regeneration of tendon in a chronic rotator cuff tear (RCT) model of rabbit. Method: In vitro, the cellular properties as well as the expression profiles of growth factors of BMAC were analyzed. The multi-lineage differentiation potential of BMAC with different carriers (atelocollagen and poly-deoxyribonucleotide) was also assayed. In vivo, sixty-four rabbits were randomly allocated 4 groups (n = 16 each). To create the chronic RCT model, we induced complete supraspinatus tendon tears in both shoulders, and left them untreated for 6 weeks. All transected tendons were repaired in a transosseous manner with saline injection in group A, only BMAC injection in group B, BMAC + poly-deoxyribonucleotide (PDRN) injection in group C, and BMAC + atelocollagen injection in group D. Genetic analysis was performed at 4 weeks after repair (8 rabbits per group), and the biomechanical analysis was performed at 12 weeks after repair (8 rabbits per group). Results: In vitro, the successful multi-lineage differentiations of BMACs were achieved under both PDRN and atelocollagen environments, forming multiphase tissues with tendon and cartilage-like regions, and there were no differentiation differences between two carrier environments. In vivo, groups with carriers (group C and D) showed higher collagen type Ia1, bone morphogenetic protein 2, and aggrecan expressions than the control groups. In vivo, groups with carriers (group C and D) showed higher collagen type Ia1, bone morphogenetic protein 2, and aggrecan expressions than the control groups. How-ever, the combination of BMAC and atelocollagen finally had more superior tendon-to-bone healing effects in a RCT model of rabbit.

Category: Shoulder - Rotator Cuff

Superior Capsular Reconstruction Using An Acellular Dermal Xeno- Or Allograft for the Treatment of Irreparable Posterosuperior Rotator Cuff Tears: Clinical and Radiographic Outcome at Minimum 2-Year Follow-Up

Abstract ID# 23248
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Summary: Superior capsular reconstruction leads to an improvement of pain and shoulder function in a cohort with irreparable posterosuperior rotator cuff tears.

Data:
Purpose: The purpose of this study was to evaluate the clinical and radiological outcome following superior capsular reconstruction (SCR) as a salvage procedure for patients with irreparable posterosuperior rotator cuff tears. It was hypothe-sized that SCR would lead to a significant reduction in pain and improvement of shoulder function, but that a low rate of graft integration would be observed. Material and Methods: Patients with irreparable posterosuperior rotator cuff tears, who underwent SCR with an allograft (acellular dermal patch) or xenograft (porcine xenograft) between the 05/2018 and 03/2020, were eligible for participation. Pre- and minimum 24 months postoperatively, patient-reported outcome measures (PROMs; American Shoulder and Elbow Society Score (ASES), Subjective Shoulder Value (SSV), Visual Analog Scale (VAS) for pain) and shoulder range of motion were evaluated. Additionally, isometric abduction, flexion, and external rotation strength was tested postoperatively using an isometric dynamometer and compared to the contralateral side. Lastly, magnetic resonance imaging was performed to evaluate graft integration. The pre- to postoperative change in PROMs and side-to-side difference in ROM as well as isometric strength were tested for statistical significance. Results: In total, 21 patients (mean age 52.6 ± 9.4 years; 59.1% male) were included in the study. In 12 cases (54.5%) an allograft and in 9 cases (45.5%) a xenograft was used. At follow-up (33.6 ± 7.1 months), a significant improvement of the ASES Score (38.0 [interquartile range 21.5-59.0] vs. 70.0 [62.5-95.0]; p<0.001) and the SSV (70 [50-80] vs. 95 [77.5-100]; p<0.004) as well as a significant reduction in pain (VAS for pain 6 [4-8.0] vs. 1 [0-2.0]; p<0.001) were reported. Patients’ abduction (807 [45.0-100.0] vs. 145.07 [100.0-165.0]; p<0.004) and flexion (907 [60.0-155.0] vs. 1507 [95.0-170.0]; p<0.017) ROM significantly improved, whereas external rotation ROM did not change significantly (p=0.775). Abduction (p<0.001) and flexion (p<0.001) strength was significantly lower when compared to the contralateral side, but no significant difference was noted regarding external rotation strength (p>0.05). Magnetic resonance imaging revealed an SCR-graft integration in one case (5.9%). In total, 4 patients under- went revision surgery (2x latisimus dorsi transfer, 2x reverse total shoulder arthropasty), which was performed in the xenograft group (44% revision rate for xenografts). Conclusion: In a cohort with irreparable posterosuperior rotator cuff tears, SCR achieved a significant improvement in shoulder function and reduc-tion in pain. However, an overall low rate of graft integration and high rate of revision when using xenografts should be noted.

Category: Shoulder - Rotator Cuff

Clinical Results After Tendon Patch Grafting Using Distal Fascia Lata Autograft For Irreparable Massive Rotator Cuff Tears

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Summary: The purpose of this study is to investigate the clinical outcomes and MRI results of autologous fascia lata transplantation in massive rotator cuff tears.

Data:
PURPOSE: To assess minimum 2-year clinical outcomes after open biologic patch augmentation with distal fascia lata (DFL) repair in patients with irreparable large or massive rotator cuff tears (RCTs) with low-grade fatty tendon degeneration (stage 1 or 2 according to Goutallier classification) MATERIALS & METHODS: This study included 32 patients (24 men and 8 women) with a mean age of 57 years (range, 26 to 68 years) with massive rotator cuff tears who underwent open rotator cuff repair with patch augmentation were identified after clinical and MRI evaluation. All selected patients have undergone conservative therapy with ineffective results before surgical treatment and have persistent pain and weakness. Outcomes data collected included Constant and American Shoulder and Elbow Surgeons scores (ASES). After patch augmentation, there were no complications, no adverse reactions to the patch, and no patients required further surgery. Minimum 2-year outcome scores were available for 30 of 32 (96.3%) shoulders after a mean follow-up period of 2.5 years (range, 2.0 to 4.0 years). The ASES score improved by 79.2% (p<0.05) points especially the function component improved significantly when compared with their preoperative baseline (p<0.05). Median patient satisfaction at final follow-up was 9/10 (range, 2 to 10). Regarding the Constant shoulder score an excellent grade was achieved in 27 patients of 32 form the baseline. Post-operative MRI at the final follow-up showed that 3 shoulders (8.3%) had retears of the repaired RC, 6 (12.5%) had graft tears but no retears of the repaired RC, and 25 (79.2%) had no graft tears or retears of the repaired tendon; furthermore no progression of fatty degeneration was detected. CONCLUSIONS: Biologic patch augmentation using distal fascia lata autograft was an inexpensive, safe and effective treatment method for patients with RCT with deficient rotator cuff tendons with low-grade fatty tendon degeneration.

Category: Shoulder - Rotator Cuff

The Change in Shoulder Muscle Strength After Superior Capsule Reconstruction for Reinforcement of Arthroscopic Rotator Cuff Repair

Abstract ID# 22447
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Summary: Superior capsule reconstruction for reinforcement prevents postoperative retear of the repaired rotator cuff tendon and improves shoulder muscle strength.

Data:
Background: Arthroscopic rotator cuff repair (ARCR) is a useful surgical procedure for rotator cuff tears. However, clinical outcomes and shoulder muscle strength are impaired when retears occur after surgery. Recently, superior capsule reconstruction for reinforcement of arthroscopic rotator cuff repair (SCRR) has been introduced to prevent retear after ARCR for degenerated rotator cuff tears. However, it remains unclear how much shoulder muscle strength recover after SCRR. The objective of this study was to investigate the changes in shoulder muscle strength after SCRR in patients with reparable but degenerated rotator cuff tears.

Methods: We retrospectively studied twenty patients (mean age of 68.2 years) with degenerated rotator cuff tears (19 medium and one large tears, the Goutallier grade of the supraspinatus was 2–3) who underwent SCRR using an autograft of fascia lata. Shoulder muscle strength, Japanese Orthopaedic Association (JOA) score, and shoulder pain using Visual Analog Scale (VAS) were evaluated before and at the final follow-up (mean, 23.3 months; range, 12–62 months). Shoulder muscle strength in abduction (at full-can position and at 90 degrees of shoulder abduction position), external and internal rotation at side were measured using digital handheld dynamometer (microFET2; Hoggan Scientific). Muscle strength in the affected shoulder was calculated as a percentage of that in the asymptomatic shoulder.

Results: In this study, all 20 patients had no retear at the final follow-up. All shoulder muscles strengths significantly increased after SCRR (abduction strength at full-can position, 46% preoperatively to 87% postoperatively; at 90 degrees of shoulder abduction position, 31% to 88%; external rotation strength, 50% to 86%; and internal rotation, 85% to 105%, all P < 0.0001). JOA score was significantly improved after SCRR (62.5 ± 10.7 points preoperatively to 92.0 ± 6.3 points postoperatively, P < 0.0001). VAS score for shoulder pain was significantly decreased after SCRR (at rest: 15.5 mm preoperatively to 0.2 mm postoperatively, during motion: 58.5 mm to 8.1 mm, both P < 0.0001). Conclusions: SCRR prevented postoperative retear of the repaired rotator cuff tendon even in cases with severely degenerated tendon. SCRR provided a significant pain relief and shoulder muscle strength returned to 86 to 105% of the uninjured contralateral side after SCRR.

Category: Shoulder - Rotator Cuff

Ultrasound Detects Increased Vascularity Following Rotator Cuff Tears Compared to Asymptomatic and Repaired Rotator Cuff Tendons

Abstract ID# 22835
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Summary: Ultrasound examination provides a low-risk method of examining microvascular changes seen in tendons after injury and during recovery. This study investigates the potential for utilization in future treatment and recovery monitoring.

Data: INTRODUCTION: Tears to the rotator cuff tendons are among the most common clinical tendon complications in the aging population [1]. Tendons are dense, highly organized, and relatively avascular tissues; however, tendon structural integrity and vascularity decrease with age and may be related to increased injury risk with age [1-3]. Further, tendon vascularity may change in the presence of tendon pathology consistent with acute inflammatory and healing processes such as in response to rotator cuff tears [4,5]. The aim of this study is to examine the microvascular nature of the supraspinatus tendon (SSP) and long head of the biceps tendon (LHBT) using an ultrasound technique for superb microvascular imaging (SMI) in asymptomatic, torn, and repaired rotator cuff tendons. METHODS: This prospective study was approved by the institutional IRB and included 18 volunteers with asymptomatic shoulders (55 ± 18 y BMI 22.6 ± 3.0 kg/m2, 7 males), 6 with an unrepaird rotator cuff tear involving the SSP (64 ± 3 y, BMI 24.6 ± 4.1 kg/m2, 5 males, mean 28 months since tear), and 6 who had undergone a rotator cuff repair and biceps tenodesis surgery at least 4 months prior (57 ± 10 y, BMI 25.5 ± 1.5 kg/m2, 5 males, mean 7 months since repair). An ultrasound examination was performed using an Aploio i800 system and an i1BLX linear array transducer (PLI-1205SB/FS, Canon Medical Systems, Inc.). Two orthopedic surgeons with 6 years of experience with musculoskeletal ultrasonography measured microvasculature in the SSP and proximal LHBT with the SMI mode. The area of the vascular signal (cm2) within the tendons was recorded in both transverse and longitudinal orientations. Correlations between tendon vascular signal and age were assessed for asymptomatic subjects using a Pearson’s correlation coefficient. Differences between asymptomatic, tear, and repair cohorts and between readers were compared using a two-way ANOVA statistical test with a Tukey post-hoc analysis. RESULTS: There was significantly greater vascular signal in the longitudinal direction of torn supraspinatus (p = 0.036, Figures 1 and 2) and biceps tendons (p = 0.002, Figure 1) compared to asymptomatic and post-operative tendons. There were no differences between groups when vascularity was measured in the transverse direction (SSP p = 0.728, biceps p = 0.264). Correlations could not be found between the age of asymptomatic participants and the vascular signal within the SSP (R = 0.1732, p = 0.5063) and LHBT (R = −0.3594, p = 0.1566) in the longitudinal direction, nor in the transverse direction for the SSP (R = −0.2903, p = 0.2583) or LHBT (R = 0.2498, p = 0.3335). DISCUSSION: There was minimal vascular signal within asymptomatic tendons. The vascularity signal increased in individuals with unrepaird SSP tears. Approximately 4-8 months following SSP repair and biceps tenodesis, tendon vascularity was not significantly different from asymptomatic tendons. Overall, results suggest that ultrasound techniques that evaluate tendon microvasculature in the absence of contrast agents may represent a low-risk and reliable method to monitor rotator cuff tendons following injury and during recovery. Further investigation will examine if the increased vascularity in the torn state could be a potential target for medication to increase healing rates. SIGNIFICANCE/ CLINICAL RELEVANCE: Ultrasound examination provides a low-risk method of examining microvascular changes seen in tendons after injury and during recovery. This study investigates the potential for utilization in future treatment and recovery monitoring.

Category: Shoulder - Rotator Cuff

Outcome Comparison Between Arthroscopic Repair Of Full-Thickness Rotator Cuff Tear In Workers’ Compensation And Non-Workers’ Compensation Patients: Special Counseling Is Required

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Summary: WC patients are on average 8 years younger than non-WC patients but have lower clinical outcomes scores at week 26 compared with non-WC patients. Paradoxically however, WC patients have better healing with inferior retear rates and therefore, it is speculated, a better long-term prognosis. This result is helpful in the counselling of these patients and the formation of rehabilitation plans.

Data: Introduction: Rotator cuff tears (RCTs) are significantly more common in manual workers referred to as workers’ compensation patients (WC), especially those involved in repetitive overarm lifting compared to the general population. RCTs are therefore a burden on the health care system as well as the manual workers, who are cared for under the WC insurance. The purpose of this study was to compare the functional outcome and retear rate of arthroscopic repair of full-thickness rotator cuff tear (FTRCT) in WC compared to non-WC patients. Methods: A total of 301 patients with FTRCT were included. 243 non-WC patients and 58 WC patients that required an arthroscopic rotator cuff repair between 2012 and 2020 were assessed by Constant score, Western Ontario Rotator Cuff Index (WORC), and Oxford score. Details were retrieved from the Socrates Orthopaedic Outcomes Software database. Surgical procedures were performed by the same experienced senior surgeon (MH). All patients had undergone an arthroscopic suture bridge repair technique. Results: Statistically, a significant difference was observed between the mean age of patients. 63 years ± 8.28 for the non-WC group and 55 years ± 7.52 for the WC group (p<0.001). No differences in the grade of tendinopathy were observed between both groups. Clinical outcomes were significantly improved at week 26 of all three scores (p<0.05) compared to preoperative scores in both groups. WC patients have statistically significant inferior Total Oxford Scores and WORC Total score preoperatively, at week 12 and at week 26 compared with non-WC patients (p<0.05). No differences between preoperatively Constant Scores were observed between both groups. Although subjective Constant score was statistically significantly lower in the WC group (15.69 ± 7.5 vs 18.51 ± 6.5 p<0.05). The Constant score at week 26 reflected statistically...