Preoperative Predictive Factors for Rotator Cuff Repair Tension during Arthroscopic Rotator Cuff Repair

Y. Takeda, K. Fujii, N. Suzue

Department of Orthopaedic Surgery
Tokushima Red Cross Hospital
Tokushima, Japan
12th Biennial ISAKOS Congress

COI Disclosure Information

Presenter: Yoshitsugu Takeda MD.PhD.

I have no financial conflicts to disclose.
Intraoperative Rotator Cuff Repair Tension

• Intraoperative rotator cuff repair tension plays an significant role on achieving anatomic healing after rotator cuff repair\(^{(1-6)}\).

• However, correlations between preoperative factors and repair tension have not been well documented\(^{(3)}\).

Objectives

• To determine the preoperative clinical and MRI factors for affecting repair tension during arthroscopic rotator cuff repair (ARCR)
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

- Exclusion criteria
  - Incomplete or partial repair
  - History of previous shoulder surgery
  - Isolated subscapularis tendon tear
Subjects

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

Preoperative Clinical Factors
- Age
- Sex
- BMI
- Duration between onset and surgery
- Diabetes mellitus
- Smoking

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

Grade 1  Grade 2  Grade 3  Grade 4
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. (1)
Statistical Analysis

- **Pearson/Spearman correlation coefficient**
  - To determine the correlation between various preoperative factors with the repair tension

- **Multiple regression analysis**
  - To identify the independent preoperative factors to predict intraoperative repair tension

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

- **Mean Repair Tension**
  - 26.6N ± 12.6 (2.2 – 66.7)

- **Significant Correlation with Repair tension**
  - Tear size: ML
  - Tear size: AP
  - Fatty Infiltration

  - **FI:SSP**
    - \( r=0.251 \)
    - \( p=0.006 \)

  - **FI:ISP**
    - \( r=0.272 \)
    - \( p=0.003 \)

  - **r=0.519, p<0.001**
  - **r=0.374, p<0.001**

- **No Significant Correlation with Repair tension**
  - Age, Sex, BMI, Duration, DM, Smoking
  - Occupation ratio
# Multiple Regression Analysis for Independent Variables on Repair Tension

<table>
<thead>
<tr>
<th>Variable</th>
<th>$\beta$</th>
<th>95% CI</th>
<th>p value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Occupation Ratio</td>
<td>0.449</td>
<td>0.020-0.477</td>
<td>0.034</td>
</tr>
<tr>
<td>Tear size:ML</td>
<td>0.820</td>
<td>0.275-1.456</td>
<td>0.005</td>
</tr>
</tbody>
</table>

- Occupation Ratio
- Tear size in ML direction
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)

- Better clinical outcome and cuff integrity can be expected, if the tension is less than 29N.
  Nakamizo H. Katakansetsu 2008(5)

- Repair tension in Healed vs. Retear = 27N : 37N
  Kim DH. AJSM 2016(3)
Intraoperative repair tension can be used as one of the indicators for surgical procedure.

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

Preoperative predictive factors for intraoperative repair tension would be helpful in preparation for surgery & explanation to patients.

- Tear size in ML direction
- Occupation Ratio
Conclusion

- Although tear size in AP direction and fatty infiltration of SSP/ISP were significantly correlated with repair tension, only tear size in ML direction and occupation ratio of SSP were the only independent factors to affect repair tension during surgery.

References

1. Davidson PA. JSES 2000
2. Guoltta L. JBJS Am 2011
4. Mannava S. JBJS Am 2011
5. Nakamizo H. Katakansetsu 2008
6. Takeda Y. ISAKOS 2019