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BACK

Upper extremity

Journal of Arthroscopy, Volume 38, Issue 2, P 209-658

Outcomes of Arthroscopic Elbow Contracture Release: Improvement for Severe Prosupination and Flexion Contracture

C.M. Beck, M.J. Gluck, et al.

DOI: https://doi.org/10.1016/j.arthro.2021.07.020

Purpose
The purpose of this study was to investigate outcomes following arthroscopic elbow contracture release to describe the use of arthroscopy for improvement in extension/flexion and pronation/supination arcs of motion at a single institution for degenerative and posttraumatic etiologies.

Methods
Consecutive arthroscopic elbow arthrolysis performed between 2003 and 2015 were retrospectively reviewed. Basic patient demographics, indications for surgery, preoperative and postoperative elbow range of motion, postoperative patient outcome score, and all complications were recorded and analyzed.

Results
Fifty-two patients were included with an average follow-up of 5.1 years (range 1.4 to 9.4). Severe contractures made up 50% of cases, followed by 23% moderate, and 27% mild. Average extension/flexion for the post-traumatic group (n = 30) increased by 63° ± 31 and by 29° ± 24 for the degenerative group (n = 22). Average gain in pronosupination was 38° ± 62 in the post-traumatic group and 13°±23 in the degenerative group. Postoperative DASH scores were 17.5 ± 18.4 for post-traumatic cases and 12.8 ± 19.3 for degenerative cases.

Conclusion
Arthroscopic elbow contracture release is an effective intervention for degenerative and post-traumatic elbow contracture for both flexion/extension and pronosupination contracture. Furthermore, a two-stage release should be considered when both flexion and pronosupinaton contractures are present.

Level of Evidence
IV, case series, treatment study

BACK

Open Subpectoral Biceps Tenodesis May Be an Alternative to Arthroscopic Repair for SLAP Tears in Patients Under 30

E.T. Hurley, C.A. Colasanti, et al.

DOI https://doi.org/10.1016/j.arthro.2021.07.028

Purpose

The purpose of the current study is to compare the outcomes of open subpectoral biceps tenodesis (BT) to arthroscopic repair (AR) for SLAP tears in patients under the age of 30 years.

Methods

A retrospective review of patients under the age of 30 years who underwent either isolated BT or AR for a diagnosis of a SLAP tear between 2011 and 2019 was performed. Patients were included if they were >16 years old at the time of surgery, had an isolated SLAP tear involving instability of the biceps-labral anchor (types II-IV), were skeletally mature, and had a minimum follow-up of 12 months. The American Shoulder & Elbow Surgeons score, visual analog scale, Subjective Shoulder Value, patient satisfaction, willingness to undergo surgery again, revisions, and return to play (RTP) were evaluated. A P value of <.05 was considered statistically significant.

Results

Our study included 103 patients in total; 29 patients were treated with BT, and 74 were treated with AR. The mean age was 24.8 years, and the mean follow-up duration was 60 months. At final follow-up, there was no difference between treatment groups in any of the functional outcome measures assessed (P > .05). Overall, there was no significant difference in the total rate of RTP (BT: 76.3%, AR: 85%; P = .53), timing of RTP (BT: 8.8 months, AR: 9.4 months; P = .61), and total rate of RTP among overhead athletes (BT: 84.2%, AR: 83.3%; P > .99). Among those undergoing AR, 9 required a revision procedure (11.5%) compared to none treated with BT (P = .11).

Conclusions

In patients under the age of 30 years with a symptomatic isolated SLAP tear, BT may be a reliable alternative to AR.

Level of Evidence

Level III, retrospective comparative study.

BACK

Two-Year Retrospective Patient-Reported Outcomes Following Superior Capsular Reconstruction

A.H. Hammad, C. Phillips, et al.

DOI: https://doi.org/10.1016/j.arthro.2021.05.025

Purpose

The purpose of this study was to evaluate the short-term patient-reported outcomes of superior capsular reconstruction (SCR) and identify factors contributing to the success or failure of the procedure at 2 years.

Methods

A retrospective review was performed on data prospectively collected from the Surgical Outcomes System database. Patient-reported outcomes (PROMs) including American Shoulder and Elbow Surgeons (ASES) score, Single Assessment Numeric Evaluation (SANE) score, visual analog scale for pain, and Veterans RAND 12-Item Health Survey (VR-12) were evaluated at a minimum of 2 years postoperatively and reported using a minimal clinically important difference (MCID) and the percent of maximal possible improvement (MPI). In addition, preoperative and intraoperative variables were evaluated in patients with and without a postoperative improvement in ASES and SANE scores meeting the threshold of MCID.

Results

Two-year follow-up data were available for 350 patients. Statistically significant improvements were noted in all PROMs at 2-year follow-up. In total, 240 patients (68.8%) achieved an MCID improvement of >17.5 in ASES score, and 185 patients (52.9%) achieved an MCID of >29.8 improvement in the SANE score. Primary SCRs were associated with a higher MPI in the ASES score (60.1% ± 39.8% vs 40.4% ± 47.9%; P = .025) and VR-12 physical score (14.0% ± 13.8% vs 8.0% ± 14.7%; P = .028) compared to revision repairs. Only diabetes was identified as a predictor of SANE score improvement (64.5% vs 62.2%; P = .041).

Conclusions

SCR is associated with improvement in patient-reported outcomes at short-term follow-up, with 53% to 69% of patients achieving an improvement considered to meet the MCID. Greater improvement is expected when SCR is performed as a primary procedure rather than as a revision procedure for failed rotator cuff repair.

Level of Evidence

Level III, retrospective comparative study.

BACK

Superior Capsular Reconstruction: A Salvage Option for Massive Irreparable Rotator Cuff Tears with Pseudoparalysis or Subscapularis Insufficiency

M.N. Ulrich, T.L. Frantz, et al.

DOI: https://doi.org/10.1016/j.arthro.2021.05.018

Purpose

We sought to examine superior capsular reconstruction (SCR) outcomes after minimum 2-year follow-up and determine risk factors that were predictive of outcomes.

Methods

Forty consecutive patients (mean age 57.3 years, 87.5% male) who underwent SCR for massive irreparable rotator cuff tears (RCT) met the inclusion criteria. Minimum 2-year follow-up was obtained for 32 patients (80% follow-up). Patient demographics and preoperative clinical findings were collected. Postoperative data, including complications, patient satisfaction, strength and range-of-motion (ROM), and patient-reported outcomes were collected.

Results

The Hamada score was ≤2 in 88% with average acromiohumeral interval distance of 6.8 mm. Preoperatively, 6 patients had external rotation lag (19%) and 6 had pseudoparalysis (19%). Intraoperative assessment of the subscapularis demonstrated true insufficiency in 38%. There was significant improvement in forward elevation (FE) (31° increase; $P = .007$) and strength in all planes (all $P < .05$). Patient-reported outcomes significantly improved (American Shoulder and Elbow Surgeon [ASES] 34-point increase; visual analog scale [VAS] 2.9-point decrease; single alpha-numeric evaluation [SANE] 48-point increase; all $P < .05$). Twenty-six patients (81%) were completely or somewhat satisfied with surgery. At time of final follow-up, 3/32 patients (9%) failed SCR and converted to reverse total shoulder arthroplasty. There were 4 (13%) reported complications (2 patients had postoperative falls; 1 patient had persistent severe pain; 1 had persistent stiffness). One patient was deceased. Patients with pseudoparalysis ($n = 6$) had significant improvement in post-operative FE (28 vs 154°; $P < .0001$) and SANE score ($P = .016$) with 66% patient satisfaction. However, outcome scores overall remained lower than SCR without pseudoparalysis. Regarding subscapularis insufficiency ($n = 12$), significant improvement was seen in postoperative FE (108 vs 158°; $P = .019$) and patient-reported outcome scores ($P < .005$). In patients converted from SCR to reverse total shoulder arthroplasty ($n = 3$), there were no distinguishing characteristics present.

Conclusion

Superior capsular reconstruction is an effective salvage operation for massive irreparable RCT. Patients with pseudoparalysis or subscapularis insufficiency demonstrate significant postoperative improvement in FE and patient-reported outcomes.

Level of Evidence

IV, retrospective cohort.

BACK

Arthroscopically Assisted Coraco-Clavicular Ligament Reconstruction in Treatment of Acute Displaced Distal Clavicle Fractures Provides Good to Excellent Shoulder Function Despite Low Union Rates and High Complication Rates: A Systematic Review

S.S. Malik, M. Tahir, et al.

DOI: https://doi.org/10.1016/j.arthro.2021.06.034

Purpose

The aim of this systematic review was to assess the clinical outcome of arthroscopically assisted coraco-clavicular ligament (AACCL) reconstruction for treatment of displaced distal clavicle fractures in terms of union rate, complications, and shoulder function.

Methods

A review of the online databases Medline and Embase was conducted on January 1, 2021, according to PRISMA guidelines. The review was registered prospectively in the PROSPERO database. Clinical studies reporting union rate, complications, and shoulder function were included. The studies were appraised using the Methodological Index for Non-Randomized Studies (MINORS) tool.

Results

The search strategy identified 14 studies eligible for inclusion, 12 retrospective case series and 2 nonrandomized retrospective comparative studies. All studies reported on shoulder function, union rate, and complications. The overall shoulder function was good to excellent according to Constant-Murley score, with mean scores ranging from 81.8 to 96.2 [I2 (inconsistency) = 0% (95% confidence interval [CI] = 0% to 61%)]. The mean union rate ranged from 70% to 100% [I2 = 32.6% (95% CI = 0% to 63.4%)], and the mean complication rate ranged from 0 to 28.6% [I2 = 43.4% (95% CI = 0% to 68.4%)]. The most common complications were hardware related (3.1%), wound related (2.7%), and postoperative shoulder stiffness (2.2%).

Conclusion

This systematic review analyzed clinical studies that evaluated the outcome of AACCL reconstruction in displaced distal clavicle fractures. The overall findings of this systematic review are that the union rate can be as low as 70% with this technique and the complication rate as high as 28.6%. Overall shoulder function was good to excellent according to Constant-Murley score. As the literature surrounding this topic is heterogeneous, further comparative clinical studies are required to assess superiority compared with other traditional techniques.

Level of Evidence

V: systematic review of level III and IV studies.

BACK

Bone Block Augmentation of the Posterior Glenoid for Recurrent Posterior Shoulder Instability Is Associated With High Rates of Clinical Failure: A Systematic Review

D.J. Cognetti, J.D. Hughes, et al.

DOI: https://doi.org/10.1016/j.arthro.2021.07.018

Purpose

To determine whether posterior glenoid bone block augmentation performed for the treatment of recurrent posterior shoulder instability succeeds in restoring stability and is associated with rates of complications or clinical failures comparable to other glenoid bone augmentation procedures.

Methods

A comprehensive search of PubMed, MEDLINE, and EMBASE databases was performed. Level of evidence studies I to IV pertaining to posterior bone block augmentation reporting on outcomes or complications were included. The search was carried out in accordance with the Preferred Reported Items for Systematic Reviews and Meta-analyses guidelines.

Results

Screening of titles, abstracts, and manuscripts with application of inclusion and exclusion criteria yielded 17 full-text articles reporting on 269 shoulders undergoing bone block augmentation. Surgical technique varied between studies with regard to graft type (iliac crest, 13 studies; scapular spine, 2; acromion, 1; distal tibia allograft, 1), graft positioning (medial to 1.5 cm lateral to glenoid surface, equatorial to subequatorial), and open versus arthroscopic technique (open, 10 studies; arthroscopic, 4; both, 3). Four of the 8 studies with pre- and postoperative patient-reported outcomes (PROs) showed significant improvements in these outcomes at final follow-up. The postoperative outcomes ranged from 60 to 90 for Rowe scores (n = 7 studies) and 79 to 90 for Walch-Duplay scores (n = 7 studies). Complications were commonly encountered, with high rates of recurrent instability (0% to 73%) and revision procedures (0% to 67%) across different studies.

Conclusion

Posterior bone block augmentation for recurrent posterior shoulder instability does not reliably yield substantial improvements in PROs, and complications are frequently observed. The substantial heterogeneity across studies and the small number of patients precludes any substantive judgements as to the superiority of one surgical technique over another.

Level of Evidence

IV, systematic review of level III and IV studies.

BACK

Platelet-Rich Plasma Has Better Results for Retear Rate, Pain, and Outcome Than Platelet-Rich Fibrin After Rotator Cuff Repair: A Systematic Review and Meta-analysis of Randomized Controlled Trials

Y. Li, T. Li, et al.

DOI: https://doi.org/10.1016/j.arthro.2021.05.023

Purpose
To perform a systematic review and meta-analysis of randomized controlled trials (RCTs) in the literature to ascertain the extent to which platelet-rich plasma (PRP) and platelet-rich fibrin (PRF) improved patient outcomes in arthroscopic rotator cuff repair.

Methods
Two independent reviewers performed the literature search based on the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines, with a third author resolving any discrepancies. RCTs comparing PRP or PRF to a control in rotator cuff repair were included. Quality of evidence was assessed using the Cochrane Collaboration risk of bias tool. Clinical outcomes were compared using the risk ratio for dichotomous variables and the mean difference for continuous variables. A P value <.05 was deemed statistically significant.

Results
Included in this review are 23 RCTs with 1440 patients. PRP resulted in significantly decreased rates of retear (15.9% versus 29.0%, respectively; P < .0001). Significant results were noted in favor of PRP compared with control based on the Constant score (83.9 versus 81.2, respectively; P = .0006); the University of California, Los Angeles score (31.1 versus 30.2; P < .00001); the American Shoulder and Elbow Surgeons score (87.3 versus 84.5; P = .04); and the visual analog scale score (1.3 versus 1.6; P = .01). PRF resulted in an improved Constant score (80.1 versus 80.0, respectively; P = .04) compared with control.

Conclusions
The current evidence shows that using PRP in arthroscopic rotator cuff repair can improve pain levels and functional outcome scores while reducing the retear rate after surgery. PRF injection, on the other hand, improves only the Constant score.

Level of evidence
II; systematic review and meta-analysis of level I and II evidence.

BACK

Shoulder Latarjet Surgery Shows Wide Variation in Reported Indications, Techniques, Perioperative Treatment, and Definition of Outcomes, Complications, and Failure: A Systematic Review

J.W. Arner, K. Tanghe

DOI: https://doi.org/10.1016/j.arthro.2021.09.020

Purpose

To systematically review and compare the surgical indications, technique, perioperative treatment, outcomes measures, and how recurrence of instability was reported and defined after coracoid transfer procedures.

Methods

A systematic review of the literature examining open coracoid transfer outcomes was conducted according to PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) guidelines using the Cochrane registry, MEDLINE, and EMBASE databases from 2010 to 2020. Inclusion criteria included open coracoid transfer techniques, including the Bristow or Latarjet technique, full text availability, human studies, and English language.

Results

A screen of 1,096 coracoid transfer studies yielded 72 studies, which met inclusion criteria with a total of 4,312 shoulders. One study was a randomized controlled trial, but the majority of them were retrospective. Of those, 65 studies reported on postoperative outcome scores, complication rates, revision rate, and recurrence rates. Forty-three reported on range of motion results. Thirty studies reported on primary coracoid transfer only, 7 on revision only, and 30 on both primary and revision, with 5 not reporting. Average follow-up was 26.9 months (range: 1-316.8 months). Indications for coracoid transfer, technique, perioperative care, complications, and how failure was reported varied greatly among studies.

Conclusions

Latarjet and coracoid transfer surgery varies greatly in its indications, technique, and postoperative care. Further, there is great variation in reporting of complications, as well as recurrence and failure and how it is defined. Although coracoid transfer is a successful treatment with a long history, greater consistency regarding these factors is essential for appropriate patient education and surgeon knowledge.

Level of Evidence

Level IV, systematic review of Level I-IV studies.

BACK

Journal of Shoulder and elbow surgery, February 2022, volume 31, issue 2, pages 310 - 317

Retear bigger than preoperative tear size would lead to treatment failure after rotator cuff repair

Kim, H., Kim, D.M., Kholinne, E., et al.

DOI: https://doi.org/10.1016/j.jse.2021.07.012

Background
This study aimed to (1) define treatment failure using the referred patient acceptable symptomatic state (PASS) values for pain visual analog scale (PVAS), American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form (ASES), and Single Assessment Numeric Evaluation (SANE) clinical scores and (2) identify the factors that lead to patient dissatisfaction after arthroscopic rotator cuff repair (ARCR).

Methods
We analyzed the arthroscopic rotator cuff surgery registry data from January 2015 to December 2016. Patients were followed for ≥2 years and categorized as dissatisfied or satisfied based on our own definition of treatment failure at 2 years postoperatively. For defining treatment failure, the referred PASS values for the PVAS, ASES, and SANE scores were used. Patients who failed to attain the PASS value for the PVAS, ASES, or SANE score were categorized into the dissatisfied group. Pre- and postoperative imaging and basic demographic data were compared between groups. Univariable and multivariable logistic regression analyses were performed to identify the factors affecting patient satisfaction at 2 years after rotator cuff repair.

Results
Of 117 patients, 30 (25.6%) were defined as the dissatisfied group (mean follow-up period, 37.5 months). Seventeen patients (14.5%) had confirmed retear on follow-up magnetic resonance imaging. In the univariate analysis, sex significantly differed between the groups (female, satisfied vs. dissatisfied groups: 39 [44.8%] vs. 22 [73.3%]; $P = .010$). Retear alone did not affect patient satisfaction in the univariate analysis ($P = .11$). Progressed retear size featured a significantly higher risk of patient dissatisfaction ($P = .024$; odds ratio 6.430, 95% confidence interval 1.270-32.541) in the multivariable analysis using symptom duration, sex, preoperative ASES score, preoperative tear size, retear, and progressed retear size as variables. Moreover, female sex had an increased odds for dissatisfaction (odds ratio 4.646, 95% confidence interval 1.590-13.578; $P = .005$).

Conclusion
Two years after ARCR, most patients (74.4%) reported satisfaction with their outcomes. However, satisfaction levels can be altered by female sex or progressed retear size compared with the preoperative state.

Level of evidence
Level III

BACK

American Journal of Sports Medicine (AJSM), Volume 50, Issue 2

Outcomes of 270° Labral Repair for Combined Shoulder Instability in Active-Duty Military Patients: A Retrospective Study

John P. Scanaliato, MD*, John C. Dunn, MD, Austin B. Fares, MD, Hunter Czajkowski, BS, Nata Parnes, MD

First Published December 13, 2021; pp. 334–340

https://doi.org/10.1177%2F03635465211061602

Background: There is a high prevalence of combined shoulder instability in military patients. Short-term outcomes after 270° labral repair are promising; however, there is a paucity of longer term outcome data in this high-demand group of patients.

Purpose: To report the midterm outcomes of active-duty military patients treated with 270° labral repair for combined shoulder instability.

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

Methods: All consecutive patients between January 2011 and January 2019 who underwent 270° labral repair by the senior surgeon with complete outcome scores were identified. All patients had experienced a shoulder dislocation after a traumatic event and had magnetic resonance imaging and intraoperative findings consistent with combined-type instability. A total of 52 patients met the inclusion criteria for the study, and all were active-duty servicemembers at the time of surgery.

Results: The mean follow-up was 78.21 months (range, 24-117 months). There was a statistically significant increase in the mean American Shoulder and Elbow Surgeons score (from 44.92 to 89.31; $P < .0001$), Single Assessment Numeric Evaluation score (from 52.32 to 93.17; $P < .0001$), and Rowe instability score (from 46.63 to 91.35; $P < .0001$) from preoperatively to postoperatively. Mean pain decreased significantly as measured by the visual analog scale for pain (from 8.04 to 1.44; $P < .0001$). Range of motion in forward flexion (from 155.29° to 155.96°; $P = .6793$), external rotation (from 67.50° to 65.29°; $P = .0623$), and internal rotation (from T9.58 to T9.56; $P = .9650$) did not change significantly postoperatively. Outcomes did not differ significantly for patients who underwent surgery on their dominant shoulder versus those who underwent surgery on their nondominant shoulder, nor did outcomes vary with the type of anchor utilized (biocomposite vs all-suture). The overall rate of return to active duty was 92.31%.

Conclusion: Midterm outcomes in this population of active-duty patients undergoing 270° labral repair for combined shoulder instability demonstrated a statistically and clinically significant improvement in patient-reported outcome scores, a significant decrease in pain, and an overall rate of return to active duty of 92.31%.

BACK

Bone and Joint Journal (BJJ), Volume 104, issue 2

Postoperative immobilization using a short-arm cast in the semisupination position is appropriate after arthroscopic triangular fibrocartilage complex foveal repair

Hyoung-Seok Jung, Jung-Gwan Park, Hyeong-Jun Park, Jae Sung Lee

DOI: https://doi.org/10.1302/0301-620X.104B2.BJJ-2021-0592.R2

Aims
The aim of this study was to assess and compare active rotation of the forearm in normal subjects after the application of a short-arm cast (SAC) in the semisupination position and a long-arm cast (LAC) in the neutral position. A clinical study was also conducted to compare the functional outcomes of using a SAC in the semisupination position with those of using a LAC in the neutral position in patients who underwent arthroscopic triangular fibrocartilage complex (TFCC) foveal repair.

Methods
A total of 40 healthy right-handed volunteers were recruited. Active pronation and supination of the forearm were measured in each subject using a goniometer. In the retrospective clinical study, 40 patients who underwent arthroscopic foveal repair were included. The wrist was immobilized postoperatively using a SAC in the semisupination position (approximately 45°) in 16 patients and a LAC in 24. Clinical outcomes were assessed using grip strength and patient-reported outcomes. The degree of disability caused by cast immobilization was also evaluated when the cast was removed.

Results
Supination was significantly more restricted with LACs than with SACs in the semisupination position in male and female patients ($p < 0.001$ for both). However, pronation was significantly more restricted with SACs in the semisupination position than with LACs in female patients ($p = 0.003$) and was not significantly different in male patients ($p = 0.090$). In the clinical study, both groups showed improvement in all parameters with significant differences in grip strength, visual analogue scale scores for pain, modified Mayo Wrist Score, the Disability of the Arm, Shoulder, and Hand (DASH) score, and the Patient-Rated Wrist Evaluation (PRWE) score. No significant postoperative differences were noted between LACs and SACs in the semisupination position. However, the disability caused by immobilization in a cast was significantly higher in patients who had a LAC on the dominant hand ($p < 0.001$).

Conclusion
We found that a SAC in the semisupination position is as effective as a LAC in restricting pronation of the forearm. In addition, postoperative immobilization with a SAC in the semisupination position resulted in comparable pain scores and functional outcomes to immobilization with a LAC after TFCC foveal repair, with less restriction of daily activities. Therefore, we recommend that surgeons consider using a SAC in the semisupination position for postoperative immobilization following TFCC foveal repair for dorsal instability of the distal radioulnar joint.

BACK

Lower Extremity

Journal of Arthroscopy, Volume 38, Issue 2, P 209-658

Isolated Arthroscopic Partial Meniscectomy Is More Effective at Improving Meniscal Symptoms in Comparison With Mechanical Symptoms in Patients With Concomitant Untreated Chondral Lesions

L.J. Bisson, M. A. Kluczynskie, et al.

DOI: https://doi.org/10.1016/j.arthro.2021.09.029

Purpose
To rank Knee Injury and Osteoarthritis Outcome Score (KOOS) questions from most to least improvement after arthroscopic partial meniscectomy (APM) and compare improvement of meniscal versus mechanical symptoms.

Methods
A secondary analysis of the Chondral Lesions and Meniscus Procedures (ChAMP) Trial was performed. Inclusion criteria were age 30 years or older with degenerative meniscal tear failing nonoperative management, with or without associated unstable chondral lesions. No chondral debridement was performed. Responses to the 42 KOOS questions ranged from 0 (extreme problems) to 4 (no problems), and were answered preoperatively and at 1 year after isolated APM. The 1-year mean change, or delta (Δ), was calculated for each KOOS question and the Δ for meniscal and mechanical symptoms were statistically compared.

Results
Greatest improvement in 135 eligible patients was observed for questions about (1) awareness of knee problems (Δ = 1.93, standard deviation [SD] = 1.38), (2) frequency of knee pain (Δ = 1.93, SD = 1.29), (3) degree of difficulty while twisting/pivoting on the injured knee (Δ = 1.88, SD = 1.13), (4) degree of difficulty while running (Δ = 1.67, SD = 1.30), and (5) being troubled by lack of confidence in the knee (Δ = 21.67, SD = 1.11). Least improvement was observed for questions about: (1) degree of difficulty while getting on/off the toilet (Δ = 0.94, SD = 0.96), (2) feel grinding or hear clicking when the knee moves (Δ= 0.90, SD = 1.25), 3) degree of difficulty while getting in/out of the bath (Δ= 0.88, SD = 1.00), (4) knee catches/hangs up during movement (Δ= 0.80, SD = 1.09), and (5) the ability to straighten the knee fully (Δ= 0.54, 1.44). There was greater improvement for the KOOS questions pertaining to meniscal versus mechanical symptoms ($P < .00001$).

Conclusions
KOOS symptoms as reported by subjects' responses to the questions pertaining to the frequency of knee pain, twisting/pivoting, running, squatting, and jumping showed the most improvement 1 year after isolated APM, whereas those relating to mechanical symptoms improved the least. Focusing on meniscal rather than mechanical symptoms may help surgeons better identify patients expected to benefit from APM.

Level of Evidence
Level IV retrospective analysis of prospectively collected data.

BACK

A National Perspective of Patellar Instability in Children and Adolescents in the United States: MPFL Reconstruction Is Three Times Higher Than the Incidence of Isolated Lateral Release

P.Kamalapathy, J.K. Rush, et al.

DOI: https://doi.org/10.1016/j.arthro.2021.05.061

Purpose

The objective was to (1) evaluate any recent changes in the United States in the incidences of medial patellofemoral ligament (MPFL) reconstruction and isolated lateral release for patellar instability in children and adolescents, (2) identify concomitant procedures with MPFL, and (3) report national complication rates after MPFL reconstruction with and without concomitant procedures in children and adolescents.

Methods

A national database was queried for patients aged 5 to 18 years who underwent operative treatment for patellar instability from 2010 to 2018. Inclusion criteria were either an MPFL reconstruction or lateral release for a diagnosis of patellar instability. Concomitant procedures with MPFL reconstruction assessed were tibial tubercle osteotomy, associated arthroscopic procedures, and lateral release. Changes in incidence in MPFL reconstruction, lateral release and concomitant procedures were assessed. The following postoperative complications were assessed: knee stiffness, infection, patella fracture, and growth arrest or angular deformity.

Results

2,161 patients who underwent MPFL reconstruction and 1,159 patients who underwent isolated lateral release for patellar instability were identified. The incidence of MPFL reconstruction in adolescents from 2010 to 2018 did not change significantly (2010: 7.11, 2018: 5.91, $P = .137$), while isolated lateral release decreased (2010: 6.06, 2018: 1.83, $P < .0001$). Concomitant procedures with MPFL reconstruction were common, with arthroscopy being the most frequent (58-67%). The most common complication within 90 days of surgery was patella fracture (0.4% to 2.0%). Infection (0.4% to 1.0%) and growth arrest (0.09% to 0.61%) were the least common. MPFL and arthroscopy had a decreased risk of growth arrest following surgery compared to MPFL alone ($P = .038$).

Conclusions

The incidence of MPFL reconstruction remained high from 2010 to 2018, while isolated lateral release decreased during the same time period. Complications after MPFL reconstruction, isolated lateral release, and concomitant procedures were infrequent, with postoperative patella fracture the most common.

Level of Evidence

IV, case series

BACK

Do Outcomes of Meniscal Allograft Transplantation Differ Based on Age and Sex? A Comparative Group Analysis

R. Frank, R. Gilat, et al.

DOI: https://doi.org/10.1016/j.arthro.2021.05.029

Purpose

To analyze the effect of patient age, sex, and associated preoperative factors on patient-reported outcome (PRO) measures and graft survival following primary meniscal allograft transplantation (MAT).

Methods

A prospectively collected database was retrospectively reviewed to identify patients who underwent primary MAT with a minimum of 2 years of follow up between 1999 and 2017. Demographic, intraoperative, and postoperative outcome data were collected for each patient. Postoperative outcomes were stratified based on age and sex, and comparative statistical analysis was performed between sexes, both >40 and <40.

Results

A total of 238 patients underwent primary MAT during the study period, of which 212 patients (mean age, 28.5 ± 9.0 years; range, 15.01-53.67 years) met the inclusion criteria with a mean follow-up of 5.1 ± 3.4 years (range 2.0-15.9 years). At final follow-up, patients ≥40 and <40 years of age demonstrated statistically significant improvements in nearly all PRO scores ($P < .05$ for both groups). There were no significant differences between either group for achievement of minimal clinically important difference for International Knee Documentation Committee ($P = .48$) or Knee Injury and Osteoarthritis Outcome Score symptoms ($P = .76$). Because of insufficient numbers, a statistically significant difference could not be demonstrated in reoperation rate (≥40: 1.49 ± 1.77 years, <40: 1.87 ± 1.98 years, $P = .591$), failure rate (≥40: 7/32 [21.9%], <40: 19/180 [10.6%], $P = .072$), or complication rate (≥40: 2/32 [6.3%], <40: 12/180 [6.7%], $P = .930$) based on age. Both sexes showed a significant improvement in PROs, whereas female patients were more likely to undergo revision surgery ($P = .033$), with no significant differences based on time to reoperation, failure, or complication rates.

Conclusions

PROs similarly improved following MAT in both patients aged ≥40 and those <40 at final follow-up with no significant differences in minimal clinically important difference achievement rate, complication rate, reoperation rate, time to reoperation, or failure rate between groups. Female patients may be more likely to undergo revision surgery after MAT.

Level of Evidence

III; therapeutic retrospective comparison study.

BACK

Intraoperative and Early (90-Day) Postoperative Complications and Associated Variables with Multiligamentous Knee Reconstruction: 15-year Experience from a Single Academic Institution

D.P. Axibal, N.C. Yeattes, et al.

DOI: https://doi.org/10.1016/j.arthro.2021.05.027

Purpose

We sought to determine the rate of intraoperative and early postoperative (90-day) complications of multiligamentous knee reconstruction surgeries, both medical and surgical, and associated variables from the 15-year experience of a single academic institution.

Methods

Patients treated at a single academic institution between 2005 and 2019 who underwent multiligament knee surgery were identified. Inclusion criteria included intervention with 2+ ligament reconstructions performed concurrently, and more than 90 days postoperative follow-up. Exclusion criteria included revision ligamentous knee surgery. Patient demographics, mechanism of injury, and associated injuries of patients with intraoperative and postoperative complications, time from injury to multiligamentous knee reconstruction, and surgical data, including tourniquet time, procedure time, and type of procedures performed were retrospectively recorded.

Results

301 knees in 296 patients met the eligibility criteria. There were 11 intraoperative complications in 9 knees (rate of 3%) and 136 postoperative complications in 90 knees (rate of 30%). Shorter time from injury to date of surgery was associated with arthrofibrosis (P = .001) and superficial wound infections (P = .015). Concurrent head injuries were associated with less complications (P = .029). Procedural time >300 minutes was associated with intraoperative blood transfusions (P > .05), deep infections (P = .003) and arthrofibrosis (P = .012). Inside-out meniscal repair was associated with superficial and deep infections (P = .006 and .0004). Tibial-based posterolateral corner (PLC) reconstruction was associated with symptomatic hardware (P = .037) and arthrofibrosis (P = .019) in comparison with fibular-based PLC reconstruction. Posterior cruciate ligament (PCL) reconstruction was associated with deep infections (P = .015), arthrofibrosis (P = .003), and postoperative blood transfusions (P = .018).

Conclusion

Our 15-year data reveal there is a low intraoperative complication rate and high early postoperative complication rate with multiligamentous knee surgery. Surgeons should be wary of the increased intraoperative and postoperative complications associated with longer procedure times, inside-out meniscal repair, tibia-based PLC reconstruction, PCL reconstruction, and shorter time to surgery.

Level of Evidence

Case series: IV.

BACK

Changes in Hip Capsule Morphology after Arthroscopic Treatment for Femoroacetabular Impingement Syndrome with Periportal Capsulotomy are Correlated With Improvements in Patient-Reported Outcomes

K.H. Nguyen, C.Shaw, et al.

DOI: https://doi.org/10.1016/j.arthro.2021.05.012

Purpose

To assess the correlation between changes in hip capsule morphology with improvements in patient-reported outcome (PRO) scores after arthroscopic surgery for femoroacetabular impingement syndrome (FAIS) using the periportal capsulotomy technique.

Methods

Twenty-eight patients with cam morphology FAIS (without arthritis, dysplasia, or hypermobility) were prospectively enrolled before arthroscopic labral repair and femoroplasty through periportal capsulotomy (anterolateral/midanterior portals) without closure. Patients completed the Hip Disability and Osteoarthritis Outcomes Score (HOOS) and had nonarthrographic 3T magnetic resonance imaging (MRI) scans of the affected hip before and 1 year after surgery. Anterior capsule thickness, posterior capsule thickness, anterior-posterior capsule thickness ratio, and proximal-distal anterior capsule thickness ratio were measured on axial-oblique MRI sequences. Pearson correlation coefficients were calculated to determine the association between hip capsule morphology and PRO scores.

Results

Postoperative imaging showed that for all 28 patients (12 female), labral repairs and capsulotomies had healed within 1 year of surgery. Analysis revealed postoperative decreases in anterior hip capsule thickness (1395.4 ± 508.4 mm3 vs 1758.4 ± 487.9 mm3; P = .003) and anterior-posterior capsule thickness ratio (0.92 ± 0.33 vs 1.12 ± 0.38; P = .02). Higher preoperative anterior-posterior capsule thickness ratio correlated with lower preoperative scores for HOOS pain (R = −0.43; P = .02), activities of daily living (ADL) (R = −0.43; P = .02), and sport (R = −0.38; P = .04). Greater decrease from preoperative to postoperative anterior-posterior capsule thickness ratio correlated with greater improvement for HOOS pain (R = −0.40; P = .04), ADL (R = −0.45; P = .02), and sport (R = −0.46; P = .02).

Conclusions

Periportal capsulotomy without closure demonstrates capsule healing by 1 year after arthroscopic FAIS treatment. Changes in hip capsule morphology including decreased anterior-posterior capsule thickness ratio after surgery may be correlated with improvements in patient pain, function, and ability to return to sports.

Level of Evidence

Level II, prospective cohort study.

BACK

Multicenter Outcomes After Primary Hip Arthroscopy: A Comparative Analysis of Two-Year Outcomes After Labral Repair, Segmental Labral Reconstruction, or Circumferential Labral Reconstruction

B.M. Bodendorfer, T.D. Alter, et al.

DOI https://doi.org/10.1016/j.arthro.2021.05.013

Purpose

(1) To report minimum 2-year follow-up patient-reported outcome measures in patients undergoing labral repair (LR), segmental labral reconstruction (SLR), or circumferential labral reconstruction (CLR) in the primary setting; and (2) to compare minimum 2-year follow-up patient-reported outcome measures among these groups.

Methods

A retrospective review of a prospectively maintained multicenter database of patients undergoing hip arthroscopy was performed. Inclusion criteria were patients undergoing hip arthroscopy for treatment of labral tear and femoroacetabular impingement syndrome between January 2014 and October 2017, and completion of minimum 2-year postoperative outcome scores. Exclusion criteria were patients undergoing revision hip surgery, labral treatment limited to debridement, lateral center-edge angle <20°, osteoarthritis (Tönnis grade > 1), slipped capital femoral epiphysis, workers compensation status, and patients undergoing concomitant gluteus medius and/or minimus repair. Labral reconstruction patients were matched (1:3) with labral repair patients on age, sex, and body mass index. The labral reconstruction group was further stratified into SLR, and CLR groups. Patient demographic characteristics and clinical outcomes including Hip Outcome Score – Activities of Daily Living, Hip Outcome Score – Sport Subscale, modified Harris Hip Score, international Hip Outcome Tool, and visual analog scale for pain were analyzed, as well as achievement of the minimal clinical improvement difference (MCID). A P-value less than .05 indicated statistical significance.

Results

A total of 416 patients were included (LR, n = 312; SLR, n = 53; CLR, n = 51). The age, body mass index, and sex of the matched cohort were 42.3 ± 11.2 years, 24.7 ± 3.7, and 55.0% female. At a minimum of 2-year after hip arthroscopic surgery, no differences were found in preoperative, postoperative, or the delta visual analog scale for pain, modified Harris Hip Score, Hip Outcome Score – Activities of Daily Living, Hip Outcome Score – Sport Subscale, or international Hip Outcome Tool. Subsequently, the proportion of patients achieving the MCID and the PASS at latest follow-up were analyzed. This analysis revealed that no significant differences in the rate of MCID or PASS achievement for any outcome measure existed based on labral treatment.

Conclusions

In this multicenter study on labral treatment in the primary setting, patients undergoing LR, SLR, and CLR demonstrated no difference in preoperative or postoperative scores, nor the proportion of patients achieving clinically significant outcome improvement.

Level of Evidence

III; therapeutic outcome study with controls.

BACK

Comparable Minimum 2-Year Patient-Reported Outcome Scores Between Circumferential and Segmental Labral Reconstruction for the Management of Irreparable Labral Tear and Femoroacetabular Impingement Syndrome in the Primary Setting: A Propensity-Matched Study

D.R. Maldonado, C. Kyin, et al.

DOI: https://doi.org/10.1016/j.arthro.2021.04.037

Purpose

To compare minimum 2-year follow-up patient-reported outcome scores (PROs) in patients who underwent primary acetabular circumferential and segmental labral reconstruction for irreparable labral tears and femoroacetabular impingement syndrome (FAIS).

Methods

Data were reviewed from August 2010 to December 2017. Patients with primary labral reconstruction and minimum 2-year follow-up 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 included. Circumferential and segmental reconstruction were selected in each case based on the extent of the labral pathology. Exclusion criteria were previous ipsilateral hip surgery/conditions, dysplasia, or Tönnis grade >1. Patients were propensity matched 1:1 based on age, sex, and body mass index. Secondary surgeries were reported. The P value was set at <.05.

Results

In total, 144 hips were eligible, and 17 hips were lost to follow-up, leaving 127 hips (88.2%) for analysis. Eighty hips underwent a segmental reconstruction, and 47 hips underwent a circumferential reconstruction. Forty-seven hips with circumferential reconstruction were matched to 47 hips with segmental reconstruction. The average follow-up and age for the segmental and circumferential groups were 29.0 ± 7.8 and 27.9 ± 7.0 months (P = .732) and 43.1 ± 9.4 and 44.7 ± 10.2 years (P = .442) respectively. The segmental and circumferential groups were 48.9% and 51.1% female, respectively. The groups achieved significant and comparable improvement for all PROs and rates of secondary surgeries. No differences were found for achieving the minimal clinically important difference (MCID) and the patient acceptable symptomatic state (PASS). The MCIDs for the segmental and circumferential groups were 76.7% and 77.8% for the mHHS, 64.9% and 77.8% for the HOS-SSS, 71.1% and 68.9% for the VAS, and 68.9% and 73.9% for the NAHS, respectively. The PASSs for the segmental and circumferential groups were 78.3% and 73.3% for the mHHS, 55.3% and 55.0% for the HOS-SSS, and 75.6% and 71.1% for the International Hip Outcome Tool 12, respectively.

Conclusions

At minimum 2-year follow-up, patients who underwent primary hip arthroscopy for either circumferential or segmental labral reconstruction for irreparable labra and FAIS reported significant improvement and similar postoperative scores for all PROs, with no difference in psychometric outcomes and rate of secondary surgeries. A customized approach, using the extent of the irreparable labral tear, seems to be an appropriate strategy.

Level of Evidence

Level III, retrospective comparative therapeutic trial.

BACK

Improved Outcome and Earlier Return to Activity After Suture Tape Augmentation Versus Broström Repair for Chronic Lateral Ankle Instability? A Systematic Review

U. Wittig, G. Hohenberger, et al.

DOI: https://doi.org/10.1016/j.arthro.2021.06.028

Purpose

To determine whether the use of suture tape augmentation (ST) would lead to improved clinical outcomes, increased stability, shorter postoperative immobilization, and earlier return to activity and sports compared with Broström repair (BR) in surgical treatment of chronic lateral ankle instability (CLAI).

Methods

A systematic literature search was performed using Pubmed and Embase according to PRISMA guidelines. The following search terms were used: ankle instability, suture tape, fiber tape, and internal brace. Full-text articles in English that directly compared BR and ST cohorts were included, with a minimum cohort size of 40 patients. Exclusion criteria were former systematic reviews, biomechanical studies, and case reports.

Results

Ultimately, 7 clinical trials were included in this systematic review. Regarding the clinical and radiologic outcomes and complication rates, no major differences were detected between groups. Recurrence of instability and revision surgeries tended to occur more often after BR, whereas irritation of the peroneal nerve and tendons seemed to occur more frequently after ST. Postoperative rehabilitation protocols were either the same for both groups or more aggressive in the ST groups. When both techniques were performed with arthroscopic assistance, return to sports was significantly faster in the ST groups.

Conclusions

In conclusion, suture tape augmentation showed excellent results and is a safe technique comparable to traditional Broström repair. No major differences regarding clinical and radiologic outcomes or complications were found.

Level of Evidence

III, systematic review of level I, II, and III studies.

BACK

Social Determinants of Health Influence Access to Care and Outcomes in Patients Undergoing Anterior Cruciate Ligament Reconstruction: A Systematic Review

A. Ziedas, V. Abed, et al.

DOI: https://doi.org/10.1016/j.arthro.2021.06.031

Purpose

To investigate the impact social determinants of health (SDOH) have on accessing orthopaedic treatment after an anterior cruciate ligament injury, as well as patient-reported and surgical outcomes after anterior cruciate ligament reconstruction (ACLR).

Methods

A systematic search of the PubMed, MEDLINE, Epub Ahead of Print, Embase, and Web of Science databases was performed according to the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines to identify studies that reported at least 1 SDOH and its effect on patient-reported outcomes or surgical outcomes after anterior cruciate ligament reconstruction. Our search identified 937 studies. After eliminating 273 duplicates, 2 authors screened 664 articles on the basis of title and abstract. After this initial screening, 76 studies were evaluated for data extraction. Studies were categorized based on the social determinant(s) of health reported.

Results

Twenty-two articles published between 2002 and 2020 were included in this study, encompassing 15 retrospective cohort studies, 3 prospective cohort studies, 3 cross-sectional studies, and 1 case-control study from 9 journals across 3 countries. Of these articles, 9 investigated race/ethnicity, 8 investigated insurance status, 4 investigated income, 5 investigated education level, 2 investigated employment status, and 5 investigated socioeconomic status. Reported outcomes included time to treatment, concomitant knee injury, patient-reported outcome measurement scores, postoperative complications, need for additional surgery, and postoperative healthcare utilization.

Conclusions

Certain SDOH, including black race, Hispanic ethnicity, public health insurance, and lower socioeconomic status contribute to a delay in access to care, which may result in increased severity of concomitant knee injuries encountered at the time of anterior cruciate ligament reconstruction and inferior outcomes.

Study Design

Level III, systematic review of level I-III evidence.

BACK

Tranexamic Acid Use in Anterior Cruciate Ligament Reconstruction Decreases Bleeding Complications: A Systematic Review and Meta-Analysis of Randomized Controlled Trials
N. Alkhatib, M. AlNouri, et al.

DOI: https://doi.org/10.1016/j.arthro.2021.07.030

Purpose
To systematically review all available randomized controlled trials (RCTs) in the literature that examine outcomes following tranexamic acid (TXA) use in anterior cruciate ligament reconstruction (ACLR) to determine its effectiveness.

Methods
PubMed/MEDLINE, Embase, Science Direct, Web of Science, CINAHL, and The Cochrane Library databases were systematically searched for RCTs comparing TXA versus no TXA in ACLR with a 4-week minimum follow-up. Quality was assessed using Risk of Bias 2. Pooled analyses were conducted using inverse variance for continuous variables and Mantel–Haenszel for dichotomous variables. The Grading of Recommendations, Assessment, Development and Evaluation guidelines were used to evaluate primary outcomes.

Results
A total of 807 patients (632 male, 175 female) from 7 RCTs were included. Mean age was 28.4 years. Bias was graded “low” in 4 RCTs, “some concerns” in 2 RCTs, and “high” in 1 RCT. Visual analog scale was found to be not significantly different with TXA use at day 1-3 (mean difference [MD] –0.92, I2 = 96%, P = .14) and 12 weeks (MD –0.03, I2 = 0%, P = .73). Visual analog scale was significantly decreased at week 2 (MD –1.18, I2 = 56%, P < .00001) and weeks 3-6 (MD –0.38, I2 = 73%, P < .010). Lysholm scores were greater with TXA use at week 2 (MD 9.04, I2 = 74%, P = .002) and weeks 4-6 (MD 6.17, I2 = 73%, P = .0004) but not significantly different at 12 weeks (MD 6.13, I2 = 98%, P = .28). Need for aspiration was less with TXA use (odds ratio 0.40, I2 = 49%, P = 0.0009). Considerable heterogeneity was seen in many results. Certainty was low for 2 primary outcomes, moderate for 2, and high for 5.

Conclusions
Pooled data suggest that the use of TXA in ACLR reduces the need for aspiration, hemarthrosis, drain output, and knee swelling in the postoperative period. While early improvements in pain and function were observed, the clinical relevance is questionable. The risk of complications does not increase with TXA use, and the use of intravenous TXA over intra-articular TXA may improve and prolong hemarthrosis reduction, although the evidence is weak.

Level of Evidence
Level II, systematic review of therapeutic Level I-II studies.

BACK

Knee Surgery, Sports Traumatology, Arthroscopy, February 2022, volume 30, issue 2, pages 368 - 375

Machine learning algorithm to predict anterior cruciate ligament revision demonstrates external validity

Martin, R.K., Wastvedt, S., Pareek, A. *et al.*

DOI: https://doi.org/10.1007/s00167-021-06828-w

Purpose
External validation of machine learning predictive models is achieved through evaluation of model performance on different groups of patients than were used for algorithm development. This important step is uncommonly performed, inhibiting clinical translation of newly developed models. Machine learning analysis of the Norwegian Knee Ligament Register (NKLR) recently led to the development of a tool capable of estimating the risk of anterior cruciate ligament (ACL) revision (https://swastvedt.shinyapps.io/calculator_rev/). The purpose of this study was to determine the external validity of the NKLR model by assessing algorithm performance when applied to patients from the Danish Knee Ligament Registry (DKLR).

Methods
The primary outcome measure of the NKLR model was probability of revision ACL reconstruction within 1, 2, and/or 5 years. For external validation, all DKLR patients with complete data for the five variables required for NKLR prediction were included. The five variables included graft choice, femur fixation device, KOOS QOL score at surgery, years from injury to surgery, and age at surgery. Predicted revision probabilities were calculated for all DKLR patients. The model performance was assessed using the same metrics as the NKLR study: concordance and calibration.

Results
In total, 10,922 DKLR patients were included for analysis. Average follow-up time or time-to-revision was 8.4 (± 4.3) years and overall revision rate was 6.9%. Surgical technique trends (i.e., graft choice and fixation devices) and injury characteristics (i.e., concomitant meniscus and cartilage pathology) were dissimilar between registries. The model produced similar concordance when applied to the DKLR population compared to the original NKLR test data (DKLR: 0.68; NKLR: 0.68–0.69). Calibration was poorer for the DKLR population at one and five years post primary surgery but similar to the NKLR at two years.

Conclusion
The NKLR machine learning algorithm demonstrated similar performance when applied to patients from the DKLR, suggesting that it is valid for application outside of the initial patient population. This represents the first machine learning model for predicting revision ACL reconstruction that has been externally validated. Clinicians can use this in-clinic calculator to estimate revision risk at a patient specific level when discussing outcome expectations pre-operatively. While encouraging, it should be noted that the performance of the model on patients undergoing ACL reconstruction outside of Scandinavia remains unknown.

Level of evidence
III.

BACK

American Journal of Sports Medicine (AJSM), Volume 50, Issue 2

Open Versus Endoscopic Surgical Treatment of Posterior Ankle Impingement: A Meta-analysis

Ruben Zwiers, Thymen Miedema, et al.

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DOI: https://doi.org/10.1177%2F03635465211004977

Background: Surgical treatment of symptomatic posterior ankle impingement consists of resection of the bony impediment and/or debridement of soft tissue. Historically, open techniques were used to perform surgery with good results. However, since the introduction of endoscopic techniques, advantages attributed to these techniques are shorter recovery time, fewer complications, and less pain.

Purpose: The primary purpose was to determine whether endoscopic surgery for posterior ankle impingement was superior to open surgery in terms of functional outcome (American Orthopaedic Foot & Ankle Society [AOFAS] score). The secondary aim was to determine differences in return to full activity, patient satisfaction, and complications.

Study Design: Systematic review and meta-analysis.

Methods: MEDLINE, EMBASE (Classic), and CINAHL databases were searched. Publication characteristics, patient characteristics, surgical techniques, AOFAS scores, time to return to full activity, patient satisfaction, and complication rates were extracted. The AOFAS score was the primary outcome measure. Data were synthesized, and continuous outcome measures (postoperative AOFAS score and time to return to full activity) were pooled using a random-effects inverse variance method. Random-effects meta-analysis of proportions using continuity correction methods was performed to determine the proportion of patients who were satisfied and who experienced complications.

Results: A total of 32 studies were included in this review. No statistically significant difference was found in postoperative AOFAS scores between open surgery (88.0; 95% CI, 82.1-94.4) and endoscopic surgery (94.4; 95% CI, 93.1-95.7). There was no difference in the proportion of patients who rated their satisfaction as good or excellent, 0.91 (95% CI, 0.86-0.96) versus 0.86 (95% CI, 0.79-0.94), respectively. No significant difference in time to return to activity was found, 10.8 weeks (95% CI, 7.4-15.9 weeks) versus 8.9 weeks (95% CI, 7.6-10.4 weeks), respectively. Pooled proportions of patients with postoperative complications were 0.15 (95% CI, 0.11-0.19) for open surgery versus 0.08 (95% CI, 0.05-0.14) for endoscopic surgery. Without the poor-quality studies, this difference was statistically significant for both total and minor complications, 0.24 (95% CI, 0.14-0.35) versus 0.02 (95% CI, 0.00-0.06) and 0.14 (95% CI, 0.09-0.20) versus 0.03 (95% CI, 0.01-0.05), respectively.

Conclusion: We found no statistically significant difference in postoperative AOFAS scores, patient satisfaction, and return to preinjury level of activity between open and endoscopic techniques. The proportion of patients who experienced a minor complication was significantly lower with endoscopic treatment when studies of poor methodological quality were excluded.

BACK

Predictors of Graft Failure in Young Active Patients Undergoing Hamstring Autograft Anterior Cruciate Ligament Reconstruction With or Without a Lateral Extra-articular Tenodesis: The Stability Experience

Andrew D. Firth, Dianne M. Bryant, *et al.*

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DOI: https://doi.org/10.1177%2F03635465211061150

Background: Anterior cruciate ligament (ACL) reconstruction (ACLR) has higher failure rates in young active patients returning to sports as compared with older, less active individuals. Augmentation of ACLR with an anterolateral procedure has been shown to reduce failure rates; however, indications for this procedure have yet to be clearly defined.

Purpose/Hypothesis: The purpose of this study was to identify predictors of ACL graft failure in high-risk patients and determine key indications for when hamstring ACLR should be augmented by a lateral extra-articular tenodesis (LET). We hypothesized that different preoperative characteristics and surgical variables may be associated with graft failure characterized by asymmetric pivot shift and graft rupture.

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

Methods: Data were obtained from the Stability 1 Study, a multicenter randomized controlled trial of young active patients undergoing autologous hamstring ACLR with or without a LET. We performed 2 multivariable logistic regression analyses, with asymmetric pivot shift and graft rupture as the dependent variables. The following were included as predictors: LET, age, sex, graft diameter, tear chronicity, preoperative high-grade knee laxity, preoperative hyperextension on the contralateral side, medial meniscal repair/excision, lateral meniscal repair/excision, posterior tibial slope angle, and return-to-sports exposure time and level.

Results: Of the 618 patients in the Stability 1 Study, 568 with a mean age of 18.8 years (292 female; 51.4%) were included in this analysis. Asymmetric pivot shift occurred in 152 (26.8%) and graft rupture in 43 (7.6%). The addition of a LET (odds ratio [OR], 0.56; 95% CI, 0.37-0.83) and increased graft diameter (OR, 0.62; 95% CI, 0.44-0.87) were significantly associated with lower odds of asymmetric pivot shift. The addition of a LET (OR, 0.40; 95% CI, 0.18-0.91) and older age (OR, 0.83; 95% CI, 0.72-0.96) significantly reduced the odds of graft rupture, while greater tibial slope (OR, 1.15; 95% CI, 1.01-1.32), preoperative high-grade knee laxity (OR, 3.27; 95% CI, 1.45-7.41), and greater exposure time to sport (ie, earlier return to sport) (OR, 1.18; 95% CI, 1.08-1.29) were significantly associated with greater odds of rupture.

Conclusion: The addition of a LET and larger graft diameter were significantly associated with reduced odds of asymmetric pivot shift. Adding a LET was protective of graft rupture, while younger age, greater posterior tibial slope, high-grade knee laxity, and earlier return to sport were associated with increased odds of graft rupture. Orthopaedic surgeons should consider supplementing hamstring autograft ACLR with a LET in young active patients with morphological characteristics that make them at high risk of reinjury.

BACK

Revision Anterior Cruciate Ligament Reconstruction Using Bone-Patellar Tendon-Bone Graft Combined With Modified Lemaire Technique Versus Hamstring Graft Combined With Anterolateral Ligament Reconstruction: A Clinical Comparative Matched Study With a Mean Follow-up of 5 Years From The SANTI Study Group

J. Rayes, H. Ouanezar, *et al.*

DOI: https://doi.org/10.1177%2F03635465211061123

Background: Additional lateral extra-articular tenodesis (LET) has recently been correlated with improved clinical outcomes and reduced failure rates in revision anterior cruciate ligament (ACL) reconstruction (ACLR). However, no data are available on clinical outcomes and reoperation after revision ACLR using different LET procedures.

Purpose: To compare the clinical outcomes of ACL + anterolateral ligament (ALL) reconstruction using hamstring tendon graft (HT-ALL) and a bone–patellar tendon–bone (BPTB) graft + modified Lemaire tenodesis procedure (BPTB-Lemaire) in the setting of revision ACLR and to determine whether ALL reconstruction is associated with an increased rate of adverse outcomes when compared with a modified Lemaire tenodesis procedure.

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

Methods: Descriptive data and clinical outcomes were prospectively collected from patients who underwent revision ACLR with LET between 2009 and 2018 with a minimum follow-up of 2 years. Patients with an HT autograft combined with ALL reconstruction (HT-ALL group) were matched in a 1:1 propensity ratio to patients with a BPTB autograft combined with a modified Lemaire LET procedure (BPTB-Lemaire group). The evaluated parameters included complications and reoperations; knee laxity tests; return to sports; and various scores, including the Lysholm knee score, Tegner activity scale, Anterior Cruciate Ligament Return to Sport After Injury scale, Marx activity rating scale, International Knee Documentation Committee subjective knee evaluation form, and Knee injury and Osteoarthritis Outcome Score.

Results: In total, 36 matched pairs were included in the analysis. The mean follow-up durations for the BPTB-Lemaire and HT-ALL groups were 56 ± 35 and 57 ± 23 months, respectively ($P = .91$). No significant differences were found in graft rupture rate (HT-ALL, 0%; BPTB-Lemaire, 11.1%; $P = .13$) or reoperations (HT-ALL, 8.3%; BPTB-Lemaire, 22.2%; $P = .23$). No specific complications with regard to LET were noted in either group. Additionally, there were no significant differences in knee laxity parameters, return to sports, or clinical scores between the groups at the final follow-up, except for the Tegner activity scale score (HT-ALL, 6.4; BPTB-Lemaire, 7.3; $P = .03$). HT-ALL was associated with a shorter surgical time (41.4 vs 59.8 minutes; $P < .0001$).

Conclusion: HT-ALL was at least equivalent, in terms of clinical outcomes, to the more commonly performed procedure, BPTB-Lemaire. Performing ALL reconstruction in the setting of revision ACLR is therefore safe and effective.

BACK

ACL Reconstruction Combined With the Arnold-Coker Modification of the MacIntosh Lateral Extra-articular Tenodesis: Long-term Clinical and Radiological Outcomes

E. Viglietta, A. Ponzo, *et al.*

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Background: Interest in the role of lateral extra-articular tenodesis (LET) in preventing rotatory instability and the pivot-shift phenomenon after anterior cruciate ligament reconstruction (ACLR) has been recently renewed. Nevertheless, there is still concern about overconstraint of the lateral compartment of the knee and the risk of subsequent osteoarthritis (OA).

Purpose: The purpose of this retrospective study was to compare long-term subjective and objective outcomes and the rate of OA development between patients undergoing isolated ACLR (iACLR) with a hamstring tendon autograft and those with a combined Arnold-Coker modification of the McIntosh extra-articular procedure. Risk factors for long-term OA were evaluated.

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

Methods: The study included 165 consecutive patients treated at a single center by ACLR. A total of 86 patients underwent iACLR (iACLR group) and 79 received combined intra- and extra-articular reconstruction (ACLR+LET). The International Knee Documentation Committee (IKDC), Lysholm, and Tegner activity scores were administered. Knee stability was tested through the Lachman test, the pivot-shift test, and the KT-1000 knee arthrometer test. A positive pivot-shift test (++/+++), laxity on the KT-1000, and referred giving-way episodes or revision ACLR were considered failures. Radiographic results were assessed according to the Fairbank, IKDC, and Kellgren-Lawrence scales. Radiographic evaluation included both the overall tibiofemoral joint and the medial and lateral compartment separately. A univariate and a multivariate logistic regression with penalized maximum likelihood was used to identify risks factors associated with long-term OA.

Results: The mean follow-up was 15.7 years. There were no statistically significant differences in subjective scores between the 2 groups. A side-to-side difference >5 mm on the KT-1000 arthrometer evaluation was found in 8 patients in the iACLR group and in 1 patient in the ACLR+LET group (P = .01). Nine cases of failure were found in the iACLR group and only 1 case was found in the ACLR+LET group (P = .0093). Patients in the iACLR group had a significantly higher OA grades than those in the ACLR+LET group for the overall tibiofemoral joint and the lateral compartment of the knee. No differences were found in the medial compartment. A higher level of lateral compartment OA was found in patients who received partial lateral meniscectomy in the iACLR group compared with those in the ACLR+LET group. Univariate and multivariate analysis results demonstrated that meniscectomy was the most significant factor for long-term OA development.

Conclusion: A significantly higher risk of long-term OA was found with iACLR than with ACLR combined with the Arnold-Coker modification of the McIntosh extra-articular procedure. Knees with combined ACLR also had a significantly lower OA grade after partial lateral meniscectomy. Additionally, those undergoing combined ACLR had better knee stability and lower graft rupture rates at the long-term follow-up. Partial meniscectomy was the main risk factor negatively associated with OA changes.

BACK

Femoral Positioning of the Anterolateral Ligament Graft With and Without Ultrasound Location of the Lateral Epicondyle

M. Castoldi, M. Cavaignac, *et al.*

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Background: In anterior cruciate ligament (ACL) reconstruction with anterolateral ligament (ALL) reconstruction, precise positioning of the ALL graft on the femur and tibia is key to achieve rotational control. The lateral femoral epicondyle is often used as a reference point for positioning of the ALL graft and can be located by palpation or with ultrasound guidance.

Purpose: To compare the ALL graft positioning on the femoral side between an ultrasound-guided technique and a palpation technique for the location of the lateral epicondyle.

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

Methods: A total of 120 patients receiving a primary combined ACL and ALL reconstruction between June and December 2019 were included. The location of the lateral epicondyle was determined by palpation in the palpation group (n = 60) and with preoperative ultrasound guidance in the ultrasound group (n = 60). Groups were comparable in age, sex, body mass index (BMI), and operated side. The planned positioning of the femoral ALL graft was proximal and posterior to the lateral epicondyle. The effective positioning of the femoral ALL graft was evaluated on postoperative lateral radiographs. The primary outcome was location of the graft in a 10-mm quadrant posterior and proximal to the lateral epicondyle. Results were analyzed in 2 subgroups according to BMI.

Results: All 60 anterolateral grafts (100%) in the ultrasound group were positioned in a 10-mm quadrant posterior and proximal to the lateral epicondyle, as opposed to 52 (87%) in the palpation group (P = .006). Errors in graft positioning with palpation occurred in overweight patients (BMI >25) as well as nonoverweight patients (P = .3).

Conclusion: Femoral positioning of the ALL graft posterior and proximal to the lateral epicondyle is more reproducible with ultrasound guidance when compared with palpation alone, regardless of BMI.

BACK

Patient-Reported Outcome, Return to Sport, and Revision Rates 7-9 Years After Anterior Cruciate Ligament Reconstruction: Results From a Cohort of 2042 Patients

P. Randsborg, N. Cepeda, *et al.*

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Background: Long-term patient-reported outcome measures (PROMs), rates of return to sport, and revision risk after anterior cruciate ligament (ACL) reconstruction (ACLR) are not well understood.

Purpose: To provide long-term follow-up of PROMs, return-to-sport rates, and revision rates after ACLR and to identify predictors for poor outcome.

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

Methods: A total of 2042 patients were included in an institutional ACL registry (2009-2013) and longitudinally followed. PROMs were completed preoperatively and at all follow-up time points. Questions regarding return to sport and knee stability were completed at final follow-up. Predictors for poor outcome on the International Knee Documentation Committee (IKDC) score were estimated in a regression model incorporating risk factors such as patient characteristics, graft choice, and concomitant injuries. Revision rates and risk of subsequent non-ACL surgeries were calculated.

Results: Autografts were used in 76% of the patients (patellar tendon, 62%; hamstring grafts, 38%). Allografts were used in 24% of patients. The questionnaires were returned by 1045 (51.2%) patients at a mean of 7.2 years (range, 5.0-9.8 years) after surgery. Improvements in IKDC score of >30 points were sustained for all patient categories. The strongest predictor for lesser improvement in IKDC score was a cartilage lesion >2 cm2 identified during surgery. Male sex and college education completion were associated with improved IKDC scores. Meniscal lesions did not predict change) in the IKDC score. A total of 69% of patients had returned to sport after 8.1 years (range, 6.7-9.8 years). The main reason for not returning to sport was fear of reinjury. The revision rate was 7.2% after 9 years (range, 8-11 years), 13% of patients needed subsequent ipsilateral non-ACL surgery, and 6% underwent contralateral ACLR. The absence of a meniscal tear, younger age, and male sex were predictors for revision. Graft choice did not predict PROM results or revision risk.

Conclusion: Improvements in IKDC scores were sustained 7 years after ACLR. The strongest predictor for poor outcome was a cartilage lesion >2 cm2. Patients can expect a 70% return-to-sport rate and an 87% chance of their knee feeling stable during daily and athletic activities after 8 years. Young male patients have better PROM scores but a higher risk of revision. There is a 26% chance of subsequent knee surgery within 9 years, including a revision rate of 7%, subsequent non-ACL surgery to the operated knee in 13%, and a 6% chance of contralateral ACLR.

BACK

Individual and Combined Anatomic Risk Factors for the Development of an Anterior Cruciate Ligament Rupture in Men: A Multiple Factor Analysis Case-Control Study

A. Misir, G. Sayer, *et al.*

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Background: No comparative studies have evaluated anatomic risk factors in a large cohort including both patients with anterior cruciate ligament (ACL) ruptures and healthy participants.

Purpose: To determine which anatomic parameters are independently associated with an ACL rupture and the diagnostic values of the individual and combined anatomic parameters.

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

Methods: A total of 352 male patients who underwent arthroscopic ACL reconstruction because of a primary ACL rupture and 350 age-, sex-, body mass index–, and side dominance–matched healthy participants were included. Measurements of 32 previously determined parameters and 7 calculations were performed. Between-group differences were calculated. Univariate and multivariate logistic regression models and receiver operating characteristic curve analysis were conducted for the individual and combined independently associated factors.

Results: The mean age and body mass index of all participants were 29.9 ± 7.7 years and 27.2 ± 3.1, respectively. There were significant differences between the groups regarding the notch width (NW), notch shape index, anterior tibial slope, notch width index, NW–eminence width (NW:EW) ratio, notch height, axial lateral wall angle, medial intercondylar ridge thickness, alpha angle, medial tibial depth (MTD), lateral tibial slope (LTS), coronal tibial plateau width, eminence width index, tibial proximal anteroposterior distance (TPAP), lateral condylar anteroposterior distance (LCAP)/TPAP, ACL cross-sectional area, ACL volume, medial and lateral meniscal cartilage height, medial and lateral meniscal cartilage angle (MCA), and medial and lateral meniscal cartilage bone height. The NW:EW ratio (odds ratio [OR], 4.419; P = .017), MTD (OR, 8.617; P = .001), LTS (OR, 2.254; P = .011), LCAP/TPAP (OR, 2.782; P = .037), and medial MCA (OR, 1.318; P = .010) were independently associated with the development of an ACL rupture. Combining the independently associated factors revealed a sensitivity of 93% and a specificity of 94% (area under the curve, 0.968).

Conclusion: Patients with ACL ruptures could be distinguished from uninjured controls with high sensitivity and specificity via the combined use of the NW:EW ratio, MTD, LTS, LCAP/TPAP, and medial MCA. In clinical practice, these findings may contribute to the development of preventive strategies for ACL ruptures.

BACK

Symmetry in Triple Hop Distance Hides Asymmetries in Knee Function After ACL Reconstruction in Athletes at Return to Sports

A. Kotsifaki, S. Van Rossom, *et al.*

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Background: After anterior cruciate ligament reconstruction (ACLR), a battery of strength and hop tests is frequently used to determine the readiness of an athlete to successfully return to sports. However, the anterior cruciate ligament reinjury rate remains alarmingly high.

Purpose: To evaluate the lower limb function of athletes after ACLR at the time when they had been cleared to return to sports (RTS). We aimed to evaluate if passing discharge criteria ensures restoration of normal lower limb biomechanics in terms of kinematics, kinetics, work, and percentage work contribution during a triple hop for distance.

Study Design: Controlled laboratory study.

Methods: Integrated 3-dimensional motion analysis was performed in 24 male athletes after ACLR when cleared to RTS and 23 healthy male controls during the triple-hop test. The criteria for RTS were (1) clearance by the surgeon and the physical therapist, (2) completion of a sports-specific on-field rehabilitation program, and (3) limb symmetry index >90% after quadriceps strength and hop battery tests. Lower limb and trunk kinematics, as well as knee joint moments and work, were calculated. Between-limb differences (within athletes after ACLR) and between-group differences (between ACLR and control groups) were evaluated using mixed linear models.

Results: Although achieving 97% limb symmetry in distance hopped and displaying almost 80% symmetry for knee work absorption in the second rebound and third landing, the ACLR cohorts demonstrated only 51% and 66% limb symmetry for knee work generation in the first and second rebound phases, respectively. During both work generation phases of the triple hop, the relative contribution of the involved knee was significantly smaller, with a prominent compensation from the hip joint ($P < .001$, for all phases) as compared with the uninvolved limb and the controls. In addition, patients deployed a whole body compensatory strategy to account for the between-limb differences in knee function, mainly at the hip, pelvis, and trunk.

Conclusion: Symmetry in the triple hop for distance masked important deficits in the knee joint work. These differences were more prominent during work generation (concentric-propulsive) than work absorption (eccentric-landing).

Clinical Relevance: Symmetry in hop distance during the triple hop test masked significant asymmetries in knee function after ACLR and might not be the appropriate outcome to use as a discharge criterion. Differences between limbs in athletes after ACLR were more prominent during the power generation than the absorption phase.

BACK

Changes in the Synovial Fluid Cytokine Profile of the Knee Between an Acute Anterior Cruciate Ligament Injury and Surgical Reconstruction

M. T. Kingery, U. Anil, *et al.*

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Background: Changes in the intra-articular inflammatory state during the immediate period after an acute anterior cruciate ligament (ACL) rupture are not well defined.

Purpose: To evaluate changes in the concentration of select proinflammatory and anti-inflammatory synovial fluid cytokines during the interval between an ACL injury and surgical reconstruction.

Study Design: Descriptive laboratory study.

Methods: In patients with an acute ACL injury, a synovial fluid sample was obtained from the injured knee during the initial office visit within 2 weeks of the inciting traumatic event. An additional synovial fluid sample was collected at the time of ACL reconstruction just before the surgical incision. Synovial fluid samples from both the acute injury and the surgery time points were processed with a protease inhibitor, and the concentrations of 10 cytokines of interest were measured using a multiplex magnetic bead immunoassay. The primary outcome was the change in cytokine concentrations between time points.

Results: A total of 20 patients with a mean age of 30.2 ± 8.3 years were included. The acute injury synovial fluid samples were collected at 6.6 ± 3.8 days after the injury. The surgical synovial fluid samples were collected at 31.6 ± 15.6 days after the acute injury samples. Based on a series of linear mixed-effects models to control for the effect of concomitant meniscal injuries and by-patient variability, there was a statistically significant increase in the concentrations of RANTES and bFGF and a statistically significant decrease in the concentrations of IL-6, MCP-1, MIP-1β, TIMP-1, IL-1Ra, and VEGF between time points.

Conclusion: This study demonstrates the ongoing alterations in the intra-articular microenvironment during the initial inflammatory response in the acute postinjury period. We identified 6 synovial fluid cytokines that significantly decreased and 2 that significantly increased between the first clinical presentation shortly after the injury and the time of surgery 1 month later.

Clinical Relevance: This study describes the molecular profile of the inflammatory changes between the time of an acute ACL injury and the time of surgical reconstruction 1 month later. A greater understanding of the acute inflammatory response within the knee may be helpful in identifying the optimal timing for a surgical intervention that balances the risk of chondral damage with the likelihood of successful, well-healed reconstruction.

BACK