The Influence of Intraoperative Repair Tension on the Rotator Cuff Integrity after Arthroscopic Repair

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COI Disclosure Information

Presenter: Yoshitsugu Takeda MD.PhD.

I have no financial conflicts to disclose.
Introduction

• Intraoperative cuff repair tension plays an significant role on achieving anatomic healing after rotator cuff repair\(^{(1-6)}\).
• However, few have correlated intraoperative repair tension with postoperative rotator cuff integrity\(^{(5)}\).

Objectives

• To evaluate the repair tension as a predictive factor for rotator cuff integrity after arthroscopic rotator cuff repair (ARCR), and to determine the minimum repair tension to increase the risk of retear.
Subjects

Consecutive patients who underwent ARCR from June 2014 to June 2017

Inclusion criteria

- Full thickness RC tear with medium or larger size
- Complete repair coverage of the footprint
- Available for MRI pre-op. and at 12 months after surgery

- Male: 85, Female: 35
- Mean Age: 64.5yrs. (33~80)
- Tear Classification (DeOrio & Cofield)
  - Medium 69, Large 44, Massive 7 shoulders
- Surgical Procedure
  - Single-row 13, Double-row 34, Suture-bridge 73 shoulders
MRI Examination

Intra Achiva 3.0T® (Philips)

Pre-operative MRI

- **Tear Size**
  - Mediolateral, Anteroposterior
- **Fatty infiltration: SSP&ISP**
  - Stage I, II. vs. III, IV
- **Muscle atrophy: SSP**
  - Occupation Ratio (%)

Post-operative MRI

- **Sugaya’s classification**
  - Type I, II, III: Healed
  - Type IV, V: Retear
Measurement of Repair Tension

30° ABD & 0° ER in Scapular plane

#2 FiberWire at the point of maximal tension

Tension meter was attached to the suture after 50 cyclic tensioning

Tendon was pulled at the lateral edge of the tuberosity

Tension was measured after 30 seconds

Davidson PA. JSES 2000 (1)
Statistical Analysis

- **Multiple regression analysis**
  - To determine whether repair tension is an independent factor for predicting retear after ARCR

- **Receiver operating characteristic (ROC) curve**
  - Discriminative ability for Repair tension to predict retear
  - Cut-off value to distinguish those who have a tear from those who do not.

- **Significance level was set at \( P < .05 \)
Results

- **Rotator Cuff Integrity**
  - Sugaya Type IV+V: 29 Shoulders (24.2%)

- **Mean Repair Tension**
  - 26.6N ± 12.6 (2.2 – 66.7)
  - Repair group: 24.3±11.3N
  - Retear group: 34.7±13.6N

- **Factors for retear using logistic regression**

<table>
<thead>
<tr>
<th>Parameter</th>
<th>Estimate</th>
<th>Odds ratio</th>
<th>95% CI</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Repair Tension</td>
<td>0.6765</td>
<td>1.0579</td>
<td>1.0160</td>
<td>1.1015</td>
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<tr>
<td>Occupation ratio</td>
<td>-0.9849</td>
<td>0.9271</td>
<td>0.8853</td>
<td>0.9709</td>
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Cut-off value to distinguish those who have a tear from those who do not

**Cut-off value : 26.0N**

![ROC Curve](image)

**AUC**
**(Area Under Curve)**
**0.712 (p<0.001)**

Discriminative ability for Repair tension to predict retear
Discussion

Effect of Repair Tension on Clinical Outcome/Cuff Integrity

- High tension repairs (>36N) are associated with poor outcomes and are not recommended.

  Davidson PA. JSES 2000\(^{(1)}\)

- Repair tension in Healed vs. Retear = 27N : 37N

  Kim DH. AJSM 2016\(^{(5)}\)
Repair tension vs. RC integrity

- Within our knowledge, only Kim’s study\(^{(5)}\) investigated the relationship between intraoperative repair tension and postoperative RC integrity.

- The present study showed that repair tension and occupation ratio of the SSP are the independent predictive factor for RC integrity.

- ROC curve determined the cut-off value of repair tension for retear was 26.0N.

- AUC of the ROC curve was 0.712, which indicated that discriminative ability for repair tension to predict retear was moderate.
Discussion

Decision Making for Surgical Procedure

Primary repair or

- Medialization
- Partial repair
- Muscle advancement
- Muscle transfer
- SCR

Measured tension can be used as one of the indicator for surgical procedure

- Easy to measure
- With an inexpensive equipment
- In a few minutes
Conclusion

- Intraoperative repair tension was an independent predictive factor that affected the incidence of retear after ARCR.
- Repair tension of more than 26N increases the risk of retear.

References

1. Davidson PA. JSES 2000
2. Domb BG. JBJS 2008
3. Guoltta L. JBJS Am 2011
5. Kim DH. AJSM 2016