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Upper extremity

Journal of Arthroscopy, Volume 38, Issue 8, pages 2361-2588

Time-Driven Activity-Based Costing Accurately Determines Bundle Cost for Rotator Cuff Repair

D.S. Koolmees, P.N. Ramkumar, et al.

DOI: https://doi.org/10.1016/j.arthro.2022.02.006

Purpose
The purpose of this study was to determine the cost of the episode of care for primary rotator cuff repair (RCR) from day of surgery to 90 days postoperatively using the time-driven activity-based costing (TDABC) method. The secondary purpose of this study was to identify the main drivers of cost for both phases of care.

Methods
This retrospective case series study used the TDABC method to determine the bundled cost of care for an RCR. First, a process map of the RCR episode of care was constructed in order to determine drivers of fixed (i.e., rent, power), direct variable (i.e., healthcare personnel), and indirect costs (i.e., marketing, building maintenance). The study was performed at a Midwestern tertiary care medical system, and patients were included in the study if they underwent an RCR from January 2018 to January 2019 with at least 90 days of postoperative follow-up. In this article, all costs were included, but we did not account for fees to provider and professional groups.

Results
The TDABC method calculated a cost of $10,569 for a bundled RCR, with 76% arising from the operative phase and 24% from the postoperative phase. The main driver of cost within the operative phase was the direct fixed costs, which accounted for 35% of the cost in this phase, and the largest contributor to cost within this category was the cost of implants, which accounted for 55%. In the postoperative phase of care, physical therapy visits were the greatest contributor to cost at 59%.

Conclusion
In a bundled cost of care for RCR, the largest cost driver occurs on the day of surgery for direct fixed costs, in particular, the implant. Physical therapy represents over half of the costs of the episode of care. Better understanding the specific cost of care for RCR will facilitate optimization with appropriately designed payment models and policies that safeguard the interests of the patient, physician, and payer.

Level of Evidence
IV, therapeutic case series.

BACK

Injection of Leukocyte-Poor Platelet-Rich Plasma for Moderate-to-Large Rotator Cuff Tears Does Not Improve Clinical Outcomes but Reduces Retear Rates and Fatty Infiltration: A Prospective, Single-Blinded Randomized Study

C Zhang, Y. Cai, Y. Wang

DOI: https://doi.org/10.1016/j.arthro.2022.02.007

Objectives
To determine whether leukocyte-poor platelet-rich plasma (Lp-PRP) reduced retear rates, reduced fatty infiltration, and improved functional outcomes in patients with degenerative moderate-to-large rotator cuff tears.

Methods
This was a randomized controlled study at a single center. A consecutive series of 104 patients with moderate-to-large rotator cuff tears was enrolled and randomly allocated to a control group (double-row suture-bridge arthroscopic rotator cuff repair alone, n = 52) and a study group (double-row suture-bridge repair followed by 3 Lp-PRP injections at the tendon repair site during surgery, at days 7 and 14 after surgery, n = 52). All patients were followed up for 27.2 months (range 24-36 months), with University of California at Los Angeles (UCLA) shoulder rating scale, the Constant score, and a visual analog scale (VAS) evaluated respectively. The integrity and fatty infiltration of repaired tissue were assessed by magnetic resonance imaging using the Sugaya classification and Goutallier grade classification at 24 months after surgery. Statistical analysis was performed based on the t test, $\chi 2$ test, and the Kendall tau-b correlation coefficient.

Results
Four patients refused follow-up, and 11 patients had incomplete data. Eventually, a total of 89 patients were available for 24 months follow-up. The mean UCLA score increased from 14.80 ± 2.53 to 29.37 ± 2.06 in control group and from 13.74 ± 3.30 to 30.14 ± 2.32 in study group (P = .103). The mean Constant score increased from 46.56 ± 5.90 to 86.83 ± 4.94 in control group and from 44.37 ± 7.92 to 88.80 ± 4.92 in study group (P = .063). The VAS score decreased from 3.22 ± 1.24 to 0.97 ± 1.12 in control group and in 3.49 ± 1.52 to 1.16 ± 0.99 in study group (P = .41). All differences in UCLA score, Constant score, and VAS between pre- and postoperation achieved minimal clinically important differences proposed for arthroscopic rotator cuff repair. Of the 89 patients, 76 had magnetic resonance imaging performed at 24 months after surgery. The retear rate was 17.6% in study group, which was lower than that in control group (38.1%, P = .049). In addition, the Goutallier grade was found to be significant difference between groups postoperatively (Kendall tau-b –0.24, P = .03) but no significant difference preoperatively (Kendall tau-b –0.18, P = .11). There were no complications in the patients.

Conclusions
Our procedures involving repeated injections of Lp-PRP during surgery and at days 7 and 14, as described in this study, have positive effects on reducing retear rate and promoting Goutallier grade in patients following arthroscopic rotator cuff repair and could also provide substantial clinical outcomes that reach the minimal clinically important difference for surgical treatment. However, given the numbers available for analysis, it did not promote better clinical results when compared with the control group.

Level of Evidence
II, randomized controlled study.

BACK

Learning Curve for Arthroscopic Shoulder Latarjet Procedure Shows Shorter Operating Time and Fewer Complications with Experience

B. Bøe, R. Ø. Støen, et al.

DOI: https://doi.org/10.1016/j.arthro.2022.01.042

Purpose

To evaluate the learning curve of the arthroscopic Latarjet procedure in a consecutive series of 103 shoulders in 102 patients by comparing the early clinical and radiologic outcomes and complications of the first 25 patients with the latter 25 patients. Our hypothesis was that the studied parameters would be enhanced over time.

Methods

A consecutive cohort of 103 shoulders in 102 patients treated with arthroscopic Latarjet procedure was prospectively registered from December 2014 until November 2019. Patients in this cohort represent the first cases of arthroscopic Latarjet for the 2 shoulder surgeons. All patients had a double screw fixation technique. The Western Ontario Shoulder Instability Index (WOSI) score preoperatively and at 1-year follow-up and 3-dimensional computed tomography scans preoperatively, postoperatively, and at 1-year follow-up were prospectively registered. Patient demographics, intraoperative data, complications, and reoperations were all recorded. In total, 85 of 103 shoulders (83%) had complete data sets. Patient demographics, WOSI scores, operating time, complications, satisfaction rate, and radiology scores in the first and last 25 patients were compared to evaluate learning curve.

Results

There was longer operating time in the early group compared with the latter (130 vs 105 minutes, P = .001) and number of complications was reduced with experience (16 vs 4, P = .0005). Serious complications requiring a reoperation were 4 (16%) in the early group compared to 1 (4%) in the latter group (P = .157). Clinical results were good with major improvement in WOSI scores and 84 % satisfaction rates in both groups.

Conclusions

Arthroscopic Latarjet was associated with a learning curve where the early group had longer operating time and greater rates of complications. This is a procedure with few serious complications, acceptable surgery time and learning curve.

Level of Evidence

Level III, retrospective comparative observation trial.

BACK

Retear After Arthroscopic Rotator Cuff Repair Results in Functional Outcome Deterioration Over Time

H.J. Jeong, K.P. Nam, et al.

DOI: https://doi.org/10.1016/j.arthro.2022.02.016

Purpose
This study aimed to evaluate the effect of retear on long-term functional outcomes and glenohumeral joint osteoarthritis (OA) progression after arthroscopic rotator cuff repair (ASRCR).

Methods
We retrospectively reviewed 201 patients who underwent ASRCR and were followed up for at least 5 years. Rotator cuff tendon structural integrity was evaluated using magnetic resonance imaging and/or ultrasonography. Pain, active range of motion, and the American Shoulder and Elbow Surgeons Standardized Shoulder Assessment Form (ASES) were evaluated for functional outcomes. To evaluate deterioration over time, the minimal clinically important difference value of pain and ASES were used.

Results
The mean follow-up period was 8.6 ± 2.2 years and overall retear rate was 21.4%. OA progression was strongly associated with retear (odds ratio 5.1, $P < .001$). Functional outcomes at the 2-year postoperative follow-up significantly improved compared to the preoperative status (all $P < .017$), regardless of retear. However, the retear group presented worse functional outcomes at the final follow-up (pain: 3.1 ± 2.6; ASES: 72.0 ± 17.4) than at the 2-year postoperative follow-up (pain: 1.2 ± 2.3, $P = .014$; ASES: 91.1 ± 9.9, $P= .015$) than the healed tendon group at final follow-up (pain: .6 ± 1.7; $P < .001$; ASES 95.5 ± 11.8; $P < .001$). The time for deterioration of pain (healed group vs. retear group: 5.5 ± 0.5 vs. 10.6 ± 0.4 years; $P < .001$) and ASES (healed group vs. retear group: 7.5 ± 0.5 vs. 12.8 ± 0.2 years; $P < .001$) decreased in the retear group.

Conclusions
The functional status improved after ASRCR in short- and long-term follow-up, regardless of retear. However, retear was strongly associated with OA progression, and long-term functional outcomes deteriorated over time in retear cases, which was not observed during short-term follow-up.

Study Design
III, retrospective cohort study.

BACK

Journal of Shoulder and elbow surgery, January 2021, volume 30, issue 8, pages 1687-1695.

Majority of patients find sleep patterns return to normal 6 months following rotator cuff repair

Dolan, M.T., Lowenstein N.A. et al.

DOI: https://doi.org/10.1016/j.jse.2022.01.122

Background and hypothesis

Rotator cuff tears have a wide variability in presentation, with some causing pain and reduced function but others remaining completely asymptomatic. Sleep disturbances are a primary driver for patients with rotator cuff tears to see a physician, and one of the main goals of rotator cuff repair (RCR) surgery is to restore normal sleep patterns in these patients. The primary purpose of this study aimed to determine the percentage of patients undergoing RCR who report preoperative sleep disturbances. Second, this study sought to identify at what postoperative follow-up intervals patients stopped reporting sleep disturbances and how the percentages change over time. It was hypothesized that the majority of patients undergoing arthroscopic RCR would report preoperative and initial postoperative sleep disturbances and that 75% of patients would report resolution of sleep disturbances by 1 year postoperatively.

Methods

A total of 326 patients undergoing primary arthroscopic RCR were prospectively enrolled in this study. Validated patient-reported outcome measures were obtained preoperatively and postoperatively, including the visual analog pain scale score, American Shoulder and Elbow Surgeons score, Single Assessment Numeric Evaluation score, Simple Shoulder Test (SST) score, and Veterans RAND 12-Item Health Survey physical and mental component scores.

Results

According to question 2 of the SST, 291 patients (89%) reported preoperative sleep disturbances. Within the cohort of patients who reported resolution of sleep disturbances, 46% reported resolution by 3 months postoperatively; an additional 31%, by 6 months; a further 14%, by 12 months; and the final 8%, by 24 months. Age ≥ 65 years was significantly associated with increased reporting of resolution compared with age < 65 years. All patient-reported outcome measures, including the visual analog pain scale score, American Shoulder and Elbow Surgeons score, Single Assessment Numeric Evaluation score, SST score, and Veterans RAND 12-Item Health Survey (physical component) score, showed statistically significant improvements after surgery.

Conclusions

Eighty-nine percent of patients reported preoperative sleep disturbances. Seventy-seven percent of patients reported resolution of sleep disturbances by 6 months postoperatively, and 81% of patients reported resolution of sleep disturbances by 2 years postoperatively.

Level of evidence

Level IV, Case Series, Treatment Study

BACK

Minimum 15-year follow-up for clinical outcomes of arthroscopic rotator cuff repair
Nicholson, A.D., Estrada, J.A. et al.

DOI: https://doi.org/10.1016/j.jse.2022.01.116

Background and hypothesis
Arthroscopic rotator cuff repair surgery is one of the most common shoulder procedures performed in the United States. Although several studies have shown considerable symptomatic relief in the short term following surgery, a relatively high rate of recurrent defects has led surgeons to question the long-term durability of this operation. We hypothesized that outcomes at a minimum of 15 years of follow-up in patients who underwent all-arthroscopic rotator cuff repair would be maintained and would remain significantly improved compared with the preoperative status.

Methods
All-arthroscopic rotator cuff repairs were performed in 193 patients from 2003 to 2005. Patient-reported outcomes were collected preoperatively and at 1, 2, 5, and ≥15 years postoperatively. The primary outcome was the American Shoulder and Elbow Surgeons (ASES) score. Secondary outcomes included Single Assessment Numeric Evaluation (SANE), Shoulder Activity Scale (SAS), visual analog scale, and Patient-Reported Outcomes Measurement Information System (PROMIS)–Upper Extremity (UE) scores. Patient demographic characteristics, revision surgical procedures, and complications were recorded. Generalized estimating equations were used to model scores over time, and multiple comparisons between time points were performed using Tukey adjustment.

Results
This study included 60 patients with a mean follow-up period of 16.5 years (range, 15.8-17.7 years). The mean ASES score improved from 60.2 ± 18.8 preoperatively to 93.0 ± 9.4 at ≥15 years ($P < .0001$). The mean visual analog scale pain score decreased from 4.1 ± 0.7 preoperatively to 0.7 ± 0.3 at ≥15 years ($P < .0001$). The average SANE, SAS, and PROMIS-UE scores at ≥15 years were 87.8 ± 14.8, 8.8 ± 4.3, and 49.6 ± 10.2, respectively. Of 60 patients, 7 underwent revision surgery. Older age and female sex were associated with lower SAS scores at 15 years, whereas female sex was associated with lower PROMIS-UE scores. There were no factors predictive of ASES or SANE scores.

Conclusion
At long-term follow-up (≥15 years), the patient-reported outcomes of all-arthroscopic rotator cuff repair show significant improvement from baseline preoperative function and remain durable over a period of 15 years. This information is useful in counseling patients regarding the long-term results of this procedure.

Level of evidence
Level IV, Case Series, Treatment Study

BACK

Evaluation of spin in systematic reviews and meta-analyses of superior capsular reconstruction

Kim, M.S., Hasan, L.K. et al.

DOI: https://doi.org/10.1016/j.jse.2022.03.015

Background

Small, preliminary studies and the systematic reviews on superior capsular reconstruction (SCR) that collate data are at increased risk spin. This study's primary objective was to identify, describe, and account for the incidence of spin in systematic reviews of SCR. This study's secondary objective was to characterize the studies in which spin was identified to determine whether identifiable patterns of characteristics exist among studies with spin.

Methods

This study was conducted per Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) guidelines using a predetermined protocol. A search was conducted on the PubMed and Embase databases for systematic reviews and meta-analyses on SCR. Screening and data extraction were conducted independently by 2 authors. Each included study's abstract was assessed for the presence of the 15 most common types of spin, with full texts reviewed during cases of disagreement or for clarification. General data that were extracted included study title, authors, publication year, journal, level of evidence, study design, funding source, reported adherence to PRISMA guidelines, preregistration of the study protocol, and primary and secondary outcome measures. Full texts were used in the assessment of study quality per AMSTAR 2.

Results

We identified 53 studies during our search, of which 17 met the inclusion criteria. At least 1 form of spin was observed in all 17 studies. The most common types of spin were type 5 ("The conclusion claims the beneficial effect of the experimental treatment despite a high risk of bias in primary studies") and type 9 ("Conclusion claims the beneficial effect of the experimental treatment despite reporting bias"), both of which were observed in 11 studies (11 of 17, 65%). A statistically significant association between lower level of evidence and type 5 ("The conclusion claims the beneficial effect of the experimental treatment despite a high risk of bias in primary studies") was observed (P = .0175). A statistically significant association was also found between more recent year of publication and the spin category misleading interpretation (P = .0398), and between lower AMSTAR 2 score and type 13 ("Failure to specify the direction of the effect when it favors the control intervention") (P = .0260). No other statistical associations between other study characteristics were observed.

Conclusion

Spin is highly prevalent in abstracts of SCR systematic reviews and meta-analyses. An association was found between the presence of spin and lower level of evidence, year of publication, and AMSTAR 2 ratings.

Level of evidence

Survey Study, Systematic Literature Review

BACK

Short- and long-term outcomes in Bankart repair vs. conservative treatment for first-time anterior shoulder dislocation: a systematic review and meta-analysis of randomized controlled trials

Allhatib, N., Abdullah, A.S.A. et al.

DOI: https://doi.org/10.1016/j.jse.2022.02.032

Background

First-time anterior shoulder dislocations are associated with a high rate of residual instability. Therefore, many surgeons support initial Bankart repair surgery over conservative management to address this issue. However, the optimal treatment remains controversial because of uncertainty regarding long-term surgical outcomes. The primary objective of this systematic review and meta-analysis was to compare the short- and long-term rates of residual instability following Bankart repair or conservative management after a first-time anterior shoulder dislocation.

Methods

PubMed/MEDLINE, Embase, The Cochrane Library, Web of Science, CINAHL, and ScienceDirect databases were accessed for randomized controlled trials (RCTs) comparing Bankart repair to conservative management. RoB (Risk of Bias) 2 was used to check study quality. The Grading of Recommendations, Assessment, Development and Evaluation (GRADE) guidelines were followed in assessing primary outcomes. The inverse-variance method for continuous variables and the Mantel-Haenszel method for dichotomous variables was used.

Results

A total of 348 patients from 6 RCTs published across 8 articles, with a mean age of 23.7 years, were included. Bias was graded low in 3 studies, some concerns in 3 studies, and high in 2 studies. In the short term (2-3 years), surgery lowered recurrent instability (risk ratio [RR] 0.15, 95% confidence interval [CI] 0.08, 0.27; I2 = 0%; P < .0001). Similar findings were seen in the long term (5-12 years) (RR 0.23, 95% CI 0.14, 0.39; I2 = 0%; P < .0001). No difference was observed in return to sport (RR 1.18, 95% CI 0.91, 1.52; I2 = 78%; P = .21). Initial surgery lowered subsequent stabilization surgery in the short (RR 0.19, 95% CI 0.09, 0.43; I2 = 0%; P < .0001) and long term (RR 0.17, 95% CI 0.07, 0.39; I2 = 25%; P < .0001). Western Ontario Shoulder Instability Index (WOSI) scores did not differ in the short term (MD, 2.54, 95% CI –0.51, 5.59; I2 = 48%; P = .1) but were higher in the surgical group at long-term follow-up. Patient satisfaction was also higher with surgery (RR 1.75, 95% CI 1.4, 2.2; I2 = 88%; P < .0001). Certainty of evidence was low for only 1 long-term outcome measure.

Conclusion

Bankart repair surgery for first-time anterior shoulder dislocation results in a large reduction in the risk of recurrent shoulder instability and subsequent stabilization surgery in both short- (2-3 years) and long-term (5-12 years) follow-up intervals. Additionally, slight improvements in overall patient satisfaction and WOSI score can be seen at long-term follow-up. However, surgical intervention failed to significantly improve the rate of return to sport when compared with conservative management.

Level of evidence

Level II, Meta-Analysis

BACK

American Journal of Sports Medicine (AJSM), Volume 50, Issue 10

Long-term Results of Arthroscopic Repair of Full-Thickness Traumatic Rotator Cuff Tears in Active Duty Military Patients Under the Age of 40 Years

John P. Scanaliato, MD*, Michael D. Eckhoff, MD, John C. Dunn, MD, Hunter Czajkowski, Walter A. Fink, DO, Nata Parnes, MD

First Published July 21, 2022; pp. 2753–2760

https://doi.org/10.1177/03635465221107371

Background: Arthroscopic rotator cuff repair is an effective procedure through which to decrease pain and increase strength, with favorable long-term outcomes demonstrated in older patient populations with full-thickness rotator cuff tears. The long-term outcomes after this procedure in younger, higher-demand patients, however, is not as clearly defined.

Purpose: To report on the long-term outcomes after arthroscopic rotator cuff repair of traumatic full-thickness rotator cuff tears in active duty military patients under the age of 40 years at the time of surgery.

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

Methods: Preoperative, midterm, and final evaluations were collected, including scores on the visual analog scale for pain, Single Assessment Numeric Evaluation, and American Shoulder and Elbow Surgeons shoulder form. A total of 42 patients were screened for inclusion: 3 underwent additional surgical procedures on the operative shoulder and 2 were lost to follow-up, leaving 37 patients with mean follow-up of 104.51 months available for analysis. A subgroup analysis was performed comparing outcomes between patients with Southern California Orthopaedic Institute grade 1 or 2 tears and those with grade 3 or 4 tears.

Results: At final follow-up, pain per the visual analog scale decreased to 1.16 from 8.03 ($P < .0001$); the Single Assessment Numeric Evaluation score increased to 87.32 from 48.24 ($P < .0001$); and the American Shoulder and Elbow Surgeons score increased to 88.68 from 41.00 ($P < .0001$). There was no statistically significant difference in outcome scores or range of motion between midterm and final follow-up. Improvement in outcome scores and range of motion at final follow-up did not vary between patients with small and large tears. Of 42 patients, 37 (88.1%) were able to return to full unrestricted active duty and sporting activity, while 5 (11.9%) were medically separated from the military.

Conclusion: Active duty military patients under the age of 40 years with traumatic full-thickness rotator cuff tears had statistically and clinically significant increases in outcome scores and decreases in pain after arthroscopic rotator cuff repair at long-term follow-up.

BACK

Bone and Joint Journal (BJJ), Volume 104, issue 8

Arthroscopic bone graft and fixation for proximal scaphoid nonunions

Feiran Wu, Yuhao Zhang, Bo Liu

Published Online:31 Jul 2022 https://doi.org/10.1302/0301-620X.104B8.BJJ-2022-0198.R1

Aims
This study aims to report the outcomes in the treatment of unstable proximal third scaphoid nonunions with arthroscopic curettage, non-vascularized bone grafting, and percutaneous fixation.

Methods
This was a retrospective analysis of 20 patients. All cases were delayed presentations (n = 15) or failed nonoperatively managed scaphoid fractures (n = 5). Surgery was performed at a mean duration of 27 months (7 to 120) following injury with arthroscopic debridement and arthroscopic iliac crest autograft. Fracture fixation was performed percutaneously with Kirschner (K)-wires in 12 wrists, a headless screw in six, and a combination of a headless screw and single K-wire in two. Clinical outcomes were assessed using grip strength, patient-reported outcome measures, and wrist range of motion (ROM) measurements.

Results
Intraoperatively, established avascular necrosis of the proximal fragment was identified in ten scaphoids. All fractures united within 16 weeks, confirmed by CT. At a mean follow-up of 31 months (12 to 64), there were significant improvements in the Patient-Rated Wrist Evaluation, Mayo Wrist Score, abbreviated Disabilities of the Arm, Shoulder and Hand score, wrist ROM, grip strength, and the patients' subjective pain score. No peri- or postoperative complications were encountered.

Conclusion
Our data indicate that arthroscopic bone grafting and fixation with cancellous autograft is a viable method in the treatment of proximal third scaphoid nonunions, regardless of the vascularity of the proximal fragment.

Cite this article: Bone Joint J 2022;104-B(8):946–952.

BACK

Lower Extremity

Journal of Arthroscopy, Volume 38, Issue 8, pages 2361-2588

The Presence of Central Acetabular Osteophytes May Negatively Affect the Outcome After Primary Arthroscopic Therapy of Femoroacetabular Impingement Syndrome

F. Yang, H. Huang

DOI: https://doi.org/10.1016/j.arthro.2022.01.047

Purpose
To compare short-term follow-up outcomes after primary arthroscopy in femoroacetabular impingement syndrome (FAIS) patients with untreated central acetabular osteophytes (CAO) to a control group without CAO.

Methods
A retrospective analysis was performed using data from FAIS patients who had primary arthroscopy between 2017 and 2018. The presence of CAO was confirmed arthroscopically, and there were 2 groups created. The CAO group was 1:1 propensity-score matched to a control group (without CAO) based on age, gender, body mass index (BMI), Tönnis grade, symptom duration before surgery, and follow-up time. Patient-reported outcomes (PROs), such as the Hip Outcome Score-Activities of Daily Living (HOS-ADL), International Hip Outcome Tool 12-component form (iHOT-12), modified Harris Hip Score (mHHS), and visual analog scale (VAS) scores were used to evaluate the level of function included. The minimal clinically important difference (MCID) and patient acceptable symptomatic state (PASS) were also calculated to determine meaningful outcome improvement. Radiographic measures, performed procedures, complications, and revision surgery were also compared and analyzed for both groups. P values less than .05 were considered statistically significant.

Results
A total of 46 hips with CAO and 46 hips without CAO were propensity matched. At the minimum final follow-up of 2 years, the CAO group had significantly lower HOS-ADL (78.8 vs 85.5; P = .008), iHOT-12 (74.8 vs 79.3; P = .019), and mHHS (78.9 vs 87.2; P = .002) scores, as compared to the CAO group. Furthermore, patients in the CAO group were significantly less likely to achieve the MCID and PASS for the mHHS score (78.3% vs 93.5%; P = .036, 58.7% vs 78.2%; P = .043, respectively). There was no change in the rate of complications (4.3% vs 0%) and revision hip arthroscopy (4.3% vs 2.2%) between the two groups at the final follow-up.

Conclusions
This study demonstrated that surgically treated FAIS patients with CAO might experience worse short-term, patient-reported outcomes, as compared with propensity-matched patients without CAO.

Level of Evidence
III, case-control study.

BACK

Joint Hypermobility Is Associated With Increased Risk of Postoperative Iliopsoas Tendinitis After Hip Arthroscopy for Femoroacetabular Impingement

E.S. Mojica, N.D. Rynecki, et al.

DOI: https://doi.org/10.1016/j.arthro.2022.02.015

Purpose

To determine whether increased joint hypermobility, quantified by the Beighton score, is associated with a greater incidence of iliopsoas tendinitis (IPT) in postoperative hip arthroscopy patients treated for femoroacetabular impingement (FAI).

Methods

We conducted a retrospective chart review of patients who underwent hip arthroscopy for labral repair and FAI from 2016 to 2020 for whom at least 12 months of follow-up data were available. The Beighton score was measured by a blinded, independent reviewer. IPT was clinically diagnosed by a sports medicine fellowship–trained orthopaedic surgeon through physical examination. Patients with a diagnosis of IPT were matched at a 1:1 ratio to controls based on age, sex, and body mass index. Demographic characteristics, radiographs and advanced imaging, surgical characteristics, and corticosteroid injection therapy data were obtained via chart review. Statistical analysis was conducted using Mann-Whitney testing and binary logistic regression.

Results

Forty patients in whom postoperative IPT developed were identified and matched to 40 control patients in whom postoperative tendinitis did not develop. Increased joint hypermobility, quantified by the Beighton score, was associated with an increased risk of IPT. For each 1-point increase in the Beighton score, there was a 1.69 (95% confidence interval, 1.25-2.29; $P < .001$) increased odds of IPT development postoperatively. A high (≥4) versus low (<4) Beighton score was associated with an increased likelihood of tendinitis (odds ratio, 9.82; 95% confidence interval, 2.79-34.58; $P < .001$). However, there was no association between greater Beighton scores and patients' likelihood of receiving a corticosteroid injection ($P = .173$).

Conclusions

Increased joint hypermobility, quantified by the Beighton score, is associated with an increased risk of IPT developing in the hip arthroscopy postoperative period in patients treated for FAI and labral pathology.

Level of Evidence

Level III, retrospective cohort study.

BACK

After Revision Hip Arthroscopy, Patients Having Either Circumferential or Segmental Labral Reconstructions for the Management of Irreparable Labra Show Clinical Improvement Based on Proper Indications

D.R. Maldonado, V. Ouyang, et al.

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Purpose
To compare a minimum of two-year follow-up patient-reported outcome scores (PROs) in patients who underwent revision hip arthroscopy for acetabular circumferential labral reconstruction (CLR) and segmental labral reconstruction (SLR) using propensity-matched groups, in the setting of irreparable labral tear.

Methods
Prospectively collected data were retrospectively reviewed for patients who underwent revision hip arthroscopy from April 2010 to September 2018. Patients were included if they underwent labral reconstruction and had preoperative and minimum 2-year PROs. Patients unwilling to participate, with Tönnis grade >1, or hip dysplasia were excluded. Patients in the CLR group were propensity-matched on the basis of age, sex, body mass index, and Tönnis grade to patients in the SLR group in a 1:1 ratio. The minimal clinically important difference (MCID) and the patient-acceptable symptomatic state (PASS) rates were calculated.

Results
Twenty-six hips (25 patients) with CLR were propensity-matched to 26 hips (26 patients) with SRL. The mean follow-up time 25.92 and 27.78 months for the CLR and SLR, respectively (P = .845). Groups reported comparable findings for sex (P = .773), age (P = .197), body mass index (P = .124), preoperative Tönnis grade (P = .124), lateral-center edge angle (P = .144), and alpha angle (P = .264), and comparable improvement for all PROs at minimum 2-year follow-up. Patient satisfaction was similar (P = .612). Rates of achievement for the MCID and PASS were comparable.

Conclusion
Following revision hip arthroscopy, patients who underwent CLR or SLR for complete and segmental irreparable labral tears, respectively, reported significant and comparable postoperative improvement for all PROs and rate of achievement for the MCID and PASS at a minimum 2-year follow-up.

Level of Evidence
III, retrospective comparative therapeutic trial.

BACK

Patients Follow 3 Different Rate-of-Recovery Patterns After Anterior Cruciate Ligament Reconstruction Based on International Knee Documentation Committee Score

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Purpose
To determine whether subgroups of patients exist based on the rate-of-recovery pattern of International Knee Documentation Committee (IKDC) scores after anterior cruciate ligament reconstruction (ACLR) and to determine clinical predictors for these subgroups.

Methods
Patients who underwent primary or revision ACLR at a single institution from January 2014 to January 2019 were identified. Latent class growth analyses and growth mixture models (GMMs) with 1 to 6 classes were used to identify subgroups of patients based on functional rate-of-recovery patterns by use of preoperative, 1-year postoperative, and 2-year postoperative IKDC scores.

Results
A total of 245 patients who underwent ACLR were included in the analysis. A 3-class GMM was chosen as the final model after 6 different models were run. Class 1, showing improvement from preoperatively to 1-year follow-up, with sustained improvement from 1 to 2 years postoperatively, constituted 77.1% of the study population (n = 189), whereas class 2, showing functional improvement between 1- and 2-year follow-up, was the smallest class, constituting 10.2% of the study population (n = 25), and class 3, showing slight improvement at 1-year follow-up, with a subsequent decline in IKDC scores between 1- and 2-year follow-up, constituted 12.7% of the study population (n = 31). Revision surgery (P = .005), a psychiatric history (P = .025), preoperative chronic knee pain (P = .024), and a subsequent knee injury within the follow-up period (P = .011) were the predictors of class 2 and class 3 rate-of-recovery patterns. Patient demographic characteristics, graft type, and concomitant ligament, meniscus, or cartilage injury at the time of surgery were not associated with the different recovery patterns described in this study.

Conclusions
Patients may follow different rate-of-recovery patterns after ACLR. By use of the GMMs, 3 different rate-of-recovery patterns based on IKDC scores were identified. Although most patients follow a more ideal rate-of-recovery pattern, fewer patients may follow less favorable patterns. Revision surgery, a history of psychiatric illness, preoperative chronic knee pain, and a subsequent knee injury within the follow-up period were predictive of less favorable rate-of-recovery patterns.

Level of Evidence
Level III, retrospective cohort study.

BACK

Physical Therapy Combined With Subacromial Cortisone Injection Is a First-Line Treatment Whereas Acromioplasty With Physical Therapy Is Best if Nonoperative Interventions Fail for the Management of Subacromial Impingement: A Systematic Review and Network Meta-Analysis

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Purpose
To construct an algorithm to optimize clinical outcomes in subacromial impingement based on current, high-level evidence.

Methods
A systematic review of all clinical trials on subacromial impingement published from 1999 to 2020 was performed. Demographic, clinical, range of motion (ROM), and patient-reported outcome measure (PROM) data were collected. Interventions were compared via arm-based Bayesian network meta-analysis in a random-effects model and treatments ranked via surface under the cumulative ranking curves with respect to 3 domains: pain, PROMs, and ROM.

Results
A total of 35 studies comprising 3,643 shoulders (42% female, age 50 ± 5 years) were included. Arthroscopic decompression with acromioplasty ranked much greater than arthroscopic decompression alone for pain relief and PROM improvement, but the difference in absolute PROMs was not statistically significant. Corticosteroid injection (CSI) alone demonstrated inferior outcomes across all 3 domains (pain, PROMs, and ROM) with low cumulative rankings. Physical therapy (PT) with CSI demonstrated moderate-to-excellent clinical improvement across all 3 domains whereas PT alone demonstrated excellent ROM and low-moderate outcomes in pain and PROM domains. PT with nonsteroidal anti-inflammatory drugs or alternative therapies ranked highly for PROM outcomes and moderate for pain and ROM domains. Finally, platelet-rich plasma injections demonstrated moderate outcomes for pain, forward flexion, and abduction with very low-ranking outcomes for PROMs and external rotation.

Conclusions
Arthroscopic decompression with acromioplasty and PT demonstrated superior outcomes whereas CSI demonstrated poor outcomes in all 3 domains (pain, PROMs, and ROM). For patients with significant symptoms, the authors recommend PT with CSI as a first-line treatment, followed by acromioplasty and PT if conservative treatment fails. For patients with symptoms limited to 1 to 2 domains, the authors recommend a shared decision-making approach focusing on treatment rankings within domains pertinent to individual patient symptomatology.

Level of Evidence
I, systematic review and network meta-analysis of Level I studies.

BACK

Arthroscopic Subspine Decompression Is Commonly Reported in a Heterogenous Patient Population With Concomitant Procedures: A Systematic Review

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Purpose
To systematically review the evaluation, management, and surgical outcomes of arthroscopic subspine decompression in conjunction with other intra-articular hip preservation procedures.

Methods
Two databases (PubMed and Embase) were searched from 2010 to 2021, in accordance with Preferred Reporting Items for Systematic Reviews and Meta-Analyses guidelines, for articles investigating arthroscopic subspine decompression using the key words: “subspine impingement”, “AIIS impingement”, and “extra-articular impingement.” Exclusion criteria included diagnostic studies, failure to report postoperative outcomes, and case series of less than 10 hips. Studies were assessed for patient demographics, diagnostic criteria, clinical findings, concomitant procedures, outcomes, and postoperative complications. The quality of the studies was analyzed by 2 independent reviewers (A.J.C. and A.E.J.) using the Methodological Index for Non-randomized Studies (MINORS).

Results
Ten studies consisting of 438 patients (460 hips, 48.6% female) met the inclusion criteria, with average ages and follow-up ranging from 24.9 to 34.7 years and 6.0 to 44.4 months, respectively. There was 1 Level II study, 3 Level III studies, and 6 Level IV studies. The MINORS criteria yielded an average quality assessment of 13.0 (range: 7-22), with 3 methodological domains demonstrating mean scores of less than 1: unbiased assessment of the study endpoint (.25), loss of follow up less than 5% (.25), and prospective calculation of the study size (.7). The most common exam maneuver used was the subspine impingement test (9 studies). Most subspine decompressions were performed in addition to traditional femoroacetabular impingement syndrome (FAIS) procedures, with only one study (33 hips) reporting solely on isolated subspine osteoplasty. Average preoperative and postoperative modified Harris Hip Score (mHHS) values ranged from 44.93 to 75.7 and 79.5 to 98.0, respectively. Three studies noted improved hip flexion in the postoperative period. Five surgical complications were reported.

Conclusions
Arthroscopic subspine decompression is commonly reported in a heterogenous patient population with intra-articular hip pathology. A combination of the subspine impingement test and anterior inferior iliac spine (AIIS) morphology on imaging is frequently used for diagnosis. While improved patient-reported outcomes (PROs) are consistently observed following arthroscopic decompression, conclusions are limited by study methodology and concurrent procedures performed at the time of surgery.

Level of Evidence
IV, systematic review of Level II through Level IV studies.

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Hip Arthroscopy for the Treatment of Femoroacetabular Impingement Syndrome in Hips With Mild Osteoarthritis (Tönnis Grade 1): A Matched Comparative Cohort Analysis at Minimum 5-Year Follow-up

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BACK

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Background: There is a paucity of information in the literature on midterm outcomes from the arthroscopic treatment of femoroacetabular impingement syndrome (FAIS) with concomitant labral treatment in patients with mild osteoarthritis (OA) using modern surgical techniques.

Purpose: To compare outcomes of hip arthroscopy for the treatment of FAIS between patients with mild OA (Tönnis grade 1) and patients without OA (Tönnis grade 0) at minimum 5-year follow-up.

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

Methods: Patients were identified who underwent primary hip arthroscopy for FAIS with routine capsular closure between January 2012 and December 2015. Patients with Tönnis grade 1 were matched 1:3 by age, sex, and body mass index to patients without OA. The Hip Outcome Score–Activities of Daily Living (HOS-ADL), HOS–Sports Subscale (HOS-SS), modified Harris Hip Score, and 12-item International Hip Outcome Tool were collected preoperatively and at 5 years postoperatively and compared between groups using an independent t test. Survivorship rate and percentage achievement of a Patient Acceptable Symptom State (PASS) or minimal clinically important difference (MCID) were compared using a Fisher exact test.

Results: A total of 50 patients (54 hips) with Tönnis grade 1 were matched to 162 patients (162 hips) with Tönnis grade 0. The mean ± SD age and body mass index of the Tönnis grade 1 group were 44.5 ± 9.6 years and 28.5 ± 5.5, respectively. Patient-reported outcome (PRO) scores improved significantly for both groups from presurgery to 5 years postoperatively for all PROs ($P \leq .03$). There were no significant differences in preoperative PROs between the groups. Patients with Tönnis grade 1 had significantly lower postoperative scores on the HOS-ADL (74.7 ± 22.6 vs 83.0 ± 20.1; $P = .04$) and HOS-SS (58.8 ± 33.7 vs 71.8 ± 29.3; $P = .03$) than patients with grade 0. Patients with Tönnis grade 1 also had significantly lower rates of achievement of the MCID (57.1% vs 80.2%; $P < .01$) and PASS (34.1% vs 53.4%; $P = .03$) for any PRO when compared with patients with Tönnis grade 0. Gross survivorship was significantly lower for Tönnis grade 1 versus grade 0 (77.8% vs 96.9%; $P < .001$).

Conclusion: Patients with Tönnis grade 1 arthritis experienced significant improvement in PROs after hip arthroscopy for the treatment of FAIS. However, they had significantly lower postoperative HOS-ADL and HOS-SS scores with significantly lower rates of achievement on the MCID and PASS, with a significantly lower gross survivorship rate at a minimum 5 years postoperatively in comparison with those with Tönnis grade 0 changes.

BACK

Effect of Sacroiliac Joint Pain on Outcomes in Patients Undergoing Hip Arthroscopy for the Treatment of Femoroacetabular Impingement Syndrome: A Matched Comparative Cohort Analysis at Minimum 2-Year Follow-up

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Background: Patients with femoroacetabular impingement syndrome (FAIS) may frequently have co-existing sacroiliac joint (SIJ) pain. It is known that patients with lower back pain undergoing total hip arthroplasty (THA) have inferior outcomes; however, it is unclear what the effect of SIJ pain is on outcomes after hip arthroscopy.

Purpose: To determine whether patients undergoing hip arthroscopy with SIJ pain either subjectively or on physical examination achieve similar postoperative improvement in patient-reported outcomes (PROs) compared with patients without SIJ pain at 2-year follow-up.

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

Methods: Patients with a minimum 2-year follow-up who underwent primary hip arthroscopy for FAIS with SIJ pain were matched in a 1:2 ratio to controls without SIJ pain. Baseline demographics, as well as postoperative PROs and rates of achievement of the minimal clinically important difference (MCID) or Patient Acceptable Symptom State (PASS) at 2-year follow-up were compared between the 2 groups.

Results: A total of 73 patients (75 hips) with SIJ pain were matched to 150 control patients (150 hips) without SIJ pain. Both groups demonstrated statistically significant improvement in all PROs at 2 years ($P < .05$ for all). Patients with SIJ pain had significantly lower postoperative PRO scores for the Hip Outcome Score–Activities of Daily Living (HOS-ADL) (SIJ pain: 80.4 ± 22.4 vs no SIJ pain: 88.0 ± 15.1; $P = .006$), modified Harris Hip Score (mHHS) (SIJ pain: 73.2 ± 22.8 vs no SIJ pain: 80.0 ± 17.3; $P < .001$), and International Hip Outcome Tool–12 questionnaire (iHOT-12) (SIJ pain: 61.7 ± 25.9 vs no SIJ pain: 73.7 ± 23.7; $P = .008$). There were no statistically significant differences in improvement (delta) in PRO scores between the 2 groups ($P > .05$ for all). The SIJ pain group had significantly lower achievement of MCID for the HOS-ADL (SIJ pain: 65.2% vs no SIJ pain: 80.5%; $P = .044$) but not HOS-SS, mHHS, or iHOT-12 ($P > .05$ for all). The SIJ pain group had significantly lower achievement of PASS for the mHHS (SIJ pain: 27.5% vs no SIJ pain: 45.3%; $P = .030$) and iHOT-12 (SIJ pain: 31.0% vs no SIJ pain: 56.0%; $P = .010$) but not the HOS-ADL and HOS-SS ($P > .05$ for both). Only 4.1% of patients with SIJ pain and 2.4% of controls required revision surgery or converted to THA at the time of final follow-up ($P = .69$).

Conclusion: Patients with FAIS and SIJ pain on history or physical examination experience significant improvement in PROs at 2 years after hip arthroscopy. However, they may be less likely to achieve the MCID or PASS and have significantly lower postoperative PROs compared with a matched cohort of patients without SIJ pain. Overall rates of revision and conversion to THA were similarly low in both groups.

BACK

5-Year Arthroscopy-Free Survivorship and Outcomes of Adolescents Undergoing Primary Hip Arthroscopy: A Comparison Between Traumatic and Atraumatic Injuries

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Background: There is a paucity of literature evaluating the outcomes of adolescent patients undergoing hip arthroscopy for femoroacetabular impingement syndrome (FAIS) with a discrete traumatic event related to an injury.

Purpose: (1) To evaluate 5-year outcomes of adolescents undergoing hip arthroscopy for FAIS with traumatic injuries (TIs) and (2) to compare the traumatic group with a propensity-matched control group of patients with atraumatic injuries.

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

Methods: Data were reviewed for all adolescent patients (<18 years) undergoing primary hip arthroscopy for FAIS with a TI between November 2008 and March 2015. Patients were included if they had preoperative and minimum 5-year follow-up outcomes for the modified Harris Hip Score (mHHS), Nonarthritic Hip Score, Hip Outcome Score–Sport Specific Subscale, and visual analog scale for pain. The Patient Acceptable Symptom State (PASS), minimum clinically important difference (MCID), and maximum outcome improvement satisfaction threshold (MOIT) were also calculated for both groups. Adolescents with TI were propensity matched in a 1:2 ratio according to age at surgery, sex, and body mass index (BMI) to a control group of adolescents who reported atraumatic hip symptoms (AHSs). Survivorship was defined as having no secondary surgery on the ipsilateral hip.

Results: A total of 31 patients (32 hips) with TI, out of 39 total patients (40 hips) (80%), were included with a mean follow-up time of 72.2 ± 24.1 months and age of 15.8 ± 1.3 years. The TI group demonstrated significant improvement in all patient-reported outcomes (PROs) ($P < .001$) and demonstrated high rates of MCID (78.3%) and PASS (91.3%) for the mHHS. When compared with a propensity-matched control group of 64 AHS hips (57 patients), the TI group demonstrated similar rates of improvement in all PROs, as well as rates of achieving the MCID, PASS, and MOIT for all PROs; however, the TI group demonstrated significantly higher revision rates compared with controls (28.1% vs 6.3%; $P = .008$).

Conclusion: Adolescent patients with TIs undergoing hip arthroscopy demonstrated favorable outcomes for all PROs ($P < .001$) and achieved high rates of MCID (78.3%) and PASS (91.3%) for the mHHS. When compared with a propensity-matched control group of adolescents with atraumatic injuries undergoing hip arthroscopy, they achieved similar levels of improvement, postoperative scores, and clinical benefit thresholds; however, reoperation rates were higher in the TI group compared with controls.

BACK

Primary Arthroscopic Labral Management: Labral Repair and Complete Labral Reconstruction Both Offer Durable, Promising Results at Minimum 5-Year Follow-up

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Background: Increased understanding of the acetabular labrum's role in hip joint biomechanics has led to a greater focus on the conservation and restoration of normal labral anatomic characteristics; however, labral repair is often not possible in the setting of severe intrasubstance damage or deficiency.

Purpose: To compare 5-year postoperative patient-reported outcomes between hips treated with primary complete arthroscopic labral reconstruction and those treated with primary labral repair.

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

Methods: All hips that underwent primary labral repair or reconstruction by the senior surgeon between January 2015 and December 2015 were included. Hips that had undergone a previous intra-articular procedure were excluded. Visual analog scales and patient-reported outcome (PRO) instruments were completed by patients within 1 week before surgery as a baseline measurement, between 22 and 26 months postoperatively for 2-year outcomes, and between 58 and 62 months for 5-year outcomes. PRO scores collected included the modified Harris Hip Score (mHHS), the 12-Item International Hip Outcome Tool, and the visual analog scale for pain and satisfaction. Pain and satisfaction were assessed using visual analog scales.

Results: A total of 68 primary labral repairs and 62 primary complete labral reconstructions were included in the final analysis. Patients in the reconstruction cohort were older (38.3 vs 29.9 years; $P < .001$), had a higher incidence of severe labral tearing (62.90% vs 5.88%; $P < .001$), required a greater number of concomitant procedures ($P < .001$), and were more likely to have Beck grade III or IV chondral damage (12.94% vs 1.47%; $P < .001$). Both groups demonstrated statistically significant increases in outcome scores at minimum 5-year follow-up. Patients who underwent labral reconstruction had a significantly greater increase in mHHS from the preoperative assessment to latest follow-up compared with patients undergoing labral repair (27.43 vs 17.13; $P = .04$). No statistically significant differences between the 2 cohorts were found in achievement of minimal clinically important difference, Patient Acceptable Symptom State, maximum outcome improvement, and substantial clinical benefit at latest follow-up ($P > .05$). In total, 2 patients in the repair cohort and 3 patients in the reconstruction cohort required revision arthroscopy ($P = .574$). Further, 1 patient from each group converted to arthroplasty ($P = .947$).

Conclusion: The results of this study suggest that primary complete labral reconstruction is a viable surgical option for hips with moderate to severe labral pathology. At minimum 5-year follow-up, labral reconstruction produced similar outcomes to labral repair despite less favorable preoperative patient characteristics in the reconstruction cohort.

BACK

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Arthroscopic bone graft and fixation for proximal scaphoid nonunions

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Aims
This study aims to report the outcomes in the treatment of unstable proximal third scaphoid nonunions with arthroscopic curettage, non-vascularized bone grafting, and percutaneous fixation.

Methods
This was a retrospective analysis of 20 patients. All cases were delayed presentations (n = 15) or failed nonoperatively managed scaphoid fractures (n = 5). Surgery was performed at a mean duration of 27 months (7 to 120) following injury with arthroscopic debridement and arthroscopic iliac crest autograft. Fracture fixation was performed percutaneously with Kirschner (K)-wires in 12 wrists, a headless screw in six, and a combination of a headless screw and single K-wire in two. Clinical outcomes were assessed using grip strength, patient-reported outcome measures, and wrist range of motion (ROM) measurements.

Results
Intraoperatively, established avascular necrosis of the proximal fragment was identified in ten scaphoids. All fractures united within 16 weeks, confirmed by CT. At a mean follow-up of 31 months (12 to 64), there were significant improvements in the Patient-Rated Wrist Evaluation, Mayo Wrist Score, abbreviated Disabilities of the Arm, Shoulder and Hand score, wrist ROM, grip strength, and the patients' subjective pain score. No peri- or postoperative complications were encountered.

Conclusion
Our data indicate that arthroscopic bone grafting and fixation with cancellous autograft is a viable method in the treatment of proximal third scaphoid nonunions, regardless of the vascularity of the proximal fragment.

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BACK