techniques have been developed and compared with different clinical outcomes. Our purpose was to conduct a meta-analysis of recently published studies to compare the clinical results of a double-row technique with the results of a single-row technique for different tear sizes.
Materials & Methods: A search was performed in the Medline, Embase and OVID databases. All randomized, quasi-randomized clinical trials that reported the outcome of single-row repair and double-row repair techniques were included in our meta-analysis. Two subgroups were set according to the tear size. The outcomes were the Constant Score, ASES (American Shoulder and Elbow Surgeons) Score, UCLA (University of California, Los Angeles) Score, re-tear rate, range of motion and muscle strength.
Results: We included 9 studies in this meta-analysis, five of which were randomized prospective. There was a statistically significant difference in favor of double-row repair for the overall ASES score, re-tear rate and internal rotation range of motion. In subgroup 2 (tear size >30 mm), double-row techniques produce better outcomes than do single-row. There were no statistically significant differences in the overall Constant score, UCLA score, external rotation, and forward elevation range of motion or muscle strength.
Discussion: Double-row rotator cuff repairs, using a "transosseous-equivalent technique," have been designed to achieve an initial fixation strength that is comparable to that of open or mini-open transosseous repair. Several biomechanical studies comparing single-row and double-row repair show an increased load to failure, improved contact at the tendon-bone interface, and decreased gap formation.
Conclusion: Double-row rotator cuff repair techniques have a significantly lower re-tear rate, higher ASES score and greater ROM of internal rotation than do single-row. Especially in those rotator cuff tears with a size of greater than 30 mm, the double-row technique is recommended for repair.
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B0045
ACL Reconstruction using bone-patella tendon-bone autograft: Press-fit technique vs. Interference screw fixation

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Purpose: The gold standard in ACL reconstructions has been the bone-patellar tendon-bone autograft fixed with interference screws. This prospective, randomized clinical trial aimed to compare two methods of fixation for BPTB grafts: press-fit fixation vs. interference screw, over a 12-month follow-up interval.
Methods: 158 patients with an average age of 29.8 years, between 2011 and 2012, were treated for torn ACL. 82 patients underwent reconstruction with BPTB autograft with a press fit fixation technique, and in 76 cases an interference screw was used. At the time of final follow-up, 71 patients in press-fit group and 65 patients in interference screw group were evaluated in terms of return to pre-injury activity level, pain, knee stability, range of motion, IKDC score and complications.
Results: At 12-month follow-up, 59 (83 %) and 55 (85 %) in press-fit and screw group, respectively had good-to-excellent IKDC score ($p > 0.05$). The mean laxity assessed using a KT-1000 arthrometer improved to 2.7 and 2.5 mm in press-fit and screw group, respectively. Regarding Lachman and pivot shift test, there was a statistically significant improvement in the integrity of the ACL in both the groups, but no significant differences was noted between groups. There were no significant differences in terms of femur circumference difference, effusion, knee range of motion, pain and complications.
Conclusions: The press-fit technique is an efficient procedure. Its outcome was comparable with the interference screw group. Furthermore it has unlimited bone-to-bone healing, no need for removal of hardware, ease for revision and cost effectiveness.
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B0056
Symptomatic knot impingement after arthroscopic rotator cuff repair: Which knot is critical?

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Background: We investigated knot placement on the rotator cuff tendon and the affected site on the acromion during symptomatic knot impingement after arthroscopic rotator cuff repair.
Materials and Methods: The study population comprised 632 shoulders that underwent arthroscopic rotator cuff repair (single-row, double-row, compression double-row, and knotless suture bridge) with acromioplasty from 2007 through 2014. In all patients, physical examination included measurement of shoulder range-of-motion and muscle strength, and subacromial impingement tests (Neer and Hawkins tests) were performed during the follow-up period. When shoulder pain with a positive subacromial impingement test did not disappear by 6 months after surgery, MRI and 3DCT were used to diagnose knot impingement.
Results: Two of the 632 patients (0.3%) had symptomatic knot impingement. Both patients had undergone single-row repair (one anchor and two knots) during a first surgery for a small bursal-side partial-thickness tear. Both had subacromial impingement pain (positive only in a Neer test), and bony erosion at the anterolateral corner of the acromial undersurface according to 3DCT and subacromial effusion as revealed by MRI. Arthroscopic removal of the knots relieved shoulder pain in both patients. In both patients, all knots had been placed at the muscle–tendon junction of the supraspinatus tendon and had caused the defect on the undersurface of the acromion.
Discussion: Knots at the muscle–tendon junction of the supraspinatus tendon led to subacromial impingement after single-row rotator cuff repair with a suture anchor, suggesting that knot placement at this site should be avoided whenever possible. Knots in the supraspinatus tendon caused bone erosion at the anterolateral corner of the acromion. This result suggests that subacromial impingement due to pathology of the supraspinatus tendon (such as tear or calcification) occurs at this location on the acromion. Therefore, when surgery is used to treat this defect, acromioplasty at the antero-lateral corner of the acromion may be useful.
On the other hand, acromioplasty has been reported as a possible causative factor in knot impingement. In this series, only 2 of our 632 patients had symptomatic knot impingement after arthroscopic rotator cuff repair, although acromioplasty was performed in all patients. This result suggests that acromioplasty may not be a risk factor for symptomatic knot impingement.
Conclusions: Knots tied at the muscle–tendon junction of the supraspinatus tendon caused symptomatic subacromial impingement after arthroscopic repair of partial-thickness rotator cuff tears. The knots on the supraspinatus tendon impinged on the anterolateral corner of the acromion, leading to bone erosion.
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B0057
Outcomes of arthroscopic rotator cuff repair with less tension

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Background: It is well-known that large-to-massive rotator cuff tears (RCTs) are likely to fail after an arthroscopic rotator cuff repair (ARCR). The cause of failure is over tension at the repair site. The purpose of this study is to evaluate the outcomes and failure rates of ARCR with less-tension under 30 N.
Material: 78 patients who underwent ARCR with full cover of the footprint within 30 N of extracted tendon tension measured with a tension meter by bridging suture technique under the diagnosis of RCTs including supraspinatus (SSP) and/or infraspinatus (ISP) tendon with a minimum one year follow-up included in this study. Exclusion criteria included single or double row repair, isolated subscapularis (SSC) repair, revision surgery, osteoarthritis, rheumatoid arthritis, arthritis after infection, or ARCR with any synthetic or autologous augmentation. The average age was 64.7 years old, and the patient numbers of each retracted tendon grade by Boileau classification was 24 in stage 1, 40 in stage 2, 14 in stage 3, and 0 in stage 4.
Methods: We performed ARCR for such tears with our original double-pulley suture bridge technique. RCTs including SSC tendon injuries were seen in 41 cases. Respective patient numbers graded by Lafosse classification were 24 in grade 1, 14 in grade 2, 1 in grade 3, and 2 in grade 4. We treated such cases with debridement, single repair, suture bridge, or pectoralis major transfer, respectively. Moreover, in cases of long head of biceps brachii tendon problems such as partial tear, subluxation or dislocation, we usually treated the lesions as follows; 20 cases were treated with tenotomy, 4 with tenodesis, 2 with transverse ligament release, and 3 with SLAP repair. We evaluated pre- and postoperative outcomes about the values as follows; Japanese Orthopaedic Association (JOA) score, range of motion (ROM) (flexion, external rotation (ER), and internal rotation (IR)), and isometric muscle strengths (abduction, ER, and IR). We compared statistically between pre- and postoperative values with student t tests. Moreover, we evaluated postoperative cuff integrity by MRI, distinguished between the healed group and the failed group with Sugaya classification (type IV and V as failure), and calculated the failure rate after this procedure. Furthermore, we evaluated preoperative fatty degeneration (FD) with Fuchs classification by MRI. The FD of each rotator cuff muscle (SSC, SSP, ISP) was assessed, and the general FD index (GFDI) was calculated. The FD of each muscle and GFDI was compared statistically between the healed group and the failed group with Mann Whitney's U test. A p value of $p< 0.05$ was regarded as a statistical significance.
Results: The average JOA score improved significantly from 67.2 preoperatively to 93.2 postoperatively. In ROM, flexion angle improved significantly from 127.8 degrees to 153.2 degrees, while ER and IR didn't improve significantly (58.3 degrees to 61.6 degrees in ER, and Th11.5 to Th10.3 in IR, respectively). The isometric muscle strengths of abduction, ER and IR improved significantly from 35.4 N, 42.8 N and 72.2 N preoperatively, to 56.0 N, 59.4 N, and 100.1 N postoperatively, respectively. As four patients were regarded as failures by MRI, the failure rate was 5.12%. FD in the healed group was 0.65 in SSC, 0.84 in SSP, 0.74 in ISP, and 0.73 in GFDI. On the other hand, the FD in the failed group was 1.75 in SSC, 1.50 in SSP, 2.25 in ISP, and 1.83 in GFDI. All FD values in the failed group were significantly higher than those in the healed group ($p<0.05$).
Discussion: High failure rates of ARCR for massive RCTs were reported by many authors, and high-tension repairs (greater than 8 lb, i.e. 35.6 N) were associated with poor outcomes described by Davidson et al. We therefore repaired the torn cuffs under the tension less than 30 N, and achieved good clinical outcomes and a low failure rate even for large tears. In the cases more than 30 N, we performed SSP and/or ISP muscle advancement to decrease the tension at the repair site presented in the previous 1st APKASS meetings, and we reported lower failure rate for large-to-massive RCTs by this procedure (failure rate was 23.5%). However, failure cases after ARCR with less tension existed with high grade FD and GFDI. Oh et al reported that tear retraction and FD of ISP was a prognostic factor in multivariate regression analysis. We therefore must pay closer attention to cases with high grade FD within rotator cuff muscles even with tension less than 30 N.