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Challenge for Biological Healing of Massive Rotator Cuff Tears with Muscle Advancement and Absorbable Biomaterial Augmentation

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Summary:
Ideal outcomes and low failure rate of arthroscopic rotator cuff repair aiming for biological healing with rotator cuff muscle advancement and absorbable biomaterial augmentation are expected to provide good clinical outcomes even if the tear sizes were too massive to repair.

Abstract:
Introduction: For small- to medium-sized rotator cuff tears (RCTs), many authors reported good to excellent clinical outcomes as well as high anatomical healing rates after arthroscopic rotator cuff repair (ARCR). However, high failure rates after ARCR were often reported for large to massive RCTs. Since prior reports have shown a direct correlation between the postoperative clinical outcome and anatomic healing of the RCTs, reduction of the failure rate after ARCR might be crucial to achieve an excellent outcome of the ARCR. We therefore performed ARCR aiming for biological healing with rotator cuff muscle advancement (MA) and using absorbable artificial biomaterial augmentation for the massive RCTs to decrease the tension at the repair site and to reinforce the repaired cuff. We investigated the postoperative clinical outcomes and failure rate after this procedure.
Methods: 39 patients (average age was 68.5±7.7 years) diagnosed with massive RCTs and underwent ARCR with supraspinatus and infraspinatus MA and polyglycolic acid (PGA) sheet augmentation with a minimum follow-up of 2 years after surgery were included in this study. MA was performed in cases whose cuff tendons had tension too high to cover the footprint entirely as follows; supraspinatus and infraspinatus muscles were elevated from the scapula fossa, these muscles were advanced laterally, and ARCR was performed by transosseous equivalent double-row repair. And PA was performed as follows; 0.5 mm PGA sheets double-overlapped were penetrated by the sutures of the medial anchors with torn cuff tendon, and the suture from each medial anchor held the sheets by the lateral anchors. We evaluated the pre- and postoperative range of motion (ROM), isometric muscle strength, acromio-humeral interval (AHI), and clinical outcomes using the Constant score and the UCLA score, and compared statistically. Furthermore, cuff integrity by MRI during the last follow up period was assessed, and failure rate was calculated.
Results: ROM of flexion, isometric muscle strength of abduction, external and internal rotation, AHI, the Constant score, and the UCLA score significantly improved after surgery (from 129 degrees, 22.7 N, 28.4 N, 61.0 N, 6.9 mm, 45.4 points, and 13.7 points to 147 degrees, 34.6 N, 44.2 N, 85.9 N, 9.3 mm, 67.4 points, and 28.3 points, respectively). However, ROM in external and internal rotation didn't improve significantly after surgery. Re-ruptures occurred in 8 cases, and the failure rate was 20.5%. There was no postoperative complication such as infection, foreign body reaction, or neuro-vascular injury.
Discussion and Conclusion: Although we reported the good clinical outcomes of supra- and infraspinatus MA for large-to-massive RCT at the 2015 annual meeting of ISAKOS, the failure rate of 23.5% was still high. Since we previously reported rotator cuff regeneration using the PGA sheet in rabbit cuff deficiency models, we utilized this sheet for cuff augmentation, and ideal outcomes and low failure rate were achieved. This ARCR procedure aiming for

biological healing, are expected to provide good clinical outcomes even if the tear sizes were too massive to repair.