, the summary result of University of California Los Angeles score scores in the arthroscopic combined with PRP group was (mean difference [MD] = 1.08, 95% confidence interval [CI] 0.19∼1.97, P = .02), subgroup analysis of surgical suture method visual analog scale (VAS) single-row (MD = –1.00, 95% CI –1.50 to –0.50, P < .0001), VAS double-row (MD = –0.10, 95% CI –0.17 to –0.02, P = .02), and Constant-Murley score single-row (MD = 3.49, 95% CI 0.32∼6.66, P = .03), the difference was statistically significant, and the differences in VAS, Constant-Murley score, and Quick Disabilities of the Arm, Shoulder and Hand, complications, and retear rate were not statistically significant.

Conclusions: Patients undergoing arthroscopic repair combined with PRP treatment showed no difference in pain, function, complications, and retear rate compared with those treated with arthroscopic surgery alone.

Level of Evidence: Level II, systematic review and meta-analysis of Level I and II evidence studies

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Arthroscopy-assisted procedure provides less residual horizontal instability and optimal coracoid tunnel creation with less radiation exposure compared to percutaneous procedure after endo-button fixation of type III AC joint dislocations

S. İğrek, Y. Şahbat

DOI: https://doi.org/10.1002/ksa.12358

Purpose: The aim of this study was to evaluate the postoperative radiological and functional results of patients treated with arthroscopy-assisted (AA) and percutaneous (P) procedures using endo-button for type III acromioclavicular joint dislocations with a minimum 1-year follow-up. The study hypothesis was that the AA technique would provide more favourable coracoid tunnels.

Methods: This retrospective study included patients who underwent surgery between 2017 and 2022. Computed tomography images taken immediately postoperatively of all the patients were analysed to group coracoid tunnels as optimal or suboptimal based on orientation and placement within the coracoid base. Residual horizontal instability was assessed using the bilateral Alexander view at the final follow-up. Shoulder functions were evaluated at the final follow-up examination.

Results: Of the 63 patients, 39 underwent surgery using the percutaneous procedure and 24 with the AA procedure. Surgical duration was significantly longer in the AA group (AA: 61.1 ± 5.9 min; P: 34.7 ± 5.6 min) ($p = 0.001$; 95% confidence interval [CI]: 23.3–29.3), whereas fluoroscopy time was longer in the percutaneous group (AA: 2.0 ± 0.8 s; P: 15.7 ± 3.9 s) ($p = 0.001$; 95% CI: −14.9 to 12.3). Optimal coracoid tunnels were more frequently observed in the AA group ($p = 0.001$; 95% CI: 7.4−137.8). There was no significant difference in functional scores between the groups (n.s.). Postoperative horizontal instability was more common in the percutaneous procedure ($p = 0.013$; 95% CI: 8.3–39.2).

Conclusion: Although no difference was detected between the methods in terms of complications and functional results, the higher frequency of residual horizontal instability, the high risk of suboptimal tunnel creation and greater radiation exposure were seen to be the most important disadvantages of the percutaneous technique. During surgery, such technical problems related to the percutaneous method should be kept in mind and care should be taken about the orientation of the coracoid tunnel.

Level of Evidence: Level III.

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Comparative study of two different horizontal stabilisation methods in arthroscopically assisted coracoclavicular stabilisation for acute acromioclavicular joint dislocations—Good clinical outcome and no correlation to recurrent anteroposterior instability

M. Kimmeyer, K. Rapp

DOI: https://doi.org/10.1002/ksa.12374

Purpose: The hypothesis of this study was that acromioclavicular K-wire transfixation is noninferior to horizontal FiberTape cerclage in terms of vertical and horizontal stability in the short follow-up period of acute acromioclavicular joint (ACJ) dislocations fixed with an arthroscopically assisted coracoclavicular single bundle endobutton cerclage system. The secondary aim was to investigate the impact of postoperative recurrent instability on clinical outcomes in these populations.

Methods: In this consecutive clinical trial, all patients who underwent surgery for acute AC joint dislocation between January 2017 and December 2021 were included. Two groups were formed according to the additional AC stabilisation technique (K-wire group, cerclage group). Clinical examination and bilateral radiologic analysis (Zanca stress view, Alexander view) were performed with a follow-up period of at least 12 months. Satisfaction, return to sports, active range of motion, global shoulder scores and specific shoulder scores including constant score, disabilities of the arm, shoulder and hand (DASH) score and ACJ instability score (ACJI) were evaluated. Complications, including recurrent instability, and revision rate were assessed.

Results: Included were 59 patients (32 K-wire group, 27 cerclage group, 92% male, median follow-up 33 months). No significant differences were found in the clinical outcome parameters between the different techniques, except for the DASH value (superior in the K-wire group). Recurrent anteroposterior instability was radiographically detected in 27% of patients. No correlation was found between anteroposterior instability and clinical outcome parameters. There was no revision surgery due to chronic ACJ instability.

Conclusion: Horizontal ACJ stabilisation with temporary K-wire transfixation does not appear to be inferior to a FiberTape cerclage technique in acute ACJ dislocations stabilised in an arthroscopically assisted single bundle DogBone technique. Recurrent ACJ instability detected radiographically does not necessarily correlate with the functional outcome and can be well compensated.

Level of Evidence: Level III.

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American Journal of Sports Medicine (AJSM), Volume 53, Issue 2

Reconstruction of the Superior Capsule Using Peroneus Longus Tendon Graft Combined With Transposition of Biceps Tendon for Irreparable Massive Rotator Cuff Tears

Zhou Y, Chen L, Bai F, Yang X, Fu W.

DOI: https://doi.org/10.1177/03635465241303153

Background: Traditional superior capsular reconstruction (SCR) with biceps tendon transposition (TB) alone for irreparable massive rotator cuff tears (IMRCTs) has demonstrated a high retear rate, highlighting the need for alternative approaches. Therefore, SCR using a peroneus longus tendon graft (PLG) combined with TB (PLG-TB) should be clinically studied.

Purpose: To compare the clinical and radiological outcomes of SCR using the PLG-TB technique versus the TB technique alone for IMRCT.

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

Methods: Between February 2017 and March 2022, 94 patients were diagnosed with IMRCT; 45 patients underwent SCR using the TB technique (group 1), and 49 patients underwent SCR using the PLG-TB technique (group 2). The choice of technique was based on tendon damage severity and patient preference. After a minimum follow-up period of 2 years, postoperative clinical outcomes were compared using the American Shoulder and Elbow Surgeons (ASES); University of California, Los Angeles (UCLA); Constant; and visual analog scale (VAS) for pain scores as well as the shoulder range of motion. The integrity of tendons, acromiohumeral distance, and retear was evaluated through magnetic resonance imaging (MRI).

Results: The mean follow-up times were 35.2 ± 4.2 months for group 1 and 34.1 ± 3.2 months for group 2. There was a significant improvement observed in all clinical outcomes in both groups from the baseline preoperative evaluations to the final follow-up assessments (P = .001 for ASES score, UCLA score, Constant score, VAS score, forward flexion, abduction, and external rotation). Shoulder abduction in group 2 showed statistically significant mean improvements at the postoperative 3-month, 6-month, and final follow-ups compared with group 1 (3 months: 105.17°± 7.13° vs 89.34°± 7.34° [P = .001]; 6 months: 138.14°± 9.12° vs 107.35°± 8.54° [P = .001]; final follow-up: 157.35°± 8.11° vs 135.31°± 7.01° [P = .001]). The tendon integrity at the final follow-up (Sugaya MRI grades 1/2/3/4/5) was significantly better in group 2 (30/6/6/4/3) compared with group 1 (11/13/5/6/10) (P = .014). Additionally, the tendon retear rate was lower in group 2 (7/49; 14.29%) than in group 1 (16/45, 35.56%) (P = .015).

Conclusion: Both surgical techniques led to acceptable clinical outcomes in patients with IMRCT. However, using the PLG-TB technique for SCR was associated with lower retear rates and enhanced abduction function outcomes compared with the TB technique for SCR.

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Arthroscopic Repair of Bursal-Sided Partial-Thickness Rotator Cuff Tears: Literature Review and Meta-analysis

Dalmas Y, Hao KA, Barret H, Mansat P, Bonnevialle N.

DOI: https://doi.org/10.1177/03635465241239883

Background: The surgical management of bursal-sided partial-thickness rotator cuff tendon tears is controversial. The 2 methods used are in situ repair (ISR), preserving the contingent of intact articular tendon fiber, or tear completion before repair (TCBR) according to the operating surgeon's usual technique. No study with sufficient power has demonstrated a superior technique.

Purpose: The 2 techniques are equivalent in terms of clinical outcome and tendon healing.

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

Methods: A systematic review was carried out in accordance with PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) recommendations on the PubMed, Embase, and Cochrane Library databases from January 2003 through March 2023. Only articles dealing with Ellman grade 3 bursal-sided tears with a minimum follow-up of 1 year were included. Primary endpoints were American Shoulder and Elbow Surgeons and Constant-Murley scores, pain on a visual analog scale, and retear rate. The secondary endpoint was recovery of active mobility.

Results: Twelve studies were included with overlap of 3, leaving 8 ISR studies (360 patients; mean follow-up, 30 months) and 7 TCBR studies (224 patients; mean follow-up, 51 months) for statistical analysis. No significant clinical differences were found when comparing mean American Shoulder and Elbow Surgeons (92.2 [95% CI, 88.1-96.2] vs 88.9 [95% CI, 85.8-92.0]; P = .21), Constant-Murley (86.3 [95% CI, 81.5-91.0] vs 91.8 [95% CI, 88.1-95.6]; P = .07), and visual analog scale (0.8 [95% CI, 0.2-1.4] vs 1.0 [95% CI, 0.5-1.4]; P = .63) scores in the TCBR and ISR groups, respectively. The retear rate was 6.8% (95% CI, 3.1%-14.3%) in the TCBR group and 9.5% (95% CI, 6.1%-14.3%) in the ISR group (P = .46). Active mobility was also comparable.

Conclusion: This meta-analysis suggests that ISR and TCBR provide comparable results in the surgical management of Ellman grade 3 bursal-sided partial-thickness rotator cuff tears.

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Patients With Dysplasia Achieve Similar Outcomes and Survivorship to Nondysplastic Patients 10 Years After Hip Arthroscopy for Femoroacetabular Impingement

K. Mullins, D. Filan

DOI: https://doi.org/10.1016/j.arthro.2024.08.022

Purpose: To determine the long-term outcomes of hip arthroscopy (HA) for femoroacetabular impingement (FAI) in the presence of concomitant lateral rim dysplasia compared with a matched control group.

Methods: Patients undergoing HA between January 2009 and October 2013 with minimum 10-year follow-up were reviewed. The inclusion criteria consisted of patients undergoing HA for FAI with evidence of lateral rim dysplasia (lateral-center edge angle [LCEA] < 25°). Patients with lateral rim dysplasia were matched to patients with an LCEA greater than 30° based on sex, Tönnis grade, and age. Outcomes included survival (avoidance of total hip replacement [THR]), repeated HA, and patient-reported outcomes (PROs). Survivorship was assessed using a Kaplan-Meier curve and log rank test, whereas revision rates between groups were assessed using $\chi 2$ analysis. Between- and within-group analyses of PROs were conducted using the Mann-Whitney U test and Wilcoxon signed rank test, respectively. The proportion of cases achieving the patient acceptable symptom state was compared between groups using $\chi 2$ analysis.

Results: This study comprised 46 dysplasia cases and 90 control cases. There was no statistically significant difference between groups in baseline metrics apart from the LCEA ($P < .001$), Sharp angle ($P < .001$), and Tönnis angle ($P < .001$). By 10 years postoperatively, 9% of dysplasia cases and 4% of control cases underwent conversion to THR. There was no statistically significant difference between groups in survival or revision rates. Both groups reported improvements in PROs, and there was no difference between PRO scores at either time point. Excluding cases that underwent THR, 84% and 83% of dysplasia and control cases, respectively, achieved the patient acceptable symptom state.

Conclusions: HA for symptomatic FAI is a successful treatment in cases in which dysplasia is present. Low complication rates, comparable outcomes to cases without lateral rim dysplasia, and a high survivorship rate of 91% at minimum 10-year follow-up are observed. Increasing Tönnis angle preoperatively may increase the risk of THR conversion.

Level of Evidence: Level IV, retrospective cohort study.

BACK

Patients With a History of Lumbar Fusion Have a Greater Risk of Revision Arthroscopy and Conversion to Total Hip Arthroplasty After Primary Hip Arthroscopy

A.Chatterjee, K. Yao

DOI: https://doi.org/10.1016/j.arthro.2024.08.026

Purpose: To characterize the risk of revision hip arthroscopy or conversion to total hip arthroplasty (THA) among patients with a history of lumbar fusion undergoing primary hip arthroscopy.

Methods: We used the Statewide Planning and Research Cooperative System, an administrative database including all ambulatory and inpatient surgery encounters in New York, to identify all patients who underwent hip arthroscopy for femoroacetabular impingement between 2010 and 2020. Patients with previous lumbar fusion were identified using Current Procedural Terminology and International Classification of Diseases, Ninth and Tenth Revision, coding definitions. Patients with and without previous fusion were matched in a 1:5 ratio according to age and comorbidity burden. The number of levels fused was defined in the following fashion: (1) no fusion, (2) 1-2 levels, or (3) ≥3 levels. Patients were followed for 2 years to evaluate the rate of revision hip arthroscopy or conversion to THA. Multivariable logistic regression models were used to measure the association between number of levels fused and revision hip arthroscopy or conversion to THA.

Results: Between 2010 and 2020, there were 23,277 patients who underwent primary hip arthroscopy in New York state. Of these, 348 (1.4%) had a previous lumbar fusion. After matching for age and comorbidities, the composite rate of revision hip arthroscopy or conversion to THA was greater in patients with previous lumbar fusion compared with patients without (16.5% vs 8.5%; $P < .001$). This risk increased with the number of levels fused (1-2 levels: 15.1%; adjusted odds ratio, 1.8; 95% confidence interval 1.3-2.6; vs ≥3 levels: 26.3%; adjusted odds ratio, 3.4; 95% confidence interval 1.7-7.0).

Conclusions: Patients with a history of lumbar fusion had significantly greater rates of revision hip arthroscopy and conversion to THA compared with patients without previous fusion. The risk of revision hip arthroscopy or conversion to THA was increased approximately 2-fold in patients with 1 to 2 levels fused and 3-fold in patients with 3 or more levels fused.

Level of Evidence: Level III, retrospective matched comparative case series.

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Knee Surgery, Sports Traumatology, Arthroscopy (KSSTA), Volume 33, Issue 2

Moderate burden amongst caregivers posthip arthroscopy linked to younger caregiver age and task load: A cross-sectional survey study

Y. Bourgeault-Gagnon, M. Patel

DOI: https://doi.org/10.1002/ksa.12414

Purpose: To evaluate the burden experienced by primary informal caregivers of patients who have undergone hip arthroscopy and to identify factors that predict increased caregiver burden.

Methods: A cross-sectional study was conducted at a single academic hospital centre, enroling caregivers of patients who underwent hip arthroscopy between November 2018 and November 2023. Caregiver burden was assessed using the Caregiver Burden Inventory (CBI) survey. Multivariable linear regression models were used to identify predictors of caregiver burden, with the global CBI score serving as the primary outcome measure. Secondarily, open-ended survey questions were analyzed qualitatively to elucidate specific challenges and facilitators of caregiving, as reported by the caregivers themselves.

Results: The study involved 99 eligible caregivers (mean [standard deviation] age; 47 [11] years), 58% were female, and 85% were relatives of the patient. The median global CBI score was 13.0 (interquartile range: 8.0–22.4), indicating a moderate burden. Regression analyses demonstrated that younger caregiver age and a higher number of caregiving tasks were significant predictors of increased global burden. Additionally, nonweightbearing status of patients, female gender of caregivers and working full-time statistically significantly increased specific dimensions of caregiver burden.

Conclusion: This study highlights the meaningful burden faced by caregivers of patients undergoing hip arthroscopy, despite its minimally invasive nature and outpatient setting. Identified risk factors such as younger caregiver age, female gender of the caregiver, nonweight-bearing status and increased caregiving tasks suggest targeted areas for intervention. The qualitative analysis revealed that caregivers struggle with time management and physical and emotional strain, yet better communication and practical support from healthcare teams could help to alleviate these challenges.

Level of Evidence: Level IV, prognostic study

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American Journal of Sports Medicine (AJSM), Volume 53, Issue 2

Exploring the Relationship Between Combined, Acetabular, and Femoral Version on Postoperative Outcomes 2 Years After Hip Arthroscopy for Femoroacetabular Impingement Syndrome

Larson JH, Allahabadi S, Kaplan D, et al.

DOI: https://doi.org/10.1177/03635465241303704

Background: Many studies have examined the prevalence of acetabular version (AV) and femoral version (FV) abnormalities and their effect on patient-reported outcomes (PROs) after hip arthroscopy for femoroacetabular impingement syndrome (FAIS), but few have explored the prevalence and influence of combined version (CV) abnormalities.

Purpose: To (1) describe the distribution of AV, FV, and CV in the largest cohort to date and (2) determine the relationship between AV, FV, and CV and PROs after hip arthroscopy for FAIS.

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

Methods: Patients were identified who underwent primary hip arthroscopy for FAIS between 2012 and 2018 and received computed tomography containing the pelvis and transcondylar knee slices. AV and FV were assessed on computed tomography, with CV calculated as their sum. PROs were collected preoperatively and 2 years postoperatively. The distributions of AV, FV, CV, and combinations thereof were described based on published ranges. The relationships between version measurements and PROs were analyzed based on a given measurement's distance from a normative value, defined as the mean within the study population (eg, relative acetabular anteversion [AAr]). These relationships were first assessed using univariate natural (restricted) cubic regression splines to account for nonlinearity. The relationship between each relative version group (to the mean) and PROs was then assessed using multiple linear regression, with the other 2 version measurements held constant.

Results: In total, 566 patients were included (66.4% female; mean age, 32.6 ± 11.9 years; mean body mass index, 25.2 ± 5.1). The mean follow-up was 28.0 months. The mean AV, FV, and CV were 17.1°± 5.2°, 12.1°± 9.2°, and 29.3°± 11°, respectively. Univariate natural cubic regression splines demonstrated that AAr had a significant negative association with 4 of 5 PROs preoperatively and 3 of 5 PROs 2 years postoperatively ($P \leq .018$). All other relative version groups did not have a significant relationship with any PRO at either time point ($P > .05$). The association between AAr and relatively worse PROs was maintained after controlling for relative FV and CV via multiple linear regression, particularly in patients with relative femoral retroversion.

Conclusion: FV and CV, as distinct measures, are not associated with outcomes after hip arthroscopy for FAIS. AAr is associated with worse preoperative status and less improvement at 2 years postoperatively, particularly in patients with relative femoral retroversion.

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Sex-Based Differences in the Arthroscopic Treatment of Femoroacetabular Impingement Syndrome: 10-Year Outcomes With a Nested Propensity-Matched Comparison

Domb BG, Kufta AY, Kingham YE, Sabetian PW, Harris WT, Perez-Padilla PA.

DOI: https://doi.org/10.1177/03635465241302806

Background: Sex has been associated with different pathologic characteristics in painful hips undergoing hip arthroscopic surgery.

Purpose: To compare minimum 10-year patient-reported outcomes (PROs) and survivorship in patients who underwent primary hip arthroscopic surgery for femoroacetabular impingement syndrome and labral tears according to sex.

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

Methods: Data from patients who underwent primary hip arthroscopic surgery between March 2009 and May 2011 were reviewed. Patients with minimum 10-year PROs for the modified Harris Hip Score (mHHS), Non-Arthritic Hip Score (NAHS), Hip Outcome Score–Sports-Specific Subscale (HOS-SSS), and visual analog scale (VAS) for pain were eligible. Exclusion criteria included previous ipsilateral hip conditions or surgical procedures, Tönnis grade >1, or dysplasia (lateral center-edge angle <25°). In the subanalysis, female patients were matched to male patients using a 1:1 ratio by age, sex, and body mass index.

Results: A total of 375 hips had a minimum 10-year follow-up. There were 249 female (mean age, 36.8 ± 13.1 years) and 126 male (mean age, 38.9 ± 13.1 years) hips. Survivorship was defined as no conversion to total hip arthroplasty. Female and male hips exhibited similarly high rates of survivorship (80.3% vs 72.2%, respectively; P = .076). Female hips underwent secondary arthroscopic surgery at a statistically higher rate of 14.5% (P = .021) and had higher rates of capsular repair and iliopsoas fractional lengthening (P < .0001 and P < .001, respectively). Male hips had a significantly higher rate of acetabular labrum articular disruption/Outerbridge grade 3 and 4 damage at 54.0% compared with female hips (both P < .001) and underwent femoroplasty and acetabular microfracture at significantly higher rates of 88.1% versus 51.0%, respectively, and 16.7% versus 4.8%, respectively (both P < .001). In the subanalysis, both groups showed significant improvements in all PROs from baseline (all P < .001). Even though female patients demonstrated a higher rate of secondary arthroscopic surgery, they had a higher self-reported mean satisfaction score of 9.0 compared with 8.4 (P = .003) and a greater magnitude of improvement in 10-year PROs (ΔmHHS: 29.3 ± 17.5 vs 23.1 ± 19.8, respectively [P = .036]; ΔNAHS: 33.2 ± 21.3 vs 25.1 ± 19.5, respectively [P = .012]; ΔHOS-SSS: 47.0 ± 32.0 vs 32.7 ± 31.9, respectively [P = .008]; and ΔVAS: –4.6 ± 2.7 vs −3.5 ± 2.0, respectively [P = .009]). However, all PROs at a minimum 10-year follow-up were similar between the groups.

Conclusion: After undergoing hip arthroscopic surgery for femoroacetabular impingement syndrome, both female and male patients reported significant improvements in all PROs at a minimum 10-year follow-up and high patient satisfaction, with similar final functional scores. Even though female patients demonstrated a higher rate of secondary arthroscopic surgery, they had a higher satisfaction score and a greater magnitude of improvement in PROs postoperatively.

BACK

The Association Between Delaying Anterior Cruciate Ligament Reconstruction in Adolescents and Increasing Meniscal and Chondral Pathology: A Cohort Study of 2740 Adolescents

Hickie KL, Salmon LJ, Gooden BR, et al.

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Background: A growing body of evidence surrounds secondary meniscal and cartilage pathology after delay to anterior cruciate ligament (ACL) reconstruction (ACLR). Many of these studies focus on or include an adult population.

Purpose: To elucidate the prevalence of secondary meniscal and chondral pathology with delay to ACLR in the adolescent population as well as examine the influence of sex, skeletal maturity, and trends over the years.

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

Methods: A prospective database was used to identify all patients younger than 19 years who underwent ACLR at the authors' center between January 1993 and April 2023. Operative data including meniscal and chondral injury and treatment were prospectively recorded at the time of ACLR. A retrospective analysis was performed assessing the relationship between meniscal treatment and chondral injury at ACLR and the time from injury to ACLR, controlling for age, sex, and decade of surgery with multiple regression analysis. Prevalence of meniscal and chondral surgery at ACLR was examined over time and compared between sexes and age groups.

Results: A total of 2740 patients were identified with a median age of 17 years (range, 7-19 years). Surgical delay of 5 to 12 months increased the risk of medial meniscal tear requiring surgery by 1.6 (95% CI, 1.1-2.2; P = .007). Surgical delay >12 months increased the risk of medial meniscal tear requiring surgery by 4.2 (95% CI, 3.1-5.8; P = .001) and medial chondral injury by 3.4 (95% CI, 2.2-5.1; P = .001). The repairability of medial meniscal tears decreased with greater delay to reconstruction (57% before 5 months vs 19% after 12 months; P = .001). Lateral meniscal tear repairability followed a similar trend. More male than female participants had secondary pathology (46% vs 39%; P = .001). Patients aged 14-19 years had more meniscal surgery and chondral pathology compared with those younger than 14 years (45% vs 30%, P = .001).

Conclusion: Surgical delay >4 months from injury is associated with a steady increase in the prevalence of medial meniscal and chondral pathology in adolescents with ACL rupture. If ACL surgery is delayed >12 months, the odds of requiring medial meniscal surgery is increased by a factor of 4 and the odds of having a chondral lesion is increased by a factor of 3. Timely diagnosis of ACL injury and early surgical referral are important for reducing the odds of meniscal and chondral pathology in adolescents.

BACK

The Clinical Significance of Using PASS Thresholds When Administering Patient-Reported Outcome Instruments After Anterior Cruciate Ligament Reconstruction

Mobley J, Kelly DK, Lauck BJ, et al.

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Background: Patient-reported outcome (PROs) instruments of knee function quality of life are routinely administered to patients after anterior cruciate ligament reconstruction (ACLR). The Patient Acceptable Symptom State (PASS), an evidence-based threshold defining perceived outcomes, may be a useful indicator of strength and functional performance.

Purpose: To compare strength and functional performance between patients recovering from ACLR who did and did not meet PASS thresholds on associated PROs.

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

Methods: A total of 223 patients who had undergone ACLR (106 women, 117 men; 7.62 ± 1.71 months after ACLR) completed isokinetic knee extensor and flexor strength at 90 deg/s, hop performance (single-limb hop for distance [SLHD], triple hop for distance [THD], 6-m timed hop [6MH]), and PROs (International Knee Documentation Committee Subjective Form [IKDC], Knee injury and Osteoarthritis Outcome Score [KOOS], and Anterior Cruciate Ligament Return to Sport After Injury [ACL-RSI]) assessments in a controlled laboratory setting at an academic institution. Independent-samples t tests compared strength and hop measures between patients who did and did not achieve a PASS on the PROs. Limb symmetry index (LSI) was calculated as (ACLR Limb ÷ Contralateral Limb) × 100%. Strength and hop performance LSI outcomes were converted into indicator variables, categorized as either a “pass” or “fail” based on the operational definition of having an LSI value ≥90%. Chi-square tests compared strength and hop LSI PASS status measures to PRO PASS status.

Results: Patients who achieved IKDCPASS were significantly stronger and had more symmetric limbs than those who did not achieve IKDCPASS. Values for IKDCPASS were as follows: knee extension ACLR limb 1.72 ± 0.47 N·m/kg, contralateral limb 2.40 ± 0.45 N·m/kg, LSI 71.64% ± 15.23%; knee flexion ACLR limb 1.04 ± 0.29 N·m/kg, contralateral limb 1.05 ± 0.26 N·m/kg, LSI 99.12% ± 17.22%. Values for IKDCFAIL were knee extension ACLR limb 1.47 ± 0.52 N·m/kg, contralateral limb 2.25 ± 0.47 N·m/kg, LSI 64.66% ± 17.07%; knee flexion ACLR limb 0.88 ± 0.28 N·m/kg, contralateral limb 0.97 ± 0.28 N·m/kg, LSI 90.46% ± 17.41%. Effect sizes ranged from small to moderate ($P < .001$; $d = 0.3$-0.55). IKDCPASS status was significantly associated with an LSI ≥90% for knee flexion peak torque ($\chi 2 = 9.66$; $P = .002$), SLHD ($\chi 2 = 9.61$; $P = .002$), and THD ($\chi 2 = 3.97$; $P = .02$), with a moderate effect size ($P < .05$; $d = 0.41$-0.73). Significant relationships were found with KOOSPASS (Pain, Activities of Daily Living [ADL], and Sport) and LSI ≥90% for peak knee flexion torque with a moderate effect size (Pain and ADL, $P < .001$; Sport, $P = .04$; $d = 0.59$-0.72) and SLHD with a strong effect size for the Symptom subscale (Symptom, $P < .01$, $d = 1.21$; Pain, $P = .003$; ADL, $P = .04$; Sport, $P = .001$). No differences were found in strength outcomes for patients who achieved ACL-RSIPASS versus those who did not ($P > .05$). Patients who achieved ACL-RSIPASS had more symmetric SLHD and THD LSI scores and jumped farther on their contralateral limb for the THD compared with ACL-RSIFAIL patients ($P < .05$; $d = 0.50$-0.64).

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Conclusion: Patients meeting thresholds for the IKDCPASS and KOOSPASS (Pain, ADL, and Sport subscales) demonstrated greater knee strength bilaterally, and hopped farther and more symmetrically, compared with patients who scored below the PASS threshold on the same PROs. Using PASS thresholds for PROs can aid clinicians when considering when patients can safely return to activities after ACLR.

BACK

Association of Smokeless Tobacco Use With Perioperative Complications and Revision Surgery After Anterior Cruciate Ligament Reconstruction

Holle AM, Tummala SV, Pejic J, Van Schuyver PR, Chhabra A, Economopoulos KJ.

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Background: Tobacco use is a known modifiable risk factor for postoperative complications and revision surgery after anterior cruciate ligament reconstruction (ACLR). Previous studies focus on tobacco as a broad categorization of traditional smoking, smokeless tobacco, and other forms of nicotine use. It is unclear if differences in the type of nicotine used lead to similar adverse outcomes after ACLR.

Purpose: To (1) assess the incidence of postoperative complications among ACLR patients who use smokeless tobacco and (2) compare these outcomes with those of patients who do not use tobacco and those who smoke tobacco.

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

Methods: A retrospective cohort study utilizing the PearlDiver database was conducted. Patients undergoing primary ACLR with a minimum 2-year follow-up were included. Smokeless tobacco users (n = 898), cigarette smokers (n= 22,062), and non–tobacco users (n= 207,462) were matched based on patient variables and comorbidities. Postoperative complications within 90 days of surgery and subsequent knee surgery within 2 years were compared among groups. Multivariable logistic regressions were used to control for confounding variables.

Results: Compared with nonusers, smokeless tobacco users demonstrated an increased risk of pneumonia (odds ratio [OR], 3.36; 95% CI, 1.41-7.90), acute kidney injury (OR, 12.7; 95% CI, 3.77-52.8), and emergency department (ED) utilization (OR, 6.29; 95% CI, 3.70-10.9) within 90 days of the ACLR. Additionally, smokeless tobacco users had an increased risk of ACLR (OR, 4.75; 95% CI, 3.60-6.26) and meniscal surgery (OR, 2.89; 95% CI, 2.23-3.73) within 2 years. When compared with cigarette smokers, smokeless tobacco users showed an increased risk of pneumonia (OR, 3.25; 95% CI, 1.33-7.78), acute kidney injury (OR, 7.63; 95% CI, 2.72-22.5), and ED visits (OR, 1.55; 95% CI, 1.26-1.90) within 90 days and subsequent ACLR (OR, 4.81; 95% CI, 3.58-6.47) and meniscal surgery (OR, 3.23; 95% CI, 2.45-4.26) within 2 years.

Conclusion: Smokeless tobacco use was associated with an increased risk of medical complications, ED utilization, and subsequent procedures compared with nonuser controls and traditional smokers. These findings highlight the importance of considering specific forms of tobacco use in preoperative screening for patients undergoing ACLR.

BACK

Immunophenotyping of Synovial Tissue in Adolescents Undergoing ACL Reconstruction: What Is the Role of Synovial Inflammation in Arthrofibrosis?

Romereim SM, Smykowski MR, Ball EK, et al.

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Background: Loss of motion and arthrofibrosis after anterior cruciate ligament (ACL) reconstruction (ACLR) can be devastating complications for athletes. The cellular and molecular pathogenesis of arthrofibrosis is poorly understood, limiting prevention and treatment options. Synovial inflammation may contribute to post-ACLR arthrofibrosis.

Purpose: Higher synovial immune cell infiltration and inflammatory/catabolic gene expression patterns at the time of ACLR would correlate with poorer motion-related outcomes.

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

Methods: Patients aged 10 to 18 years undergoing primary ACLR were enrolled in a prospective pilot study, and synovial tissue biopsy specimens were obtained during ACLR. Flow cytometry and single-cell RNA sequencing explored synovial cell types/frequencies and gene expression. Principal component analysis was performed, followed by clustering which grouped patients into distinct immunophenotypes based on their synovial cell composition. Clinical follow-up data with knee range of motion (ROM), need for lysis of adhesions, and patient-reported outcome measures were collected and compared between immunophenotypes.

Results: Enrolled patients (n = 17) underwent ACLR at a median of 37 days after injury. Analysis revealed 3 distinct immunophenotypes. Type 1 consisted of patients with the longest time between injury and surgery and the lowest hematopoietic and T-cell infiltration. Types 2 and 3 had similar times between injury and surgery; type 2 had intermediate while type 3 had the highest hematopoietic and T-cell percentages. Type 3 was associated with worse ROM at 2 and 6 weeks postoperatively; T-cell prevalence and ROM were inversely correlated at those time points. The only patient requiring lysis of adhesions for arthrofibrosis had a type 3 immunophenotype.

Conclusion: Synovial immune infiltration after ACL injury shows variability between patients that clusters into 3 immunophenotypes correlating with early ROM and the risk of arthrofibrosis. T-cell recruitment and infiltration were the strongest factors correlated with ROM outcomes and present an exciting venue for future research on post-ACLR arthrofibrosis.

BACK

Kinetics During the Tuck Jump Assessment and Biomechanical Deficits in Female Athletes 12 Months After ACLR Surgery

Kember LS, Riehm CD, Schille A, et al.

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Background: Residual interlimb deficits after anterior cruciate ligament reconstruction (ACLR) can lead to functional maladaptation and increase the risk of reinjury. The tuck jump assessment (TJA) may offer a more effective evaluation of ACLR status as compared with traditional tasks owing to increased risk of altered landing mechanics, asymmetrical landing, and increased knee valgus attributed to the cyclical nature of the task. However, it remains unclear whether altered TJA kinetics resolve over time or persist through return-to-play phases of rehabilitation.

Purpose: To examine longitudinal kinetics, asymmetries, and functional performance deficits during TJA at 9 and 12 months after ACLR in female athletes at high risk of reinjury.

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

Methods: Female athletes (ACLR, n = 24; controls, n = 19; total, N = 43) performed a single trial of TJA on dual-force plates at 2 time points. The ACLR group (mean ± SD age, 16.8 ± 1.9 years) was tested at 9 and 12 months after surgery, and the control group (16.5 ± 3.6 years) was tested at similar time points. All athletes participated in similar sports and had comparable activity levels. Discrete time point analysis and statistical parametric mapping were used to identify deficits within each group.

Results: At 9 months after surgery, the ACLR group exhibited significant interlimb differences in all kinetic variables ($P < .05$), which persisted at 12 months with only small reductions in magnitude. As compared with controls, the ACLR group demonstrated a persistent offloading strategy in the involved limb by exhibiting larger interlimb asymmetries for a range of kinetic variables and a greater vertical ground-reaction force in the uninvolved limb during most of the stance phase at both time points ($P < .001$). Distinct differences in functional performance of TJA were evident at both time points, characterized by lower peak vertical ground-reaction force, peak center of mass displacement, and relative vertical leg stiffness and longer ground contact times ($P < .001$).

Conclusion: This study revealed that young female athletes after ACLR exhibit persistent interlimb deficits and functional maladaptations up to 12 months after surgery. The TJA identified significant biomechanical impairments to both limbs, resulting in asymmetrical loading and altered movement strategies as compared with healthy controls. Despite some improvements, athletes with ACLR continued to demonstrate offloading to the uninvolved limb, indicating incomplete neuromuscular recovery.

BACK

Longitudinal Changes in Medial Meniscal Extrusion After ACL Injury and Reconstruction and Its Relationship With Cartilage Degeneration Assessed Using MRI-Based T1ρ and T2 Analysis

Watanabe S, Joseph GB, Sato D, et al.

DOI: https://doi.org/10.1177/03635465241305734

Background: Anterior cruciate ligament (ACL) injury often leads to posttraumatic osteoarthritis (PTOA), despite ACL reconstruction (ACLR). Medial meniscal extrusion (MME) is implicated in PTOA progression but remains understudied after ACL injury and ACLR.

Purpose: It was hypothesized that MME would increase longitudinally after ACL injury and ACLR, with greater changes in the ipsilateral knee compared with the contralateral knee, leading to cartilage degeneration. The study aimed to assess MME 3 years after ACLR and its relationship with magnetic resonance imaging (MRI) T1ρ and T2 as cartilage degeneration markers.

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

Methods: MME and relative percentage of extrusion (RPE) were measured on 3 coronal slices of 3-dimensional fast spin-echo images and the mean values were used. T1ρ and T2 sequences were obtained and cartilage compositional measurements were performed using in-house developed software with MATLAB. Mixed models were used to assess the longitudinal changes and linear regression was used to assess the relationships between RPE and T1ρ and T2 values.

Results: A total of 54 participants with unilateral ACL injuries underwent preoperative bilateral knee MRI. A total of 36 participants completed MR scans at 6 months and 3 years after ACLR. MME and RPE measurements demonstrated high reliability (ICC > 0.88 and > 0.91, respectively). The predicted values of MME and RPE from the mixed models showed that the ipsilateral side had significantly greater MME and RPE than the contralateral side at all 3 time points ($P = .023$ for MME; $P = .013$ for RPE at baseline; and $P < .001$ at 6 months and $P < .001$ at 3 years for both MME and RPE). The rate of change of MME and RPE on the ipsilateral side was significantly greater than that on the contralateral side ($P < .001$). Postoperative RPE was associated with T1ρ and T2 values in the posterior medial femoral condyle.

Conclusion: MME and RPE obtained pre- and postoperatively after ACLR on the ipsilateral side were significantly greater than those on the contralateral side, and the longitudinal increases on the ipsilateral side were greater than those on the contralateral side. Postoperative RPE was significantly associated with cartilage degeneration in the posterior medial femoral condyle.

BACK

Knotless Versus Knotted Suture Anchors for Labral Repair of the Hip: A Systematic Review of Clinical and Biomechanical Outcomes

Johns WL, Baumann AN, Callaghan ME, Walley KC, Patel NK, Salvo J.

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Background: Arthroscopic labral repair of the hip is successfully performed with increasing frequency using either knotless or knotted suture anchors, each with its own risks and benefits.

Purpose: To examine biomechanical and clinical outcomes for labral repair of the hip based on the use of knotted or knotless suture anchors.

Study Design: Systematic review; Level of evidence, 4.

Methods: A search was performed to retrieve clinical and biomechanical studies examining the use of knotless or knotted suture anchors for arthroscopic labral repair of the hip. The studied outcomes included functional outcome scores such as modified Harris Hip Score (mHHS) and Hip Outcome Score Activities of Daily Living, biomechanical outcomes, failure mechanisms, and complications such as revision/reoperation and conversion to total hip arthroplasty (THA).

Results: A total of 47 articles met inclusion criteria for analysis (5 articles examining biomechanical outcomes and 42 reporting clinical outcomes). Included patients (N = 6185) who underwent hip labral repair had a mean age of 33.0 ± 8.5 years and follow-up time of 43.8 ± 18.4 months. The knotless group (n = 2719) had a mean preoperative mHHS of 63.3 ± 4.1 and postoperative mHHS of 86.3 ± 2.8 at a mean follow-up time of 47.2 ± 16.1 months. The knotted group (n = 2600) had a mean preoperative mHHS of 69.5 ± 8.3 and postoperative mHHS of 88.8 ± 5.5 with a mean follow-up time of 44.8 ± 18.1 months. The most common reason for failure of knotless anchors in biomechanical studies was suture breakage or pullout, and for knotted anchors it was anchor pullout. Of the articles reporting on revisions and/or conversion to THA after labral repair, the knotless group had 225 reoperations (8.1%) and 123 cases of conversion to THA (4.4%). The knotted group had 101 reoperations (6.2%) and 31 cases of conversion to THA (1.9%).

Conclusion: Arthroscopic management of labral repairs of the hip using either knotless or knotted suture anchors appears to be both safe and effective in reducing pain and improving function. Biomechanical evaluation suggests differing failure mechanisms in knotted versus knotless anchors. The rates of revision and conversion to THA are low overall, irrespective of knotted or knotless anchors.

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