Subacromial steroid injection is safe and effective to improve painful LOM after rotator cuff repair

Joo Han Oh\textsuperscript{a}, Sae Hoon Kim\textsuperscript{b}, Je Kyun Kim\textsuperscript{a}, Dae Ha Kim\textsuperscript{a}, Seok Hoon Yang\textsuperscript{a}, Sung Min Rhed\textsuperscript{a}, Hyeon Jang Jeonga\textsuperscript{a}, Kyung Soon Jeonga\textsuperscript{a}, Shang Mi Shima\textsuperscript{a}

\textsuperscript{a} Department of Orthopaedic surgery, Seoul National University College of Medicine, Seoul National University Bundang Hospital, Korea
\textsuperscript{b} Department of Orthopaedic surgery, Seoul National University College of Medicine, Seoul National University Hospital, Korea

\textbf{Background:} Painful limitation of motion (LOM) is a common situation during the recovery period after arthroscopic rotator cuff repair. Subacromial corticosteroid injection can be helpful to improve painful LOM, however, the concern exists regarding the adverse effect on the rotator cuff tendon healing.

\textbf{Materials and methods:} Among 410 patients who underwent arthroscopic rotator cuff repair between January 2012 and May 2014 and who were followed up for more than 6 months with functional and anatomical outcome (mean 12 months), 195 patients received a single subacromial corticosteroid injection for painful LOM at around the postoperative 12 weeks with the confirmation of cuff integrity using ultrasonography. We assessed the changes of range of motions (ROMs) over time, visual analogue scale (VAS) for pain, the Constant score, the American Shoulder and Elbow Surgeons (ASES) score and cuff integrity at least 6 months after surgery, and finally compared with control patients (n=215) who did not get injection.

\textbf{Results:} At the time of injection, all ROMs were significantly lower in the injection group compared to the control group. At postoperative 6 months, there were no statistical differences between two groups in terms of ROM, pain VAS and functional outcome scores (all $P>0.05$). There was no statistical difference in the healing failure rate between two groups (14.5\% vs. 11.3\%, $P=0.39$). No other complications were observed.

\textbf{Discussion and conclusion:} Subacromial corticosteroid injection can be an effective and safe method for painful LOM during the recovery period after arthroscopic rotator cuff repair without the concern of rotator cuff healing failure.
Introduction and Aims
Increasingly anchors are used to repair rotator cuff tears, particularly with more frequent use of mini-open and arthroscopic approaches. Little information exists from large scale clinical studies comparing outcomes for different anchor types, anchor materials or the suture configuration employed in rotator cuff repair.

Methods
Between the 1st March 2009 and 31st December 2010 those patients undergoing repair of either partial or full-thickness tears were recruited by 92 surgeons nationwide. Only patients with pre-op Flex-SF, Pain scores and Operating day questionnaires were included in this analysis. The Operating day questionnaire required the surgeon to complete questions including fixation method (bone tunnels, suture anchors or both), number of anchors, number of margin convergence sutures, suture pattern (mattress, simple, Mason Allen, Suture bridge/trans-osseous equivalent, modified Kessler or other) suture pattern (single row/double row) and anchor type. Outcome was assessed by questionnaires at 6, 12 and 24 months including Flex-SF activity score and pain score.

Results
1383 repairs were analysed. Comparison of the 2 year pain score with the pre-op pain score allowed calculation of improvement in pain for the different anchor materials. PEEK anchors (n=295) improved by 3.47 points on a VAS 0-10 score, titanium (n=238) 2.89, PLLA (n=41) 3.34 and PLDLA (n=284) 3.13. Comparing PEEK and titanium anchors the PEEK showed significantly greater improvement in pain score (p<0.001). PEEK also showed significantly greater improvement than PLDLA (p=0.03). No difference was seen between PEEK and PLLA (p=0.69).

Improvement in Flex-SF score was 15.24 for PEEK, 15.63 for titanium, 16.43 for PLLA and 16.31 for PLDLA. There was no statistically significant difference between the Flex-SF scores. Tear size was no different for each anchor material. In contrast tear size varied widely with suture pattern making comparison of different suture configurations difficult.

Outcome for those anchor types implanted more than 50 times will be presented with appropriate statistical analysis.

Conclusions
At two years pain scores following rotator cuff repair showed significantly greater improvement for PEEK anchors compared with titanium (p<0.001) or with PLDLA (p<0.03). These differences should be considered in anchor selection by the surgeon and indeed by anchor manufacturers particularly if a similar pattern is replicated by other multicentre studies currently in progress.
Symptomatic knot impingement after arthroscopic rotator cuff repair: which knot is critical?

Akihiro Uchida1; Teruhisa Mihata1,2,3; Yasuo Itami1; Akihiko Hasegawa1,3; Masashi Neo1

1 Osaka Medical College, Japan; 2 Katsuragi Hospital, Japan; 3 Daiichi Towakai Hospital, Japan

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.
Clinical Analysis of surgical techniques of approach of arthroscope
approach of rotator cuff repair in 46 cases

LIU Bao-rong1, ZHOU Yi-zhao1
(1Department of Orthopaedics, Hunan Province People's Hospital, Changsha Hunan 410005, China)

[Abstract]【Objective】To discuss and evaluate the surgical techniques of approach of arthroscopic rotator cuff repair and its clinical result.【Methods】From January 2013 to December 2014, 16 cases of rotator cuff tear were treated by arthroscopic. Constant-Murley score and SST (simple shoulder test) questionnaire were adopted before operation and at the latest follow-up.【Results】All the 46 patients were available for follow-up for 7 to 29 months, the average follow-up period being 18 months. The pre-operation and post-operation mean ASES score was 72.3 vs. 87.1 (P<0.01), with the mean VAS score for pain 5.1 vs. 2.7 (P<0.001), the mean forward flexion 173.3° vs. 150.3° (P<0.001), and the mean external rotation 28.5° vs. 45.2° (P<0.01). Constant-Murley score was 70.9 vs. 85.4 (P<0.01).【Conclusions】Arthroscopic rotator cuff repair is a successful treatment for rotator cuff tear. By the use of suture anchors, scope surgery shares the advantages of minimal morbidity and quick functional recovery. With appropriate indication control descent surgical skill and intense postrehab, gratifying outcome can usually be anticipated.
[Key words] Rotator cuff tear; Arthroscopy; Shoulder joint
Rotator Cuff Tears Combined with Long Head of the Biceps Tendon

Lesions: Tenotomy Versus Tenodesis

Shang Xiliang1, Chen Jiwu1, Chen Shiyi1

1 Department of Sports Medicine, Huashan Hospital, Fudan University, China

Background  Long head of the biceps tendon (LHBT) lesions are often associated with partial or complete rotator cuff tears, especially in elderly patients. Arthroscopic biceps tenotomy and tenotomy with tenodesis are two well-established surgical procedures. However, which technique is preferred over the other in treating patients with LHBT lesions and repairable cuff tears is still a controversy.

Purpose  The purpose of this meta-analysis was to assess whether there are differences in the outcomes between tenotomy and tenodesis in treating LHBT lesions combined with rotator cuff tears.

Methods:  We searched for articles comparing tenotomy and tenodesis combined with rotator cuff repair that were published before 2015. The controlled clinical studies that met the inclusion and exclusion criteria were assessed for quality of methodology. These results were evaluated and compared to provide an overview on benefits and drawbacks of the respective surgical procedures.

Results  Both tenotomy and tenodesis are effective and equal for the treatment of long head biceps lesions. Compared with tenodesis, tenotomy is more simple, shorter surgical time, faster pain relief, lower cost, and avoidance of implant complication. Because both the tenotomy and tenodesis with concomitant rotator cuff repair used the same rehabilitation protocol just for rotator cuff repair. Namely, this can somewhat offset the weakness that tenodesis needs a longer rehabilitation period than tenotomy. However, the incidence of the Popeye sign is significantly lower, even though tenodesis does not provide any significant clinical or functional improvement than isolated tenotomy.

Conclusions  Both tenotomy and tenodesis are effective in pain relief and functional improvement in patients with repairable rotator cuff tears. Various factors should be taken into consideration, such as ages, functional demands, cosmesis concern, and surgeon preferences, in order to decide which surgical procedure to choose. Because tenotomy requires a shorter surgical time and results in faster pain relief, we recommend tenotomy with concomitant rotator cuff repair in older than 55 years patients, with a low level of physical activity, no cosmesis concern.

Keywords  Rotator cuff tear, Long head of the biceps tendon lesions, Tenotomy, Tenodesis
Background: Limited information is available regarding the characteristics of delaminated rotator cuff tear comparing to non-delaminated tear. Furthermore, the effect of delamination on the anatomical healing of repaired cuff is conflicting.

Aim: To evaluate the characteristics of delaminated rotator cuff tear comparing with non-delaminated tear, and to find out anatomical outcomes of delaminated and non-delaminated rotator cuff tear after arthroscopic repair.

Material and Methods: Among 1061 patients who underwent primary arthroscopic rotator cuff repair between February 2010 and August 2013, 447 patients (42.1%) were confirmed delaminated tear (DL) during arthroscopic surgery while 614 patients (57.9%) were confirmed non-delaminated (N-DL). Among them, 475 patients (DL : N-DL = 226 : 249) were analyzed whose postoperative integrity was verified by CT arthrography (CTA) or MRI at least 1 year after surgery. The mean follow-up was 18.1 (12-47) months and 18.8 (12-52.6) respectively. Structural and clinical features were analyzed between DL and N-DL, and the correlation was assessed with anatomical healing.

Results: The mean age at the time of operation was 62.8 (43-80) years in DL and 59.4 (39-79) in N-DL (P < .001). The failure rate of rotator cuff healing was 25.7% (58/226) in DL and 14.9% (37/249) in N-DL (P=.005). Patients in DL suffered longer period (average 33.7 months : 23.63, P = .035); had larger tear size (retraction 2.14 cm : 1.41, AP 2.14 cm : 1.62, both P < .001); and higher grade of fatty infiltration of the supraspinatus, infraspinatus and subscapularis (all P < .005) than those in N-DL. No significant difference between articular and bursal tear size (retraction and AP) of delaminated rotator cuff tear was found.

Discussion and Conclusions: The incidence of delamination was 42.1%. The healing failure rate was higher than non-delaminated tear due to characteristics of delaminated tear – older age with longer duration of symptom, larger tear size and higher grade of fatty infiltration.
OUTCOMES OF ARTHROSCOPIC ROTATOR CUFF REPAIR WITH LESS TENSION

Shin Yokoya¹, Yohei Harada¹, Katsunori Shiraishi¹, Hiroshi Negi¹, Ryosuke Matsushita¹
Yu Mochizuki², Nobuo Adachi¹, Mitsuo Ochi¹

¹Hiroshima University; ²Hiroshima Prefectural Hospital

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.

Conclusion
We evaluated the outcomes of ARCR with tension less than 30 N. Postoperative JOA score, flexion ROM, and muscle strengths improved significantly after ARCR. Failures
after ARCR were found in 4 cases, and the failure rate was 5.12%. The FD in the failed group was significantly higher than those in the healed group. Although ARCR with less tension was effective for RCTs, we must pay closer attention in the cases with higher FD even if the retracted tendon can be mobilized with less tension.
Biomechanical comparison of 3 different suture-bridge techniques for rotator cuff tear repair

Zi-Ying Wu, Ji-Wu Chen
Department of sports medicine, Huashan hospital, Fudan University, Shanghai, China

Purpose: To compare the biomechanical properties of 3 different suture-bridge techniques for rotator cuff tear repair.

Methods: Twelve pair-matched fresh-frozen shoulder specimens were randomized to 3 groups of different repair types regarding medial-row configuration: the medially Knotted Suture Bridge group (KSB), the medially Untied Suture Bridge group (USB), the Modified Suture Bridge group (MSB). Cyclic loading test and load-to-failure test were performed for all specimens. Parameters of elongation, stiffness, load at failure and mode of failure were finally recorded.

Results: The MSB technique had the significantly greatest load to failure (515.6±78.0 N, P=0.04 for KSB group, P<0.001 for USB group), stiffness (58.0±10.7 N/mm, P<0.001 for KSB and USB group) and lowest elongation (1.49±0.39mm, P=0.009 for KSB group, P=0.001 for USB group) among 3 constructs. For the remaining groups, the KSB repair had significantly higher ultimate load (443.5±65.0 N) than USB repair (363.5±52.3 N, P=0.024). However, there was no statistical difference in stiffness and elongation between KSB and USB technique (P=0.229 and 0.242, respectively). Modes of failure varied among 3 groups.

Conclusions: Our modified suture bridge technique (MSB) may provide enhanced biomechanical properties when compared with medially knotted or knotless repair.

Clinical Relevance: Our modified technique may represent a promising alternative in arthroscopic rotator cuff repair.
A Meta-Analysis Comparing Single-Row and Double-Row Repair Techniques in the treatment of Rotator Cuff Tears

Caiqi Xu1, Jinzhong Zhao2

1. Department of Orthopaedics, Shanghai Jiao Tong University Affiliated Ruijin Hospital, Shanghai, China
2. Department of Sports Medicine, Shanghai Sixth People’s Hospital, Shanghai, China

Background: Rotator cuff tears are among the most common shoulder injuries and can be a source of persistent pain, disability, and decreased range of motion and strength. Several rotator cuff repair 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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A Survival Curve for Arthroscopic Double-Row Repair of the Rotator Cuff: Critical Period Analysis

Johannes BARTH1, Kevin Andrieu1, Elias Fotiadis1, Renaud Barthélémy2, Sophie Genna3 and Mo Saffarini1

1Centre Ostéo-Articulaire des Cèdres, Grenoble, France; 2 Clinique du Mail, Grenoble, France; 3 Alliance Scientifique, Lyon, France

a) Background
The incidence of retear following rotator cuff repair remains a major concern and the cause and timing of retear remains unclear. Most serial imaging studies suggested that retears occur during the first 3 months, but they have short follow-up or limited numbers of serial images. The aim of this study was to prospectively investigate the timing of retears following arthroscopic double-row rotator cuff repair using a sizeable cohort at multiple time intervals. The hypothesis was that the ‘critical period’ extends to the first 6 post-operative months, during which the risk of retear is highest.

b) Material
The authors enrolled a consecutive series of 257 shoulders in 243 patients (14 bilateral) that underwent arthroscopic double-row suture anchor repair of full-thickness tears, between January 2007 and June 2010. The exclusion criteria were: partial-thickness tears (n=4), revision operations (n=9), shoulder joint stiffness (n=4), Hamada stage 2 or more (acromiohumeral distance <6 mm) on plain X-Rays (n=9), arthritis and rheumatologic disorders (n=6), severe musculoskeletal pathologies (n=8), gleno-humeral joint instability (n=4) or acromioclavicular joint dislocation (n=7). Therefore a total of 206 shoulders was included for the prospective outcome evaluation.

c) Method
Patients were recalled to three follow-up visits at the following post-operative time intervals: 3 months, 6 months, and 12 months or longer. Ultrasonography on the operated shoulder was performed by an independent radiologist at each visit and the Constant score was collected during the last visit. Statistical analyses were performed using R version 3.1.3.1. Descriptive statistics were used to summarize the data. Data were not normally distributed. Between group differences were evaluated using Wilcoxon rank sum tests (Mann Whitney U test). When 3 or more groups were compared Kruskall-Wallis tests were used followed by Wilcoxon rank sum tests for pairwise comparisons (with Holm’s correction for multiplicity). Categorical data were analyzed using Pearson chi-square tests or Fisher’s exact tests. P-values < 0.05 were considered statistically significant.

d) Results
Of the initial 206 cases included, 1 died (0.5%) before the end of the follow-up period from unrelated causes, 3 cases (1.5%) had subsequent surgery on another joint that prevented them from attending the latest follow-up visit, and 26 cases (12.6%) missed one or more of the scheduled US examinations. Therefore, a total of 176 shoulders (85.4%) from 165 patients (84 men and 81 women) were available for all required follow-up visits with mean age 56.0 years. Ultrasonography revealed retears in 16 shoulders (9.1%) at 3 months, in 6 shoulders (3.4%) at 6 months, and in 5 others (2.8%) at last follow-up, while it confirmed intact cuffs in 149 shoulders (84.7%) at last follow-up (mean, 32.9 months). The incidence of retears was most significantly associated with tear size (p=0.001) and tendon degeneration (p=0.003).
Retears were observed in 42.1% (8 of 19) of the three-tendon tears, but only in 17.4% (12 of 69) of the two-tendon tears and 8.0% (7 of 88) of the one-tendon tears (p=0.001). Likewise, the incidence of retears was significantly higher for retracted tendons (p=0.038) and if the infraspinatus had stage II or III fatty infiltration (p=0.002). The Constant scores at the last follow-up were lower for shoulders that had a retear during the first 6 months compared to shoulders that had a retear after the first six months (p=0.056) or to shoulders that had no retear (p<0.001). The incidence of retears was not related to other pre-operative tear characteristics (dominant side, bilateral procedures, or cause of pathology) or to concomitant patient conditions (smoking, diabetes, cardiovascular disease or hypertension). Considering retear as the end-point, the six-month survival (and 95% Confidence Interval) for the complete series was 87.5% (82.7% – 92.5%). By contrast, the six-month survival was only 57.9% (CI, 39.5% – 85.0%) for three-tendon tears, compared to 88.4% (CI, 81.2 – 96.3) for two-tendon tears and 93.2% (CI, 88.1% – 98.6%) for one-tendon tears. In parallel, the six-month survival was merely 77.6% (CI, 68.2% – 88.3%) for degenerated tendons, compared to 93.6% (CI, 89.1% – 98.3%) for healthy tendons.

e) Discussion
Most retears occurred during the first three post-operative months (n=16), but some occurred between three and six post-operative months (n=6), and a few occurred after 6 months (n=5), considering the long follow-up period of the study. The results therefore confirm the hypothesis that the ‘critical period’ for healing and recovery following rotator cuff repair extends to the first 6 post-operative months, during which the incidence of retears is significantly higher (12.5%) than in the forthcoming months (2.8%). The findings corroborate the recent literature, which indicates that retears occur mostly during the first three post-operative months (9.1%). The observations suggest, however, that the so-called ‘critical period’ may extend until six post-operative months, particularly for patients with risk factors, most notably large tear size, degenerated tendons, tendon retraction and fatty infiltration. Our results suggest that the two factors most associated with early retears are pre-operative tear size and tendon degeneration, which corroborates the recent systematic review of Henry et al. Arthroscopy 2015 who reported a ‘pooled retear rate’ of 79% following repairs of chronic massive rotator cuff tears.

The main strengths of this study are its relatively large sample size and the acquisition of multiple serial images. The study has several limitations, typical of non-randomized studies, notably the variability of follow-up, the inclusion of patients with various sizes of subcapularis, the use of two different imaging modalities pre-operatively (CT and MRI) to assess muscle quality and fatty infiltration, the inability to analyze the inter- and intra-observer accuracy because US is a dynamic imaging modality and its interpretation must be done in the presence of the patient, and the portion of patients lost to follow-up (14.6%).

f) Conclusion
The ‘critical period’ for healing and recovery following rotator cuff repair extends to the first 6 months. Knowledge of this ‘critical period’ would enable clinicians to prescribe appropriate rehabilitation strategies, particularly for patients at risk that must return to manual work. Further research should aim to improve operative techniques and rehabilitation strategies to favor early tendon healing in patients at risk of early retear.
Partial-Thickness Rotator Cuff Tears in University Baseball Players

Rei Morikura1; Teruhisa Mihata1,2,3; Yasuo Itami1; Akihiko Hasegawa1,3; Masashi Neo1

1 Osaka Medical College, Japan; 2 Katsuragi Hospital, Japan; 3 Daiichi Towakai Hospital, Japan

Background:
Rotator cuff tears are common shoulder injuries in baseball players. In some severe tears (i.e. through more than 50% of the cuff’s thickness), conservative treatment does not work well, and surgical treatment is sometimes chosen in an effort to ensure return to play. In contrast, some partial thickness rotator cuff tears do not cause shoulder symptoms, even during throwing motion. Here, we assessed the rates and characteristics of symptomatic and asymptomatic partial thickness rotator cuff tears in baseball players.

Materials and Methods:
We studied 57 university baseball players (age: 19.7±0.8 years; baseball career: 11.5±1.7 years; position: 25 pitchers and 32 position players). All subjects completed questionnaires about current and past shoulder pain; their rotator cuff tendons were then ultrasonographically examined.

Results:
Twenty-two (39%) players were diagnosed with rotator cuff tears using ultrasonography. All tears were articular sided and of partial thickness. Eleven tears were in the supraspinatus, 5 in the infraspinatus, and 6 in both the supraspinatus and the infraspinatus. Tear depth was 3.6±1.5 mm in the supraspinatus and 2.8±1.4 mm in the infraspinatus. Only 23% of rotator cuff tears (5/22 tears) were accompanied by shoulder pain; the remaining 77% (17/22 tears) were asymptomatic. Six of the players with tears had had shoulder pain when throwing at high school or junior high school, although they had no pain at the time of our investigation. Five of the 25 pitchers (20%) and 17 of the 32 position players (53%) had rotator cuff tears.

Conclusions:
Ultrasonographic examination showed that 30% of these university baseball players had asymptomatic articular-sided partial-thickness rotator cuff tears. The tear extended for less than 50% of the medial-to-lateral dimension of the rotator cuff’s footprint on the greater tuberosity; this suggests that most of these were tears of the superior capsule but not the rotator cuff tendons, because the superior capsule is attached in the articular half of the greater tuberosity. Furthermore, 77% of tears were asymptomatic. Therefore, most so-called articular-sided partial-thickness rotator cuff tears may not be pathological tendon tear but instead adaptive changes in response to acquired laxity without any symptom.
Characteristics and clinical outcomes of the patients with articular side and bursal side rotator cuff tears

Satoshi Iwashita¹, Hiroshi Hashiguchi¹, Atsushi Okubo¹, Minoru Yoneda², Shinro Takai²

¹Department of Orthopaedic Surgery, Nippon Medical School Chiba Hokusoh Hospital
²Department of Orthopaedic Surgery, Nippon Medical School

(Background) The partial thickness tears of rotator cuff divided into bursal side tears and articular side tears. However, the differences between articular side tears and bursal side tears have not yet been revealed sufficiently. The purpose of this study was to analyze characteristics and clinical outcomes of the patients with articular side tears and bursal side tears.

(Method) 114 patients with articular side and bursal side cuff tears treated by arthroscopic rotator cuff repair were the subjects of this study. There were 70 females and 44 males whose average age was 58.4 years. 30 patients had history of trauma. The average duration of disorder was 35.5 weeks. 17 patients were diagnosed as diabetes. On types of the tears, articular side tear was observed in 60 patients (AST group) and bursal side tear in 54 patients (BST group). Stiff shoulder (passive flexion range of motion < 90 degrees) was observed in 37 patients. Capsular release was performed to the patients with stiff shoulder. The clinical outcomes were evaluated on the basis of the UCLA shoulder score between AST group and BST group. Factors compared between AST group and BST group were as follows; gender and age of the patients, preoperative history of trauma, duration of disorder, diabetes, smoking, stiffness and LHB lesion. All data were evaluated statistically by t-test and chi-square test and the significance level was set at less than 0.05.

(Results) The average UCLA shoulder score of each group improved significantly postoperatively. There was no significant difference in postoperative UCLA score between two groups. The rate of the patient with history of trauma in AST group was significantly higher than that in BST group. The rate of the patient with stiff shoulder in AST group was significantly higher than that in BST group. The other factors such as gender, age, duration of disorder diabetes and smoking were not significantly different between two groups.

(Conclusion) This study suggests that atraumatic history contributes to bursal side tears. The rate of stiff shoulder is more frequently observed in the patients with articular side tears. However, the patients with articular side tears can get satisfactory outcomes as well as the patients with bursal side tears to add correct procedures such as capsular release with rotator cuff repair.
Prognostic Factors of Retear after Arthroscopic Repair of Massive Rotator Cuff Tear

Tim-Yun Michael Ong¹, Shu-Hang Patrick Yung², Chun-Kwong Lo, Tsz-Cheung Wong¹, Kai-Ming Chan²

¹Department of Orthopaedics and Traumatology, Alice Ho Miu Ling Nethersole Hospital, Hong Kong
²Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Hong Kong
³Department of Orthopaedics and Traumatology, The Chinese University of Hong Kong, Hong Kong

Introduction: Retearing after arthroscopic repair of massive rotator cuff tear has been reported to range from 20% to 60%. This study aimed to evaluate the possible prognostic factors relating to retear of repaired massive tears of rotator cuff.

Materials and Methods: A total of 24 patients underwent arthroscopic repair of massive tears of rotator cuff during the period of 2009-2012, was assessed and reviewed, with clinical signs and functional assessment with UCLA and ASES score as the assessment criteria, as well as pre- and postoperative magnetic resonance image (MRI) assessment performed. The following factors were compared between the intact group versus retear group for final analysis: age of patient, smoking, diabetes mellitus (DM), history of significant trauma to the shoulder, presence of subscapularis tear, long head of the bicep tendon condition, delamination, size of tear, and presence of significant muscle atrophy (preoperative MRI).

Results: With a mean follow-up of 32 months among this 24 patients (mean age, 55 years), MRI revealed a complete retearing in 4 (17%) cases and partial retearing in another 4 (17%) cases. Patients with complete retear was significantly older than the group without tear. None of the patient with a history of trauma got retear or partial retear. The retearing rate of patients with either DM, LHB tear requiring tenotomy, or subscapularis tear requiring repair were significantly higher than those without them.

Discussion and Conclusion: Older age, DM, presence of LHB tear requiring tenotomy or subscapularis tear requiring repair are relative poor prognostic factors for retearing of repaired massive rotator cuff tear.
Arthroscopic incomplete repair of irreparable rotator cuff tears: 
Pre-operative factors and outcomes 

Kun-Hui Chen1, En-Rung Chiang1,2, Hsiao-Li Ma1,2

1Orthopaedics and Traumatology, Taipei Veterans General Hospital, Taipei, Taiwan;  
2Department of Surgery, School of Medicine, National Yang-Ming University, Taipei, Taiwan.

a) Background
For massive and irreparable rotator cuff tear (RCT), reverse total shoulder arthroplasty (RTSA) was developed and getting more popular. However, incomplete repair was still considered due to the improvement of clinical outcomes without the possible complications of RTSA. In this study, we evaluate the image and functional outcomes of patients treated with incomplete repair, as well as the pre-operative factors that may be related to the more improvement from the surgery.

b) Material
We reviewed patients who underwent incomplete rotator cuff repair from December 2012 to April 2015 due to irreparable RCT. The incomplete repair was defined as a residual defect of the tendon-footprint junction after repair. There were 37 patients met this criteria. The mean patient age was 60.3 years, 19 were male, 18 were female, 29 had a right shoulder RCT and eight had a left shoulder RCT. The surgical procedure included repairing the less retracted anterior and posterior margins. In addition, aggressive tendon adhesion release, interval slide or margin convergence was performed depending on the intraoperative situation. All surgeries were performed by the same surgeon.

c) Method
Patient characteristics collected before surgery included age, sex, presence or absence of diabetes, smoking status, presence or absence of night pain, duration of symptoms, the Visual Analogue Scale of pain (VAS) score, acromio-humeral distance (AHD), and American Shoulder and Elbow Surgeons (ASES) score. Duration of symptoms was categorized as 0–6 months, 7–12 months, and >12 months. MRI and X-ray were checked approximately 6 months after the surgery to evaluate the healing status and AHD, respectively. The failure of repair was defined as a progression of tear. Functional outcome was evaluated using the ASES score at least 8 months after surgery. The degree of functional improvement was defined as the difference between ASES scores before and after surgery (d-ASES).

d) Results
The mean follow-up period was 29.3 months (range, 8–80 months). The VAS score improved significantly from 5.22 to 1.51 (P < 0.01). The ASES score improved significantly from 46.0 to 78.6 (P < 0.01). The incidences of night pain significantly improved from 70.3% to 8.1% (P < 0.01).
Only lower ASES score, higher VAS score and night pain before surgery were related to the higher d-ASES score. There were no factors related to failure of repair, identified based on an MRI at a mean follow-up time of 6.4 months. AHD improved from 8.3 mm to 8.8 mm, but this was not significant (P value = 0.327). There was no correlation between the preoperative ASES score and AHD or the postoperative ASES score and AHD. The rate of failure-repair was 21.6%. The failure of repair detected based on the MRI was not related to a lower postoperative ASES score.

e) Discussion

Many reports showed a functional improvement after incomplete repair for irreparable RCT [1,2]. A previous report defined an ASES score > 80 as an excellent result for massive RCT[3]. In our study, the mean postoperative ASES score reached 78.6, implying that our result was satisfactory for the irreparable tears. There was no correlation between the postoperative ASES score and failure of repair. Failure of repair on MRI did not indicate poor function.

Controversy still exists as to the effect of AHD on functional outcome. In our study, AHD increased by approximately 0.5 mm after surgery, although this was not a significant result. This AHD increase may have been because of the repair of the rotator cuff or the performance of acromioplasty. Our study showed no correlation between the preoperative AHD and the final functional outcome.

Previous studies showed that a higher fatty infiltration of supraspinatus muscle had a negative effect on healing [4]. However, in our study, some patients were diagnosed via sonography rather than an MRI and we were unable to evaluate this factor.

The ASES questionnaire is known to be a highly reproducible and valid method for evaluating subjective shoulder function. We evaluated the effect of surgery based on the differences in the preoperative ASES score and postoperative ASES score, defining d-ASES score. We also evaluated those factors that may affect the d-ASES score. Only night pain, higher VAS score and lower ASES score had a positive effect on the d-ASES score. Other factors, such as age, sex, presence or absence of diabetes and smoking status, were not related to the d-ASES score. This may mean that patients with a poorer preoperative function and more pain will experience a better postoperative improvement.

f) Conclusion

Arthroscopic incomplete repair of the irreparable rotator cuff tear is an effective treatment to improve the shoulder function and decrease the pain. Patients with lower functional score, higher VAS score or night pain before surgery get more benefit on functional improvement from the surgery. Thus, we suggest incomplete repair for irreparable tears even in poor preoperative functional score. The incomplete repair should be tried before the reverse total shoulder arthroplasty.
g) References:


Arthroscopic medial reattachment of the torn cuff tendon for massive rotator cuff tears

Xuxu Chen, Hui Kang, Tao Wang

Department of Sports Medicine, Hong-Hui Hospital, Xi’an Jiaotong University College of Medicine, Xi’an, 710054, China.

Background: Reattaching the cuff medial to the anatomic cuff insertion site is an option for repairing massive rotator cuff tears. By doing so, tension at the repair site can be reduced and the return rate will be decreased. Although medial reattachment of the torn cuff tendon is commonly used for repairing retracted cuffs, there have been no clinical studies regarding its influence on the range of motion and the function of the shoulder.

Material: There were 12 patients with massive rotator cuff tears who were treated in our institution. There were 8 males and 4 females, with an average age of $53.3 \pm 7.9$ years (37-68). Five left shoulders and seven right ones were involved. The mean size of rotator cuff tears was $5.4 \pm 0.9$ cm.

Method: All twelve patients underwent arthroscopic rotator cuff repairs, by reattaching the torn cuff tendons medial to the anatomic cuff insertion site without excessive tension. The distance of medial reattachment was recorded during the operation. All operations were performed by one same surgeon. All patients were reviewed in the clinic. The mean follow-up time was $31.2 \pm 10.0$ months. MRI examinations were performed on every patient to observe the tendon-bone healing. The shoulder Constant-Murley score, visual analogue scale (VAS) for pain and ranges of motion were measured and recorded before and after surgery.

Results: At the follow-up ending time, there was only one patient who got the recurrence rotator cuff tear by MRI. The shoulder Constant-Murley score and ranges of motion significantly increased after surgery. The VAS for pain significantly decreased after surgery. Neither the shoulder Constant-Murley score, the VAS for pain or ranges of motion were correlated to the distance of medial reattachment. When the distance of medial reattachment was bigger than 13mm, the range of abduction motion dramatically decreased.

Conclusion: Arthroscopic medial reattachment of the torn cuff tendon is an effective method of repairing massive rotator cuff tears. At 13mm of medial reattachment of the torn cuff tendons, the range of abduction motion significantly decreased. Therefore, less than 13mm of medialization is recommended.
Association between Pre-operative MRI of the Supraspinatus Muscle and Reparability of Rotator Cuff Tears

Jeung Yeol Jeong, MD1, Jae Chul Yoo, MD2, Seung Gyoon Kang, MD3, Sang Min Lee4

1,2,3 Department of Orthopedic Surgery, Sungkyunkwan University College of Medicine, Samsung Medical Center, Korea; 4 Division of Sports Medicine, Department of Physical Medicine and Rehabilitation, Sungkyunkwan University College of Medicine, Samsung Medical Center, Korea

Background: There are few reports of the assessment of the association of the occupation ratio (a marker of supraspinatus muscle atrophy), with reparability into account. To determine the correlation between supraspinatus muscle occupation ratio and reparability of the rotator cuff muscles, (especially the supraspinatus), to determine the correlation between each occupation ratio for 1-muscle (Only SST), 2-muscles (SST + Infraspinatus [IST] or SST + Subscapularis [SBC]), and 3-muscles (SST+IST+SBC) injury of rotator cuff tear.

Material and Methods: We evaluated 170 patients (average age, 62.3 years (range, 40-83 years)) who had only arthroscopic type II, III rotator cuff repair. Patients were divided into two groups: 96 patients had underwent a type II repair, 74 patients had underwent a type III repair. Also patients were separated into four groups: i) isolated supraspinatus tears, ii) supraspinatus and infraspinatus tears, iii) supraspinatus and subscapularis tears, iv) tears in all 3 muscles. Muscle atrophy of the supraspinatus was evaluated by using occupation ratio on the most lateral T1-weighted sagittal oblique view. Occupation ratio of supraspinatus muscle in supraspinatus fossa was evaluated visually. The area was measured by 2 independent observers using Centricity-Radiology RA1000 software (GE Healthcare., Barrington, IL, USA).

Results: On MRI, the supraspinatus muscle occupation ratio was significantly different between the completely repaired (Type II) and incompletely repaired (Type III) groups. As expected, the mean occupation ratio for completely repaired group (42.39 +/- 10.1) was higher than incompletely repaired group (36.64 +/- 6.94), with statistical significance. The cutoff value from complete repair (Type II) to incomplete repair (Type III) was 41 for supraspinatus muscle occupation ratio. As expected, the supraspinatus muscle occupation ratio was significantly smaller as the tear increases (P <0.001).

Discussion: Our study shows that supraspinatus reparability (mobility to the greater tuberosity) can give some idea through the preoperative MRI sagittal-oblique view. Among the several MRI parameters mentioned in previous studies, our study shows that the pre-operative MRI supraspinatus occupation ratio is associated with reparability of rotator cuff tears, especially the supraspinatus. The supraspinatus occupation ratio cut off value between complete coverage versus incomplete coverage was 41. Several previous literature mentioned pre-operative MRI factors as one of the predictors of reparability of rotator cuff tear. However there are few papers analyzing the reparability of rotator cuff tears using supraspinatus occupation ratio, which is one of the pre-operative MRI factors. Our study shows that the supraspinatus muscle volume or atrophy measured via the occupation ratio can be effective in determining the suprapinatus-infraspinatus reparability. The supraspinatus occupation ratio < 41 suggested a high possibility in incomplete repair. Also we gave a schematic drawing showing the mean data of atrophy to have some estimation of the atrophy.
and cutoff value 41. It was surprising that even with mild atrophy surrounding the supraspinatus was about 60% atrophy. For other analysis, 2-muscle tear groups showed that the mean occupation ratio of SSP + SBC muscles tear group value higher than that of SSP + ISP muscles tear group. It indicates that the degree of atrophy is less severe in supraspinatus muscle when accompanied with anterior tear than posterior tear. This is somewhat obvious since the supraspinatus is separated by rotator interval with subscapularis tendon tear but posterosuperior tear is continuum with infraspinatus.

Conclusion: The occupation ratio of supraspinatus muscle less than 41 can be the cutoff value between coverage of greater tuberosity versus incomplete coverage. And there was a significant correlation between tendons (muscle) tear involvement and supraspinatus muscle atrophy ratio. Only SSP tear group had the least degree of muscle atrophy.
Curative effect comparison of two kinds of grafts suture for massive rotator cuff tear.

Chen Hong¹, Zhang Jun², Zhao Daohong², Lu Qinnan¹

(1. Sports medicine and Joint surgery, The First people's Hospital of Kunming, Yunnan 650000, China; 2. Department of Orthopedics, the Second Affiliated Hospital of Kunming Medical University, Yunnan 650000, China)

Corresponding author: Chen Hong. Email: fyychenghong@163.com.cn

Abstract

BACKGROUND:
Since Mihata reported that the grafts (tendons, fascia lata or artificial materials) were applied to treat massive rotator cuff tears (MRCT) by arthroscopic superior capsule reconstruction (ASCR), clinical results showed the recovery of the glenohumeral joint stability, especially pain relief were significantly improved. The literature reported that the grafts were used to repair rotator cuff tears, which were attached laterally to the greater tuberosity, but medially to the proximal rotator cuff residual (conventional patch graft) or glenoid superior tubercle (Mihata).

MATERIAL:
From January 2012 to December 2015, 25 patients with MRCT underwent ASCR, who had goutallier grade 2 of rotator cuff, severe retraction to glenoid or severe muscle atrophy. Of 25 cases, 11 were male and 14 were female, aged 48~77, the mean age was 53 years.

METHOD:
Group A: the grafts of 9 patients were sutured medially to proximal rotator cuff residual and laterally to the greater tuberosity. Group B: the grafts of 16 patients were attached medially to the glenoid superior tubercle and laterally to the greater tuberosity (ASCR), if rotator cuff residual sliding was enough, that can further overlapping suture with graft. The visual analogue scale (VAS) score, the ROM, the supraspinatus muscle strength, Constant-Murley score, American Shoulder and Elbow Surgeons (ASES) score, and magnetic resonance imaging (MRI) were used to evaluate the effectiveness.

RESULTS:
25 patients were followed up 12-36 months (mean, 18 months). At 12 months after operation, compared the grafts attached medially to the glenoid superior tubercle and proximal rotator cuff residual, VAS score was significantly decreased \((P<0.05)\), ASES score and Constant-Murley score were significantly improved \((P<0.05)\), two methods were without significant difference; the supraspinatus muscle strength preoperative were \((20+10)\%\), the supraspinatus muscle strength postoperative of group A were \((65+16)\%\), the supraspinatus muscle strength postoperative of group B were \((82+11)\%\), two methods were significant difference \((P<0.05)\).
DISCUSSION:
Patients with MRCT that cannot directly reset need patch graft, compared to grafts attached medially to the glenoid superior tubercle and proximal rotator cuff residual, pain relief and shoulder joint activities recovery were without significant difference. But for patients of grafts attached medially to the glenoid superior tubercle, the supraspinatus muscle strength postoperative recovered better and faster, the supraspinatus muscle strength postoperative 3 month of 1 case in group A recovered to normal, the supraspinatus muscle strength postoperative 1 year of 1 partly sutured patients in group B was weakness. The operation in group B was complex and needed suture anchors. We suggest that using the method of Mihata for patients with MRCT that cannot reset, which the grafts were attached medially to the glenoid superior tubercle (ASCR). Patients with MRCT that can partly reset need patch graft, the grafts can simply be sutured medially to proximal rotator cuff residual.

CONCLUSION:
Compared to grafts attached medially to the glenoid superior tubercle and proximal rotator cuff residual, the supraspinatus muscle strength postoperative of group B recovered better and faster.
Clinical and Radiologic Outcomes of Arthroscopic “Hybrid” Repair in Large to Massive Rotator Cuff Tear

Jeung Yeol Jeong, MD1, Jae Chul Yoo, MD2, Pill Ku Chung, MD3, Sang Min Lee4.

1,2,3 Department of Orthopedic Surgery, Sungkyunkwan University College of Medicine, Samsung Medical Center, Korea; 4 Division of sports Medicine, Department of Physical Medicine and Rehabilitation, Sungkyunkwan University College of Medicine, Samsung Medical Center, Korea

Background: In some large to massive rotator cuff tears, the double row repair can be difficult or even impossible especially for the supraspinatus tendon. In such circumstances, partial repair or incomplete repair is an option. Incomplete repair (Type III) can be achieved by our concept of “hybrid” repair in this kind of tears. The basic principle behind “hybrid” repair is double row in infraspinatus tendon, single row in supraspinatus tendon, medialization of supraspinatus tendon footprint, and TOE augmentation. This definition is different from previous literature referring to hybrid technique. The purpose of this study was to first to introduce the concept of hybrid repair (incomplete repair) with schematic drawing and video, second was to report the clinical and radiologic outcome of its consecutive cases with two year follow-up.

Material and Methods: From March 2011 and November 2014, 991 patients were diagnosed as rotator cuff tear and underwent repair in our hospital by a single surgeon (J.C.Y). Among them large to massive were diagnosed in 212 cases. We evaluated 49 patients (average age of 62.6 years (range, 51-74 years) who had received “hybrid” repair among those large to massive tears. The average postoperative follow-up MRI period was 5.5 months (range, 4.0~7.0 months). Functional evaluation was performed at six months, one year and two years postoperatively. The medical records of patients were reviewed to obtain available preoperative and postoperative PVAS, FVAS, Constant, KSS, ASES scores. Patients also were measured a clinical examination to determine active range of motion (AROM) in forward flexion, abduction, and external rotation with the arm at the side by a physician assistant. For the radiological evaluation, 49 patients were evaluated for repaired tendon integrity on postoperative MRI (3.0-T Gyroscan Intera Achieva scanner; Philips Medical Systems, Best, The Netherlands). Oblique coronal, oblique sagittal and transverse views of T2-weighted images on MRI were used to classify postoperative cuff integrity into 5 categories according to Sugaya et al. MRI findings were interpreted in a blinded manner by 2 orthopedic fellowship-trained shoulder surgeons.

Results: Mean pain VAS score improved from 5.727 +/- 2.31 preoperatively to 1.773 +/- 1.97 postoperatively (P=0.000); mean function VAS score improved from 5.091 +/- 1.87 preoperatively to 8.773 +/- 1.19 postoperatively (P=0.000); mean ASES score improved from 39.227 +/- 19.38 preoperatively to 77.545 +/- 16.44 postoperatively (P=0.000); mean Constant score improved from 37.364 +/- 16.19 preoperatively to 66.5 +/- 16.19 postoperatively (P=0.000); mean KSS score improved from 45.318 +/- 13.50 preoperatively to 77.545 +/- 13.50 postoperatively (P=0.000). However Results of postoperatively ROM were not significantly different statistically from results of preoperatively ROM (P>0.05). The retear occurred in 10 patients of 49 patients. Retear rate was recorded for 20%.

Discussion: The postoperative MRI at mean 5.5 months showed that even with incomplete “hybrid” repair showed surprisingly high rate of continuity of the repaired tendon without
retear. This quite interesting, because theoretically the repair is incomplete and tendon-like materials covering the GT might be scar tissue, nonetheless the continuity seems to be seen with type I, II MRI view. Furthermore the clinical outcome showed marked improvement in the functional scores. Recently, biomechanical studies have shown that the double-row (DR) repair procedure is superior for improving the pressurized contact area and the mean pressure between the tendon and footprint compared with the single-row (SR) repair procedure. Yet, there is still controversy regarding the optimal management of large to massive rotator cuff tears. There are very few studies if not no study mentioning incomplete repair as one of the repair types in large to massive rotator cuff tears. Previous literature defined incomplete repair as the supraspinatus tendon cannot cover entire cartilage portion and resulting small defect of present after the operation. Partial repair defined as repair with a substantial unrepaired defect that entailed moderate to extensive exposure of the humeral head (>10 mm) after operation. It is quite often in large supraspinatus-infraspinatus tendon tears the posterior portion of the torn cuff cover easily the original greater tuberosity whereas the anterior more supraspinatus tendon cannot cover entirely if not at all and need medialization of the footprint. We feel that these repair tendon to heal with some continuity at 5 month postoperative MRI in approximately 80% of the patient. This is surprisingly high percentage healing and with good clinical outcome. Incomplete repair mentioned in our study also utilizes this principle and performed DR repair for more mobile posterior portion to cover up the GT footprint 2nd facet completely and SR repair for less mobile anterior portion, which is covering GT footprint 1st facet incompletely as 5mm medialized. We named this repair technique utilizing both DR and SR repair methods described above as "Hybrid technique repair". Advantages of this technique are a capability of anatomical repair and the point that partial repair can be converted into incomplete repair.

Conclusion: The arthroscopic incomplete repair (Hybrid-technique) showed satisfying clinical trial outcomes for large to massive rotator cuff tear. We propose incomplete repair, providing improvements in both pain and functional outcomes, as another repair management option for large to massive rotator cuff tear.
Reversal of suprascapular neuropathy following arthroscopic repair of massive rotator cuff tear with routine nerve release

Xuan Huang, Zimin Wang, Weidong Xu,
Department of Orthopedics, Changhai hospital, Shanghai, China

Background: This study was aim to investigate the prevalence of suprascapular neuropathy (SSN) in the setting of massive rotator cuff tear (MRCT) and to determine if arthroscopic rotator cuff repair with routine nerve release, was associated with reversal of SSN and clinical improvement in pain and function.

Methods: Over a 1 year period, 22 of 316 patients with cuff tears treated operatively were identified to have MRCT associated with retraction and severe fatty infiltration of the supraspinatus and infraspinatus muscles. All patients had pain and marked weakness in abduction and external rotation which did not improve with conservative treatment. Electromyographic (EMG) and nerve conduction velocity (NCV), as well as pre- and postoperative questionnaire and physical examination, were performed. Arthroscopic repair was performed on patients identified to have a MRCT in association with SSN.

Results: Eleven of these 22 (50%) was confirmed SSN preoperatively, 2 had an associated upper trunk brachial plexus injury, and 1 had a cervical radiculopathy. All patients underwent arthroscopic cuff reconstruction with routine suprascapular nerve release, follow-up EMG/NCV after 6 months demonstrated partial or full recovery of the SSN that correlated with complete pain relief and marked improvement in function.

Conclusion: SSN is found in a significant proportion of patients with MRCT, and is associated with pain and dysfunction. Arthroscopic rotator cuff repair with nerve release can result in reversal of SSN and better heal of the rotator cuff, which may correlate with substantial improvement in pain and function.
Effect of Prior Rotator Cuff Repair on Clinical Outcomes Following Reverse Shoulder Arthroplasty

Taku Hatta1,2, Jean-David Werthel2, Eric R. Wagner2, Lukas Ernstbrunner2, Scott P. Steinmann2, Eiji Itoi1, Robert H. Cofield2, John W. Sperling2

1Tohoku University School of Medicine, Japan; 2Mayo Clinic, USA

Background: Reverse shoulder arthroplasty (RSA) has been reported to improve pain and function in patients with cuff tear arthroplasty (CTA); massive rotator cuff tear and associated glenohumeral arthritis.1,2 For the potential complication or unclear long-term outcomes, however, surgeons might consider traditional rotator cuff repair as a salvage procedure. There has been limited information regarding the effect of prior rotator cuff repair on clinical outcomes after subsequent RSA in CTA patients. Therefore, the purpose of this study was to assess the outcomes of RSA in patients who had undergone previous rotator cuff repair compared with those who had not.

Methods: Using a single institution’s total joint registry, 1082 shoulders that underwent RSA were reviewed. We identified 68 shoulders with CTA (67 patients) that had undergone open or arthroscopic rotator cuff repair prior to RSA and had >2-year follow-up. We matched a 1:1 cohort of control patients without prior rotator cuff surgeries for age, sex, body mass index, and radiologic CTA classification (Hamada classification) at the prosthetic surgery. These two groups were compared for pre- and postoperative outcomes including pain score, active range of motion, manual muscle testing (MMT) for abduction, and ASES score. As a subgroup analysis for repairing procedures, clinical outcomes of RSA with open cuff repair (44 shoulders) were also compared to those with arthroscopic repair (24 shoulders).

Results: There were no significant differences in preoperative measurements between groups. Both groups showed improvement of pain score and active range of motion after performed RSA; whereas, active forward elevation at the final follow-up were significantly inferior in shoulders with prior rotator cuff repair (mean, 144° vs 155°, P = 0.04). No differences were shown in active external rotation or MMT for abduction between groups. Postoperative ASES score showed significant differences between patients with prior rotator cuff repair and patients in the control group (mean, 65.6 vs 73.8, P = 0.01). In patients with prior rotator cuff repair, there were no significant differences in RSA outcomes between open cuff repair and arthroscopic repair.

Discussion: This study demonstrates that RSA for CTA patients who have undergone prior rotator cuff repair provides a significant improvement of their symptoms and shoulder function at >2-year follow-up. These results might support the rotator cuff repair as a surgical option for advanced tears. On the other hand, surgeons should be aware that expected outcomes of RSA in patients who had undergone previous rotator cuff repair might be lower than outcomes of those who had not.

Conclusion: RSA could be a successful surgical option in patients with CTA who have undergone arthroscopic or open rotator cuff repair in terms of improved symptoms and shoulder function with greater than 2-year follow-up.

References: