Data: Restoration of the original anatomical bone-to-tendon interface (BTI) after rotator cuff repair (RCR) remains a significant challenge, therefore a multitude of biocompatible biomaterials has been investigated to promote rotator cuff healing after repair. Purpose: To investigate the efficacy of 3D-printed scaffolds incorporated with spatiotemporal delivery of growth factors (GF) to accelerate BTI healing after RCR. Methods: Advanced 3D printing was used to fabricate the multilayered scaffolds, spatially embedded with different GFs to guide regional differentiation of endogenous stem/progenitor cells. A sustained, spatially controlled release of GFs was confirmed. The multi-lineage differentiation potential of mesenchymal stem cells (MSCs) in the scaffold was assayed. In vivo, a total of 50 rabbits, with induced chronic rotator cuff injuries, were divided into 4 groups: Normal (N, n = 2), saline control (A, n = 16), scaffold without GF (B, n = 16), and scaffold with GF (C, n = 16). At 6 weeks after the creation of rotator cuff tears, surgical repairs were performed when scaffolds were implanted between the bony footprint and supraspinatus tendon. RT-qPCR analysis was performed at 4 weeks after the repair, and biomechanical and micro-CT analyses were performed at 12 weeks after repair. Results: In vitro, the scaffolds successfully guided regional differentiation of MSCs, forming multiphase tissues with tendon, cartilage and bone-like regions. In vivo, group C showed higher collagen type Iα1, collagen type IIIα1, and aggregan expressions than the other groups (P < 0.001, = 0.005 and =0.006, respectively) at 4 weeks after repair. For the biomechanical evaluation, group C showed a significantly higher load-to-failure rate than the other groups (P = 0.003) at 12 weeks after repair. For the micro-CT analysis, group C showed higher bone mineral density and bone volume/total volume rate than the other groups (P = 0.001 and < 0.001, respectively) at 12 weeks after repair. Conclusion: This new bioactive spatially-embedded growth factor (SEGF) Scaffold effectively accelerated BTI healing in chronic rotator cuff tear model of rabbits.

Category: Shoulder - Rotator Cuff

Postoperative Graft Integrity Affects Clinical Outcomes After Superior Capsule Reconstruction Using Fascia Lata Autograft in Posterior-Superior Rotator Cuff Tears: A Multicenter Study

Abstract ID# 23082
All Authors:
Akihiko Hasegawa MD, PhD JAPAN
Teruhisa Mihata MD, PhD JAPAN
Nobuyuki Yamamoto MD, PhD JAPAN
Norimasa Takahashi MD JAPAN
Nobuyuki Senda MD JAPAN
Cazumasa Takayama MD JAPAN
Akihiro Uchida MD JAPAN
Masashi Neo MD, PhD, Prof. JAPAN

Summary:
Postoperative graft thickness and size of graft tear affected clinical and radiographic outcomes after superior capsule reconstruction using a fascia lata autograft. Shoulders with intact grafts of sufficient thickness restored glenohumeral stability and showed better clinical outcomes compared to those with graft thinning or graft tears.

Data:
Background: Previous studies have postulated that graft thickness and graft healing may be important factors for optimizing clinical outcomes of superior capsule reconstruction (SCR) for patients with irreparable rotator cuff tears (RCTs). However, the relationship between postoperative graft integrity and clinical outcomes after SCR remains unclear. We aimed to assess the relationship between postoperative graft integrity, including graft thickness and size of graft tear, and clinical outcomes after SCR in patients with irreparable RCTs.

Methods: This retrospective multicenter study included 188 patients (86 women, 102 men; mean age, 69.2 years; range, 49–87 years) with irreparable RCTs who underwent arthroscopic SCR using fascia lata autografts. Postoperative graft integrity was evaluated using magnetic resonance imaging (MRI) at 1 year or later after surgery and was classified into four categories according to Hasegawa's classification: type I-II, intact graft of sufficient thickness; type III, thinned graft without discontinuity; type IV, presence of a minor discontinuity; and type V, presence of a major discontinuity. We compared (1) baseline characteristics, (2) visual analog scale (VAS) for pain, (3) American Shoulder and Elbow Surgeons (ASES) score, (4) active shoulder range of motion (ROM), and (5) acromiohumeral distance (AHD) among four groups based on postoperative graft integrity. Results: MRI scans revealed 152 shoulders (80.9%) with type I-II graft, 13 (6.9%) with type III graft, 13 (6.9%) with type IV graft, and 10 (5.3%) with type V graft. VAS and ASES scores significantly improved after SCR in all graft types (all P < 0.05). However, shoulders with type V grafts had significantly inferior postoperative VAS and ASES scores compared to those with type I-II grafts (all P < 0.05). Shoulders without graft tears (types I-II and III) showed significant improvements in shoulder ROM after SCR (all P < 0.05). In contrast, shoulders with large graft tears (types V) showed no significant improvement in shoulder ROM. Postoperative AHD was significantly increased only in shoulders with type I-II grafts (both P < 0.0001). Conclusion: Postoperative graft thickness and size of graft tear affected clinical and radiographic outcomes after SCR using a fascia lata autograft. Patients with large graft tears had significantly inferior postoperative clinical scores compared to those with intact grafts of sufficient thickness although arthroscopic SCR provided pain relief even in patients with graft tears. Shoulders with intact grafts of sufficient thickness restored glenohumeral stability and showed better clinical outcomes compared to those with graft thinning or graft tears.

Category: Shoulder - Rotator Cuff

A Comparative Study of Patch Graft Procedure and Superior Capsular Reconstruction in the Treatment of Irreparable Large to Massive Rotator Cuff Tears

Abstract ID# 23574
All Authors:
Daisuke Mori MD JAPAN
Masahiko Kobayashi MD, PhD JAPAN

Summary:
In treatment of massive rotator cuff tears with high-grade fatty degeneration of the infraspinatus, superior capsular reconstruction may not be superior to patch procedure for graft integrity.

Data:
Purpose: This study compared clinical and radiographic outcomes after superior capsular reconstruction (SCR) and fascia lata autograft patch procedure (PG) in treatment of large to massive rotator cuff tears (RCTs). Methods: This study included 42 shoulders in 42 patients who underwent the patch graft procedure (Group PG) and 42 patients who underwent SCR (Group SCR) for irreparable large or massive RCTs. Clinical assessments were assessed using Constant score ASES Scores. We used magnetic resonance imaging (MRI) evaluation especially focusing on the patch integrity or retears of the native cuff (the infraspinatus and/or subscapularis tendon). The repair integrity was classified as intact or nonintact based on the appearance of the native cuff, the tendon-graft interface, and the graft at the anatomic footprint on the humeral head. Intact repairs showed no high signal intensity areas in the native cuff, the tendon-graft interface, or the graft-humeral interface. In addition, we assessed the presence of Sugaya 5 retear (a major discontinuity in each MRI image). Results: There were no significant differences in any variables between the 2 groups except for follow-up period, mediolateral tear size, anterior to posterior tear size, biceps tenodesis (a), preoperative supraspinatus Goutallier stage 3 or 4 (%), preoperative subscapularis Goutallier stage 3 or 4 (%). Postoperative MRI showed that 13 of 42 (31.0 %) shoulders had intact repairs in PG group and 27 of 42 (64.3 %) shoulders had intact repairs in SCR group (P = .004). In addition, Postoperative MRI showed that 19 of 42 (45.2 %) shoulders had shoulders with Sugaya 5 retear in PG group and 9 of 42 (21.4 %) shoulders had shoulders with Sugaya 5 retear in SCR group (P = .002). Compared with preoperative scores, the mean Constant, ASES scores were significantly improved at the final follow-up in both groups (P < .001) in the two groups. At the final follow-up, the mean Constant and ASES scores were higher in group SCR than in group PG without significance (71.8 vs 70.0; P = .474 for the Constant score, 84.4 vs 79.1; P = .118 for the ASES score). Stepwise multivariate logistic regression analysis identified the treatment group (PG vs SCR) and GFDI as the significant predictive factors for shoulders without intact repairs (odds ratio, 3.323; 95% CI, 1.271-8.691; P = .014 for the treatment group, odds ratio, 3.753; 95% CI, 1.374-10.253; P = .010 for GFDI, respectively). In addition, the analysis identified the presence of preoperative ISP Stage 3 or 4 and SSP stage 3 or 4 as the significant predictive factors for shoulders with Sugaya 5 retears (odds ratio, 6.791; 95% CI, 2.345-19.662; P < .001 for the ISP Stage 3 or 4, odds ratio, 5.681; 95% CI, 1.109-29.090; P = .037 for the SSP Stage