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Volume 50, Issue 1

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Volume 38, Issue 1

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Upper extremity

Arthroscopy, Volume 38, Issue 1, P1-208

Perioperative Oral Pregabalin Results in Postoperative Pain Scores Equivalent to Those of Interscalene Brachial Plexus Block After Arthroscopic Rotator Cuff Repair: A Randomized Clinical Trial.

Farlandansky E., Shoshana H., et al.

DOI: https://doi.org/10.1016/j.arthro.2021.05.022

Purpose
To compare the analgesic effects of pregabalin to those of single-shot interscalene brachial plexus block (ISBPB) in adults having arthroscopic rotator cuff (RC) repair, as well as ISBPB's effect on postoperative opioid consumption, patient satisfaction, and opioid-related adverse effects.

Methods
In this randomized trial, 79 adults having arthroscopic RC repair were randomized to receive perioperative oral pregabalin (Lyrica, twice daily starting the evening before surgery, for a total of 4 doses) or single-shot ISBPB (20 ml of bupivacaine 0.25%). Intra- and postoperative management was standardized. The primary outcome was median self-reported pain score (on a visual analog scale of 0 to 100) at rest during the initial 10 postoperative days. Other outcomes included pain during activity, postoperative opioid consumption, opioid-related adverse effects, quality of recovery, and pain satisfaction score.

Results
Of 71 eligible patients, 59 were analyzed, of whom 29 received pregabalin and 30 received ISBPB. Groups were similar regarding demographic, baseline, and intraoperative variables. Median pain score at rest over the 10 postoperative days was 51 (interquartile range 26, 76) in the pregabalin group and 52 (22, 74) in the ISBPB group (difference 0.5 points; 95% confidence interval [CI] –3.2 to 6.3; P = .53). Opioid consumption during the initial 10 postoperative days was also similar (difference in median 90 mg of morphine equivalents; 95% CI –32 to 177.5; P = .12). No differences were found in any other outcome.

Conclusions
Perioperative use of pregabalin in adults undergoing arthroscopic RC repair provided analgesia comparable to that of ISBPB for 10 days after surgery.

Level of Evidence
II, randomized controlled trial (high dropout rate)

BACK

Arthroscopic Single and Double Row Repair of Isolated and Combined Subscapularis Tears Result in Similar Improvements in Outcomes: A Systematic Review

Xiao M., Cohen S.A., et al.

DOI:https://doi.org/10.1016/j.arthro.2021.05.032

Purpose

To systematically review the literature to (1) describe arthroscopic subscapularis repair constructs and outcomes in patients with isolated and combined subscapularis tears and (2) compare outcomes after single- and double-row subscapularis repair in both of these settings.

Methods

A systematic review was performed using PRISMA guidelines. PubMed, SCOPUS, and Cochrane Central Register of Controlled Trials were searched for Level I-IV evidence studies that investigated outcomes after arthroscopic subscapularis repair for the treatment of isolated subscapularis tears or subscapularis tears combined with posterosuperior rotator cuff tears in adult human patients. Data recorded included study demographics, repair construct, shoulder-specific outcome measures, and subscapularis retears. Study methodological quality was analyzed using the MINORS score. Heterogeneity and low levels of evidence precluded meta-analysis.

Results

The initial search yielded 811 articles (318 duplicates, 493 screened, 67 full-text review). Forty-three articles (2406 shoulders, 57% males, mean age range 42 to 67.5 years, mean MINORS score 13.4 ± 4.1) were included and analyzed. Articles reported on patients with isolated subscapularis tears (n = 15), combined tears (n = 17), or both (n = 11). The majority of subscapularis repairs used single-row constructs (89.4% of isolated tears, 88.9% of combined tears). All except for one study reporting on outcome measures found clinically significant improvements after subscapularis repair, and no clinically significant differences were detected in 5 studies comparing isolated to combined tears. Subscapularis retear rates ranged from 0% to 17% for isolated tears and 0% to 32% for combined subscapularis and posterosuperior rotator cuff tears. Outcomes and retear rates were similar in studies comparing single-row to double-row repair for isolated and combined subscapularis tears ($P > .05$ for all).

Conclusion

Arthroscopic subscapularis repair resulted in significant improvements across all outcome measures, regardless of whether tears were isolated or combined or if repairs were single or double row.

Level of Evidence

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

BACK

Journal of Shoulder and elbow surgery, January 2022, Volume 31, Issue 1, P8-16.

A multicenter randomized controlled trial comparing gamification with remote monitoring against standard rehabilitation for patients after arthroscopic shoulder surgery.

Marley, W.D., Barratt A., Pigott, T., et al.

DOI: https://doi.org/10.1016/j.jse.2021.08.019

Background
Gamification has become increasingly popular in rehabilitation and is viewed as a tool to improve patient activation, motivation, and engagement. The aim of this study was to compare the efficacy of validated exergames played through a system using “depth sensor” and bespoke software against standard physiotherapy in patients treated with arthroscopic shoulder surgery. This included the following common conditions: subacromial impingement syndrome, calcific tendinopathy, and rotator cuff tear.

Methods
Following arthroscopic shoulder surgery, patients were randomized into 1 of 2 groups: In the standard rehabilitation group, patients were followed up for 12 weeks after surgery with standard postoperative physiotherapy and underwent electronic measurements of their active range of movement (ROM). In the exergame group, patients followed a postoperative regimen of exergames using the principles of gamification with physiotherapy support. Patients were given an exergame schedule prescribed by their therapist on Medical Interactive Recovery Assistant (MIRA) software (MIRA Rehab, London, UK) paired with a Microsoft Kinect sensor (Microsoft, Redmond, WA, USA). The primary outcome was active ROM objectively measured by MIRA and Kinect. Secondary outcome measures included the Oxford Shoulder Score, the Disabilities of the Arm, Shoulder and Hand score, and the EQ-VAS score at 12 weeks after surgery.

Results
A total of 71 patients were recruited to the study. We excluded 7 patients based on intraoperative findings. Thirty-three patients were treated with exergames, and 31 patients underwent conventional physiotherapy. There was no significant difference between the 2 groups in baseline ROM. Postoperatively, there was no significant difference in any of the cardinal planes of movement (forward flexion, $P = .64$; abduction, $P = .33$; and external rotation, $P = .75$). The mean Oxford Shoulder Score improved from 29.25 to 38.2 in the control group ($P = .001$) and from 27.1 to 35.1 in the trial group ($P = .01$); there was no significant difference between the groups at 12 weeks ($P = .246$). The mean Disabilities of the Arm, Shoulder and Hand score improved from 38.13 to 16.98 in the control group ($P = .001$) and from 42.3 to 22.54 in the trial group ($P = .007$); there was no significant difference between the 2 groups ($P = .328$). There was no significant difference in the EQ-VAS score in either group at any time point ($P = .5866$).

Conclusion
This randomized controlled trial demonstrates that exergames can be used effectively in the rehabilitation of patients following arthroscopic shoulder surgery. Outcomes, judged by ROM and patient-reported outcome measures, are equivalent to conventional physiotherapy rehabilitation protocols. This health care innovation has the potential to relieve some of the heavy burden placed on physiotherapy departments for “routine” postoperative care in shoulder surgery.

Level of evidence
Level II, Randomized Controlled Trial

BACK

Factors affecting the occurrence of osseous lesions in septic shoulder arthritis and the recurrence rate after arthroscopic surgery

Choi, M.H., Shin, W.C., Bae, H., et al.

DOI: https://doi.org/10.1016/j.jse.2021.05.020

Hypothesis

The purpose of this study was to determine the incidence of osseous lesions and the recurrence rate after arthroscopic surgery in shoulder septic arthritis patients and evaluate the influencing factors.

Materials and methods

We retrospectively reviewed 44 patients who underwent arthroscopic surgery for septic arthritis of the shoulder between January 2012 and September 2019. The average age of the patients was 65.57 ± 14.2 years, and 56.8% were female patients. The minimum follow-up period was 12 months (average, 32.8 ± 14.2 months; range, 12-72 months). We assessed variables including sex, age, underlying diseases, duration from symptom onset to magnetic resonance imaging (MRI), duration from symptom onset to surgery, radiologic results (radiography and MRI), history of injection therapy, and postoperative infection. The incidence of osseous lesions and the recurrence rate were calculated according to independent variables. In addition, multivariate logistic regression was performed to identify the risk factors for osseous lesions and recurrent infection after adjustment for other variables.

Results

Twenty-one patients had an osseous lesion on MRI, and 12 patients had evidence of bone erosion on radiographs. In univariate analyses, significant ($P < .05$) risk factors for the presence of osseous lesions were female sex, lower C-reactive protein level, and longer duration from symptom onset to MRI. The overall infection recurrence rate was 22.7% (10 of 44 patients). Culture results and the duration from symptom onset to surgery were significant risk factors for recurrent infection ($P < .05$). As the duration from symptom onset to MRI increased by 1 day, the probability of osseous lesions increased 1.31-fold (95% confidence interval, 1.08- to 1.59-fold; $P = .007$), and this probability was significantly higher after correction for other risk factors.

Conclusions

To reduce the severity of septic shoulder infection, timely diagnosis and treatment are essential. Even if osseous lesions are present, good results can be obtained if meticulous débridement is performed through arthroscopic surgery. However, functional and radiologic long-term follow-up studies are needed in patients with osseous lesions.

Level of evidence

Level III, Retrospective Cohort

BACK

Is there a difference in outcomes between the first and second surgical procedures in patients who have bilateral shoulder operations?

Erickson, B.J., Shishani, Y., Jones, S., et al.

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

Background

Some patients who have shoulder surgery on 1 shoulder go on to have surgery on their contralateral shoulder. It is unclear whether the clinical improvements following the second surgical procedure are as significant as the improvements after the first surgical procedure.

Methods

All patients who underwent surgery on both shoulders performed by a single surgeon between March 2013 and June 2018 were eligible for inclusion. Visual analog scale (VAS) scores were obtained preoperatively and at 2 weeks, 6 weeks, 3 months, 6 months, 1 year, and 2 years for both shoulders. Scores were then compared based on hand dominance and which shoulder was treated first. Complications were also recorded.

Results

Overall, 105 patients (210 surgical procedures) were included. Of the patients, 66 underwent bilateral open shoulder surgery and 39 underwent bilateral arthroscopic shoulder surgery. There was a significant reduction in VAS scores from preoperative to postoperative levels following surgery (5.9 before surgery vs. 1.7 after surgery). We found no difference in VAS scores at any time point when comparing whether the dominant or nondominant shoulder was operated on first. Significantly higher VAS scores were observed at 2 weeks, 6 weeks, and 3 months following the first shoulder operation compared with the second; by 6 months and beyond, there was no longer a difference.

Conclusion

Patients who undergo bilateral shoulder surgery have more pain in the first 3 months following their first shoulder operation compared with their second. However, there is no difference in pain scores at 6 months and beyond between shoulders.

Level of evidence

Level III, Retrospective Cohort Comparison

BACK

Quantitative magnetic resonance imaging assessment of the infraspinatus and teres minor in massive rotator cuff tear and its significance in clinical outcome after rotator cuff repair

Oh, J.H., Rhee, S.M., Park, J.H., et al.

DOI: https://doi.org/10.1016/j.jse.2021.06.001

Background

Teres minor (TM) muscle hypertrophy in large to massive rotator cuff tears (RCTs) has been considered a compensatory change to atrophy of the infraspinatus (ISP). However, few reports have assessed its relation to the prognosis after rotator cuff repair.

Methods

A total of 139 patients who underwent arthroscopic repair of large to massive RCTs involving the ISP between January 2013 and December 2015 were retrospectively investigated. Occupational ratios of the ISP (OR_ISP) and TM (OR_TM) were measured by sagittal magnetic resonance imaging (MRI). Rotator cuff healing was evaluated by MRI 1 year postoperatively, and functional outcomes using the Simple Shoulder Test (SST) and Constant score and external rotator (ER) strength by isokinetic muscle performance test (IMPT) were measured.

Results

A total of 116 patients completed the MRI and IMPT at 1 year postoperatively, and functional scores were measured at least 2 years postoperatively. Of these, the repaired tendon had not healed in 34 patients (29%). There was a highly negative correlation between OR_ISP and OR_TM both pre- and postoperatively (Pearson correlation = –0.52 and –0.54, respectively). Preoperative OR_ISP was significantly higher in the healed than in the healing failure group (0.47 ± 0.10 vs. 0.41 ± 0.12, P = .02); however, postoperative OR_ISP and pre- and postoperative OR_TM were not. The preoperative OR_ISP cutoff value for healing was 0.46. For functional outcomes, only postoperative OR_ISP showed a statistical correlation with SST, Constant score (P = .04 and .03, respectively), and ER strength (P = .02).

Conclusion

TM muscle hypertrophy in large to massive RCT appears to be a compensatory change in the progression of atrophy of the ISP muscle and was not a significant indicator of either better healing of the repaired rotator cuff tendon or better function. Only preoperative OR_ISP was an independent prognostic factor affecting rotator cuff healing after repair of large to massive RCTs.

Level of evidence

Level III

BACK

Clinical outcomes of revision arthroscopic Bankart repair for anterior shoulder instability: a systematic review of studies

Haskel, J.D., Wang, K.H., Hurley, E.T., et al.

DOI: https://doi.org/10.1016/j.jse.2021.06.021

Background

The purpose of this study was to review the literature to ascertain the functional outcomes, recurrence rates, and subsequent revision rates following revision arthroscopic Bankart repair.

Methods

Two independent reviewers performed a literature search based on PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-analyses) guidelines using the Embase, MEDLINE, and Cochrane Library databases. Studies in which arthroscopic Bankart repair was performed as a revision procedure were included. The clinical outcomes extracted and analyzed were functional outcomes, return to play, and recurrent instability.

Results

Fourteen studies with 433 patients met the inclusion criteria. The majority of patients were male patients (63.7%); the average age was 26.1 years (range, 14-58 years), and the mean follow-up period was 37.6 months (range, 10-144 months). The mean Rowe score was 84.2, and 79.7% of patients had good to excellent outcomes. The rate of return to play was 78.5%, with 47.5% of patients returning to their preinjury level of play across 10 studies. The rate of recurrent instability was reported in 12 studies, with 328 shoulders demonstrating 86 instability events (26.2%). The rate of recurrent instability due to dislocation was reported in 7 studies (n = 176), with 19 events (10.8%), whereas the rate of subluxation was reported in 4 studies (n = 76), with 6 events (7.9%).

Conclusions

Revision arthroscopic Bankart repair for anterior shoulder instability was shown to result in a high rate of recurrent shoulder instability. There was a relatively poor rate of return to sport among athletes, and only about half of the patients were able to return at or above their preoperative level of ability.

Level of evidence

Level IV, Systematic Review

BACK

Routine diagnostic arthroscopy with elbow ulnar collateral ligament reconstruction does not reduce the need for future valgus extension overload–related surgeries: a systematic review and meta-analysis

Looney, A.M., Bovill, J.D., Huffman, S.S., et al.

DOI: https://doi.org/10.1016/j.jse.2021.08.004

Background

Valgus extension overload syndrome (VEOS) most commonly affects overhead athletes and consists of a constellation of conditions involving the medial, posterior, and lateral elbow, with the most widely discussed being ulnar collateral ligament (UCL) injuries. Many athletes with UCL tears also have findings consistent with other VEOS conditions, though these are not consistently symptomatic. Given the high rate of concomitant pathology, many authors have recommended performing arthroscopy at the time of UCL reconstruction (UCLR) to diagnose and address concomitant VEOS pathology; however, it is not known if this practice actually leads to a reduction in subsequent surgeries for VEOS conditions following index UCLR. The purpose of this systematic review and meta-analysis was to determine if performing routine diagnostic arthroscopy (RDA) in patients undergoing UCLR was associated with a lower incidence of future VEOS-related surgery.

Methods

This study was performed in accordance with the Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines, with the primary outcome of interest being the likelihood of needing future surgery to address VEOS conditions with or without RDA at the time of index UCLR. The proportion and incidence rate of subsequent VEOS-related surgeries following UCLR with and without RDA were compared in mixed effects models.

Results

There were 25 eligible studies from an initial 1335 systematically identified articles, with results for 2118 UCLR cases. Among these, there were a total of 94 reported VEOS-related surgeries. The proportion of subsequent VEOS-related surgeries was lower when UCLR was performed with RDA (0.40%, 95% CI 0.00%-3.51%) than without (1.16%, 95% CI 0.03%-3.25%), but the difference was not significant (P = .584). The incidence rate of VEOS-related surgeries was 0.16 (95% CI 0.00-0.95) per 100 person-years with RDA and 0.14 (95% CI 0.00-0.55) per 100 person-years without RDA (P = .942).

Conclusion

RDA preceding UCLR does not significantly reduce the proportion or rate of subsequent surgery for other VEOS conditions. There has been a decrease in RDA utilization with UCLR over time for athletes with torn/incompetent UCLs but otherwise no known symptomatic VEOS conditions, and this trend appears to be justified based on these findings.

Level of evidence

Level IV, Systematic Review/Meta-Analysis

BACK

American Journal of Sports Medicine (AJSM), Volume 47, Issue 1

Use of Suture Tapes Versus Conventional Sutures for Arthroscopic Rotator Cuff Repairs: A Systematic Review and Meta-analysis

Khalis Boksh, BSc (Hons), MRCS, Aziz Haque, BSc (Hons)., et al.

https://doi.org/10.1177%2F0363546521998318

Background: Various suture materials are available for arthroscopic rotator cuff repair. More recently, suture tapes have become popular as they are perceived to be easier to use with less soft tissue irritation. However, little is known about their biomechanical and clinical properties compared with conventional sutures in rotator cuff repairs.

Purpose: To perform a systematic review and meta-analysis on whether suture tapes are biomechanically superior to conventional sutures in arthroscopic rotator cuff repairs and whether this translates to superior functional outcomes and a lower incidence of retears.

Study Design: Meta-analysis.

Methods: The Cochrane Controlled Register of Trials, PubMed, Medline, and Embase were used to perform a systematic review and meta-analysis using the PRISMA (Preferred Reporting Items for Systematic Reviews and Meta-Analyses) criteria with the following search terms: (rotator cuff repair OR arthroscopic rotator cuff repair) AND (“tape” OR “wire” OR “cord” OR “suture”). Data pertaining to certain biomechanical properties (contact area, contact pressure, gap formation, load to failure, and stiffness), retears, and patient-reported outcome measures (PROMs) were extracted. The pooled outcome data were analyzed by random- and fixed-effects models.

Results: After abstract and full-text screening, 7 biomechanical and 6 clinical studies were included. All biomechanical studies were on animals, with 91 suture tapes and 91 conventional sutures compared. Suture tapes had higher contact pressure (mean difference [MD], 0.04 MPa; 95% CI, 0.01-0.08; P = .02), higher load to failure (MD, 52.62 N; 95% CI, 27.34-77.90; P < .0001), greater stiffness (MD, 4.47 N/mm; 95% CI, 0.57-8.38; P = .02), and smaller gap formation (MD, −0.30 mm; 95% CI, −0.45 to −0.15; P < .0001) compared with conventional sutures. From the clinical analysis of the 681 rotator cuff repairs treated with a suture tape (n = 380) or conventional suture (n = 301), there were no differences in retear rates between the groups (16% vs 20% suture tape and wire, respectively; P = .26) at a mean of 11.2 months. Qualitatively, there were no differences in PROMs between the groups at a mean of 36.8 months.

Conclusion: Although biomechanically superior, suture tapes showed similar retear rates and postoperative function to conventional sutures. However, higher-quality clinical studies are required to investigate whether there are no true differences.

BACK

Lower Extremity

Arthroscopy, Volume 38, Issue 1, P1-218

The Incidence of Hip Arthroscopy in Patients With Femoroacetabular Impingement Syndrome and Labral Pathology Increased by 85% Between 2011 and 2018 in the United States.

Zusmanovich M., Haselman B.S., et al.

DOI: https://doi.org/10.1016/j.arthro.2021.04.049

Purpose
The purpose of this study was to investigate the incidence of hip arthroscopy in patients with labral pathology in the United States from 2011-2018 using a large national database.

Methods
Patients who underwent hip arthroscopy from 2011-2018 were identified using Current Procedural Terminology (CPT) codes in the PearlDiver Patients Records Database (Colorado Springs, CO), which is a national database of orthopedic insurance records, including Medicare patients. The incidence of surgeries, age, and gender were all recorded. Groups were analyzed using SPSS version 24 (IBM, Armonk NY). CPT codes 29914/15/16 were introduced January 1, 2011 which is when we began our analysis. CPT-29999 and laterality were not assessed.

Results
In total, 35,966 arthroscopies were identified between 2011 and 2018 from a randomly selected sample of 30 million orthopaedic patients from the PearlDiver Mariner dataset. The incidence increased by 85% from 2011 to 2018 (7.31 cases vs 13.54 cases per 100,000 patients). The distribution of the age of patients undergoing hip arthroscopy was bimodal with the mode of each peak at 18 years old and 42 years old, respectively. Females underwent surgery more frequently (67.9%) than males (32.1%). The most common CPT code for hip arthroscopy was 29914 (43.9) which corresponds to a hip arthroscopy with femoroplasty.

Conclusions
Our findings corroborate those of previous studies and support the increase in incidence of hip arthroscopy in the United States. We indicate an overall increase of 85% from 2011 to 2018 and support previous trends, such as higher incidence of hip arthroscopy in women. Our study also supports a decreasing mean age for patients, likely due to improved diagnostics and surgeon familiarity and comfort with the procedure.

Level of Evidence
Level 3, Retrospective Comparative Study.

BACK

The Erector Spinae Plane Block in the Setting of Hip Arthroscopy: A Prospective Randomized Controlled Clinical Trial

Zimmerer A., Schneider M.M., et al.

DOI:https://doi.org/10.1016/j.arthro.2021.09.012

Purpose

To investigate whether the use of an erector spinae plane block (ESPB) would reduce perioperative pain after arthroscopic therapy for femoroacetabular impingement syndrome (FAIS) and to examine the amount of additional opioids and postoperative nausea and vomiting (PONV).

Methods

From October 2019 to October 2020, 68 patients undergoing arthroscopic therapy for FAIS were randomly allocated into 2 groups. The first group received an ultrasound-guided ESPB preoperatively with 30 mL of 0.375% ropivacaine and standard postoperative oral medication. The second group received a sham block preoperatively with 30 mL of 0.9% saline and standard postoperative oral medication. The primary endpoint was pain scores (numeric pain score out of 10) during the first 24 hours postoperatively. Secondary outcomes were opioid consumption during the first 24 hours (converted to morphine equivalents) and the incidence of PONV. Demographic and clinical characteristics were recorded for all patients. Categorial data were compared with chi-squared and Fisher's exact tests. Continuous data were compared with 2-sided t tests and Wilcoxon rank-sum tests.

Results

Sixty-eight subjects consented and were successfully randomized. Reported postoperative pain was significantly lower in the ESPB group than in the control group during the first 24 hours. The opioid amount (P = .865) and postoperative nausea (P = .642) did not differ significantly between groups. No associated complications such as falls, hematomas, or muscular weakness occurred in either group.

Conclusion

This study demonstrates that ESPB significantly decreases pain in the first 24 hours after arthroscopic therapy for FAIS. However, there was no evidence of lower opioid consumption compared with the control group. Overall, a low and comparable rate of PONV was present. Therefore, the ESPB seems to complement a multimodal approach to perioperative pain management in hip arthroscopy.

Level of Evidence

Level I, randomized controlled trial.

BACK

High Return to Play and Low Reinjury Rates in National Collegiate Athletic Association Division I Football Players Following Anterior Cruciate Ligament Reconstruction Using Quadrupled Hamstring Autograft

Jeffers K.W., Shah S.A., et al.

DOI: https://doi.org/10.1016/j.arthro.2021.04.057

Purpose

The purpose of this study was to examine the outcomes of anterior cruciate ligament (ACL) reconstruction using quadrupled hamstring (QH) autograft in a cohort of National Collegiate Athletic Association (NCAA) Division I football players.

Methods

A retrospective analysis was performed on NCAA Division I football players at a single institution who had transtibial ACL reconstruction using QH autograft between 2001 and 2016. Primary outcomes were ACL reinjury and return to play (RTP). Secondary outcomes were position, percent of eligibility used after surgery, graft diameter, Tegner-Lysholm scores, concomitant injuries/surgeries, and postcollegiate professional play.

Results

Between 2001 and 2016, 34 players had QH autograft ACL reconstruction, and 29 players achieved RTP. Of the 29, 2 (6.9%) sustained ACL reinjuries. The average RTP was 318 days (range 115-628) after surgery. Players used 79.5% of their remaining collegiate eligibility after surgery. Nine players sustained multiligamentous knee injuries. This did not have a significant effect on RTP ($P = 0.709$; mean 306±±24 days for isolated ACL, mean of 353±±51 for 2 ligaments, mean of 324±±114 for 3 + ligaments) and none sustained reinjury. Associated meniscal injuries were sustained by 28, and 8 sustained chondral injuries. The mean postoperative Tegner-Lysholm score was 90.7 of 100, with mean follow-up of 102 months. Of these players, 18 went on to play professionally, with 17 joining National Football League rosters and 1 an arena team roster.

Conclusion

QH demonstrated an ACL reinjury and RTP rates similar to those in previously published, predominantly bone-patella tendon-bone ACL reinjury data in elite athletes. This study demonstrates that QH autograft may be a viable option in elite athletes.

Level of Evidence

IV, case series.

BACK

Lateral Extra-Articular Tenodesis Combined With Anterior Cruciate Ligament Reconstruction Is Effective in Knees With Additional Features of Lateral, Hyperextension, or Increased Rotational Laxity: A Matched Cohort Study

Mahmoud A., Torbey S., et al.

DOI: https://doi.org/10.1016/j.arthro.2021.04.068

Purpose

To investigate the patient-reported outcome measures (PROMs) and graft survival of combined anterior cruciate ligament reconstruction (ACLR) and lateral extra-articular tenodesis (ACLR-LET) compared with a matched cohort having ACLR alone.

Methods

Patients were retrospectively recruited from a consecutive series of primary ACLR-LET, between 1996 and 2015, with a minimum postsurgical time of 4 years. ACLR-LET were matched with isolated ACLR for age, gender, and operation year. The indications for adding lateral extra-articular tenodesis were lateral laxity of grade 1 or 2, hyperextension laxity, and/or increased rotational laxity of 5° to 10°. The technique used involved detaching a strip of iliotibial band proximally, before being passed deep to the lateral collateral ligament, looped through Kaplan's fibers, and sutured back onto itself at physiological tension. The PROMs used were the Lysholm Knee Scoring Scale, Tegner Activity Scale, Oxford Knee Score, and International Knee Documentation Committee subjective knee form. Failure was defined as graft rupture. Student's t-test was used to compare the matched groups and Kaplan-Meier analysis for survivorship.

Results

Eighty-three patients had ACLR-LET between 1996 and 2015. Nine revision cases and 2 with less than 4 years follow-up were excluded. The remaining 72 ACLR-LET patients were matched and included in the survival analysis. Seventy percent of patients completed the PROMs. In both groups, 76% were males, and the mean age was 25 years (standard deviation ± 8.5). The median follow-up was 10 years (interquartile range, 6.7 years). There was no significant change of PROMs (Lysholm Knee Scoring Scale: P = .82, 95% confidence interval (CI) −13 to 11; International Knee Documentation Committee: P = .07, CI −1 to 24; Oxford Knee Score: P = .5, CI −8 to 4; Tegner Activity Scale: P = .5, CI −1 to 3) between the groups. The pre- to postoperative PROMs, except the Tegner Activity Scale, improved significantly, clinically and statistically. There was no statistically significant difference in graft failure between the ACLR-LET group (n = 4, 5%) and the ACLR group (n = 9, 11%) (log-rank P = .099).

Conclusion

ACLR-LET shows good graft survival and PROMs in a high-risk population. This suggests that lateral extra-articular tenodesis is an effective technique to restore joint stability to a knee with additional features of laxity.

Level of Evidence

III, matched cohort study.

BACK

Allograft Medial Patellofemoral Ligament Reconstruction in Adolescent Patients Results in a Low Recurrence Rate of Patellar Dislocation or Subluxation at Midterm Follow-Up

Allahabadi S., Pandya N. K., et al.

DOI: https://doi.org/10.1016/j.arthro.2021.05.005

Purpose

To evaluate rates of recurrent instability in adolescent patients with medial patellofemoral ligament (MPFL) reconstruction with allograft and associations of anatomic risk factors with complications.

Methods

A retrospective review identified patients of a single surgeon who underwent MPFL reconstruction with allograft for recurrent patellar instability with minimum 2-year follow-up. Surgical management was recommended after a minimum 6 weeks of nonoperative management and included MPFL reconstruction with gracilis allograft using a double-bundle technique. Preoperative radiographs were evaluated to assess physeal closure, lower-extremity alignment, trochlear morphology, and Insall-Salvati and Caton-Deschamps ratios. Magnetic resonance images were reviewed to evaluate the MPFL, trochlear morphology, and tibial tubercle trochlear groove distance (TT-TG). Descriptive statistics were used to characterize data. The primary outcome was recurrent instability.

Results

20 patients (24 knees; 18 knees in 14 females and 6 knees in 6 males; average age 15.7 years; range 11.5 to 19.6) underwent MPFL reconstruction with allograft (mean ± standard deviation follow-up 5.2 ± 1.7 years; range 2.2 to 8.1). Physes were open in 9 knees. The Insall-Salvati ratio was 1.09 ± 0.16, and the Caton-Deschamps index was 1.17 ± 0.15. Preoperatively, 19 patients were noted to have trochlear dysplasia, and TT-TG was 15.3 ± 3.9 mm. Three of 4 knees (16.7%) with non–hardware-related complications had open physes: 3 (12.5%) had recurrent instability, 2 of which underwent subsequent operation, and 1 sustained a patella fracture after a fall, requiring open reduction and internal fixation. The average Insall-Salvati ratio of these 4 patients was 1.21 ± 0.20, Caton-Deschamps index was 1.18 ± 0.17, and TT-TG was 17.5 ± 3.3 mm, none of which were statistically different from the group without complications. There were no clinically noted growth disturbances postoperatively.

Conclusions

MPFL reconstruction using allograft tissue may be performed safely in the pediatric and adolescent population with good outcomes at midterm follow-up, few complications, and a low rate of recurrent instability.

Level of Evidence

IV, case series.

BACK

Transosseous-Equivalent/Suture Bridge Arthroscopic Rotator Cuff Repair in Combination With Late Postoperative Mobilization Yield Optimal Outcomes and Retear Rate: A Network Meta-analysis of Randomized Controlled Trials

Colasantie C.A., Fried J.W., et al.

DOI:https://doi.org/10.1016/j.arthro.2021.05.050

Purpose

The purpose of this study was to perform a network meta-analysis of the randomized controlled trials (RCTs) in the literature in order to assess the evidence defining the optimal combination of surgical technique single-row repair (SRR), double-row repair (DRR), or transosseous-equivalent/suture bridge (TOE/SB) arthroscopic rotator cuff repair (ARCR) and postoperative rehabilitation (early or late) protocol for ARCR.

Methods

The literature search was performed based on the Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines. Randomized SSR-early trials (RCTs) comparing SRR vs DRR vs TOE/SB ARCR techniques were included, as well as early vs late postoperative range of motion. Clinical outcomes were compared using a frequentist approach to network meta-analysis, with statistical analysis performed using R. The treatment options were ranked using the P-score.

Results

Twenty-eight studies comprising 2,181 total shoulders met the inclusion criteria. TOE/SB-late (odds ratio [OR], 0.19; 95% confidence interval [CI], 0.08-0.46) and DRR-late (OR, 0.25; 95% CI, 0.12-0.52) were found to significantly reduce the rate of retear, with TOE/SB-late resulting in the highest P-score for the American Shoulder and Elbow Surgeons (P-score: 0.7911) score and retear rate (P-score: 0.8725). DRR-early did not result in any significant improvements over the SRR-early group, except in internal rotation. There was no significant difference in forward flexion between groups, with almost equivalent P-scores. Furthermore, TOE/SB-early and TOE/SB-late trended toward worsening external rotation compared with the control.

Conclusions

The current study suggests that rotator cuff repair using the TOE/SB technique and late postoperative mobilization yields the highest functional outcomes and lowest retear rate in the arthroscopic management of symptomatic rotator cuff tears.

Level of Evidence

Level I, meta-analysis of Level I studies.

BACK

Knee Surgery, Sports Traumatology, Arthroscopy, January 2022, Volume 30, Issue 1, P34-51

Current trends in the anterior cruciate ligament part II: evaluation, surgical technique, prevention, and rehabilitation

Musahl, V., Engler, I.D., Nazzal, E.M. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06825-z

Clinical evaluation and management of anterior cruciate ligament (ACL) injury is one of the most widely researched topics in orthopedic sports medicine, giving providers ample data on which to base their practices. The ACL is also the most commonly treated knee ligament. This study reports on current topics and research in clinical management of ACL injury, starting with evaluation, operative versus nonoperative management, and considerations in unique populations. Discussion of graft selection and associated procedures follows. Areas of uncertainty, rehabilitation, and prevention are the final topics before a reflection on the current state of ACL research and clinical management of ACL injury.

Level of evidence
Level V

BACK

Preoperative ultrasound predicts the intraoperative diameter of the quadriceps tendon autograft more accurately than preoperative magnetic resonance imaging for anterior cruciate ligament reconstruction

Takeuchi, S., Rothrauff, B.B., Taguchi, M. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-020-06408-4

Purpose

Sizing of potential autografts is essential to match the native anterior cruciate ligament (ACL) dimensions when performing ACL reconstruction (ACLR). We aimed to investigate the accuracy and reliability of the thickness and cross-sectional area (CSA) assessments for the prediction of the intraoperative diameter of the QT autograft using preoperative ultrasound and MRI.

Methods

Thirty patients (mean age ± standard deviation, 19.9 ± 5.0 years), who underwent ACLR using QT autograft, were included. The maximum thickness of the QT was assessed at 15 and 30 mm proximal using ultrasound with a long axis image, and at 15 mm proximal to the superior pole of the patella using MRI with a sagittal image. The CSA was assessed at the central 10 mm of the medial–lateral QT width at 30 mm proximal using ultrasound with a short axis image, and at 15 mm proximal to the superior pole of the patella using MRI with an axial image. Intraoperatively, QT autograft was harvested with a 10 mm width and the diameter was measured using a graft sizing device.

Results

Intra- and inter-observer reliabilities of all measurements using ultrasound and MRI were good (Intra-class correlation coefficient, 0.720–0.941). Correlation coefficient with the intraoperative diameter of the QT autograft was higher in ultrasound ($R = 0.738–0.791$, $P < 0.001$) than MRI ($R = 0.449–0.543$, $P = 0.002–0.013$).

Conclusions

Preoperative ultrasound predicted the intraoperative diameter of the QT autograft more accurately than MRI. Ultrasound may be used clinically to assure a sufficiently large QT autograft diameter to match the diameter of the patient's native ACL.

Level of evidence

Level III.

BACK

The effect of lateral extra-articular tenodesis on in vivo cartilage contact in combined anterior cruciate ligament reconstruction.

Nishida, K., Gale, T., Chiba, D. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06480-4

Purpose

Lateral extra-articular tenodesis (LET) may confer improved rotational stability after anterior cruciate ligament reconstruction (ACLR). Little is known about how LET affects in vivo cartilage contact after ACLR. The aim of this study was to investigate the effect of LET in combination with ACLR (ACLR + LET) on in vivo cartilage contact kinematics compared to isolated ACLR (ACLR) during downhill running. It was hypothesised that cartilage contact area in the lateral compartment would be larger in ACLR + LET compared with ACLR, and that the anterior–posterior (A–P) position of the contact center on the lateral tibia would be more anterior after ACLR + LET than after ACLR.

Methods

Twenty patients were randomly assigned into ACLR + LET or ACLR during surgery (ClinicalTrials.gov:NCT02913404). At 6 months and 12 months after surgery, participants were imaged during downhill running using biplane radiography. Tibiofemoral motion was tracked using a validated registration process. Patient-specific cartilage models, obtained from 3 T MRI, were registered to track bone models and used to calculate the dynamic cartilage contact area and center of cartilage contact in both the medial and lateral tibiofemoral compartments, respectively. The side-to-side differences (SSD) were compared between groups using a Mann–Whitney *U* test.

Results

At 6 months after surgery, the SSD in A–P cartilage contact center in ACLR + LET (3.9 ± 2.6 mm, 4.4 ± 3.1 mm) was larger than in ACLR (1.2 ± 1.6 mm, 1.5 ± 2.0 mm) at 10% and 20% of the gait cycle, respectively ($p < 0.01$, $p < 0.05$). There was no difference in the SSD in cartilage contact center at 12 months after surgery. There was no difference in SSD of cartilage contact area in the medial and lateral compartments at both 6 and 12 months after surgery. There were no adverse events during the trial.

Conclusion

LET in combination with ACLR may affect the cartilage contact center during downhill running in the early post-operation phase, but this effect is lost in the longer term. This suggests that healing and neuromuscular adaptation occur over time and may also indicate a dampening of the effect of LET over time.

Level of evidence

Level II.

BACK

The radiographic tibial spine area is correlated with the occurrence of ACL injury
Iriuchishima, T., Goto, B. & Fu, F.H.

DOI*:* https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06523-w

Purpose
The purpose of this study was to reveal the possible influence of the tibial spine area on the occurrence of ACL injury.

Methods
Thirty-nine subjects undergoing anatomical ACL reconstruction (30 female, 9 male: average age 29 ± 15.2) and 37 subjects with intact ACL (21 female, 16 male: average age 29 ± 12.5) were included in this study. In the anterior–posterior (A–P) and lateral knee radiograph, the tibial spine area was measured using a PACS system. In axial knee MRI exhibiting the longest femoral epicondylar length, the intercondylar notch area was measured. Tibial spine area, tibial spine area/body height, and tibial spine area/notch area were compared between the ACL tear and intact groups.

Results
The A–P tibial spine area of the ACL tear and intact groups was 178 ± 34 and 220.7 ± 58mm^2, respectively. The lateral tibial spine area of the ACL tear and intact groups was 145.7 ± 36.9 and 178.9 ± 41.7mm^2, respectively. The tibial spine area was significantly larger in the ACL intact group when compared with the ACL tear group (A–P: $p = 0.02$, lateral: $p = 0.03$). This trend was unchanged even when the tibial spine area was normalized by body height (A–P: $p = 0.01$, lateral: $p = 0.02$). The tibial spine area/notch area of the ACL tear and intact groups showed no significant difference.

Conclusion
The A–P and lateral tibial spine area was significantly smaller in the ACL tear group when compared with the ACL intact group. Although the sample size was limited, a small tibial spine might be a cause of knee instability, which may result in ACL injury.

Level of evidence
Level III.

BACK

Return to preinjury sports after anterior cruciate ligament reconstruction is predicted by five independent factors

Muller, B., Yabroudi, M.A., Lynch, A. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06558-z

Purpose

To determine factors that predict return to the same frequency and type of sports participation with similar activity demands as before injury.

Methods

Individuals 1 to 5 years after primary ACL reconstruction completed a comprehensive survey related to sports participation and activity before injury and after surgery. Patient characteristics, injury variables, and surgical variables were extracted from the medical record. Return to preinjury sports (RTPS) was defined as: “Returning to the same or more demanding type of sports participation, at the same or greater frequency with the same or better Marx Activity Score as before injury.” Variables were compared between individuals that achieved comprehensive RTPS and those that did not with univariate and multivariate logistic regression models.

Results

Two-hundred and fifty-one patients (mean age 26.1 years, SD 9.9) completed the survey at an average of 3.4 years (SD 1.3) after ACL reconstruction. The overall rate of RTPS was 48.6%. Patients were more likely to RTPS if they were younger than 19 years old (OR = 4.07; 95%CI 2.21–7.50; $p < 0.01$) or if they were competitive athletes (OR = 2.07; 95%CI 1.24–3.46; $p = 0.01$). Patients were less likely to RTPS if surgery occurred more than 3 months after injury (OR = 0.31, 95%CI 0.17–0.58; $p < 0.01$), if there was a concomitant cartilage lesion (OR = 0.38; 95%CI 0.21–0.70; $p < 0.01$), and if cartilage surgery was performed (OR = 0.17; 95%CI 0.04–0.80; $p = 0.02$).

Conclusion

Five variables best predicted RTPS including age at time of surgery. Only time from injury to surgery is a potentially modifiable factor to improve RTPS; however, the reasons for which patients delayed surgery may also contribute to them not returning to sports. Regardless, younger patients, those that partake in sports on a competitive level, those that undergo surgery sooner, or do not have a cartilage injury or require cartilage surgery are more likely to return to pre-injury sports participation.

Level of evidence

III.

BACK

Anterior cruciate ligament reconstruction with lateral extraarticular tenodesis better restores native knee kinematics in combined ACL and meniscal injury

Gibbs, C.M., Hughes, J.D., Popchak, A.J. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06476-0

Purpose

To determine if anterior cruciate ligament (ACL) reconstruction (ACLR) with lateral extraarticular tenodesis (LET) is beneficial for restoring knee kinematics with concomitant meniscal pathology causing rotatory knee instability.

Methods

Twenty patients with an ACL tear were randomized to either isolated ACLR or ACLR with LET. Patients were divided into four groups based on the surgery performed and the presence of meniscal tear (MT): ACLR without MT, ACLR with MT, ACLR with LET without MT, and ACLR with LET with MT. Kinematic data normalized to the contralateral, healthy knee were collected using dynamic biplanar radiography superimposed with high-resolution computed tomography scans of patients' knees during downhill running. Anterior tibial translation (ATT) and tibial rotation (TR) as well as patient-reported outcome measures (PROMs) were analyzed at 6- and 12-months postoperatively.

Results

At 6 months, ACLR with LET resulted in significantly decreased ATT at heel strike compared to ACLR (ACLR without MT: 0.3 ± 0.8 mm and ACLR with MT: 1.4 ± 3.1 mm vs. ACLR with LET without MT: − 2.5 ± 3.4 mm and ACLR with LET with MT: − 1.5 ± 1.2 mm ATT, $p = 0.02$). At 6 months, at toe off ACLR with LET better restored ATT to that of the contralateral, healthy knee in patients with meniscal pathology, while in patients without meniscal pathology, ACLR with LET resulted in significantly decreased ATT (1.0 ± 2.6 mm ATT vs. − 2.6 ± 1.7 mm ATT, $p = 0.04$). There were no significant differences in kinematics or PROMs between groups at 12 months.

Conclusion

For combined ACL and meniscus injury, ACLR with LET restores native knee kinematics at toe off but excessively decreases ATT at heel strike in the early post-operative period (6 months) without altering knee kinematics in the long term. Future large-scale clinical studies are needed to better understand the function of LET and ultimately improve patient outcomes.

Level of evidence

III.

BACK

A high tibial slope, allograft use, and poor patient-reported outcome scores are associated with multiple ACL graft failures

Winkler, P.W., Wagala, N.N., Hughes, J.D. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06460-8

Purpose

To compare clinical outcomes, radiographic characteristics, and surgical factors between patients with single and multiple anterior cruciate ligament (ACL) graft failures. It was hypothesized that patients experiencing multiple ACL graft failures exhibit lower patient-reported outcome scores (PROs) and a higher (steeper) posterior tibial slope (PTS) than patients with single ACL graft failure.

Methods

Patients undergoing revision ACL reconstruction with a minimum follow-up of 12 months were included in this retrospective cohort study. Based on the number of ACL graft failures, patients were assigned either to the group “single ACL graft failure “or” multiple ACL graft failures “. The PTS was measured on strict lateral radiographs. Validated PROs including the International Knee Documentation Committee (IKDC) subjective knee form, Knee Injury and Osteoarthritis Outcome Score, Lysholm Score, Tegner Activity Scale, ACL-Return to Sport after Injury Scale, and Visual Analogue Scale for pain were collected.

Results

Overall, 102 patients were included with 58 patients assigned to the single ACL graft failure group and 44 patients to the multiple ACL graft failures group. Quadriceps tendon autograft was used significantly more often (55% vs. 11%, $p < 0.001$) and allografts were used significantly less often (31% vs. 66%, $p < 0.001$) as the graft for first revision ACL reconstruction in patients with single versus multiple ACL graft failures. Patients with multiple ACL graft failures were associated with statistically significantly worse PROs (IKDC: 61.7 ± 19.3 vs. 77.4 ± 16.8, $p < 0.05$; Tegner Activity Scale: 4 (range, 0–7) vs. 6 (range 2–10), $p < 0.05$), higher PTS ($12 \pm 3°$ vs. $9 \pm 3°$, $p < 0.001$), and higher rates of subsequent surgery (73% vs. 14%, $p < 0.001$) and complications (45% vs. 17%, $p < 0.05$) than patients with single ACL graft failure.

Conclusion

Compared to single ACL graft failure in this study multiple ACL graft failures were associated with worse PROs, higher PTS, and allograft use. During the first revision ACL reconstruction, it is recommended to avoid the use of allografts and to consider slope-reducing osteotomies to avoid multiple ACL graft failures and improve PROs.

Level of evidence

Level 3.

BACK

Quadriceps tendon autograft is becoming increasingly popular in revision ACL reconstruction

Winkler, P.W., Vivacqua, T., Thomassen, S. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06478-y

Purpose

To evaluate trends in revision anterior cruciate ligament reconstruction (ACL-R), with emphasis on intra-articular findings, grafts, and concurrent procedures. It was hypothesized that revision ACL-Rs over time show a trend toward increased complexity with increased use of autografts over allografts.

Methods

This was a two-center retrospective study including patients undergoing revision ACL-R between 2010 and 2020. Demographic and surgical data including intra-articular findings and concurrent procedures were collected and compared for the time periods 2010–2014 and 2015–2020. All collected variables were compared between three pre-defined age groups (< 20 years, 20–30 years, > 30 years), right and left knees, and males and females. A time series analysis was performed to assess trends in revision ACL-R.

Results

This study included 260 patients with a mean age of 26.2 ± 9.4 years at the time of the most recent revision ACL-R, representing the first, second, third, and fourth revision ACL-R for 214 (82%), 35 (14%), 10 (4%), and 1 (< 1%) patients, respectively. Patients age > 30 years showed a significantly longer mean time from primary ACL-R to most recent revision ACL-R (11.1 years), compared to patients age < 20 years (2.2 years, $p < 0.001$) and age 20–30 years (5.5 years, $p < 0.05$). Quadriceps tendon autograft was used significantly more often in 2015–2020 compared to 2010–2014 (49% vs. 18%, $p < 0.001$). A high rate of concurrently performed procedures including meniscal repairs (45%), lateral extra-articular tenodesis (LET; 31%), osteotomies (13%), and meniscal allograft transplantations (11%) was shown. Concurrent LET was associated with intact cartilage and severely abnormal preoperative knee laxity and showed a statistically significant and linear increase over time ($p < 0.05$). Intact cartilage (41%, $p < 0.05$), concurrent medial meniscal repairs (39%, $p < 0.05$), and LET (35%, non-significant) were most frequently observed in patients aged < 20 years.

Conclusion

Quadriceps tendon autograft and concurrent LET are becoming increasingly popular in revision ACL-R. Intact cartilage and severely abnormal preoperative knee laxity represent indications for LET in revision ACL-R. The high rate of concurrent procedures observed demonstrates the high surgical demands of revision ACL-R.

Level of evidence

Level III.

BACK

High incidence of superficial and deep medial collateral ligament injuries in 'isolated' anterior cruciate ligament ruptures: a long overlooked injury

Willinger, L., Balendra, G., Pai, V. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06514-x

Purpose

In anterior cruciate ligament (ACL) injuries, concomitant damage to peripheral soft tissues is associated with increased rotatory instability of the knee. The purpose of this study was to investigate the incidence and patterns of medial collateral ligament complex injuries in patients with clinically 'isolated' ACL ruptures.

Methods

Patients who underwent ACL reconstruction for complete 'presumed isolated' ACL rupture between 2015 and 2019 were retrospectively included in this study. Patient's characteristics and intraoperative findings were retrieved from clinical and surgical documentation. Preoperative MRIs were evaluated and the grade and location of injuries to the superficial MCL (sMCL), dMCL and the posterior oblique ligament (POL) recorded. All patients were clinically assessed under anaesthesia with standard ligament laxity tests.

Results

Hundred patients with a mean age of 22.3 ± 4.9 years were included. The incidence of concomitant MCL complex injuries was 67%. sMCL injuries occurred in 62%, dMCL in 31% and POL in 11% with various injury patterns. A dMCL injury was significantly associated with MRI grade II sMCL injuries, medial meniscus 'ramp' lesions seen at surgery and bone oedema at the medial femoral condyle (MFC) adjacent to the dMCL attachment site ($p < 0.01$). Logistic regression analysis identified younger age (OR 1.2, $p < 0.05$), simultaneous sMCL injury (OR 6.75, $p < 0.01$) and the presence of bone oedema at the MFC adjacent to the dMCL attachment site (OR 5.54, $p < 0.01$) as predictive factors for a dMCL injury.

Conclusion

The incidence of combined ACL and medial ligament complex injuries is high. Lesions of the dMCL were associated with ramp lesions, MFC bone oedema close to the dMCL attachment, and sMCL injury. Missed AMRI is a risk factor for ACL graft failure from overload and, hence, oedema in the MCL (especially dMCL) demands careful assessment for AMRI, even in the knee lacking excess valgus laxity. This study provides information about specific MCL injury patterns including the dMCL in ACL ruptures and will allow surgeons to initiate individualised treatment.

Level of evidence

III.

BACK

Anterolateral complex injuries occur in the majority of 'isolated' anterior cruciate ligament ruptures

Balendra, G., Willinger, L., Pai, V. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06543-6

Purpose

The anterolateral soft tissue envelope of the knee is frequently injured at the time of ACL rupture. This study aims to investigate the MRI injury patterns to the Anterolateral complex and their associations in patients with acute 'isolated ligament' ACL ruptures.

Methods

Professional athletes who underwent ACL reconstruction for complete ACL rupture between 2015 and 2019 were included in this study. Patients' characteristics and intraoperative findings were retrieved from clinical and surgical documentation. Preoperative MRIs were evaluated and the injuries to respective structures of the Anterolateral complex and their associations were recorded.

Results

Anterolateral complex injuries were noted in 63% of cases. The majority of injuries were to Kaplan Fibre (39% isolated injury and 19% combined with Anterolateral ligament injury). There was a very low incidence of isolated Anterolateral ligament injuries (2%). Kaplan Fibre injuries are associated with the presence of lateral femoral condyle bone oedema, and injuries to the superficial MCL, deep MCL, and ramp lesions. High grade pivot shift test was not associated with the presence of Kaplan Fibre or Anterolateral ligament injuries. Patients with an intact Anterolateral complex sustained injury to other knee structures (13% to medial ligament complex, 14% to medial meniscus, and 16% to lateral meniscus).

Conclusion

There is a high incidence of concomitant Anterolateral complex injuries in combination with ACL ruptures, with Kaplan Fibre (and therefore the deep capsulo-osseous layer of the iliotibial band) being the most commonly injured structure. Anterolateral ligament injuries occur much less frequently. These findings reinforce the importance of considering the presence of, and if necessary, treating injuries to structures other than the ACL, as a truly isolated ACL injury is rare.

BACK

Ramp lesions are six times more likely to be observed in the presence of a posterior medial tibial bone bruise in ACL-injured patients

Beel, W., Mouton, C., Tradati, D. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06520-z

Purpose

The aim of this study was to determine whether posterior tibial slope (PTS), meniscal slope (MS), and bone bruise pattern (BBP), as observed on magnetic resonance imaging (MRI), differed between patients with or without medial meniscus ramp lesions at the time of anterior cruciate ligament reconstruction (ACLR). The hypothesis was that patients with a ramp lesion had a higher PTS and MS, with a different BBP than patients without a ramp lesion.

Methods

Fifty-six patients undergoing ACLR were selected from an in-house registry and separated into 2 groups: (1) the RAMP group included patients with a primary ACLR and a medial meniscus ramp lesion diagnosed intraoperatively; (2) the CONTROL group included patients with a primary ACLR without ramp lesion after arthroscopic exploration of the posteromedial knee area. The two groups were matched for age, sex and type of concomitant meniscal lesions. The medial/lateral-PTS/MS and BBP were subjected to blinded evaluation on the preoperative MRI of the reconstructed knee.

Results

Twenty eight patients (21 males; 7 females) were included in each group. No significant difference could be observed between groups in terms of demographical characteristics, PTS, and MS. A posteromedial tibial plateau (PMTP) bone bruise was more often observed in the RAMP group ($n = 23/28$) compared to the CONTROL group ($n = 12/28$) ($p < 0.01$). The RAMP group was 6.1 (95%CI [1.8; 20.8]) times more likely to present a PMTP bone bruise. The likelihood of having a bone bruise in both the medial and lateral compartments was 4.5 (95%CI [1.2; 16.5]) times higher in the RAMP group. However, a BBP only involving the lateral tibiofemoral compartment was more likely to be observed in the CONTROL group ($n = 10/28$) compared to the RAMP group ($n = 3/28$, $p < 0.05$ – odds ratio 4.6 (95%CI [1.1; 19.2]).

Conclusion

Ramp lesions were 6.1 and 4.5 times more likely to be observed in the presence of a posteromedial tibia plateau bone bruise or a combined bone bruise respectively in both the medial and lateral tibiofemoral compartment in patients undergoing ACLR. The tibial and meniscal slopes did not differ between patients with or without ramp lesions undergoing ACLR.

Level of evidence

Level III

BACK

Failed meniscal repair increases the risk for osteoarthritis and poor knee function at an average of 9 years follow-up

Rönnblad, E., Barenius, B., Stålman, A. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06442-w

Purpose

The purpose of this study was to determine the effect of meniscal repair on OA in the knee joint and patient-related outcomes.

Methods

Three-hundred and sixteen meniscal repairs performed between 1999 and 2011 were analysed. Patient-related outcome measures were assessed through mailed questionnaires including KOOS, Lysholm score and Tegner activity level. Patients answering the questionnaires were encouraged to perform a radiographic evaluation with Rosenberg views, assessed according to Kellgren–Lawrence (KL) classification. The primary endpoint was to determine the effect of meniscal repair on the development of radiographic OA defined as a KL grade 2 or more.

Results

Mean follow-up time was 9.3 years (SD 3.6), 162 (51%) patients answered the questionnaires, and 86 patients completed the X-ray. The odds ratio for OA with a failed meniscus repair was 5.1 ($p = 0.007$) adjusted for gender and age at time of follow-up. KOOS showed a clinically important difference in the sport and recreation subscale ($p = 0.041$).

Conclusions

There was an increased risk for OA in the affected compartment with a failed meniscus fixation. This supports the fact that the meniscus is an important protector of the cartilage in the knee. The meniscus injury affects the long-term health-related quality of life according to KOOS and in light of this study we recommend repair of a torn meniscus whenever possible.

Level of evidence

III.

BACK

The clinical outcome of minimally invasive popliteal tendon recess procedure is comparable to arthroscopic popliteal tendon reconstruction in patients with type A posterolateral rotational instability

Li, Y., Feng, H., Li, X. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06444-8

Purpose

To compare the objective and subjective clinical outcome of minimally invasive popliteal tendon (PT) recess procedure versus arthroscopic PT reconstruction, combined with posterior cruciate ligament reconstruction in patients with Type A posterolateral rotational instability (PLRI). The hypothesis was that the two techniques had comparable clinical outcomes.

Methods

Between 2012 and 2017, patients who were eligible for inclusion in this study if they (1) had Type A PLRI according to Fanelli's classification with posterior tibial translation > 12 mm on stress radiography and side-to-side difference of dial test external rotation > 10°, (2) PT peel-off lesion or laxity with structural integrity (3) were followed for a minimum of 2 years with examination under anesthesia (EUA) and stress radiograph results. Evaluation included subjective scoring, knee stability examinations and second-look arthroscopic lateral gutter drive-through (LGDT) test. Patients who underwent PT recess procedure were designated as Group A, while patients who underwent arthroscopic PT reconstruction were labelled as Group B. The differences between the two groups were analyzed.

Results

A total of 61 eligible patients with a minimum follow-up time of 2 years were evaluated in the present study. At the final follow-up, there were no significant inter-group differences in Lysholm scores (Group A: 69.0 ± 16.5, Group B: 75.8 ± 14.6, ns), Tegner scores [Group A: 2 (1–4), Group B: 3 (1–5), ns], or IKDC subjective scores (Group A: 70.5 ± 13.5, Group B: 71.1 ± 9.1, ns). No significant difference in side-to-side difference on posterior stress radiography (Group A: 4.3 ± 3.8 mm, Group B: 4.7 ± 4.6 mm, $P = 0.701$), dial test result (Group A: 0.9 ± 4.4°, Group B: 1.6 ± 4.9°, ns) or LGDT test positive rate (Group A: 2/34, 5.9%, Group B: 2/27, 7.7%, ns) was observed.

Conclusion

Both minimally invasive PT recess procedure and arthroscopic PT reconstruction significantly improved the knee stability and subjective outcome comparing with preoperative value. In a comparison with arthroscopic PT reconstruction, the recess procedure demonstrated comparable subjective and objective clinical outcome. When both PT reconstruction and PT recess procedure are indicated, the minimally invasive and graft-free recess procedure can be a viable option.

Level of evidence

III.

BACK

Allogenic umbilical cord blood-derived mesenchymal stromal cell implantation was superior to bone marrow aspirate concentrate augmentation for cartilage regeneration despite similar clinical outcomes

Yang, HY., Song, EK., Kang, SJ. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06450-w

Purpose

The aim of this study was to compare clinical and second-look arthroscopic outcomes between bone marrow aspirate concentrate (BMAC) augmentation and human umbilical cord blood-derived mesenchymal stromal cell (hUCB-MSC) implantation in high tibial osteotomy (HTO) for medial compartmental knee osteoarthritis and identify the relationship between articular cartilage regeneration and HTO outcomes.

Methods

A total of 176 patients who underwent HTO combined with a BMAC or hUCB-MSC procedure for medial compartment osteoarthritis (Kellgren–Lawrence grade 3) between June 2014 and September 2018 with a minimum follow-up of 2 years were reviewed. After HTO, multiple holes were drilled at cartilage defect sites of the medial femoral condyle (MFC), and then prepared BMAC or hUCB-MSCs in combination with scaffolds were implanted in the MFC lesions. After propensity score matching based on sex, age, body mass index, and lesion size, 55 patients in each of the BMAC and hUCB-MSC groups were successfully matched. Second-look arthroscopic findings were assessed according to the International Cartilage Repair Society (ICRS) Cartilage Repair Assessment (CRA) grading system and Koshino staging system. Clinical outcomes were evaluated using the International Knee Documentation Committee (IKDC), Knee Injury and Osteoarthritis Outcome Score (KOOS), Short-Form 36 (SF-36), and Tegner activity scores.

Results

At a mean follow-up of 33 months, clinical outcomes including IKDC, KOOS, SF-36, and Tegner activity scores were significantly improved in both groups ($p < 0.001$); however, there were no differences between the two groups. Second-look arthroscopy showed better healing of regenerated cartilage in the hUCB-MSC group (Grade I [4 cases, 9.1%]; Grade II [30 cases, 68.2%]; Grade III [11 cases, 22.7%]) than in the BMAC group (Grade I [1 case, 2.7%]; Grade II [20 cases, 54.1%]; Grade III [11 cases, 29.7%]; Grade IV [5 cases, 13.5%]) according to the ICRS CRA grading system ($p = 0.040$). There was no significant intergroup difference in terms of defect coverage based on the Koshino staging system ($p = 0.057$). Moreover, ICRS CRA grades at second-look arthroscopy were significantly correlated with clinical outcomes ($r = -0.337$; $p = 0.002$).

Conclusion

There were no significant differences in the clinical outcomes between the two groups. Both treatments provided similar, reliable outcomes in terms of pain relief, functional scores, and quality of life at a mean follow-up of 33 months. However, hUCB-MSC implantation was more effective than BMAC augmentation for articular cartilage regeneration.

BACK

An older age, a longer duration between injury and surgery, and positive pivot shift test results increase the prevalence of articular cartilage injury during ACL reconstruction in all three compartments of the knee in patients with ACL injuries

Nakamae, A., Miyamoto, A., Kamei, G. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06461-7

Purpose

To investigate factors that influence the prevalence of articular cartilage injury in patients with anterior cruciate ligament (ACL) injury.

Methods

This multicentre study included patients with ACL injury. Logistic regression analysis was conducted to identify factors that influence the prevalence of cartilage injury during ACL reconstruction.

Results

A total of 811 patients were enrolled. The factors that significantly influenced the prevalence of cartilage injury were age (odds ratio [OR], 1.04; $P = 0.000$), a positive pivot shift test result (OR, 1.43; $P = 0.021$), medial meniscal injury (OR, 2.55; $P = 0.000$), and delayed surgery (≥ 12 months) (OR, 2.52; $P = 0.028$) in the medial compartment of the knee; age (OR, 1.05; $P = 0.000$), subjective grades of apprehension during the pivot shift test (OR, 1.46; $P = 0.010$), lateral meniscal injury (OR, 1.98; $P = 0.003$), femoro-tibial angle (FTA) (OR, 0.92; $P = 0.006$), and delayed surgery (≥ 12 months) (OR, 2.63; $P = 0.001$) in the lateral compartment; and age (OR, 1.06; $P = 0.000$), body mass index (OR, 1.07; $P = 0.028$), a positive pivot shift test result (OR, 1.60; $P = 0.018$), FTA (OR, 0.90; $P = 0.006$), and delayed surgery (≥ 12 months) (OR, 3.17; $P = 0.008$) in the patellofemoral compartment.

Conclusion

An older age, a longer duration between injury and surgery, and a positive pivot shift test result were positively associated with the prevalence of cartilage injury in three compartments in patients with ACL injuries. Early ACL reconstruction is recommended to prevent cartilage injury.

Level of Evidence

Level III.

BACK

n patients eligible for meniscal surgery who first receive physical therapy, multivariable prognostic models cannot predict who will eventually undergo surgery

Noorduyn, J.C.A., Teuwen, M.M.H., van de Graaf, V.A. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06468-0

Purpose

Although physical therapy is the recommended treatment in patients over 45 years old with a degenerative meniscal tear, 24% still opt for meniscal surgery.

The aim was to identify those patients with a degenerative meniscal tear who will undergo surgery following physical therapy.

Methods

The data for this study were generated in the physical therapy arm of the ESCAPE trial, a randomized clinical trial investigating the effectiveness of surgery versus physical therapy in patients of 45–70 years old, with a degenerative meniscal tear. At 6 and 24 months patients were divided into two groups: those who did not undergo surgery, and those who did undergo surgery. Two multivariable prognostic models were developed using candidate predictors that were selected from the list of the patients' baseline variables. A multivariable logistic regression analysis was performed with backward Wald selection and a cut-off of $p < 0.157$. For both models the performance was assessed and corrected for the models' optimism through an internal validation using bootstrapping technique with 500 repetitions.

Results

At 6 months, 32/153 patients (20.9%) underwent meniscal surgery following physical therapy. Based on the multivariable regression analysis, patients were more likely to opt for meniscal surgery within 6 months when they had worse knee function, lower education level and a better general physical health status at baseline. At 24 months, 43/153 patients (28.1%) underwent meniscal surgery following physical therapy. Patients were more likely to opt for meniscal surgery within 24 months when they had worse knee function and a lower level of education at baseline at baseline. Both models had a low explained variance (16 and 11%, respectively) and an insufficient predictive accuracy.

Conclusion

Not all patients with degenerative meniscal tears experience beneficial results following physical therapy. The non-responders to physical therapy could not accurately be predicted by our prognostic models.

Level of evidence

III.

BACK

Bacterial contamination of irrigation fluid and suture material during ACL reconstruction and meniscus surgery

Bartek, B., Winkler, T., Garbe, A. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06481-3

Purpose

During knee arthroscopy, irrigation fluid from the surgical site accumulates in the sterile reservoir. Whether these fluid collections and also suture material used during the arthroscopic surgical processes show bacterial contamination over time during surgery remains unclear. The purpose of this study was to determine this contamination rate and to analyze its possible influence on postoperative infection.

Materials and methods

In this study, 155 patients were included. Fifty-eight underwent reconstruction of the anterior cruciate ligament (ACL), 63 meniscal surgery and 34 patients combined ACL reconstruction and meniscus repair. We collected pooled samples of irrigation fluid from the reservoir on the sterile drape every 15 min during the surgery. In addition, we evaluated suture material of ACL graft and meniscus repair for bacterial contamination. Samples were sent for microbiological analysis, incubation time was 14 days.

All patients were seen in the outpatient department 6, 12 weeks and 12 months postoperatively and examined for clinical signs of infection.

Results

A strong statistical correlation ($R^2 = 0.81$, $p = 0.015$) was found between an advanced duration of surgery and the number of positive microbiological findings in the accumulated fluid. Suture and fixation material showed a contamination rate of 28.4% (29 cases). Despite the high contamination rate, only one infection was found in the follow-up examinations, caused by *Staphylococcus lugdunensis*.

Conclusion

Since bacterial contamination of accumulated fluid increases over time the contact with the fluid reservoirs should be avoided.

Level of evidence

IV.

BACK

Satisfactory patient-reported outcomes at 5 years following primary repair with suture tape augmentation for proximal anterior cruciate ligament tears

Hopper, G.P., Aithie, J.M.S., Jenkins, J.M. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06485-z

Purpose

An enhanced understanding of anterior cruciate ligament (ACL) healing and advancements in arthroscopic instrumentation has resulted in a renewed interest in ACL repair. Augmentation of a ligament repair with suture tape reinforces the ligament and acts as a secondary stabilizer. This study assesses the 5-year patient-reported outcomes of primary repair with suture tape augmentation for proximal ACL tears.

Methods

Thirty-seven consecutive patients undergoing ACL repair with suture tape augmentation for an acute proximal rupture were prospectively followed up for a minimum of 5 years. Patients with midsubstance and distal ruptures, poor ACL tissue quality, retracted ACL remnants and multiligament injuries were excluded. Patient-reported outcome measures were collated using the Knee Injury and Osteoarthritis Outcomes Score (KOOS), Visual Analogue Pain Scale (VAS-pain), Veterans RAND 12-Item Health Survey (VR-12) and the Marx Activity Scale. Patients with a re-rupture were identified.

Results

Three patients were lost to follow-up leaving 34 patients in the final analysis (91.9%). The mean KOOS at 5 years was 88.5 (SD 13.8) which improved significantly from 48.7 (SD 18.3) preoperatively ($p < 0.01$). The VAS score improved from 2.3 (SD 1.7) to 1.0 (SD 1.5) and the VR-12 score improved from 35.9 (SD 10.3) to 52.4 (SD 5.9) at 5 years ($p < 0.01$). However, the Marx activity scale decreased from 12.4 (SD 3.4) pre-injury to 7.3 (SD 5.2) at 5 years ($p = 0.02$). Six patients had a re-rupture (17.6%) and have since undergone a conventional ACL reconstruction for their revision surgery with no issues since then. These patients were found to be younger and have higher initial Marx activity scores than the rest of the cohort ($p < 0.05$).

Conclusion

Primary repair with suture tape augmentation for proximal ACL tears demonstrates satisfactory outcomes in 28 patients (82.4%) at 5-year follow-up. Six patients sustained a re-rupture and have no ongoing problems following treatment with a conventional ACL reconstruction. These patients were significantly younger and had higher initial Marx activity scores.

Level of evidence

Level IV.

BACK

The bone microstructure from anterior cruciate ligament footprints is similar after ligament reconstruction and does not affect long-term outcomes

Stolarz, M., Rajca, J., Cyganik, P. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06493-z

Purpose

The purpose of this study was to assess the quality of the bone tissue microstructure from the footprints of the anterior cruciate ligament (ACL) and its impact on late follow-up outcomes in patients who undergo anterior cruciate ligament reconstruction (ACLR).

Methods

The records of 26 patients diagnosed with a completely torn ACL who underwent ACLR were collected. During the surgery performed using the Felmet method, bone blocks from the native ACL footprints were collected. The primary measurements of the bone microstructure were made using a microtomographic scanner. In late follow-up examinations, a GNRB arthrometer was used.

Results

There was no significant difference in the bone microstructure assessed using micro-CT histomorphometric data according to the blood test results, plain radiographs, age or anthropometric data. There was no difference in the bone volume/total volume ratio or trabecular thickness in the area of the native ACL footprints. Routine preoperative examinations were not relevant to the quality of the bone microstructure. The elapsed time from an ACL injury to surgery had no relevance to the results of arthrometry.

Conclusion

The similarities in the microstructure of bone blocks from ACL footprints from the femur and tibia allow the variable use of these blocks to stabilize grafts in the Felmet method. The bone microstructure is not dependent on the time from injury to surgery. Histomorphometric values of the structure of the femoral and tibial ACL footprints have no impact on the long-term stability of the operated knee joint.

Level of evidence

II.

BACK

Italian version of the anterior cruciate ligament-return to sport after injury scale (IT ACL-RSI): translation, cross-cultural adaptation, validation and ability to predict the return to sport at medium-term follow-up in a population of sport patients

Thiebat, G., Cucchi, D., Spreafico, A. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06498-8

Purpose

The timing of psychological and physical recovery after anterior cruciate ligament reconstruction represents an open issue in current orthopedic practice. Several tools have been developed to evaluate these factors, with the most recent being represented by the anterior cruciate ligament (ACL) return to sport injury scale (ACL-RSI). The aims of this study were to provide a validated Italian translation of the ACL-RSI in a population of sport patients, and to identify a possible correlation of the ACL-RSI score with the return to sport (RTS) time and the level of sport participation in comparison to the pre-injury one.

Methods

The Italian translation and cultural adaptation of the scale were completed using a using the "translation–back translation" method. A total of 130 patients were enrolled and completed the study questionnaires 6 months after ACL reconstruction. Randomly, 65 of them were re-tested for the ACL-RSI within 2 weeks. The internal consistency, reliability, feasibility, and construct validity of the Italian version of ACL-RSI were assessed and compared to Italian version of the KOOS, the Lysholm Score, the AKPS and the IKDC subjective score. Responsiveness was tested comparing patients returning to sport at 6 and 12 months. The Tegner activity scale was collected at baseline, 6 and 12 months to identify the level of activity after return to sport, in relation to the ACL-RSI score.

Results

The Italian adaptation of the ACL-RSI demonstrated excellent internal consistency (Cronbach's alpha = 0.953), reliability (test–retest ICC = 0.916) and feasibility, with no ceiling or floor effect. Construct validity was confirmed by the moderate to strong correlation with all the other scales ($p < 0.0001$). Slight and non-significant higher ACL-RSI score was shown by patients returned to sport at 6 or 12 months after surgery. Nevertheless, the ACL-RSI score at 6 months was significantly different between patients who returned and those who did not returned to the same level of sport activity 12 months after the procedure.

Conclusions

This study demonstrated that the Italian ACL-RSI is a reliable tool for evaluating the psychological readiness for return to sports of athletes who underwent ACL reconstruction, especially when collected at the end of the rehabilitation process. Since the IT ACL-RSI used in this study is a faithful translation of the original English version, this finding can be generalized to other cultural contexts and languages too.

Level of evidence

Level II.

BACK

Anatomic medial knee reconstruction restores stability and function at minimum 2 years follow-up

Tapasvi, S., Shekhar, A., Patil, S. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06502-1

Purpose

Chronic grade 3 tears of the medial collateral ligament and posterior oblique ligament may result in valgus laxity and anteromedial rotational instability after an isolated or multiligament injury. The purpose of this study was to prospectively analyze the restoration of physiologic medial laxity as assessed on stress radiography and patient reported subjective functional outcomes in patients who undergo an anatomic medial knee reconstruction.

Methods

This was a prospective study which included patients with chronic (> 6 weeks old) posteromedial corner injury with or without other ligament and meniscus lesions. Pre- and post-operative valgus stress radiographs were performed in 20° knee flexion and functional outcome was recorded as per the International Knee Documentation Committee (IKDC) and Lysholm scores. All patients underwent anatomic medial reconstruction with two femoral and two tibial sockets using ipsilateral hamstring tendon autograft. Simultaneous ligament and meniscus surgery was performed as per the associated injury pattern. All patients were followed up for a minimum of 24 months post-surgery.

Results

Thirty-four patients (23 males, 11 females) were enrolled in the study and all were available till final follow-up of mean 49.7 ± 14.9 months. The mean age was 30.6 ± 7.9 (18–52 years). Two patients had isolated medial sided lesions and 23 had associated ligament injuries. The mean follow up was 49.7 (24–72) months. The mean IKDC score improved from 58 ± 8.3 to 78.2 ± 9.5 ($p < 0.001$). Post-operatively there were 15 excellent, 11 good and 8 fair outcomes on Lysholm score. The mean pre-operative valgus side-to-side opening improved from 7.5 ± 2.5 mm to 1.2 ± 0.7 mm on stress radiography ($p < 0.001$).

Conclusion

Anatomic reconstruction of the superficial medial collateral and posterior oblique ligaments restore stability in a consistent manner cases of chronic grade 3 instability. The objective functional results, subjective outcomes and measures of static medial stability are satisfactory in the short term.

Level of Evidence

IV

BACK

Hamstring graft diameter above 7 mm has a lower risk of failure following anterior cruciate ligament reconstruction

Alomar, A.Z., Nasser, A.S.B., Kumar, A. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06503-0

Purpose

Multi-stranded hamstring-tendon autografts have been widely used for anterior cruciate ligament reconstruction (ACLR) surgeries. Recently, smaller diameter hamstring autografts have been linked with the risk of failure or graft rupture. However, there is limited evidence concerning the optimal diameter of the hamstring autografts for ACLR. The current systematic review and meta-analysis analysed the association of ACLR failure with the diameter of hamstring autografts.

Methods

A systematic search of three major scientific databases (Pubmed, EMBASE, and Cochrane library) was conducted to identify studies that presented ACLR failure-related outcomes with different diameters of hamstring autografts. The pooled data from the included studies were analysed to investigate the association between ACLR failure and the cut-off diameters of 6, 7, 8, and 9 mm. Subgroup analyses based on the level of evidence and follow-up duration were also performed at each cut-off diameter.

Results

Of the 2282 studies screened, 16 reported failure rates with hamstring autografts of different diameters, 15 of which were included in the meta-analysis. A graft diameter ≥ 7 mm was associated with significantly lower ACLR failure rates than a graft diameter < 7 mm ($p = 0.005$), based on pooled data of 19,799 cases. Age < 20 years and higher physical activity were associated with significantly higher ACLR failure rates.

Conclusion

The current systematic review suggests that the hamstring graft diameter for ACLR should be more than 7 mm considering the significantly higher failure rates with graft diameters less than 7 mm.

Level of evidence

Level IV

BACK

Steep posterior lateral tibial slope, bone contusion on lateral compartments and combined medial collateral ligament injury are associated with the increased risk of lateral meniscal tear

Kim, S., Seo, JH., Kim, DA. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06504-z

Purpose

To determine the risk factors for lateral meniscus and root tears in patients with acute anterior cruciate ligament (ACL) injuries.

Methods

A total of 226 patients undergoing acute ACL reconstruction were included in the study sample. Exclusion criteria were revisions, fractures, chronic cases, and multiple ligament injuries, with the exception of medial collateral ligament (MCL) injuries. The patients were divided into groups based on the presence of lateral meniscus and root tears by arthroscopy. Binary logistic regression was used to analyze risk factors including age, sex, body mass index (BMI), injury mechanism (contact/non-contact), Segond fracture, side-to-side laxity, location of bone contusion, medial and lateral tibial and meniscal slope, mechanical axis angle, and grade of pivot shift.

Results

Overall lateral meniscus (LM) tears were identified in 97 patients (42.9%), and LM root tears were found in 22 patients (9.7%). The risk of an LM tear in ACL-injured knees increased with bone contusion on LTP (odds ratio [OR], 3.5; 95% confidence interval [CI] 1.419–8.634; $P = 0.007$), steeper lateral tibial slope (OR, 1.133; 95% CI 1.003–1.28; $P = 0.045$), MCL injury (OR, 2.618; 95% CI 1.444–4.746; $P = 0.002$), and non-contact injury mechanism (OR, 3.132; 95% CI 1.446–6.785; $P = 0.004$) in logistic regression analysis. The risk of LM root tear in ACL-injured knees increased with high-grade pivot shift (OR, 9.127; 95% CI 2.821–29.525; $P = 0.000$) and steeper lateral tibial slope (OR, 1.293; 95% CI 1.061–1.576; $P = 0.011$).

Conclusion

The increased risk of LM lesions in acute ACL-injured knees should be considered if significant risk factors including bone contusion on lateral compartments, MCL injury, and a steeper lateral tibial slope are present. Moreover, high-grade rotational injury with steeper lateral tibial slope are also significant risk factors for LM root tears, and therefore care should be taken by clinicians not to miss such lesions.

Level of evidence

III.

BACK

Injuries to the anterolateral ligament are observed more frequently compared to lesions to the deep iliotibial tract (Kaplan fibers) in anterior cruciate ligamant deficient knees using magnetic resonance imaging

Runer, A., Dammerer, D., Kranewitter, C. *et al*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06535-6

Purpose
To determine the accuracy of detection, injury rate and inter- and intrarater reproducibility in visualizing lesions to the anterolateral ligament (ALL) and the deep portion of the iliotibial tract (dITT) in anterior cruciate ligament (ACL) deficient knees.

Methods
Ninety-one consecutive patients, out of those 25 children (age 14.3 ± 3.5 years), with diagnosed ACL tears were included. Two musculoskeletal radiologists retrospectively reviewed MRI data focusing on accuracy of detection and potential injuries to the ALL or dITT. Lesion were diagnosed in case of discontinued fibers in combination with intra- or peri-ligamentous edema and graded as intact, partial or complete tears. Cohen's Kappa and 95% confidence intervals (95% CI) were determined for inter- and intrarater reliability measures.

Results
The ALL and dITT were visible in 52 (78.8%) and 56 (84.8%) of adult-and 25 (100%) and 19 (76.0%) of pediatric patients, respectively. The ALL was injured in 45 (58.5%; partial: 36.4%, compleate: 22.1%) patients. Partial and comleate tears, where visualized in 21 (40.4%) and 16 (30.8%) adult- and seven (28.0%) and one (4%) peditric patients. A total of 16 (21.3%; partial: 13.3%, compleate: 8.0%) dITT injuries were identified. Partal and complete lesions were seen in seven (12.5%) and five (8.9%) adult- and three (15.8%) and one (5.3%) pediatric patients. Combined injuries were visualized in nine (12.7%) patients. Inter-observer (0.91–0.95) and intra-observer (0.93–0.95) reproducibility was high.

Conclusion
In ACL injured knees, tears of the ALL are observed more frequently compared to lesions to the deep iliotibial tract. Combined injuries of both structures are rare. Clinically, the preoperative visualization of potentially injured structures of the anterolateral knee is crucial and is important for a more personalized preoperative planning and tailored anatomical reconstruction. The clinical implication of injuries to the anterolateral complex of the knee needs further investigation.

Level of evidence
II.

BACK

Laterally shifted tibial tunnel can be the risk of residual knee laxity for double-bundle anterior cruciate ligament reconstruction

Chiba, D., Yamamoto, Y., Kimura, Y. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06546-3

Purpose

To elucidate the relationship between graft tunnel position and knee laxity in the cases of double-bundle ACL reconstruction.

Methods

Total of 132 cases were included. Femoral and tibial tunnels were evaluated by quadrant method on 3D-CT. As additional reference of tibia, the distances from medial tibial spine to the tunnel center (D_{MS}) and from Parsons' knob to the tunnel center (D_{PK}) were evaluated; %D_{MS}/ML and %D_{PK}/AP were calculated (ML and AP: mediolateral and anteroposterior width of tibial plateau). Preoperative and postoperative (1 year from surgery) stabilities were evaluated by Lachman and pivot-shift procedures. If there was ≥ 2 mm side-to-side difference, the subject was defined as having anterior knee laxity (AKL); if the pivot-shift phenomenon was observed with IKDC grade ≥ 1, there was rotatory knee laxity (RKL). Multiple logistic regression analysis was conducted with the prevalence of AKL or RKL as the dependent variable and with tunnel positions as the independent variables.

Results

Overall, 21 subjects (15.9%) showed AKL, and 15 subjects (11.4%) showed RKL. Those with postoperative laxity showed higher %D_{MS}/ML and higher femoral position than those without laxity. Regarding posterolateral bundle, logistic regression model estimated that %D_{MS}/ML was associated with the prevalence of AKL ($B = 0.608$; $p < 0.001$) and RKL ($B = 0.789$; $p < 0.001$); %high-low femoral tunnel position ($B = -0.127$; $p = 0.023$) was associated with that of RKL.

Conclusion

There was the risk of residual knee laxity in ACL-reconstructed knee when tibial tunnel shifted more laterally or higher femoral tunnel was created with regard to posterolateral bundle.

Level of evidence

III.

BACK

No differences in clinical outcome between CMI and Actifit meniscal scaffolds: a systematic review and meta-analysis

Reale, D., Previtali, D., Andriolo, L. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06548-

Purpose

To compare the results of two meniscal scaffolds, CMI and Actifit, for the treatment of partial meniscal lesions.

Methods

A systematic review was performed on the PubMed, Web of Science, Scopus, Embase, and Cochrane databases in January 2021, including randomized controlled trails (RCTs) and prospective and retrospective observational studies on the clinical results of meniscal scaffolds. A meta-analysis of the clinical results was performed; the rate of failures was recorded, as well as radiological results. The quality of the included studies was assessed with a modified Coleman Methodology Score (CMS).

Results

The search identified 37 studies (31 in the last 10 years): 2 RCTs, 5 comparative studies, 26 prospective and 4 retrospective series on a total of 1276 patients (472 CMI, 804 Actifit). The quality of evidence was generally low. An overall significant improvement in all clinical scores was documented for both scaffolds. The meta-analysis showed no differences between the two scaffolds in terms of patient reported outcome measures and activity level. The meta-analysis on the risk of failures documented a risk of failures of 7% in the CMI and of 9% in the Actifit group.

Conclusions

There is a growing interest on the results of meniscal scaffolds, with most studies published recently. However, long-term data on the Actifit scaffold and high-level comparative studies are missing. Both CMI and Actifit offered good clinical results with a significant and comparable improvement in symptoms and function, and with a low number of failures over time. Accordingly, with the proper indication, their use may be encouraged in the clinical practice.

Level of evidence

Level IV.

BACK

The Diagnostic Arthroscopy Skill Score (DASS): a reliable and suitable assessment tool for arthroscopic skill training

Anetzberger, H., Becker, R., Eickhoff, H. *et al.*

DOI: https://doi-org.eur.idm.oclc.org/10.1007/s00167-021-06554-3

Purpose

To develop and validate a novel score to more objectively assess the performance of diagnostic knee arthroscopy using a simulator.

Methods

A Diagnostic Arthroscopy Skill Score (DASS) was developed by ten AGA (AGA-Society for Arthroscopy and Joint-Surgery) instructors for the assessment of arthroscopic skills. DASS consists of two parts: the evaluation of standardized diagnostic knee arthroscopy ($DASS_{part1}$) and the evaluation of manual dexterity, including ambidexterity and triangulation, using objective measurement parameters ($DASS_{part2}$). Content validity was determined by the Delphi method. One hundred and eleven videos of diagnostic knee arthroscopies were recorded during simulator training courses and evaluated by six specially trained instructors using DASS. Construct validity, measurement error calculated by the minimum detectable change (MDC), internal consistency using Cronbach's alpha and interrater and intrarater reliability were assessed. The Bland–Altman method was used to calculate the intrarater agreement.

Results

Six skill domains were identified and evaluated for each knee compartment. DASS, $DASS_{part1,}$ and $DASS_{part2}$ showed construct validity, with experts achieving significantly higher scores than competents and novices. MDC was 4.5 ± 1.7 points for $DASS_{part1}$. There was high internal consistency for all domains in each compartment from 0.78 to 0.86. The interrater reliability showed high agreement between the six raters (ICC = 0.94). The evaluation of intrarater reliability demonstrated good and excellent agreement for five raters (ICC > 0.80) and moderate agreement for one rater (ICC = 0.68). The Bland–Altman comparison showed no difference between the first and second evaluations in five out of six raters. Precision, estimated by the regression analysis and comparison with the method of Bland and Altman, was excellent for four raters and moderate for two raters.

Conclusions

The results of this study indicate good validity and reliability of DASS for the assessment of the surgical performance of diagnostic knee arthroscopy during simulator training. Standardized training is recommended before arthroscopy surgery is considered in patients.

Level of evidence

II.

BACK

American Journal of Sports Medicine (AJSM), Volume 47, Issue 1

Survivorship Rate and Clinical Outcomes 10 Years After Arthroscopic Correction of Symptomatic Femoroacetabular Impingement

Patrick Carton, MD*, David Filan, MSc, Karen Mullins, PhD

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Background: Femoroacetabular impingement (FAI) is a common mechanical hip condition, prevalent in both the athletic and the general population. Surgical intervention is an effective treatment option that improves both symptoms and function in short- to medium-term follow-up. Few studies within the literature have reported the longer-term success of arthroscopic surgery.

Purpose: The aim of this study was to quantify the 10-year survivorship and clinical outcome for patients treated arthroscopically for symptomatic FAI.

Methods: Patients from our hip registry (n = 119) completed patient-reported outcome measures (PROMs) including the modified Harris Hip Score (mHHS), University of California Los Angeles (UCLA) activity scale, 36-Item Short Form Health Survey (SF-36), and Western Ontario and McMaster Universities Osteoarthritis Index (WOMAC) at a minimum of 10 years after arthroscopy (range, 10-12 years). Results were compared with baseline scores using the Wilcoxon signed rank test. The associations among several prognostic factors, which included age, sex, Tönnis grade, and labral treatment, and subsequent conversion to total hip replacement (THR) or repeat hip arthroscopy (RHA) were analyzed using the chi-square analysis. Relationships between range of motion and radiological findings with clinical outcome were also examined using Pearson correlation analysis. Minimal clinically important difference (MCID) was calculated using a distribution method (0.5 standard deviation of the change score), and substantial clinical benefit (SCB) was determined using an anchor method. Finally, receiver operating characteristic curves with subsequent Youden index were used to determine cutoffs for PROMs, which equated to a Patient Acceptable Symptom State (PASS).

Results: A total of 8.4% of cases required conversion to THR, and 5.9% required RHA. Statistically significant improvements in mHHS, SF-36, and WOMAC scores, with high satisfaction (90%), were observed 10 years after surgery. No significant change was seen in activity level (UCLA score) despite patients being 10 years older. A high percentage of patients achieved MCID for mHHS (88%), SF-36 (84%), and WOMAC (60%). The majority of patients also achieved PASS (62% for mHHS, 85% for UCLA, 78% for SF-36, and 84% for WOMAC) and SCB (74% for mHHS, 58% for UCLA, 52% for SF-36, and 56% for WOMAC).

Conclusion: Arthroscopic intervention is a safe and viable treatment option for patients with symptomatic FAI, and patients can expect long-term improvements and high satisfaction. Results indicated a high satisfaction (90%) and survivorship rate (91.6%), with excellent clinical outcome, 10 years after the initial procedure.

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

BACK

Return to Sport in Athletes With Borderline Hip Dysplasia After Hip Arthroscopy for Femoroacetabular Impingement Syndrome

Thomas D. Alter, MS, Derrick M. Knapik, MD., et al.

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Background: Data on outcomes in patients with borderline hip dysplasia (BHD) who undergo hip arthroscopy remain limited, particularly in regard to return to sport (RTS).

Purpose: To evaluate outcomes in patients with BHD and their ability to RTS after hip arthroscopy for treatment of femoroacetabular impingement syndrome (FAIS).

Methods: Consecutive patients with self-reported athletic activity and radiographic evidence of BHD, characterized by a lateral femoral center-edge angle (LCEA) between 18° and 25° and a Tönnis angle >10°, who underwent hip arthroscopy for FAIS between November 2014 and March 2017 were identified. Patient characteristics and clinical outcomes including the Hip Outcome Score–Activities of Daily Living (HOS-ADL), Hip Outcome Score–Sports Subscale (HOS-SS), modified Harris Hip Score (mHHS), international Hip Outcome Tool (iHOT-12), and visual analog scale (VAS) for pain and satisfaction were analyzed at minimum 2-year follow-up. In addition, all patients completed an RTS survey.

Results: A total of 41 patients with a mean age and body mass index (BMI) of 29.6 ± 13.4 years and 25.3 ± 5.6, respectively, were included. Mean LCEA and Tönnis angle for the study population were 22.7°± 1.8° and 13.3°± 2.9°, respectively. A total of 31 (75.6%) patients were able to RTS after hip arthroscopy at a mean of 8.3 ± 3.2 months. A total of 14 patients (45.2%) were able to RTS at the same level of activity, 16 patients (51.6%) returned to a lower level of activity, and only 1 (3.2%) patient returned to a higher level of activity. Of the 11 high school and collegiate athletes, 10 (90.9%) were able to RTS. All patients demonstrated significant improvements in all patient-reported outcome measures (PROMs) as well as in pain scores at a mean of 26.1 ± 5.4 months after surgery. Patients who were able to RTS had a lower preoperative BMI than patients who did not RTS. Analysis of minimum 2-year PROMs demonstrated better HOS-ADL, HOS-SS, mHHS, iHOT-12, and VAS outcomes for pain in patients able to RTS versus those who did not RTS ($P < .05$).

Conclusion: Of the patients with BHD studied here, 75.6% of patients successfully returned to sport at a mean of 8.3 ± 3.2 months after hip arthroscopy for FAIS. Of the patients who successfully returned to sport, 45.2% returned at the same level, and 3.2% returned at a higher activity level.

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

BACK

Nonarthritic Hip Pathology Patterns According to Sex, Femoroacetabular Impingement Morphology, and Generalized Ligamentous Laxity

Victor Ortiz-Declet, MD, David R. Maldonado, MD., et al.

https://doi.org/10.1177%2F03635465211056086

Background: Sex differences are frequently encountered when diagnosing orthopaedic problems. Current literature suggests specific sex differences, such as a higher prevalence of cam-type femoroacetabular impingement syndrome in male patients and features of hip instability in female patients.

Purpose: To identify hip pathology patterns according to sex, alpha angle deformity, and generalized ligamentous laxity (GLL) in a nonarthritic patient population that underwent primary hip arthroscopy in the setting of femoroacetabular impingement syndrome and labral tears.

Methods: Patients who underwent primary hip arthroscopy between February 2008 and February 2017 were included and separated into male and female groups for initial analysis. Patients were excluded if they had Tönnis osteoarthritis grade >1, previous ipsilateral hip surgery, or previous hip conditions. The demographics, radiographic findings, intraoperative findings, and surgical procedures were then analyzed and compared. Subanalyses were performed for both groups. A threshold of 1 SD above the mean alpha angle in the male group was used to create 2 subgroups. For female patients, GLL based on a Beighton score ≥4 was used to divide the group. Intraoperative findings were compared for both subanalyses.

Results: A total of 2701 hips met all inclusion and exclusion criteria. Of those, 994 hips were in the male group and 1707 in the female group. The mean ± SD age was 36.6 ± 13.8 and 37.1 ± 15.0 years for the male and female groups, respectively($P = .6288$). The average body mass index was significantly higher in the male group ($P < .0001$). GLL was more common in women (38.6%) than men (13.6%) ($P < .001$). The male group had a higher proportion of acetabular Outerbridge grade 3 (21.8%) and 4 (19.2%) lesions when compared with the female group (9.3% and 6.3%, respectively) ($P < .0001$). Men in the subgroup with an alpha angle ≥78° reported higher rates of acetabular Outerbridge grade 4 damage than men with an alpha angle <78° ($P < .001$). Mean lateral center-edge angle was lower in the female subgroup with Beighton score ≥4 vs <4 (23.7°± 4.2° vs 31.3°± 5.8°; $P < .0001$).

Conclusion: In this analysis of a large cohort of patients who underwent hip arthroscopy, 2 patterns of hip pathologies were related to sex. On average, male patients had larger alpha angles and increased acetabular chondral damage when compared with their female counterparts. Furthermore, a larger cam-type anatomy was associated with more severe acetabular chondral damage in men. In the female group, the incidence of features of hip instability such as GLL were significantly higher than in the male group.

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

BACK

Clinical Outcomes and Reoperation Rates After Hip Arthroscopy in Female Athletes With Low Versus Normal Body Mass Index: A Propensity-Matched Comparison With Minimum 2-Year Follow-up

Andrew E. Jimenez, MD, Peter F. Monahan, BS., et al.

https://doi.org/10.1177%2F03635465211055175

Background: The effect of low body mass index (BMI) on outcomes in female athletes is unknown.

Purpose: (1) To report minimum 2-year patient-reported outcomes and return to sports for high-level female athletes with low BMI undergoing hip arthroscopy for femoroacetabular impingement syndrome and (2) to compare results with those of a propensity-matched control group of high-level female athletes with a normal BMI.

Methods: Data were collected on all professional, collegiate, and high school female athletes who had a low BMI and underwent primary hip arthroscopy between September 2009 and March 2017 at our institute. Return-to-sports status and minimum 2-year patient-reported outcomes were collected for the modified Harris Hip Score (mHHS), Nonarthritic Hip Score, Hip Outcome Score–Sport Specific Subscale, and visual analog scale (VAS) for pain. The percentage of patients achieving the minimal clinically important difference (MCID), Patient Acceptable Symptom State (PASS), and maximum outcome improvement satisfaction threshold (MOIST) was also recorded. These patients were propensity matched to high-level female athletes with a normal BMI for comparison.

Results: A total of 21 high-level female athletes (25 hips) with a mean ± SD follow-up of 58.9 ± 31.5 months were included. They demonstrated significant improvement from preoperatively to latest follow-up for the mHHS, Nonarthritic Hip Score, Hip Outcome Score–Sport Specific Subscale, and VAS ($P < .001$). When outcomes were compared with those of the control group, female athletes with low BMI demonstrated lower rates of achieving the MCID for the mHHS (54.5% vs 77.4%; $P = .041$), PASS for the International Hip Outcome Tool–12 (45.5% vs 72.6%; $P = .022$), and MOIST for the VAS (31.8% vs 56.5%; $P = .047$). There were no other significant differences in the rate of achieving the MCID, PASS, or MOIST between the groups ($P > .05$). Female athletes with low BMI also had higher rates of revision when compared with the control group (27.2% vs 10.6%; $P = .049$), but there were comparable return-to-sports rates (75.0% vs 74.5%; $P > .05$).

Conclusion: High-level female athletes with low BMI undergoing primary hip arthroscopy for femoroacetabular impingement syndrome demonstrated significant improvement in patient-reported outcomes and acceptable rates of return to play. When compared with a control group with normal BMI, they exhibited higher rates of revision and lower rates of achieving the MCID for the mHHS, PASS for the International Hip Outcome Tool–12, and MOIST for the VAS.

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

BACK

Return to Sports and Minimum 2-Year Outcomes of Hip Arthroscopy in Elite Athletes With and Without Coexisting Low Back Pain: A Propensity-Matched Comparison

Andrew E. Jimenez, MD, Jade S. Owens, BS., et al.

https://doi.org/10.1177%2F03635465211056964

Background: Patient-reported outcomes (PROs) and return to sports (RTS) after hip arthroscopy for femoroacetabular impingement syndrome (FAIS) have not been established in elite athletes with coexisting low back pain (LBP).

Purpose: (1) To report minimum 2-year PROs and RTS rates after primary hip arthroscopy for FAIS in elite athletes with coexisting LBP and (2) to compare clinical results with a propensity-matched control group of elite athletes without back pain.

Methods: Data were reviewed for elite athletes (college and professional) who underwent hip arthroscopy for FAIS and had coexisting LBP between October 2009 and October 2018. Inclusion criteria were preoperative and minimum 2-year follow-up for the modified Harris Hip Score, Nonarthritic Hip Score, Hip Outcome Score–Sports Specific Subscale (HOS-SSS), and visual analog scale for pain. Exclusion criteria were Tönnis grade >1, hip dysplasia (lateral center-edge angle <18°), and previous ipsilateral hip or spine surgery or conditions. Rates of achieving the minimal clinically importance difference (MCID), patient acceptable symptomatic state (PASS), and maximum outcome improvement satisfaction threshold were recorded in addition to RTS. For the subanalysis, the elite athlete study group was propensity matched to an elite athlete control group without back pain.

Results: A total of 48 elite athletes with LBP who underwent primary hip arthroscopy met inclusion criteria, and follow-up was available for 42 (87.5%) at 53.2 ± 31.6 months (mean ± SD). Elite athletes with coexisting LBP demonstrated significant improvements in all recorded PROs and achieved the MCID and PASS for the HOS-SSS at rates of 82.5% and 67.5%, respectively. They also returned to sports at a high rate (75.8%), and 79% of them did not report LBP postoperatively. PROs, rates of achieving the MCID and PASS for the HOS-SSS, and RTS rates were similar between the study group and propensity-matched control group.

Conclusion: Elite athletes with coexisting LBP who undergo primary hip arthroscopy for FAIS may expect favorable PROs, rates of achieving the MCID and PASS for the HOS-SSS, and RTS rates at minimum 2-year follow-up. These results were comparable to those of a propensity-matched control group of elite athletes without back pain. In athletes with hip-spine syndrome, successful treatment of their hip pathology may help resolve their back pain.

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

BACK

Journal of Bone and Joint Surgery (JBJS), Volume 104, issue 1

Functional Outcomes of Arthroscopic Acetabular Labral Repair with and without Bone Marrow Aspirate Concentrate

Martin, Scott D., MD; Kucharik, Michael P., et al.

DOI: 10.2106/JBJS.20.01740

Background: Osteoarthritis (OA) of the hip is a debilitating condition associated with inferior outcomes in patients undergoing hip arthroscopy. To provide symptom relief and improve outcomes in these patients, bone marrow aspirate concentrate (BMAC) has been applied as an adjuvant therapy with the hope of halting progression of cartilage damage. The current study examined the clinical efficacy of BMAC application in patients undergoing arthroscopic acetabular labral repair by comparing patient-reported outcome measures (PROMs) between groups with and without BMAC application.

Methods: Patients who received BMAC during arthroscopic acetabular labral repair from December 2016 to June 2019 were compared with a control cohort that underwent the same procedure but did not receive BMAC from November 2013 to November 2016. Patients in both cohorts were asked to prospectively complete PROMs prior to surgery and at 3, 6, 12, and 24-month follow-up intervals; those who completed the PROMs at enrollment and the 12-month follow-up were included in the study. An a priori subgroup analysis was performed among patients with moderate cartilage damage (Outerbridge grade 2 or 3). The analyses were adjusted for any differences in baseline factors between groups.

Results: Sixty-two patients with BMAC application were compared with 62 control patients without BMAC application. When compared with the no-BMAC cohort, the BMAC cohort did not report significantly different mean International Hip Outcome Tool-33 (iHOT-33) scores at any postoperative time point. However, when patients with moderate cartilage damage were compared across groups, the BMAC cohort reported significantly greater mean (95% confidence interval) scores than the no-BMAC cohort at the 12-month (78.6 [72.4 to 84.8] versus 69.2 [63.3 to 75.2]; $p = 0.035$) and 24-month (82.5 [73.4 to 91.6] versus 69.5 [62.1 to 76.8]; $p = 0.030$) follow-up. Similarly, these patients reported greater score improvements at 12 months (37.3 [30.3 to 44.3] versus 25.4 [18.7 to 32.0]; $p = 0.017$) and 24 months (39.6 [30.4 to 48.7] versus 26.4 [19.1 to 33.8]; $p = 0.029$).

Conclusions: Patients with moderate cartilage injury undergoing arthroscopic acetabular labral repair with BMAC application reported significantly greater functional improvements when compared with similar patients without BMAC application.

Level of Evidence: Therapeutic Level III.

BACK

Miscellaneous

Arthroscopy, Volume 38, Issue 1, P1-208

Independent Suture Augmentation With All-Inside Anterior Cruciate Ligament Reconstruction Reduces Peak Loads on Soft-Tissue Graft. A Biomechanical Full-Construct Study.

Bachmajer S., Smith P.A., et al.

DOI: https://doi.org/10.1016/j.arthro.2021.09.032

Purpose
To evaluate the effect of suture augmentation (SA) of 7-mm and 9-mm diameter graft on load sharing, elongation, stiffness, and load to failure for all-inside anterior cruciate ligament reconstruction (ACLR) in a biomechanical Study was funded by Arthrex ID: EMEA-16020. full-construct porcine model.

Methods
Bovine tendon grafts, 7-mm and 9-mm diameter, with and without SA were tested using suspensory fixation (n = 8). The independent SA was looped over a femoral button and knotted on a tibial button. Preconditioned constructs were incrementally increased loaded (100N/1,000 cycles) from 100N to 400N for 4,000 cycles (0.75 Hz) with final pull to failure (50 mm/min). Isolated mechanical and optical measurements during construct loading of the SA allowed to quantify the load and elongation range during load sharing. Construct elongation, stiffness and ultimate strength were further assessed.

Results
Load sharing in 7-mm grafts started earlier (200N) with a significant greater content than 9-mm grafts (300N) to transfer 31% (125N) and 20% (80N) of the final load (400N) over the SA. Peak load sharing with SA reduced total elongation for 7-mm (1.90 ± 0.27 mm vs 4.77 ± 1.08 mm, P < .001) and 9-mm grafts (1.50 ± 0.33 mm vs 3.57 ± 0.54 mm, P < .001) and adequately increased stiffness of 7-mm (113.4 ± 9.3 N/mm vs 195.9 ± 9.8 N/mm, P < .001) to the level of augmented 9-mm grafts (208.9 ± 13.7N/mm). Augmentation of 7-mm (835 ± 92N vs 1,435 ± 228N, P < .001) and 9-mm grafts (1,044 ± 49N vs 1,806 ± 157N, P < .001) significantly increased failure loads.

Conclusions
Load sharing with SA occurred earlier (200N vs 300N) in lower stiffness 7-mm grafts to carry 31% (7-mm) and 20% (9-mm) of the final load (400N). Loads until peak load sharing were transferred over the graft. Augmented constructs showed significantly lower construct elongation and increased stiffness without significance between variable grafts. Failure load of augmented grafts were significantly increased.

Clinical Relevance
Suture tape ligament augmentation may potentially protect biological grafts from excessive peak loading and elongation, thus reducing the risk of graft tears.

BACK