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Contact 4@erasmusmc.nl

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Upper extremity

Arthroscopy, Volume 36, Issue 7

How Is Maximum Outcome Improvement Defined in Patients Undergoing Shoulder Arthroscopy for Rotator Cuff Repair? A 1-Year Follow-Up Study

Edward C. Beck, Anirudh K. Gowd, Joseph N. Liu, Brian R. Waterman, Kristen F. Nicholson, Brian Forsythe, Adam B. Yanke, Brian J. Cole, Nikhil N. Verma

<https://doi.org/10.1016/j.arthro.2020.02.047>

Purpose

To (1) determine the American Shoulder and Elbow Surgeons (ASES), Single Assessment Numeric Evaluation (SANE), and Constant-Murley subjective score thresholds for achieving maximal outcome improvement (MOI) after arthroscopic rotator cuff repair and (2) identify preoperative predictors of reaching the ASES threshold for achieving MOI.

Methods

A retrospective cohort study was performed to identify patients undergoing rotator cuff repair at a high-volume institution from January 2014 to January 2017 with a 1-year minimum follow-up. Patient characteristics, as well as preoperative and postoperative outcome scores, were analyzed. MOI for the ASES and SANE score were calculated as previously described, and a receiver operating characteristic (ROC) curve analysis was used to determine thresholds for percentage of maximal improvements for each outcome measure based on a satisfaction anchor question. Last, a logistic regression model was used to identify predictors of reaching the ASES threshold for achieving MOI.

Results

A total of 220 patients were included in the final analysis. There was a statistically significant increase in score average across all 3 outcome measures ($P < .001$ for all), with 162 (73.6%) patients rating their surgical outcome as satisfactory at 1-year follow-up. The ROC curve analysis demonstrated that ASES, SANE, and Constant-Murley threshold percentages for achieving MOI was 69.5% (area under the curve [AUC], 0.86; 95% confidence interval [CI], 0.81-0.91; $P < .001$), 75% (AUC, 0.814; 95% CI, 0.758-0.871; $P < .001$), and 55.1% (AUC, 0.84; 95% CI, 0.783-0.898; $P < .001$), respectively. Logistic regression demonstrated that workers compensation cases (odds ratio, 0.69; 95% CI, 0.55-0.86; $P = .001$) and dominant-sided surgery (odds ratio, 0.72; 95% CI, 0.59-0.88; $P = .002$) were predictors of not achieving maximal improvement on the ASES score.

Conclusion

Achieving 69.5% of maximal ASES score improvement or 75% of maximal SANE score improvement is indicative of achieving patient satisfaction after arthroscopic rotator cuff repair. Preoperative variables including workers compensation cases and surgery to the dominant side were predictors of not achieving maximal improvement.

Level of Evidence

IV, case series.

[BACK](#)

Risk Factors for Postoperative Opioid Use in Arthroscopic Shoulder Labral Surgery

Toufic R. Jildeh, Kevin A. Taylor, Joseph S. Tramer, Lafi S. Khalil, Laith Hasan, Kelechi R. Okoroa, Vasilios Moutzouros

<https://doi.org/10.1016/j.arthro.2020.03.008>

Purpose

To determine the correlation between preoperative and postoperative opioid use in patients undergoing arthroscopic shoulder labral repair, as well as patient risk factors associated with increased postoperative opioid use after the procedure.

Methods

A retrospective review of all patients undergoing arthroscopic shoulder labral surgery at a single institution between August 2013 and November 2017 was performed. Patients were stratified as opioid nonusers, acute users, or chronic users based on preoperative consumption. Patient demographic characteristics, injury characteristics, surgical interventions, and postoperative opioid use for the first 12 months after surgery were then analyzed.

Results

A total of 340 patients were included in this study. The average age was 26.3 years (range, 13-68 years), and the average body mass index was 27.5 (range, 18.4-45.0). Preoperative opioid users (acute and chronic) were found to continue to receive opioid medications at extended time points beyond 2 months postoperatively compared with nonusers ($P < .001$). Patients with intraoperatively identified SLAP tears experienced more preoperative pain and required more postoperative opioid prescriptions ($P = .018$). On stratification for other common shoulder instability injury patterns, no differences were found between the number of postoperative opioid prescriptions filled and the presence of Bankart lesion, Hill-Sachs lesion, reverse Hill-Sachs lesion, anterior labroligamentous periosteal sleeve avulsion, glenolabral articular disruption, or humeral avulsion of the glenohumeral ligament ($P > .05$).

Conclusions

In patients undergoing arthroscopic labral surgery, the chronicity of preoperative opioid use, number of concomitant procedures at the time of initial surgery, and presence of biceps tenodesis were found to significantly increase postoperative opioid demand. Orthopaedic surgeons should recognize risk factors for increased opioid use postoperatively and adapt treatment strategies and patient counseling accordingly.

Level of Evidence

Level III, retrospective cohort study.

Functional Outcomes Are Similar After Early and Late Arthroscopic One-Tunnel Transosseous Repair of Triangular Fibrocartilage Complex Foveal Tears

Ji Hun Park, Jung Wook Lim, Young Woo Kwon, Jong Woo Kang, In Cheul Choi, Jong Woong Park

<https://doi.org/10.1016/j.arthro.2020.03.026>

Purpose

To compare outcomes at different time periods following arthroscopic triangular fibrocartilage complex (TFCC) transosseous foveal repair within 6 months, between 6 and 12 months, and more than 12 months from injury.

Methods

Consecutive patients treated with arthroscopic TFCC foveal repair using the uniform one-tunnel transosseous suture technique by a surgeon from 2014 to 2017 were retrospectively reviewed. The patients were assigned to 1 of 3 groups according to time between injury and surgery. Pain visual analog scale (VAS); grip strength; modified Mayo wrist score (MMWS); Quick disabilities of the arm, shoulder, and hand (QuickDASH) score; and distal radioulnar joint stability were assessed at minimum 2 years postoperatively, along with minimal clinically important difference, and overall patient satisfaction.

Results

This study cohort consisted of 80 patients: group A (<6 months, n = 38), group B (6-12 months, n = 20), and group C (>12 months, n = 22). No differences were found among groups in VAS, grip strength, and MMWS and QuickDASH. Overall, patients exhibited significant functional improvement at 2 years (VAS: 3-0, $P < .001$; grip strength: 77.1%-95.6%, $P < .001$; MMWS: 65-90, $P < .001$, QuickDASH: 20.5-4.5, $P < .001$). Median changes in outcome variables and the proportion of patients achieving minimal clinically important difference for the QuickDASH were similar among groups. Seventy-eight patients (97%) achieved distal radioulnar joint stability, and 70 patients (87%) were satisfied with treatment.

Conclusions

Although this current study has insufficient statistical power, the available data suggest that patients with a TFCC foveal tear who underwent arthroscopic transosseous repair surgery more than 12 months after injury could expect to experience similar functional improvement compared with patients who underwent surgery within 6 months or between 6 and 12 months following injury.

Level of Evidence

Level III, retrospective comparative study.

Outcomes and Survivorship After Arthroscopic Treatment of Glenohumeral Arthritis: A Systematic Review

Brady T. Williams, Alexander Beletsky, Kyle N. Kunze, Evan M. Polce, Brian J. Cole, Nikhil N. Verma, Jorge Chahla

<https://doi.org/10.1016/j.arthro.2020.02.036>

Purpose

To perform a systematic review of the literature describing outcomes, surgical procedures, and rates of conversion to arthroplasty after arthroscopic debridement of symptomatic primary glenohumeral osteoarthritis.

Methods

The Cochrane Database of Systematic Reviews, Cochrane Central Register of Controlled Trials, PubMed, Embase, and Ovid MEDLINE were queried. Articles without sufficiently detailed descriptions of the debridement procedure, those primarily describing cartilage resurfacing procedures, or those that did not report any postoperative outcomes were excluded. Study design, patient demographic characteristics, operative details, imaging findings, patient-reported outcomes, and rates of conversion to arthroplasty were compiled and reported. Assessment of bias was performed using the Methodological Index for Non-randomized Studies (MINORS) criteria.

Results

A total of 371 patients (382 shoulders) in 8 studies were included. Patient sample sizes ranged from 8 patients (9 shoulders) to 98 patients (107 shoulders), and the samples were predominantly comprised of male patients (range, 57.1%-100%). The mean age and follow-up period ranged from 38 to 59 years and from 13.7 to 46.8 months, respectively. In studies reporting both preoperative and postoperative outcomes, improvements were found in American Shoulder and Elbow Surgeons scores (range, 8.6-22) and visual analog scale scores for pain (range, 0.4-3.8). There was significant heterogeneity ($I^2 = 75\%$) in the rates of conversion to shoulder arthroplasty, which ranged from 4% to 42.4%, with the mean time to conversion ranging from 9 to 56 months. Study heterogeneity improved with subgroup analyses based on minimum duration of follow-up (>2 years) and preoperative radiographic inclusion criteria.

Conclusions

Arthroscopic treatment of glenohumeral osteoarthritis provides improvements in ROM and patient-reported outcomes with minimal complications. Despite variability in procedures and rates of subsequent conversion to arthroplasty, arthroscopic treatment appears to provide symptom relief and functional improvements in carefully selected patients. However, the longevity of improvement remains unclear, with studies including a longer duration of follow-up showing potential regression of symptom relief and increased rates of conversion to arthroplasty.

Level of Evidence

Level IV, systematic review of Level III and IV studies

[BACK](#)

Effect of cocktail therapy after arthroscopic rotator cuff repair: a randomized, double-blind trial.

Teratani, T.

DOI: <https://doi.org/10.1016/j.jse.2020.03.004>

Background

We investigated the effectiveness of cocktail therapy after arthroscopic rotator cuff repair (ARCR).

Methods

We evaluated 128 shoulders undergoing ARCR and used block randomization to divide patients into 2 groups in this double-blind trial: The cocktail group received 20 mL of 0.75% ropivacaine, 5 mg of morphine, 0.3 mg of epinephrine, 2 mg of betamethasone, and saline solution to a total of 42 mL, whereas the control group received 20 mL of 0.75% ropivacaine and saline solution to a total of 42 mL. Postoperatively, one of the drug mixtures was injected into the glenohumeral joint, subacromial bursa, suprascapular nerve, and anterior, middle, and posterior parts of the deltoid muscle according to the treatment group. We recorded patients' visual analog scale scores preoperatively and at 4, 8, 16, 24, and 48 hours postoperatively; the number of patients using postoperative diclofenac suppositories and buprenorphine hydrochloride; the number of patients experiencing nausea; the number of patients with infection and delayed wound healing as adverse effects; the surgery time; the retear rate; and passive shoulder range of motion.

Results

The cocktail group constituted 64 shoulders (50.0%), with 39 men (60.9%) and 25 women (39.1%); the mean age was 64.2 ± 10.2 years. The control group constituted 64 shoulders (50.0%), with 41 men (64.1%) and 23 women (35.9%); the mean age was 65.2 ± 7.5 years. We found no significant difference in age or sex between the 2 groups. There was also no significant difference in rotator cuff tear size or surgery time between the 2 groups. The visual analog scale scores at 8, 16, and 24 hours postoperatively were significantly lower in the cocktail group. The number of patients using suppositories was also significantly lower in the cocktail group. The number of patients receiving buprenorphine injections tended to be lower in the cocktail group, but the difference was not significant. Nausea occurred in 6.3% of patients in the cocktail group and 15.6% in the control group, but the difference was not significant. No infection or delayed wound healing occurred in either group. There was no significant difference in the retear rate between the 2 groups. Passive anterior elevation at 3 months postoperatively was significantly better in the cocktail group than in the control group.

Conclusion

We compared cocktail therapy and ropivacaine after ARCR and found no difference in results except for VAS score at 8, 16, and 24 hours postoperatively and frequency of postoperative suppository use without an apparent risk of infection or a detrimental effect on tendon healing.

Level of evidence

Level II

Shoulder stiffness after rotator cuff repair: the fate of stiff shoulders up to 9 years after rotator cuff repair.

Millican, C.R., Lam, P.H., Murrell, G.A.C.

DOI: <https://doi.org/10.1016/j.jse.2019.11.020>

Background

Stiffness and retear are 2 common complications of rotator cuff repair. McNamara et al found that postoperative stiffness was associated with lower retear rates at 6 months. This study aimed to determine if stiffness after rotator cuff repair protects the individual from retear up to 9 years after surgery.

Materials and methods

Two groups of patients, 69 with stiff and 63 with nonstiff shoulder, who underwent arthroscopic rotator cuff repair were created based on external rotation measurements at 6 weeks postoperatively. Patients had regular follow-up assessments at 6, 12, and 24 weeks and were instructed to return for a follow-up at least 2 years after surgery. Patients were assessed for range of motion, shoulder function, strength, and rotator cuff integrity using ultrasound.

Results

For patients with postoperative stiffness at 6 weeks, the retear rate at 6 months was 3%, whereas the rate for nonstiff patients was 19% ($P = .004$). This protective effect of postoperative stiffness persisted up to 9 years after surgery ($P = .002$). Postoperative stiffness resolved by 5 years after surgery for all measurements except external rotation (50° vs. 61°) ($P = .006$). Patients with postoperative stiffness had continued improvements in abduction ($P < .001$), internal rotation ($P = .020$), and all patient-ranked measurements from the 6-month follow-up to 5 years after surgery. Patients with stiff shoulder had greater overall satisfaction by the final follow-up ($P = .028$).

Conclusions

In patients experiencing stiffness after rotator cuff surgery, the repair is less likely to fail at 6 months. Although the stiffness generally resolves by 5 years, this protective effect still persists at 9 years after surgery.

Level of evidence

Level III

Outcomes following arthroscopic Bankart repair in female patients.

Moore, T.K., Hurley, E.T., Rowe, D.N., et al.

DOI: <https://doi.org/10.1016/j.jse.2019.12.012>

Purpose

The purpose of this study is to evaluate clinical outcomes and recurrence among women who have undergone an arthroscopic Bankart repair for recurrent anterior shoulder instability.

Methods

A retrospective review of patients with anterior shoulder instability that have undergone an arthroscopic Bankart repair between 2012-2017 was performed. Patients were followed up to assess their visual analog scale (VAS) score, Rowe score, Shoulder Instability–Return to Sport after Injury (SIRSI), and the Subjective Shoulder Value (SSV) and their satisfaction level. Whether they were able to return to sport, the timing of return, and the level to which they returned were reported.

Results

Our study included 31 female patients (34 shoulders), with a mean follow-up of 51.9 months. Overall, 82.4% (28/34 shoulders) were satisfied/very satisfied with their surgery. The mean scores were as follows: Rowe, 79.2; SIRSI, 53.9; SSV, 81.9; and VAS, 1.9. Of the 29 patients (32 shoulders) who played sport prior to surgery, 24 returned to play and 17 returned to the same or higher level. One patient suffered a recurrent dislocation and 2 patients suffered recurrent subluxation. No patients underwent a revision procedure.

Conclusion

Female patients with anterior shoulder instability treated with arthroscopic Bankart repair have low recurrence rates, with good patient-reported outcomes and high satisfaction rates. Of those participating in sport prior to surgery, there was a high rate of return to play. The overall rate of complications was low, with a low rate of revision surgery.

Level of evidence

Level IV

Medium-term outcomes of a cohort of revision rotator cuff repairs.

Hoffman, T.W., Maher, A., Leigh, W. B., et al.

DOI: <https://doi.org/10.1016/j.jse.2019.12.011>

Background

There are limited medium- and long-term studies investigating clinical outcomes following revision rotator cuff surgery. The aim of the current study was to analyze the medium-term pain and functional outcomes of a cohort of revision rotator cuff repairs.

Methods

This was a multicenter, prospective cohort study of revision rotator cuff repairs undertaken between March 2009 and December 2010. Pain, function (Flex-SF), and postoperative data were collected at baseline; 6, 12, and 24 months; and 5 years.

Results

A total of 125 revision rotator cuff repairs were included in this study. Average improvement in Flex-SF and pain from baseline to 5 years was 8.5 ($P < .001$) and 2.1 points, respectively ($P < .001$). The improvement was not as pronounced as those who underwent primary repair. Significantly lower pain scores were seen in nonsmokers ($P < .001$) and in those who underwent tenotomy rather than tenodesis (2 vs. 3.5, $P < .05$) for a damaged long head of biceps. Significantly higher function scores were seen in those with only 1 tendon involved ($P < .05$). The patient-reported retear rate was 32.6%, and the reoperation rate was 34.7%.

Conclusion

Revision rotator cuff repair provides significant improvement in both pain and function at 5 years postoperation, though not as good as primary repair. Superior clinical outcomes are seen in nonsmokers, those with only 1 tendon affected, and those who undergo tenotomy instead of tenodesis for a damaged long head of biceps tendon.

Level of evidence

Level IV

The lower trapezius transfer: a systematic review of biomechanical data, techniques, and clinical outcomes.

Clouettea, J., Leroux, L., Shanmugaraj, A. et al.

DOI: <https://doi.org/10.1016/j.jse.2019.12.019>

Background

Lower trapezius (LT) transfers were originally described to restore external rotation (ER) in the management of brachial plexus palsy; however, there is recent interest in the role of this transfer to restore shoulder function, specifically ER, in patients with a massive irreparable rotator cuff tear (RCT). The purpose of this systematic review is to summarize the current literature pertaining to LT transfers, including biomechanics, techniques, and clinical outcomes for patients with brachial plexus palsy and massive RCTs.

Methods

MEDLINE, EMBASE, and PubMed were searched for biomechanical and clinical studies, as well as technique articles. Four biomechanical studies reported on moment arms, range of motion (ROM), and force vectors. Seven clinical studies reported postoperative ROM and functional outcomes, and weighted mean improvements in ROM were calculated.

Results

Overall, 18 studies were included, and then subdivided into 3 themes: biomechanical, technique, and clinical. Biomechanical studies comparing LT and latissimus dorsi (LD) transfers observed an overall larger moment arm in abduction and ER in adduction for the LT transfer, with similar results in forward elevation. Clinical studies noted significant improvement in shoulder function following the LT transfer, including ROM and functional outcome scores. There were several described techniques for performing the LT transfer, including arthroscopically assisted and open approaches, and the use of both allograft and autograft augmentation.

Conclusion

This study suggests that the LT transfer is generally safe, and the clinical and biomechanical data to date support the use of the LT transfer for restoration of function in these challenging patient populations.

Level of evidence

Level IV

Knee Surgery, Sports Traumatology, Arthroscopy (KSSTA) Volume 28, Issue 7, pages 2316–2324.

The novel arthroscopic subscapular sling procedure grants better stability than an arthroscopic Bankart repair in a cadaveric study.

Terje Vagstad, T., Klungsøyr, P. J., Drogset, J. O., et al.

DOI: <https://doi-org.eur.idm.oclc.org/10.1007/s00167-019-05737-3>

Purpose

This novel arthroscopic subscapular sling procedure stabilizes the shoulder using a semitendinosus graft to create a sling around the subscapular tendon, which provides both static and dynamic stability. The aim of the study was to evaluate the biomechanical stability of the subscapular sling procedure in human cadaveric shoulders. The hypothesis was that the sling offers an equal stabilizing effect and range of motion compared to an arthroscopic Bankart repair.

Methods

Sixteen shoulders were investigated using an industrial robot-based testing platform and four different conditions: the physiologically intact shoulder, after creating a Bankart lesion, after arthroscopic Bankart repair, and finally after applying the subscapular sling procedure using a semitendinosus tendon graft. Joint translation and external rotation were evaluated for each condition.

Results

The results show improved stability in the shoulders with the subscapular sling. The robot testing revealed a significant reduction in translation in anterior and anterior–inferior directions compared to the arthroscopic Bankart repair. None of the shoulders were dislocated by forced manual abduction and external rotation. No difficulties were encountered in performing the arthroscopic subscapular sling procedure. Thorough postoperative anatomical dissection showed no alterations to structures at risk.

Conclusion

The biomechanical results show increased stability with the use of the subscapular sling method.

Dexmedetomidine combined with interscalene brachial plexus block has a synergistic effect on relieving postoperative pain after arthroscopic rotator cuff repair.

Hwang, J. T., Jang, J.S., Lee, J.J., et al.

DOI: <https://doi-org.eur.idm.oclc.org/10.1007/s00167-019-05799-3>

[BACK](#)

Purpose

Interscalene brachial plexus block (ISB) is one of the most commonly used regional blocks in relieving postoperative pain after arthroscopic rotator cuff repair. Dexmedetomidine (DEX) is an alpha 2 agonist that can enhance the effect of regional blocks. The aim of this study was to compare the effects of DEX combined with ISB with ISB alone on postoperative pain, satisfaction, and pain-related cytokines within the first 48 h after arthroscopic rotator cuff repair.

Methods

Fifty patients with rotator cuff tears who had undergone arthroscopic rotator cuff repair were enrolled in this single center, double-blinded randomized controlled trial study. Twenty-five patients were randomly allocated to group 1 and received ultrasound-guided ISB using a mixture of 1 ml (100 µg) of DEX and 8 ml of 0.75% ropivacaine preemptively. The other 25 patients were allocated to group 2 and underwent ultrasound-guided ISB alone using a mixture of 1 ml of normal saline and 8 ml of ropivacaine. The visual analog scale (VAS) for pain and patient satisfaction (SAT) scores were checked within 48 h postoperatively. The plasma interleukin (IL)-6, -8, -1β, cortisol, and substance P levels were also measured within 48 h, postoperatively.

Results

Group 1 showed a significantly lower mean VAS score and a significantly higher mean SAT score than group 2 at 1, 3, 6, 12, and 18 h postoperatively. Compared with group 2, group 1 showed a significantly lower mean plasma IL-6 level at 1, 6, 12, and 48 h postoperatively and a significantly lower mean IL-8 level at 1, 6, 12, 24, and 48 h postoperatively. The mean timing of rebound pain in group 1 was significantly later than that in group 2 (12.7 h > 9.4 h, $p = 0.006$).

Conclusions

Ultrasound-guided ISB with DEX in arthroscopic rotator cuff repair led to a significantly lower mean VAS score and a significantly higher mean SAT score within 48 h postoperatively than ISB alone. In addition, ISB with DEX showed lower mean plasma IL-6 and IL-8 levels than ISB alone within 48 h postoperatively, with delayed rebound pain.

Level of evidence

I.

Benefits of bone graft augmentation to arthroscopic Bankart repair for recurrent anterior shoulder instability with glenoid bone loss.

Iizawa, N. Yoneda, M., Yamada, S.

[BACK](#)

Purpose

Glenoid bone loss contributes to recurrent instability after arthroscopic Bankart repair alone. With significant glenoid bone loss, better results have been reported after arthroscopic Bankart repair with glenoid arc reconstruction. However, no reports compare augmentation using bone graft with non-augmentation for glenoid bone loss. The purpose of this study was to assess clinical results of an arthroscopic Bankart repair with or without arthroscopic bone graft augmentation. It was hypothesized that such bone graft augmentation would restore shoulder stability, and lead to excellent outcomes.

Methods

Of 552 patients treated for anterior glenohumeral instability with arthroscopic Bankart repair, 68 met this study's inclusion criteria of glenoid bone loss over 20% and follow-up of at least 2 years. Patients were divided into 2 groups based on whether with bone graft augmentation for glenoid bone loss [Group A: $n = 35$, median age; 21 years (range 13–72 years)], or not (Group B: $n = 33$, median age; 21 years (range 13–50 years)). For grafting, either autologous iliac bone or artificial bone made of hydroxyapatite was used. Rowe score, recurrence rate, and return to sport were used to assess the results.

Results

Mean Rowe score was 95.0 (SD 10.6) in Group A and 69.7 (SD 27.2) in Group B ($p < 0.05$). The recurrence rate was 2.9% (1/36) in Group A and 48.5% (16/33) in Group B ($p < 0.05$). Regarding contact/collision athletes, 24 were contained in Group A and 22 in Group B. Of the patients with recurrence in Group B, 13 (59.1%) were contact/collision athletes. Finally, 50% of the contact/collision sports athletes for both groups returned to their sports at the same as pre-injury level. Of the 11 patients who returned to the same level of contact/collision sports in Group B, seven returned with residual instability. Nine athletes in Group A and 3 in Group B quit their sports for personal or social reasons.

Conclusions

Bone graft augmentation was beneficial when used with Arthroscopic Bankart repair for recurrent anterior shoulder instability with glenoid bone loss. Especially, for recurrent anterior shoulder instability with glenoid bone loss in contact/collision sports athletes, bone graft augmentation should be strongly considered as beneficial.

Level of evidence

Level IV.

Latarjet with cortical button fixation is associated with an increase of the risk of recurrent dislocation compared to screw fixation.

Hardy, A., Sabatier, V., Schoch, B., et al.

DOI: <https://doi-org.eur.idm.oclc.org/10.1007/s00167-019-05815-6>

Purpose

The purpose of this study was to compare the clinical results of the Latarjet procedure using two cortical buttons vs two screws. It was hypothesized that cortical button would result in similar rates of recurrent dislocations, but a lower rate of reoperation compared to screw fixation.

Methods

A retrospective comparative case-cohort analysis was performed for all patients undergoing a Latarjet procedure for recurrent anterior glenohumeral instability. Patient demographics, number of dislocations prior surgery, arm dominance, shoulder hyperlaxity, level of sport, type of sport and ISIS score were collected. Shoulders were separated into two groups based on surgical fixation (screws vs cortical button). Postoperatively, shoulders were evaluated for recurrent dislocation, revision surgery, post-operative Walch–Duplay score, and the Simple shoulder test (SST). Two hundred and thirty-six patients were included in the screw fixation group (group A) and 72 in button fixation group (group B) and were evaluated at a mean follow-up of 3.4 ± 0.8 years. Demographics of the two groups were similar with the exception of operative side hand dominance, which was more common in group B [50 (69.4%) vs 128 (54.2%), $p = 0.02$].

Results

Recurrent dislocation was significantly lower in Group A: 6 (2.5%) vs 6 (8.3%) ($p = 0.02$). Reoperation was more common in group A [14 (5.9%) vs 0 (0%)]. At follow-up, Walch–Duplay scores and simple shoulder tests were similar in both groups.

Conclusion

Button fixation for Latarjet showed higher rates of recurrent dislocation compared to screw fixation. However, the increased stability afforded by screw fixation needs to be weighed against the increased risk of reoperation for hardware prominence.

Level of evidence

III.

The latissimus dorsi tendon functions as an external rotator after arthroscopic-assisted transfer for massive irreparable posterosuperior rotator cuff tears.

Galasso, O., Mantovani, M., Muraccini, M., et al.

[BACK](#)

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Purpose

Latissimus dorsi tendon transfer is a surgical option for the treatment of massive irreparable posterosuperior rotator cuff tear. Whether a favourable clinical outcome is due to the latissimus dorsi muscle contraction rather than the passive tenodesis effect remains to be confirmed. The purpose of the current case–control study was to evaluate the shoulder kinematics and latissimus dorsi activation after latissimus dorsi tendon transfer.

Methods

Eighteen patients suffering from irreparable rotator cuff tear that underwent latissimus dorsi tendon transfer and 18 healthy individuals were examined using a 3D kinematic tracking system and electromyography. Active maximal flexion–extension and abduction–adduction of the humerus were measured for the operated and the contralateral shoulder of the patients and the shoulder of healthy individuals to evaluate the range of motion (ROM) and scapulohumeral rhythm. Electromyographic comparison of isometric contraction between the latissimus dorsi of the operated and contralateral shoulder was carried out.

Results

After arthroscopic-assisted latissimus dorsi tendon transfer, patients showed comparable flexion and abduction ROM to their asymptomatic contralateral shoulders and to the shoulders of healthy individuals. Significantly higher scapular ROM values were found between the latissimus dorsi tendon transfer side and the shoulders of healthy individuals. While performing external rotation with 0° shoulder abduction, a greater percentage of the electromyographic peak value ($p = 0.047$) and a higher latissimus dorsi internal/external rotation ratio ($p = 0.004$) were noted for the transferred muscle in comparison to the contralateral shoulder.

Conclusion

Although the arthroscopic-assisted latissimus dorsi tendon transfer failed to normalize scapulothoracic joint movements of patients, a functional latissimus flap and a shoulder ROM similar to the contralateral side or the shoulder of healthy individuals can be expected after this procedure in patients with massive irreparable posterosuperior rotator cuff tear.

Level of evidence

III.

Patients undergoing shoulder surgery have high preoperative expectations.

Nadarajah, V., Stevens, K.N., Henry, L., et al.

[BACK](#)

DOI: <https://doi-org.eur.idm.oclc.org/10.1007/s00167-019-05824-5>

Purpose

The primary aims of this study were to (1) assess the preoperative expectations of patients undergoing shoulder surgery, and (2) determine the relationship between preoperative patient demographics, PROs, and preoperative patient expectations. It was hypothesized that younger patients with worse function and worse health status had higher expectations of shoulder surgery.

Methods

Data from a total of 319 patients (319 shoulders) from 2015–2018 were analyzed. Patients completed a series of questionnaires covering demographics and patient-reported outcome measures. Expectations of treatment were evaluated using the Musculoskeletal Outcomes Data Evaluation and Management System. Bivariate analyses were performed to determine the significance of identified associations.

Results

The study population consisted of 186 males and 133 females. The mean age was 46.9 (\pm 17.2), and the mean BMI was 30.1 (\pm 6.8). Overall, patients had high expectations of shoulder surgery, with a mean score of 84.7 (\pm 19.3). The most commonly performed procedure in the study population was arthroscopic rotator cuff repair. There was a significant association between pre-treatment expectations and ethnicity, previous shoulder surgery, employment status, income level, tobacco use, preoperative opioid use, depression, and ASA score.

Conclusion

The findings suggest that patients undergoing shoulder surgery have high overall preoperative expectations, which were significantly associated with ethnicity, surgical history, opioid use, and employment status, and with multiple patient-reported outcome measures including physical function, pain interference, fatigue, and depression. Nevertheless, by discussing expectations preoperatively, orthopaedic surgeons can help patients develop high but realistic expectations to improve outcomes and satisfaction.

Level of evidence

IV.

Comparison of Coracoid Graft Position and Fixation in the Open Versus Arthroscopic Latarjet Techniques: A Cadaveric Study

Alvaro Minuesa-Asensio, MD, PhD, Francisco García-Esteo, MD, PhD, José Ramón Mérida-Velasco, MD, PhD, Carmen Barrio-Asensio, PhD, Pedro López-Fernández, MD, PhD, Mikel Aramberri-Gutiérrez, MD, PhD, Jorge Murillo-González, MD, PhD

<https://doi.org/10.1177/0363546520930419>

Background:

Since the description of the arthroscopic Latarjet technique, discussion about the superiority of the open or arthroscopic procedure has arisen. The appropriate placement of the coracoid graft (CG) on the anterior glenoid neck is reported to be the most important step of the Latarjet procedure.

Purpose:

To verify if there are differences in the parameters that may affect the final position and fixation of CG obtained from the open and arthroscopic Latarjet techniques.

Study Design:

Controlled laboratory study.

Methods:

Twenty fresh-frozen human paired cadaveric shoulder specimens were randomly distributed in 2 surgery groups (open group [OG] and arthroscopic group [AG]) with 10 specimens in each. Two surgeons, each with experience performing open and arthroscopic Latarjet techniques, executed these procedures: one surgeon performed all open techniques, and the other performed all arthroscopic techniques, respectively. After surgery, a computerized tomography scan was performed. The surgical time, the position of each CG, a series of variables that might affect the CG fixation, and the level of the subscapularis muscle split were evaluated.

Results:

The mean surgical time was significantly longer in the AG (mean, 26 minutes for OG and 57 minutes for AG). Three intraoperative complications (30%) were identified in the AG, consisting of graft fractures. The CG was determined to be in an optimal cranial-caudal position in 90% of specimens of the OG and 44% of the AG (Fisher, $P = .057$). In both groups, the CG was placed in an optimal medial-lateral position in all specimens. In the OG, the degree of parallelism between the major axes of the glenoid surface and CG was significantly greater than in the AG (mean, 3.8° for OG and 15.1° for AG). No significant differences were observed in superior and inferior screw orientation between the groups. In the longitudinal and transverse directions, significant differences were found in the centering of the superior screw, being closer to the ideal point in the OG than in the AG. The location where the longitudinal subscapularis muscle split was performed was significantly higher in the AG.

Conclusion:

The open Latarjet technique required less surgical time; presented a lower number of intraoperative complications; and allowed more adequate placement of the CG, better centering of the screws, and a subscapularis muscle split closer to the ideal position.

Clinical Relevance:

The reported benefits of the arthroscopic Latarjet technique seem less clear if we take into account the added surgery time and complications.

Clinical Importance of Graft Integrity in Arthroscopic Superior Capsular Reconstruction Using a Minimally Invasively Harvested Midhigh Fascia Lata Autograft: 3-Year Clinical and Magnetic Resonance Imaging Outcomes

Clara Isabel de Campos Azevedo, MD*, Ana Catarina Leiria Pires Gago Ângelo, MD, David Campos-Correia, MD, Lara Delgado, MD, Nuno Ferreira, MD, Nuno Sevilas, MD, PhD

<https://doi.org/10.1177/0363546520928649>

Background:

The clinical importance of graft type and integrity in arthroscopic superior capsular reconstruction (ASCR) remains controversial.

Purpose:

To assess 3-year clinical and magnetic resonance imaging (MRI) outcomes of ASCR using a minimally invasively harvested fascia lata autograft (FLA) for irreparable rotator cuff tears (IRCTs) and to determine the clinical importance of graft integrity and whether the results change from year 2 to 3.

Study Design:

Case series; Level of evidence, 4.

Methods:

A total of 22 consecutive patients who underwent ASCR with a minimally invasively harvested FLA were enrolled in a prospective single-arm study. At 3 years, the patients answered a satisfaction questionnaire and underwent a clinical examination and MRI. The MRI scans were independently reviewed by 3 raters to determine the graft integrity, acromiohumeral interval, supraspinatus atrophy, and fatty degeneration of the rotator cuff muscles. Reliability statistics were calculated, and the outcomes were compared across subgroups of patients with and without complete graft tears.

Results:

Overall, 21 patients (95.5%) answered the questionnaire, 20/21 (95.2%) were satisfied, 4/20 (20.0%) reported donor site pain, and 19 patients (86.4%) underwent examinations. From preoperatively to 3 years, the mean improvement was 73.68° in elevation (95% CI, 47.59°-99.77°), 89.21° in abduction (95% CI, 66.56°-111.86°), 24.74° in external rotation (95% CI, 4.72°-34.75°), 3.00 in internal rotation (95% CI, 2.36-3.64), 2.61 kg in abduction strength (95% CI, 1.76-3.45 kg), 50.79 on the Constant score (CS; 95% CI, 41.99-59.58), 7.47 on the Simple Shoulder Test (SST; 95% CI, 5.19-9.75), and 36.05% on the subjective shoulder value (SSV; 95% CI, 23.19%-48.92%), which were all significant ($P < .05$). From 2 to 3 years, the mean improvement in abduction was 20.26° (95% CI, 5.44°-35.09°), which was significant ($P = .010$). At 3 years, the raters perfectly agreed ($\kappa = 1$; $P = .000013$) that 4 patients (21.1%) had complete graft tears; this subgroup of patients had decreased external rotation strength at 90° of abduction (1.77 ± 0.17 vs 4.45 ± 2.55 kg, respectively; $P = .027$) and increased grades of infraspinatus (3.50 ± 0.58 vs 2.20 ± 1.01 , respectively; $P = .030$) and teres minor fatty degeneration (3.25 ± 0.96 vs 1.53 ± 0.64 , respectively; $P = .005$) compared with those without a complete graft tear, but the mean CS, SST, and SSV scores did not differ from those of the overall group (69.50 ± 5.20 vs 69.63 ± 18.25 ; 9.00 ± 2.31 vs 9.74 ± 4.73 ; and 72.50 ± 15.00 vs 71.58 ± 26.70 , respectively).

[BACK](#)

Conclusion:

The 3-year clinical outcomes of ASCR using a minimally invasively harvested FLA for IRCTs were good, despite donor site morbidity. Active abduction improved significantly from 2 to 3 years. Complete graft tears were correlated with significantly decreased external rotation strength at 90° of shoulder abduction and increased grades of infraspinatus and teres minor fatty degeneration.

Long-term Results of the Arthroscopic Bankart Repair for Recurrent Anterior Shoulder Instability in Patients Older Than 40 Years: A Comparison With the Open Latarjet Procedure

Lukas Ernstbrunner, MD, PhD*, Bianca De Nard, MS, Maurits Olthof, MD, PhD, Silvan Beeler, MD, Samy Bouaicha, MD, Christian Gerber, MD, Karl Wieser, MD

<https://doi.org/10.1177/0363546520931090>

Background:

Long-term results of the arthroscopic Bankart repair in patients older than 40 years are unknown and may be favorable in terms of postoperative glenohumeral arthritis as opposed to the long-term results of the open Latarjet procedure in patients older than 40 years.

Purpose:

To analyze our long-term results of the arthroscopic Bankart repair for recurrent anterior shoulder instability in patients older than 40 years of age and to compare these results with previously published long-term results of the Latarjet procedure in a cohort of similar age.

Study Design:

Cohort study; Level of evidence, 3.

Methods:

A total of 35 consecutive patients (36 shoulders) with a mean age of 47 years (range, 40-69) at time of the arthroscopic Bankart repair were studied at a mean 13.2 years (range, 8-18) after surgery. Clinical and radiographic results were then compared with those of our previous study of 39 consecutive patients (40 shoulders) of a same age group who had been treated for the same pathology with an open Latarjet procedure.

Results:

Six shoulders (17%) sustained a recurrent shoulder dislocation after a mean 5.3 years; subluxation occurred in 3 shoulders (8%); and apprehension persisted in 3 shoulders (8%). Revision surgery was performed in 8 patients (22%): 2 Bankart and 6 open Latarjet. The relative preoperative Constant score and Subjective Shoulder Value were significantly improved ($P < .001$) at final follow-up. Arthropathy of stabilization was advanced in the shoulders of 16 patients (47%) and had progressed by at least 2 grades in 21 patients (62%). There were significantly higher rates of redislocation and subluxation when compared with the open Latarjet procedure (9 vs 3; $P = .037$), and the mean final Subjective Shoulder Value was significantly lower in the Bankart group (86% vs 91%; $P = .011$). There were no significant differences in final advanced arthropathy (16 vs 14; $P = .334$) and revision rates (8 vs 7; $P = .409$) when compared with the Latarjet procedure.

Conclusion:

Arthroscopic Bankart repair for recurrent anterior shoulder instability in patients older than 40 years was associated with reliable pain relief and patient satisfaction similar to that after the open Latarjet procedure. Restoration of stability was significantly less successful and development of arthropathy no better than the open Latarjet procedure in patients older than 40 years.

[BACK](#)

Maximum Bridging Suture Tension Provides Better Clinical Outcomes in Transosseous-Equivalent Rotator Cuff Repair: A Clinical, Prospective Randomized Comparative Study

Joo Han Oh, MD, PhD, Ji Soon Park, MD, Sung-Min Rhee, MD, PhD, Joo Hyun Park, MD

<https://doi.org/10.1177/0363546520930425>

Background:

Some studies reporting clinical outcomes after transosseous-equivalent (TOE) repair have attributed type II rotator cuff failure to excessive bridging suture tension, as it can cause overloading on the medial row. In a previous biomechanical cadaveric study, increasing bridging suture tension over 90 N did not improve the contact area and ultimate failure load of the TOE construct, despite increasing the contact force and contact pressure.

Purpose:

To compare the clinical outcomes of different bridging suture tensions after TOE rotator cuff repair based on the results of a previous biomechanical study.

Study Design:

Randomized controlled trial; Level of evidence, 2.

Methods:

A total of 78 patients who underwent arthroscopic rotator cuff repair for medium- to large-sized tears were prospectively enrolled and randomly divided into 2 groups according to the applied bridging suture tension: optimum tension group (96.3 ± 4.9 N) and maximum tension group (199.0 ± 20.3 N). Bridging suture tension was measured with a customized tensiometer, as used in the previous biomechanical study. The functional outcome was measured at the final follow-up (27.4 ± 5.9 months [range, 24-45 months]) using the visual analog scale for pain, American Shoulder and Elbow Surgeons score, Simple Shoulder Test, and Constant score, and the anatomic outcome was evaluated using magnetic resonance imaging or ultrasonography at least 12 months after surgery.

Results:

Overall, 64 patients (32 in each group) were analyzed. The functional outcomes improved significantly compared with preoperative values (all $P < .05$) but did not show significant differences between the 2 groups (all $P > .05$). Regarding the anatomic outcomes, the maximum tension group ($n = 1$; 3.1%) had a significantly lower healing failure rate than the optimum tension group ($n = 9$; 28.1%) ($P = .013$). One patient in the maximum tension group had a type II failure.

Conclusion:

Maximum bridging suture tension in TOE repair for medium- to large-sized rotator cuff tears provided better anatomic healing with less risk of medial rotator cuff failure, which differs from the results of a previous time-zero biomechanical study.

Arthroscopic Repair of Large and Massive Rotator Cuff Tears

Jeong Jeung Yeol, MD; Kim Sung-jae, MD, PhD; Yoon Tae-hwan, MD; Eum Kwang-sik, MD; Chun Yong-min, MD, PhD

DOI: [10.2106/JBJS.19.01014](https://doi.org/10.2106/JBJS.19.01014)

Background:

The purpose of this retrospective study was to assess the clinical and radiographic outcomes of large and massive rotator tears treated with arthroscopic complete repair with a posterior interval slide compared with partial repair without a posterior interval slide at a minimum follow-up of 5 years.

Methods:

This study included 58 patients with large and massive rotator cuff tears that were unable to be treated with arthroscopic complete repair with an anterior interval slide and margin convergence alone. Each patient underwent either arthroscopic complete repair with an additional posterior interval slide and a subsequent side-to-side repair of the interval slide edge (complete-repair group) or arthroscopic partial repair with margin convergence and without the additional posterior interval slide (partial-repair group). Patient assignment to treatment group was not randomized. Clinical assessments included the visual analog scale pain score, the Subjective Shoulder Value, the American Shoulder and Elbow Surgeons score, the University of California Los Angeles shoulder score, and active range of motion. Preoperative and 6-month follow-up magnetic resonance arthrography (MRA) images were compared within and between groups.

Results:

At the time of the latest follow-up evaluation, both groups had significant improvements in clinical outcomes ($p < 0.001$). There were no significant differences in the clinical outcomes between groups. A retear was identified in 22 (88%) of the 25 patients in the complete-repair group and 28 (85%) of the 33 patients in the partial-repair group. Patients in the complete-repair group had larger retear sizes ($p = 0.001$) and reduced acromiohumeral intervals ($p = 0.007$) compared with those in the partial-repair group.

Conclusions:

Although larger retear size on early postoperative MRA led to significantly reduced acromiohumeral intervals in the complete-repair group, there were no significant differences in clinical outcomes between groups during the minimum 5-year follow-up period. Therefore, it may be preferable to perform partial rotator cuff repair rather than aggressive release in large and massive rotator cuff tears to achieve complete repair.

Level of Evidence:

Therapeutic Level III. See Instructions for Authors for a complete description of levels of evidence.

Lower Extremity

Arthroscopy, Volume 36, Issue 7

Staged Bilateral Hip Arthroscopy Compared With a Matched Unilateral Hip Arthroscopy Group: Minimum 2-Year Follow-Up

Anthony A. Essilfie, David A. Bloom, Mikhail Zusmanovich, Benjamin Kester, Theodore Wolfson, Thomas Youm

<https://doi.org/10.1016/j.arthro.2020.02.025>

Purpose

To determine the modified Harris Hip Score (mHHS) and Non-Arthritic Hip Score (NAHS) at 2-year follow up in patients who underwent staged bilateral hip arthroscopy versus age-, sex-, and body mass index-matched patients who underwent unilateral hip arthroscopy.

Methods

Patients who underwent staged bilateral primary hip arthroscopy between January 2007 and December 2017 for the indication of femoroacetabular impingement (FAI) with a minimum 2-year follow-up were identified. The control group comprised patients who underwent a unilateral hip arthroscopy for FAI. The mHHS and the NAHS were analyzed.

Results

Forty-two patients (84 hips) in the bilateral group were matched with 84 patients (84 hips) in the unilateral group. Both groups had significantly improved mHHS and NAHS when comparing preoperative scores with postoperative scores (bilateral group mHHS: 45.5 ± 15.1 to 81.7 ± 17.6 , $P < .0001$, bilateral group NAHS: 49.5 ± 13.8 to 83.6 ± 20.0 , $P < .0001$, unilateral group mHHS 48.5 ± 13.8 to 83.6 ± 15.9 , $P < .0001$, unilateral group NAHS 48.8 ± 12.0 to 85.0 ± 16.6 , $P < .0001$). The patient-acceptable symptomatic state was achieved in 57 hips (68%) in the bilateral group versus 62 hips (74%) in the unilateral group, $P = .4$. Patients with bilateral hip arthroscopy who had <17 months between index procedure and contralateral hip arthroscopy had significantly better mHHS and NAHS (85.5 ± 18.4 vs 75.71 ± 14.4 , $P = .013$ for mHHS and 88.1 ± 17.1 vs 76.2 ± 22.4 , $P = .0074$ for NAHS).

Conclusions

Bilateral hip arthroscopy for the indication of FAI has improved mHHS and NAHS at 2 years of follow up compared to baseline. There was no difference in 2-year mHHS and NAHS in patients who underwent bilateral hip arthroscopy and unilateral hip arthroscopy. Patients in the bilateral hip arthroscopy group that had the contralateral surgery longer than 17 months from index procedure had lower 2 year follow up mHHS and NAHS scores than those that underwent the second surgery within 17 months of the index procedure.

Level of Evidence

Level III, retrospective comparative study

[BACK](#)

Development and Validation of the Hospital for Special Surgery Anterior Cruciate Ligament Postoperative Satisfaction Survey

Cynthia A. Kahlenberg, Benedict U. Nwachukwu, Nabil Mehta, David T. Zhang, Joseph Nguyen, Peter D. Fabricant, David W. Altchek, Riley J. Williams III, Answorth A. Allen

<https://doi.org/10.1016/j.arthro.2020.02.043>

Purpose

To develop and validate a standardized patient satisfaction measurement tool for adult patients undergoing primary anterior cruciate ligament reconstruction (ACLR).

Methods

A 4-phase iterative process that included item generation and pilot survey development, item reduction, survey readability, and survey validation was used. To develop and validate the Hospital for Special Surgery ACL Satisfaction Survey (HSS ACL-SS), 70 patients were included in the survey development phase and 77 patients were included in the validation phase. The HSS ACL-SS was compared with other currently used ACLR outcome measures including the International Knee Documentation Committee score, Tegner-Lysholm score, Short Form 12 (SF-12) Mental Component Score, and SF-12 Physical Component Score. Test-retest reliability, internal consistency, convergent and discriminant validity, and floor and ceiling effects were assessed.

Results

The HSS ACL-SS consists of 10 items identified by patients as being important for satisfaction after ACLR. In the validation phase, the mean score on the HSS ACL-SS (of 50) among all patients was 37.9 ± 9.9 (range, 10-50). Statistically significant positive correlations were seen between the HSS ACL-SS score and the International Knee Documentation Committee score ($r = 0.351$, $P = .002$) and Tegner-Lysholm score ($r = 0.333$, $P = .003$). No statistically significant correlation was found between the satisfaction score and the SF-12 Mental or Physical Component Score. The lowest possible score (10 of 50 points) was achieved in 1 patient (1.3%) and the highest possible score (50 of 50 points) was achieved in 7 patients (9.1%), indicating no significant floor or ceiling effects of the instrument. Internal consistency for all 10 items was strong (Cronbach α , 0.995). The mean intraclass correlation coefficient between test and retest responses was 0.701, indicating moderate agreement.

Conclusions

The HSS ACL-SS is a validated and reliable patient-derived satisfaction measure with excellent psychometric properties for active adults undergoing ACLR. The results of this study show that the HSS ACL-SS may be a useful tool to measure postoperative patient satisfaction.

Level of Evidence

Level II, development of diagnostic or monitoring criteria in consecutive patients

Conventional Follow-up Versus Mobile Application Home Monitoring for Postoperative Anterior Cruciate Ligament Reconstruction Patients: A Randomized Controlled Trial

James Higgins, Justin Chang, Graeme Hoyt, Jas Chahal, Tim Dwyer, John Theodoropoulos

<https://doi.org/10.1016/j.arthro.2020.02.045>

Purpose

To determine whether a mobile app can reduce the need for in-person visits and examine the resulting societal cost differences between mobile and conventional follow-up for postoperative anterior cruciate ligament (ACL) reconstruction patients.

Methods

Study design was a single-center, 2-arm parallel group randomized controlled trial. All patients undergoing ACL reconstruction aged 16 to 70 years were screened for inclusion in the study. Competent use of a mobile device and ability to communicate in English was required. Patients were randomly assigned to receive follow-up via a mobile app or conventional appointments. Analysis was intention-to-treat. The primary outcome was the number of in-person visits to any health care professional during the first 6 postoperative weeks. Secondary outcomes included analysis of costs incurred by the health care system and personal patient costs related to both methods of follow-up. Patient-reported satisfaction and convenience scores, rates of complications, and clinical outcomes were also analyzed.

Results

Sixty patients were analyzed. Participants in the app group attended a mean of 0.36 in-person visits versus 2.44 in-person visits in the conventional group (95% confidence interval 0.08-0.28; $P < .0001$). On average, patients in the app group spent \$211 (Canadian dollars) less than the conventional group over 6 weeks ($P < .0001$) on personal costs related to follow-up. Health care system costs were also significantly less in the app group (\$157.5 vs CAD \$202.2; $P < .0001$). There was no difference between groups in patient satisfaction, convenience, complication rates, or clinical outcome measures.

Conclusions

Mobile follow-up can eliminate a significant number of in-person visits during the first 6 postoperative weeks in patients undergoing ACL reconstruction with cost savings to both the patient and health care system. This method should be considered for dissemination among similar orthopaedic procedures during early postoperative care.

Level of Evidence

I: Prospective randomized controlled trial

Patient-Reported and Magnetic Resonance Imaging Outcomes of Third-Generation Autologous Chondrocyte Implantation After 10 Years

Thomas R. Niethammer, Daniel Altmann, Martin Holzgruber, Mehmet F. Gülecyüz, Susan Notohamiprodjo, Andrea Baur-Melnyk, Peter E. Müller

<https://doi.org/10.1016/j.arthro.2020.03.009>

Purpose

To evaluate the long-term clinical and radiologic outcomes of third-generation autologous chondrocyte implantation (ACI) for the treatment of focal cartilage defects of the knee.

Methods

Data capture was carried out between 2004 and 2018. Included were patients with cartilage defects of the knee joint with an International Cartilage Repair Society grade of III or higher treated with third-generation ACI who had a minimum follow-up period of 10 years. International Knee Documentation Committee scores and assessment of pain at rest and on movement using visual analog scale scores were captured preoperatively and at 6 months postoperatively, as well as annually thereafter. In addition, we performed magnetic resonance imaging examinations in 13 cases after 10 years. The MOCART (Magnetic Resonance Observation of Cartilage Repair Tissue) score was used to evaluate the ACI cartilage.

Results

A total of 54 patients met the inclusion criteria. Of these, 30 reached the 10-year follow-up point and were included in this assessment. At 10 years postoperatively, all clinical outcome parameters showed a statistically significant improvement compared with the preoperative situation, with a responder rate of 70%. The average MOCART (Magnetic Resonance Observation of Cartilage Repair Tissue) score after 10 years was 59.2 points (range, 20-100 points), and over 60% of the evaluated patients showed good integration of the implant at 10 years postoperatively.

Conclusions

The clinical and radiologic findings of this study show that third-generation ACI is a suitable and effective option in the treatment of full-thickness cartilage defects of the knee. At 10 years after surgery, third-generation ACI shows stable results and leads to significant improvement in all clinical outcome parameters. Despite these results, revision surgery after third-generation ACI is common and was needed in 23% of patients in this study.

Level of Evidence

Level IV, therapeutic case series

Comparative Risk-Benefit Profiles of Individual Devices for Graft Fixation in Anterior Cruciate Ligament Reconstruction: A Systematic Review and Network Meta-analysis

Yilun Wang, Guanghua Lei, Chao Zeng, Jie Wei, Hongyi He, Xiaoxiao Li, Zhenglei Zhu, Haochen Wang, Ziyang Wu, Ning Wang, Xiang Ding, Hui Li

<https://doi.org/10.1016/j.arthro.2020.04.023>

Purpose

To compare the efficacy and safety of individual devices for femoral and/or tibial graft fixation in anterior cruciate ligament (ACL) reconstruction.

Methods

The PubMed, Embase, Cochrane Library, and Web of Science databases were searched from inception to December 12, 2018. Randomized controlled trials comparing individual devices for ACL graft fixation were included. Bayesian network meta-analysis was performed to assess the efficacy profile using the following outcomes: Lysholm score, International Knee Documentation Committee (IKDC) category, laxity, range of motion, and Tegner score. The incidence of infection, effusion, and graft rupture for each device was reported.

Results

We included 57 randomized controlled trials involving 4,304 patients aged 23.8 to 40.9 years. The female proportion ranged from 0% to 100%. The length of follow-up ranged from 6 to 144 months. Of the 13 studied femoral fixation devices, none was significantly different from the others regarding the Lysholm score, IKDC category, range of motion, and Tegner score. Bioabsorbable interference screws (standardized mean difference, 1.3; 95% credible interval, 0.0-2.5) showed higher laxity than the EndoPearl at a borderline level of statistical significance, but the difference varied substantially within multiple sensitivity analyses. Infection (2.0%) was most commonly seen with the EndoPearl, whereas the bone mulch screw had the highest incidence of effusion (5.5%) and graft rupture (5.5%). For the 9 studied tibial fixation devices, no significant difference was observed in the aforementioned efficacy measurements. Bioabsorbable interference screws with staples had the highest incidence of infection (11.1%) and effusion (15.6%), whereas graft rupture was most commonly seen with the bone plug (4.0%).

Conclusions

Graft fixation devices in ACL reconstruction share a similar efficacy profile in terms of the Lysholm score, IKDC category, range of motion, and Tegner score but not laxity. On the other hand, safety profiles seem to vary among different devices. These findings can support surgeons, alongside their experience and preference, as well as the relative cost of each device, in delivering an individualized plan for an optimal operation.

Level of Evidence

Level II, meta-analysis of Level I and II studies.

Adductor Canal Versus Femoral Nerve Block after Anterior Cruciate Ligament Reconstruction: A Systematic Review of Level I Randomized Controlled Trials Comparing Early Postoperative Pain, Opioid Requirements, and Quadriceps Strength

John-Rudolph H. Smith, John Wilson Belk, Matthew J. Kraeutler, Darby A. Houck, Anthony J. Scillia, Eric C. McCarty

<https://doi.org/10.1016/j.arthro.2020.03.040>

Purpose

To systematically review the literature to compare the adductor canal block (ACB) with the femoral nerve block (FNB) following primary anterior cruciate ligament reconstruction (ACLR) in terms of early postoperative analgesic requirements and postoperative quadriceps strength.

Methods

A systematic review was performed by searching PubMed, the Cochrane Library, and Embase up to August 2019 to identify randomized controlled trials that compared postoperative pain and functional outcomes in patients following primary ACLR with ACB versus FNB. The search phrase used was: adductor canal femoral nerve anterior cruciate ligament. Patients were evaluated based on analgesic consumption and quadriceps muscle strength. Study quality and risk of bias were evaluated with the Modified Coleman Methodology Score and Cochrane risk-of-bias tool respectively.

Results

Five studies (all Level I evidence) were identified that met inclusion criteria, including 221 patients undergoing primary ACLR with ACB (mean age 26.8 years, 68.3% male) and 221 with FNB (mean age 28.2 years, 67.0% male). Statistical assessment for heterogeneity found for opioid consumption of ACB versus FNB groups was $I^2 = 97%$ ($P < .0001$). There were no significant differences in analgesic consumption within the first 24 hours following surgery between groups except in 1 study, in which patients receiving ACB required significantly greater analgesics ($P < .001$). Three studies using 3 different techniques to measure strength found patients receiving ACB to have significantly greater quadriceps muscle function within 24 hours of surgery when compared with patients receiving FNB ($P < .05$).

Conclusions

In patients undergoing ACLR, the ACB may provide similar analgesic requirements, and the included studies suggest a potential advantage in preserving muscle strength at short-term (24-48 hours) follow-up when compared with FNB. However, the differences in muscle strength assessments between studies do not allow for strong conclusions.

Level of Evidence

I, systematic review and meta-analysis of Level I studies

Indications and Outcomes of Secondary Hip Procedures After Failed Hip Arthroscopy: A Systematic Review

Jacob Shapira, Cynthia Kyin, Cammille Go, Philip J. Rosinsky, David R. Maldonado, Ajay C. Lall, Benjamin G. Domb

<https://doi.org/10.1016/j.arthro.2020.02.028>

Purpose

(1) To identify present indications for secondary procedures in patients with failed hip arthroscopy and (2) to assess patient-reported outcomes (PROs) of the secondary procedures, including revision arthroscopy, periacetabular osteotomy (PAO), and total hip arthroplasty (THA).

Methods

Study groups included patients who had a secondary procedure after failed previous hip arthroscopy whereas the control groups were patients who had a primary procedure but did not require a secondary procedure. Indications and procedures at the time of the secondary operation were documented for each study. Average PROs were recorded, and standardized mean difference was calculated to estimate effect size.

Results

Eighteen studies reporting on patients undergoing a secondary procedure after a previous hip arthroscopy were included. The 3 main secondary procedure groups were revision hip arthroscopy, secondary PAO, and secondary THA. Regarding the revision arthroscopy group, the most common indications were labral tears, cam deformity, and pincer deformity. In addition, the most common procedures were femoroplasty, acetabuloplasty, capsular release, and labral reconstruction. The most common indications for the secondary PAO and THA groups were dysplasia and osteoarthritis respectively. Five of the revision arthroscopy studies found that revision patients had worse outcomes than the primary arthroscopy group. One PAO study found that the previous arthroscopy group had slightly worse outcomes, and 2 studies found no differences in PROs. Two THA studies reported worse outcomes for the prior arthroscopy group, and 2 studies reported no differences in outcomes.

Conclusions

The most common indications for revision hip arthroscopy were labral tears and femoroacetabular impingement. Patients undergoing a revision hip arthroscopy demonstrated good postoperative outcomes but to an overall lesser extent than their primary counterparts. The secondary PAO and THA groups also had favorable PROs, but the studies were inconclusive in determining superior outcomes between the primary and secondary groups.

Level of Evidence

IV, Systematic review of Level II-IV investigations

[BACK](#)

Acute ACL reconstruction shows superior clinical results and can be performed safely without an increased risk of developing arthrofibrosis.

Essen, von C., Eriksson, K., Barenius, B.

Knee Surgery, Sports Traumatology, Arthroscopy, July 2020, Volume 28, Issue 7, pages 2036 – 2043.

DOI: <https://doi-org.eur.idm.oclc.org/10.1007/s00167-019-05722-w>

Purpose

To compare acute ACL reconstruction (ACLR) within 8 days of injury with delayed reconstruction after normalized range of motion (ROM), 6–10 weeks after injury. It was hypothesized that acute ACL reconstruction with modern techniques is safe and can be beneficial in terms of patient-reported outcomes and range of motion.

Methods

The effect of acute and delayed ACLR was randomized studied on 70 patients with high recreational activity level, Tegner level 6 or more, between 2006 and 2013. Patient-reported outcomes, objective IKDC, KOOS, and manual stability measurements were documented during the 24-month follow-up period.

Results

The acute ACLR group did not result in increased stiffness and showed superior outcome regarding strength and how the patient felt their knee functioning at 24 months. In addition, the acute group was not inferior to the delayed group in any assessment. Regarding patient-related outcomes in KOOS, both groups showed significant improvements in all subscales, but no difference was found between the groups. Functional return (FR) rate was almost double compared to the Swedish knee ligament register and treatment failure (TF) rate was reduced by half, no significant difference between the groups. No difference regarding cyclops removal, re-injury of ACL or meniscus was found between the two surgical timing groups.

Conclusion

Acute ACLR within 8 days of injury does not appear to adversely affect ROM or result in increased stiffness in the knee joint and was not inferior to the delayed group in any assessment when compared to delayed surgery.

Level of evidence

I.

Acute reconstruction results in less sick-leave days and as such fewer indirect costs to the individual and society compared to delayed reconstruction for ACL injuries.

Essen, von C., McCallum, S., Barenius B., Eriksson, K.

DOI: <https://doi-org.eur.idm.oclc.org/10.1007/s00167-019-05397-3>

Purpose

To compare the total number of sick-leave days caused by the knee injury from the day of injury and over the first year between acute (within 8 days) and delayed (6–10 weeks) anterior cruciate ligament reconstruction (ACLR) and also assess other clinical outcomes during this period.

Methods

Seventy patients with an acute ACL injury and Tegner level of 6 or more were randomized to acute (within 8 days) or delayed (after 6–10 weeks) ACLR. Patient-reported outcomes; objective IKDC and manual stability measurements were assessed at 6 and 12 months. With data from the Swedish Social Insurance Agency (Försäkringskassan) information about the number of sick-leave days due to the knee injury over the following 12 months was collected and compared between the two groups.

Results

Seventy-one percent received compensation for sick leave (26 in the acute versus 23 in the delayed group). The mean number of sick-leave days for the acute group was significantly lower ($M = 56.9$, $SD = 36.4$) compared to the delayed group ($M = 88.5$, $SD = 50.2$), $p < 0.05$. The acute group was also significantly stronger in flexion in both slow and fast angle velocities according to Biodex®. No other differences were found between the groups in other clinical assessments or in terms of associated injuries.

Conclusion

Acute and delayed ACLR provided comparable clinical outcomes after 12 months. Acute reconstruction resulted in less sick-leave days and as such fewer indirect costs to the individual and society. These findings suggest that if patients requiring ACLR can be identified early and ACLR can be performed in the acute phase, socioeconomic costs can potentially be reduced by minimizing time off work.

Level of evidence

II.

No long-term tunnel enlargement following anterior cruciate ligament reconstruction using autograft hamstring tendon with dual suspensory fixation.

Devitt, B. M., Maes, M., Feller, J. A. et al.

DOI: <https://doi-org.eur.idm.oclc.org/10.1007/s00167-019-05741-7>

Purpose

Bone tunnel widening following anterior cruciate ligament reconstruction (ACLR) is well documented, although the aetiology and clinical significance of this phenomenon remain unclear. At mid-term follow-up, a greater prevalence of tunnel enlargement has been reported with the use of hamstring (HS) grafts. However, there are paucity of data on what happens in the longer term. The aim of this study was to assess the change in femoral and tibial tunnel dimensions 15 years after four-strand HS ACLR.

Methods

This is a retrospective review of 15 patients who underwent arthroscopic ACLR using HS autograft tendon and were followed up radiographically at 4 months, 2 years and 15 years. Suspensory fixation was used for both ends of the graft. The diameters of the bone tunnels on posteroanterior (PA) and lateral radiographs were measured using digital callipers. Repeated measures analysis of variance (ANOVA) was used to examine change in tunnel width over time.

Results

Radiographic tunnel width did not significantly change between 4 months and 2 years. However, a significant decrease in width was found for both the femoral and tibial tunnels between the 2- and 15-year follow-up ($P < 0.01$): the femoral tunnel decreased by 50% and 51% in the PA and lateral views, respectively; the tibial tunnel decreased by 77% and 91% in the PA and lateral views respectively. There was no significant correlation between femoral or tibial tunnel width and flexion and extension deficits or with side to side differences in anterior tibial laxity at 15 years.

Conclusions

This radiographic follow-up study of bone tunnel widening following HS ACLR with suspensory fixation demonstrated that tunnel width did not increase beyond 4 months and in fact had decreased significantly at long-term (15 years) follow-up. There was no correlation between tunnel width changes and clinical assessment of flexion and extension deficits or with side-to-side anterior knee laxity at 15-years.

Level of evidence

IV

Quadriceps tendon autograft for anterior cruciate ligament reconstruction is associated with high revision rates: results from the Danish Knee Ligament Registry.

Lind, M., Strauss, M.J., Nielsen, T., et al.

DOI: <https://doi-org.eur.idm.oclc.org/10.1007/s00167-019-05751-5>

Purpose

The quadriceps tendon (QT) has recently gained interest as an anterior cruciate ligament reconstruction (ACLR) autograft. There is a paucity of data from large cohort studies on failures and revision rates after ACLR using the QT graft. The purpose of the present study is to use the Danish Knee Ligament Reconstruction Registry (DKRR) to compare revision rates, objective knee stability and subjective clinical outcomes in patients who have undergone ACLR with QT, hamstring tendon (HT), and patellar tendon (PT) as a graft for ACLR. It was hypothesized that QT autografts would result in similar objective knee stability and revision rates as HT and PT autografts.

Methods

Data on primary ACLRs in the DKRR from 2005 through 2017 were analyzed. Knee injury and Osteoarthritis Outcome Scores (KOOS), Tegner activity scale scores, sagittal knee laxity, pivot-shift tests at 1-year follow-up and revision rates at 2-year follow-up were compared for the three autograft cohorts.

Results

A total of 531 QT, 14,213 HT and 1835 PT ACLR were registered in the DKLR between 2005 and 2017. QT autograft was associated with statistically significant increased laxity (1.8 mm) compared to HT autograft (1.5 mm) ($p < 0.001$) and more positive pivot shift. There was a significant higher revision rate for QT (4.7%), compared to PT (1.5%) and HT (2.3%) autografts at 2-year follow-up ($p < 0.002$).

Conclusion

Quadriceps tendon autografts for ACLR was associated with higher revision rates than HT and PT grafts. QT graft was also associated with small increased objective knee laxity and more positive pivot shift than HT and PT grafts.

Level of evidence

III

No difference between single and staged posterolateral corner surgical procedures in the multiligament injured/dislocated knee.

Freychet, B., Kennedy, N.I., Sanders, T.L., et al.

DOI: <https://doi-org.eur.idm.oclc.org/10.1007/s00167-019-05759-x>

Purpose

Posterolateral corner (PLC) injuries commonly occur in the setting of a dislocated knee and often require multiple procedures due to concomitant vascular, nerve, and soft tissue involvement. Debate persists regarding single vs staged surgery. The purpose of this study was to compare knee function after single and staged surgery for PLC injury.

Methods

Patients who underwent surgery for a PLC injury (KD I, IIIL, IV) with minimum follow-up of 2 years were included. Patients treated with staged and single surgery were matched according to age, sex, and KD grade. Lysholm and International Knee Documentation Committee (IKDC) subjective scores were obtained. Risk factors for poor knee function were assessed, including age, nerve, vascular, meniscal and articular cartilage injuries.

Results

Twenty single-surgery patients with a median age of 24 years (median follow-up 5.3 years, range 2–18.3) and 20 staged surgery patients with a median age of 26 years (median follow-up 4.3 years, range 2–19.8) were studied. The mean Lysholm score was 78.7 (\pm 20.3) in the single surgery and 84.2 (\pm 17.8) in the staged surgery cohort (n.s.). The mean IKDC score was 80.8 (\pm 21.1) in the single and 74.9 (\pm 18.9) in the staged surgery cohort (n.s.). Age at injury, peroneal, vascular, meniscal or cartilage injury were not associated with poor knee outcome.

Conclusion

This study demonstrates similar knee function among patients with PLC injuries treated with single or staged surgical procedures. The need for staged surgery for the dislocated knee with PLC involvement should be individualized based on specific knee and patient-related factors.

Level of evidence

III.

Stiffness and shape of the ACL graft affects tunnel enlargement and graft wear.

Wang, H., Zhang B., Cheng, C.

DOI: <https://doi-org.eur.idm.oclc.org/10.1007/s00167-019-05772-0>

Purpose

Tunnel enlargement and graft rupture are common complications associated with ACL reconstruction (ACLR). This study aims to explore how variations in graft stiffness and shape affect the strain energy density (SED) around bone tunnel entrances and stress on the graft and subsequently influencing the level of tunnel enlargement and graft wear.

Methods

Finite element ACLR models were developed using different graft stiffnesses (323 N/mm, 545 N/mm and 776 N/mm) and shapes (circular and elliptical). The models were subjected to a combined loading of 103 N anterior tibial load, 7.5 Nm internal tibial moment, and 6.9 Nm valgus tibial moment at joint flexion of 30°. SED at tunnel entrances and stresses on the graft was recorded and compared among the different models.

Results

Increasing the graft stiffness resulted in greater stress on the graft (17.2, 24.4 and 31.7 MPa for graft stiffnesses of 323 N/mm, 545 N/mm and 776 N/mm), but had little effect on the SED reduction around the tunnel entrances. Changing the cross section of the graft from circular to elliptical caused an additional reduction in SED (56.8 vs 2.8 kJ/m³) at the posterior zone of the femoral tunnel entrance and increased the stress on the graft (31.7 MPa vs 38.9 MPa).

Conclusions

This study recommends using ACL grafts with lower stiffness and a circular cross section to reduce tunnel enlargement and graft wear following ACLR.

Level of evidence

IV

Rates of revision and surgeon-reported graft rupture following ACL reconstruction: early results from the New Zealand ACL Registry.

Rahardja, R., Zhu, M., Love, H.

DOI: <https://doi-org.eur.idm.oclc.org/10.1007/s00167-019-05773-z>

Purpose

There remains a lack of consensus on the patient factors associated with graft rupture following anterior cruciate ligament (ACL) reconstruction. This study aimed to identify the rate of revision and surgeon-reported graft rupture and clarify the patient risk factors for failure.

Methods

Analysis was conducted on prospective data captured by the New Zealand ACL registry. All primary isolated ACL reconstructions recorded between April 2014 and December 2018 were reviewed to identify the rate of revision and surgeon-reported graft rupture. Univariate and multivariate survival analysis was performed to identify patient factors associated with revision and graft rupture.

Results

A total of 7402 primary isolated ACL reconstructions were reviewed and had a mean follow-up time of 23.1 (SD \pm 13.9) months. There were 258 surgeon-reported graft ruptures (3.5%) of which 175 patients underwent subsequent revision ACL reconstruction (2.4%). Patients younger than 18 years had the highest risk of revision (adjusted HR = 7.29, $p < 0.001$) and graft rupture (adjusted HR = 4.26, $p < 0.001$) when compared to patients aged over 36 years. Male patients had a higher risk of revision (adjusted HR = 2.00, $p < 0.001$) and graft rupture (adjusted HR = 1.70, $p < 0.001$) when compared to their female counterparts. Patients who underwent ACL reconstruction within 6 months of their injury had a two times increased risk of revision compared to patients who had surgery after 12 months (adjusted HR = 2.15, $p = 0.016$).

Conclusion

Younger age, male sex and a shorter injury-to-surgery time interval increased the risk of revision, while younger age and male sex increased the risk of surgeon-reported graft rupture.

Level of evidence

II.

Importance of functional performance and psychological readiness for return to preinjury level of sports 1 year after ACL reconstruction in competitive athletes.

Kitaguchi, T., Tanaka, Y., Takeshita, S.

DOI: <https://doi-org.eur.idm.oclc.org/10.1007/s00167-019-05774-y>

Purpose

This study aimed to identify independent predictive factors for return to sports (RTS) after anterior cruciate ligament (ACL) reconstruction in competitive-level athletes and to determine optimal cut-off values for these factors at 6 months after surgery.

Methods

A total of 124 competitive athletes (50 males and 74 females; mean age, 17.0 years; preinjury Tegner activity scale > 7) who underwent primary ACL reconstruction were enrolled. Assessments at 6 months after surgery consisted of knee functional tests [quadriceps index, hamstrings index, and single-leg hop for distance (SLH)] and 2 self-report questionnaires [IKDC subjective score and ACL-Return to Sport after Injury scale (ACL-RSI)]. At 1 year after surgery, athletes were classified into the RTS group ($n = 101$) or non-RTS group ($n = 23$) based on self-reported sports activities. After screening possible predictive factors of RTS, multivariate logistic regression and receiver operating characteristic curve analyses were performed to identify independent factors.

Results

Multivariate logistic regression analysis identified SLH (odds ratio, 2.861 per 10 unit increase; $P < 0.001$) and ACL-RSI (odds ratio, 1.810 per 10 unit increase; $P = 0.001$) at 6 months as independent predictors of RTS at 1 year after surgery. Optimal cut-off values of SLH and ACL-RSI were 81.3% (sensitivity = 0.891; specificity = 0.609) and 55 points (sensitivity = 0.693; specificity = 0.826), respectively.

Conclusion

In competitive athletes, SLH < 81% and ACL-RSI < 55 points at 6 months after surgery were associated with a greater risk of unsuccessful RTS at 1 year after surgery. SLH and ACL-RSI at 6 months could serve as screening tools to identify athletes who have difficulties with returning to sports after ACL reconstruction.

Level of evidence

III.

Young age, female gender, Caucasian race, and workers' compensation claim are risk factors for reoperation following arthroscopic ACL reconstruction.

Capogna, B.M., Mahure, S.A., Mollon, B., et al.

DOI: <https://doi-org.eur.idm.oclc.org/10.1007/s00167-019-05798-4>

Purpose

Given the increasing incidence of arthroscopic anterior cruciate ligament reconstruction (ACLR), mid- to long-term rates of reoperations were investigated on the ipsilateral knee following ACLR.

Methods

New York Statewide Planning and Research Cooperative Systems (SPARCS) database was queried from 2003 to 2012 to identify patients with a primary ICD-9 diagnosis for ACL tear and concomitant CPT code for ACLR. Patients were longitudinally followed for at least 2 years to determine incidence and nature of subsequent ipsilateral knee procedures.

Results

The inclusion criteria were met by 45,231 patients who had undergone ACLR between 2003 and 2012. Mean age was found to be 29.7 years (SD 11.6). Subsequent ipsilateral outpatient knee surgery after a mean of 25.7 ± 24.5 months was performed in 10.7% of patients. Revision ACLR was performed for nearly one-third of reoperations. Meniscal pathology was addressed in 58% of subsequent procedures. Age 19 or younger, female gender, worker's compensation (WC) insurance, and Caucasian race were identified as independent risk factors for any ipsilateral reoperation. An initial isolated ACLR and initial ACLR performed by a high-volume surgeon were found to be independently associated with *lower* reoperation rates. Tobacco use was not significant. Survival rates of 93.4%, 89.8% and 86.7% at 2-, 5- and 10 years, respectively, were found for any ipsilateral reoperation.

Conclusion

A 10.7% ipsilateral reoperation rate at an average of 25.9 (SD 24.5) months after ACLR and an overall ACLR revision rate of 3.1% were demonstrated by the analysis. Meniscal pathology was addressed in the majority of subsequent interventions. Age 19 or younger, female gender, Caucasian race, and WC claim were associated with reoperation. Initial isolated ACLR and procedure performed by high-volume surgeon were associated with reduced reoperation.

Level of evidence

Level III.

Oval femoral tunnel technique is superior to the conventional round femoral tunnel technique using the hamstring tendon in anatomical anterior cruciate ligament reconstruction.

Wen, Z., Zhang, H., Yan, W., et al.

DOI: <https://doi-org.eur.idm.oclc.org/10.1007/s00167-019-05809-4>

Purpose

This study was conducted to compare the efficacy between the oval femoral tunnel technique and the conventional round femoral tunnel technique in ACL reconstruction using an autologous hamstring tendon on the basis of the postoperative clinical outcomes and ACL graft tendon maturity. The hypothesis was that ACL reconstruction performed using the oval femoral tunnel technique was better than that performed using the round femoral tunnel technique in clinical functions and graft maturity.

Methods

One hundred and eight patients who underwent anatomical single-bundle ACL reconstruction were included in this study and the follow-up period was at least 2 years. Thirty-nine patients admitted between February and August in 2016 were included in the oval femoral tunnel group and 69 patients admitted between September 2016 and March 2017 were included in the round femoral tunnel group. The Lachman test result, pivot-shift test result, Lysholm score, IKDC score, and VAS score were used for the clinical evaluation. An objective assessment of anteroposterior stability was performed using a KT1000 arthrometer. Postoperative MRI was conducted to compare the ACL graft maturity differences between the oval femoral tunnel group and round femoral tunnel group, where the signal/noise quotient (SNQ) was calculated. In addition, second-look arthroscopy was conducted to compare the graft status and synovial coverage at 24 months postoperatively.

Results

All the patients presented with significant improvement in all clinical scores from the preoperative period to the 24-month follow-up. During the postoperative follow-up period, no statistically significant differences were found between the two groups in terms of the VAS score, knee ROM, Lachman test results, and graft status determined in the second-look arthroscopic evaluation. The Lysholm score was 97.1 ± 3.9 and 94.8 ± 5.6 in the oval femoral tunnel group and round femoral tunnel group, respectively, at the 24-month follow-up ($p = 0.031$). The IKDC subjective score was 92.0 ± 2.6 and 89.0 ± 3.6 in the oval femoral tunnel group and round femoral tunnel group, respectively, at the end of the follow-up period ($p < 0.001$). Significantly more patients with 1-degree positive pivot-shift test results were observed in the round femoral tunnel group (10/65) than in the oval femoral tunnel group (1/37) at the end of the follow-up period ($p = 0.048$). The mean SNQ of the oval femoral tunnel group was 2.7 ± 0.9 , which was significantly lower than that of the round femoral tunnel group (3.6 ± 1.1) at the 24-month postoperative follow-up ($p < 0.001$).

Conclusions

Based on the clinical evaluations, MRI findings and second-look arthroscopy results of the two groups, the oval femoral tunnel technique yielded significantly better knee function and knee laxity restoration and more mature ACL grafts than the round femoral tunnel technique, whereas no significant differences were found at the second-look arthroscopy.

Level of evidence

III.

Central patellar portal placement frequently provokes anterior knee compartment radiological abnormalities in anterior cruciate ligament reconstruction.

Goto, K., Taketomi S., Shimizu, N.

DOI: <https://doi-org.eur.idm.oclc.org/10.1007/s00167-019-05817-4>

Purpose

A central patellar (CP) portal can be used to view the native femoral insertion site of the anterior cruciate ligament (ACL). It aids in the drilling of an anatomical tunnel; however, its impact on the patellar tendon and the infrapatellar fat pad remains a concern. The aim of this study was to investigate complications associated with the CP portal use in arthroscopic ACL reconstruction (ACLR).

Methods

A total of 105 patients (107 knees, 60 females) who underwent ACLR with a CP portal from 2012 to 2017 were included in this study. The mean age was 28.3 ± 12.4 years. All surgeries were single-bundle reconstructions using the trans-tibial technique via the CP and anteromedial portals. Post-operative events, magnetic resonance imaging (MRI), and arthroscopic findings associated with CP portal creation were evaluated.

Results

Five patients (4.7%) had symptomatic postoperative complications, which included two patients with patellar tendonitis and three patients with fibrosis in the anterior knee compartment. Abnormal signal intensity of the patellar tendon on MRI and increased thickness at the CP portal area were found in 18 of 25 knees (72%). Three of 56 knees (5.4%) that underwent second-look arthroscopy showed fibrosis of the infrapatellar fat pad. Seven patients (12.5%) showed hypertrophy of the ligamentum mucosum.

Conclusions

The rate of symptomatic complications associated with CP portal placement was 4.7%; however, abnormal MRI or follow-up arthroscopy findings were much higher than clinically symptomatic patients. This study suggests that CP portal placement could provoke anterior knee compartment fibrosis or hypertrophy.

Level of evidence

IV.

Electrocautery in arthroscopic surgery: intra-articular fluid temperatures above 43 °C cause potential tissue damage.

Derriks, J. H. G., Hilgersom, N. F. J., Middelkoop, E.

DOI: <https://doi-org.eur.idm.oclc.org/10.1007/s00167-019-05574-4>

Purpose

The use of electrocautery during arthroscopy may heat intra-articular saline and subsequently damage intra- and extra-articular tissue. Newer electrocautery devices have the ability to measure the outflow fluid temperature and switch off before reaching a certain threshold; however, the scientific evidence establishing these temperature thresholds' potential for inadvertent damage is lacking. The aim of this study was to analyse current available literature on temperature thresholds for tissue damage after exposure to heated fluid and provide a recommendation for the maximum temperature of intra-articular fluid to prevent tissue damage.

Methods

In February 2018, a systematic literature review was performed using the MEDLINE/PubMed and Embase databases. Inclusion was limited to studies investigating temperature thresholds for thermal damage to at least one of the tissues of interest: skin, bone, cartilage, soft tissues, and nerves. Studies not reporting specific temperature thresholds for thermal damage were excluded.

Results

Twenty articles were selected for the final evaluation and data extraction. Varying temperature thresholds, based on the lowest reported temperature causing tissue damage, were found for the different tissues of interest: 44 °C for dermal tissues, between 47 and 50 °C for bony tissues, 50 °C for cartilage, between 43 and 55 °C for soft tissues, and 43 °C for nerves.

Conclusion

Based on the current literature, a temperature threshold for intra-articular fluid of 43 °C during an arthroscopic procedure is recommended to prevent tissue damage. Higher temperatures may cause damage to surrounding intra- and extra-articular tissues. The threshold for irreversible damage is likely to be higher. In clinical practise, one should be aware of possible heating of intra-articular fluid when using electrocautery and related risk of tissue damage.

Level of evidence

III.

Arthroscopic correction of femoroacetabular impingement improves athletic performance in male athletes.

Mullins, K., Hanlon, M., Carton, P.

DOI: <https://doi-org.eur.idm.oclc.org/10.1007/s00167-019-05683-0>

Purpose

To measure the changes in athletic performance in athletes treated arthroscopically for femoroacetabular impingement and compare results to a matched controlled athletic cohort, over a 1-year period.

Methods

Male athletes scheduled for arthroscopic correction of symptomatic FAI were recruited and tested (pre-operatively and 1-year postsurgery) for measures of athletic performance which included acceleration (10-m sprint), change of direction speed (CODS), squatting depth, and reactive strength index (RSI). The FAI group was compared to a matched, healthy, control group who were tested at baseline and 1 year later with no disruption to their regular training or competition status; the prevalence of anterior groin pain during testing in either group was recorded. Hip range of motion (ROM) was also measured for both groups at baseline and at 1 year in the FAI group to look for change following intervention.

Results

Prior to surgery, the FAI group were slower than the control group ($p < 0.001$) for acceleration (3% slower) and CODS (10% slower). At 1 year, 91% of the FAI group returned to full competition at an average time of 17 weeks, while substantial reductions in pain were also noted during acceleration (51–6%, $p = 0.004$), CODS (62–8%, $p = 0.001$), and squat test (38–8%, $p = 0.003$). Significant improvements were seen in the FAI group for CODS (7%, $p < 0.001$) and squat depth measures (6%, $p = 0.004$) from baseline to 1 year (significant time \times group interaction effects were noted for these also). The changes in performance in the control group over time were non-significant across all of the measures (n.s.). At 1-year postsurgery, there were no statistically significant differences between the groups for any of the athletic measures. There was a significant and clinically important improvement in range of hip motion in the FAI group at 1-year postsurgery ($p < 0.05$).

Conclusion

Symptomatic FAI causes substantial reductions in athletic performance compared to healthy competitors placing these athletes at a distinct performance disadvantage. The results from the current study demonstrate that arthroscopic correction (including labral repair) in athletes with symptomatic FAI, reduces pain and restores athletic performance to a level which is comparable to healthy athletes, at 1 year.

Level of evidence

II.

Sustained benefit of autologous matrix-induced chondrogenesis for hip cartilage repair in a recreational athletic population.

Thorey, F., Malahias, M.A., Giotis, D.

<https://doi.org/10.1007/s00167-019-05801-y>

Purpose

To investigate the clinical outcome of autologous matrix-induced chondrogenesis (AMIC) implementation for mid-sized chondral lesions of the acetabulum in young active patients, and assess their potential to resume an active lifestyle including return to recreational athletic activities.

Methods

Sixty-two patients with full-thickness mid-sized acetabular chondral lesions were studied. All patients who underwent an arthroscopic AMIC procedure for reconstruction of chondral defects were assessed pre-operatively and at least 2 years post-operatively using the Hip disability and Osteoarthritis Outcome Score (HOOS), modified Harris Hip Score (mHHS) and Visual Analog Scale (VAS) for pain.

Results

A significant improvement in all three scores at the time of follow-up was found. The mean HOOS improved from 58.8 ± 7.4 pre-operatively to 90.6 ± 7.1 at follow-up ($p < 0.001$) while the mean mHHS improved from 53.4 ± 6.6 to 82.4 ± 8.2 ($p < 0.001$). There was a significant decrease from 4.9 ± 1.1 pre-operatively to 1.1 ± 0.8 post-operatively ($p < 0.001$) in the VAS pain evaluation, indicating that the patients were satisfied with their relief of pain.

Conclusions

The AMIC procedure is an effective single-stage technique for the reconstruction of mid-size chondral defects of acetabulum in amateur athletes. This intervention enhanced the potential for patients to resume recreational athletic activities and the 2-year clinical outcome as evaluated by the HOOS, mHHS and VAS showed significant improvement over the pre-operative evaluations.

Level of evidence

III

Adductor canal block is similar to femoral nerve block for the quality of rehabilitation after arthroscopic partial meniscectomy.

Xin, J., Zhang, Y., Li, Q., et al.

DOI: <https://doi-org.eur.idm.oclc.org/10.1007/s00167-019-05796-6>

Purpose

Adductor canal block (ACB) provides postoperative pain relief as effectively as femoral nerve block (FNB) does, and it preserves the strength of the quadriceps femoris. However, its effect on rehabilitation after arthroscopic partial meniscectomy has not been reported. The purpose of this study was to determine the effect of pre-operative ACB and FNB on the quality of rehabilitation after arthroscopic partial meniscectomy.

Methods

A total of 150 patients undergoing arthroscopic partial meniscectomy were randomly allocated to the FNB group (receiving 0.3% ropivacaine 30 ml at the thighroot-femoral nerve), the ACB group (receiving 0.3% ropivacaine 30 ml at mid-thigh adductor canal), or the control group. The primary outcome was the Hospital for Special Surgery (HSS) knee score on the 30th postoperative day.

Results

The HSS knee score of the ACB group on the 30th day after the operation was significantly higher than those of the FNB and control groups (88.6 ± 5.3 vs. 85.3 ± 6.9 and 81.2 ± 5.9 , respectively; $P < 0.05$). Both the ACB and FNB groups showed excellent rehabilitation, indicating similar rehabilitation quality for both treatments.

Conclusion

ACB is similar to FNB concerning the quality of rehabilitation and pain relief after arthroscopic partial meniscectomy, while ACB has little effect on the strength of the quadriceps femoris.

Level of evidence

I

Does Concomitant Lumbar Spine Disease Adversely Affect the Outcomes of Patients Undergoing Hip Arthroscopy?

Jonathan D. Haskel, MD*, Samuel L. Baron, MD, Mikhail Zusmanovich, MD, Thomas Youm, MD

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Background:

The practice of hip arthroscopy is increasing in popularity, which has highlighted the importance of identifying risk factors that predict hip arthroscopy outcomes. The literature suggests that lumbar spine disease is an independent risk factor for poorer outcomes following total hip arthroplasty; however, the effect of lumbar spine disease on hip arthroscopy outcomes has not been fully investigated. At present, there is a paucity of literature investigating the effect of coexisting hip and lumbar spine disease on outcomes after hip arthroscopy.

Purpose:

To evaluate the outcomes of hip arthroscopy in patients with concomitant lumbar spine disease compared with those without a history of lumbar spine disease.

Study Design:

Cohort study; Level of evidence, 3.

Methods:

A retrospective review of a prospectively collected, single-surgeon database was performed to identify patients who underwent hip arthroscopy with subjective and objective evidence of lumbar disease. Patients were included if they were skeletally mature; had hip disease that failed nonoperative treatment; had symptoms of low back pain, lumbar radiculopathy, or lumbar stenosis at the time of surgery; and had advanced imaging of the lumbar spine (computed tomography or magnetic resonance imaging) confirming lumbar spine disease. Patients were excluded if they had any previous hip surgery or evidence of osteoarthritis of Tönnis grade 2 or higher. The hip-spine cohort was matched by age, sex, and body mass index in a 1:3 fashion to a control cohort consisting of patients without symptoms of low back pain, lumbar radiculopathy, or lumbar stenosis at the time of surgery or a history of lumbar spine disease who underwent hip arthroscopy over the same time period. Baseline preoperative modified Harris Hip Score (mHHS) and Non-Arthritic Hip Score (NAHS) were compared with scores at 3-, 6-, 12-, and 24-month follow-up, and rates of revision arthroscopy or total hip arthroplasty were assessed. Statistical analysis was performed with the Student t test.

Results:

A total of 38 patients with radiographically confirmed lumbar disease were matched with 111 control patients. Preoperative mHHS and NAHS were significantly lower in the hip-spine cohort ($P = .01$ and $P = .02$, respectively); however, no significant differences were found in mHHS or NAHS between the cohorts at 3, 6, 12, and 24 months postoperatively. A 89.8% increase in mHHS was found in the hip-spine cohort, compared with a 74.4% increase in the control cohort ($P = .0475$). No significant differences in the rates of revision or total hip arthroplasty conversion were identified between the hip-spine and control cohorts (23.7% vs 18.0%, respectively; $P = .44$).

Conclusion:

Patients with known lumbar spine disease who underwent hip arthroscopy had a significantly greater percentage improvement at 24-month follow-up compared with those without a history of lumbar spine disease, and outcomes were ultimately not significantly different. No increased risk of reoperation was noted in patients with concomitant lumbar spine disease.

Anterior Cruciate Ligament Reconstructions With Quadriceps Tendon Autograft Result in Lower Graft Rupture Rates but Similar Patient-Reported Outcomes as Compared With Hamstring Tendon Autograft: A Comparison of 875 Patients

Armin Runer, MD, Robert Csapo, PhD, Caroline Hepperger, PhD, Mirco Herbort, MD, Christian Hoser, MD, Christian Fink, MD

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Background:

Graft rupture is a devastating outcome after anterior cruciate ligament (ACL) reconstruction (ACLR). Little is known about graft rupture rates as well as clinical and functional outcomes after ACLR with quadriceps tendon (QT) autografts.

Purpose:

To compare QT with hamstring tendon (HT) autografts in terms of the rates of graft and contralateral ACL rupture as well as patient-reported outcome measures.

Study Design:

Cohort study; Level of evidence, 3.

Methods:

All primary ACLRs performed between 2010 and 2016 were followed prospectively for 24 months through the recording of graft ruptures and contralateral ACL injuries as well as patient-administered questionnaires.

Results:

A total of 875 patients were included in the study. Three factors—graft type, age group, and activity level—had a significant value in predicting the need for revision surgery. The odds of revision surgery were 5.5 times greater in children younger than 15 years than in adults older than 45 years, 3.6 times greater in patients with high activity levels than low activity levels, and 2.7 times greater in patients receiving an HT autograft as compared with a QT autograft. A significantly higher rate of ipsilateral graft ruptures versus contralateral ACL injuries was observed in the HT group (4.9% vs 2.3%; odds ratio, 2.1; $P = .01$) but not in the QT group (2.8% vs 2.3%). The difference in the ratios of graft and contralateral ACL ruptures was even more pronounced in highly active patients treated with HT autografts (11.1% vs 4.2%; odds ratio, 2.6; $P = .01$) as compared with QT autografts (5.0% vs 2.8%; $P = .48$). Two-year measures of Lysholm scores (mean \pm SD: QT, 86.0 \pm 22.3; HT, 89.4 \pm 16.4) and Tegner activity scores (QT, 6.1 \pm 2.0; HT, 5.7 \pm 1.9) as well as visual analog scale pain (QT, 0.8 \pm 1.3; HT, 0.7 \pm 1.1) did not differ between grafts.

Conclusion:

Graft choice does not influence clinical and functional outcomes 2 years after ACLR. However, 3 factors—graft type, age group, and activity level—have a significant value in predicting the need for revision surgery. Patients treated with HT autografts have a significantly higher, activity-dependent risk of revision surgery and experience more ipsilateral graft ruptures than subsequent contralateral ACL injuries when compared with patients treated with QT autografts. Young age and high activity level are significant predictors for ACL revision surgery.

[BACK](#)

Patellar Malalignment Is Associated With Patellofemoral Lesions and Cartilage Relaxation Times After Hamstring Autograft Anterior Cruciate Ligament Reconstruction

Tzu-Chieh Liao, PT, PhD*, Alejandro G. Morales Martinez, BS, Valentina Pedoia, PhD, Benjamin C. Ma, MD, Xiaojuan Li, PhD, Thomas M. Link, MD, PhD, Sharmila Majumdar, PhD, Richard B. Souza, PT, PhD

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Background:

There is growing evidence suggesting a link between patellofemoral joint (PFJ) osteoarthritis in anterior cruciate ligament (ACL)–reconstructed knees and altered joint alignment.

Purpose:

To determine whether patellar alignment differs between participants with and without ACL reconstruction (ACLR) and to identify possible associations between patellar alignment and PFJ osteoarthritis features over 3 years.

Study Design:

Cohort study; Level of evidence, 2.

Methods:

A total of 37 participants with ACLR (sex, 23 male; mean \pm SD age, 28.1 \pm 7.4 years) and 20 healthy controls (13 male; 30.4 \pm 4.8 years) participated. Patients underwent magnetic resonance imaging: (1) sagittal T2-weighted fat-saturated fast spin echo images to calculate patellar alignment, (2) sagittal 3-dimensional intermediate-weighted fast spin echo Cube sequence for clinical morphological grading (modified Whole-Organ Magnetic Resonance Imaging Score [WORMS]), and (3) sagittal combined T1 ρ /T2 mapping sequence for performing voxel-based relaxometry. Patellar alignment of the ACLR knees were assessed at 6 months (baseline). One-way analysis of variance was used to compare patellar alignment among the ACLR (at 6 months), contralateral, and control knees. Within the ACLR group, a logistic regression model was used to identify if patellar alignment measures at baseline were risk factors for worsening of PFJ structural changes over 3 years. Statistical parametric mapping was used to evaluate the longitudinal associations between patellar alignment and cartilage relaxation times at 3 years.

Results:

When compared with control knees, ACLR knees exhibited a laterally and anteriorly displaced patella ($P = .045$ and $P = .041$), less flexion ($P = .031$), and less lateral spin ($P = .012$). Furthermore, excessive lateral displacement was a significant predictor of worsening of WORMS ($P = .050$). Lateral displacement was positively correlated with increased T1 ρ and T2 in the patellar and trochlear cartilage at 3 years. Patellar lateral spin revealed similar negative findings.

Conclusion:

Participants with ACLR exhibited a laterally and anteriorly displaced patella, less flexion, and less lateral spin when compared with healthy controls. Excessive patellar lateral displacement was the strongest predictor to the development of PFJ osteoarthritis features longitudinally.

Can Predictive Modeling Tools Identify Patients at High Risk of Prolonged Opioid Use After ACL Reconstruction?

Anderson, Ashley B. MD; Grazal, Clare F. MS; Balazs, George C. MD; Potter, Benjamin K. MD; Dickens, Jonathan F. MD; Forsberg, Jonathan A. MD, PhD

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Background

Machine-learning methods such as the Bayesian belief network, random forest, gradient boosting machine, and decision trees have been used to develop decision-support tools in other clinical settings. Opioid abuse is a problem among civilians and military service members, and it is difficult to anticipate which patients are at risk for prolonged opioid use.

Questions/purposes

(1) To build a cross-validated model that predicts risk of prolonged opioid use after a specific orthopaedic procedure (ACL reconstruction), (2) To describe the relationships between prognostic and outcome variables, and (3) To determine the clinical utility of a predictive model using a decision curve analysis (as measured by our predictive system's ability to effectively identify high-risk patients and allow for preventative measures to be taken to ensure a successful procedure process).

Methods

We used the Military Analysis and Reporting Tool (M2) to search the Military Health System Data Repository for all patients undergoing arthroscopically assisted ACL reconstruction (Current Procedure Terminology code 29888) from January 2012 through December 2015 with a minimum of 90 days postoperative follow-up. In total, 10,919 patients met the inclusion criteria, most of whom were young men on active duty. We obtained complete opioid prescription filling histories from the Military Health System Data Repository's pharmacy records. We extracted data including patient demographics, military characteristics, and pharmacy data. A total of 3.3% of the data was missing. To curate and impute all missing variables, we used a random forest algorithm. We shuffled and split the data into 80% training and 20% hold-out sets, balanced by outcome variable (Outcome90Days). Next, the training set was further split into training and validation sets. Each model was built on the training data set, tuned with the validation set as applicable, and finally tested on the separate hold-out dataset. We chose four predictive models to develop, at the end choosing the best-fit model for implementation. Logistic regression, random forest, Bayesian belief network, and gradient boosting machine models were the four chosen models based on type of analysis (classification). Each were trained to estimate the likelihood of prolonged opioid use, defined as any opioid prescription filled more than 90 days after anterior cruciate reconstruction. After this, we tested the models on our holdout set and performed an area under the curve analysis concordance statistic, calculated the Brier score, and performed a decision curve analysis for validation. Then, we chose the method that produced the most suitable analysis results and, consequently, predictive power across the three calculations. Based on the calculations, the gradient boosting machine model was selected for future implementation. We systematically selected features and tuned the gradient boosting machine to produce a working predictive model. We performed area under the curve, Brier, and decision curve analysis calculations for the final model to test its viability and gain an understanding of whether it is possible to predict prolonged opioid use.

Results

Four predictive models were successfully developed using gradient boosting machine, logistic regression, Bayesian belief network, and random forest methods. After applying the Boruta algorithm for feature selection based on a 100-tree random forest algorithm, features were narrowed to a final seven features. The most influential features with a positive association with prolonged opioid use are preoperative morphine equivalents (yes), particular pharmacy ordering sites locations, shorter deployment time, and younger age. Those observed to have a negative association with prolonged opioid use are particular pharmacy ordering sites locations, preoperative morphine equivalents (no), longer deployment, race (American Indian or Alaskan native) and rank (junior enlisted).

On internal validation, the models showed accuracy for predicting prolonged opioid use with AUC greater than our benchmark cutoff 0.70; random forest were 0.76 (95% confidence interval 0.73 to 0.79), 0.76 (95% CI 0.73 to 0.78), 0.73 (95% CI 0.71 to 0.76), and 0.72 (95% CI 0.69 to 0.75), respectively. Although the results from logistic regression and gradient boosting machines were very similar, only one model can be used in implementation. Based on our calculation of the Brier score, area under the curve, and decision curve analysis, we chose the gradient boosting machine as the final model. After selecting features and tuning the chosen gradient boosting machine, we saw an incremental improvement in our implementation model; the final model is accurate, with a Brier score of 0.10 (95% CI 0.09 to 0.11) and area under the curve of 0.77 (95% CI 0.75 to 0.80). It also shows the best clinical utility in a decision curve analysis.

Conclusions

These scores support our claim that it is possible to predict which patients are at risk of prolonged opioid use, as seen by the appropriate range of hold-out analysis calculations. Current opioid guidelines recommend preoperative identification of at-risk patients, but available tools for this purpose are crude, largely focusing on identifying the presence (but not relative contributions) of various risk factors and screening for depression. The power of this model is that it will permit the development of a true clinical decision-support tool, which risk-stratifies individual patients with a single numerical score that is easily understandable to both patient and surgeon. Probabilistic models provide insight into how clinical factors are conditionally related. Not only will this gradient boosting machine be used to help understand factors contributing to opiate misuse after ACL reconstruction, but also it will allow orthopaedic surgeons to identify at-risk patients before surgery and offer increased support and monitoring to prevent opioid abuse and dependency.

Level of Evidence

Level III, therapeutic study.

Patient-related risk factors associated with less favourable outcomes following hip arthroscopy. A scoping review

Yuichi Kuroda, Masayoshi Saito, Ece Nur Çınar, Alan Norrish, Vikas Khanduja

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Aims

This paper aims to review the evidence for patient-related factors associated with less favourable outcomes following hip arthroscopy.

Methods

Literature reporting on preoperative patient-related risk factors and outcomes following hip arthroscopy were systematically identified from a computer-assisted literature search of Pubmed (Medline), Embase, and Cochrane Library using Preferred Reporting Items for Systematic Reviews and Meta-analyses (PRISMA) guidelines and a scoping review.

Results

Assessment of these texts yielded 101 final articles involving 90,315 hips for qualitative analysis. The most frequently reported risk factor related to a less favourable outcome after hip arthroscopy was older age and preoperative osteoarthritis of the hip. This was followed by female sex and patients who have low preoperative clinical scores, severe hip dysplasia, altered hip morphology (excess acetabular retroversion or excess femoral anteversion or retroversion), or a large cam deformity. Patients receiving workers' compensation or with rheumatoid arthritis were also more likely to have a less favourable outcome after hip arthroscopy. There is evidence that obesity, smoking, drinking alcohol, and a history of mental illness may be associated with marginally less favourable outcomes after hip arthroscopy. Athletes (except for ice hockey players) enjoy a more rapid recovery after hip arthroscopy than non-athletes. Finally, patients who have a favourable response to local anaesthetic are more likely to have a favourable outcome after hip arthroscopy.

Conclusion

Certain patient-related risk factors are associated with less favourable outcomes following hip arthroscopy. Understanding these risk factors will allow the appropriate surgical indications for hip arthroscopy to be further refined and help patients to comprehend their individual risk profile.