Evaluation of subscapularis tendon tear on preoperative MRI

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ABSTRACT INTRODUCTION:

Subscapularis (SSC) tendon tear is detected in about 20-40% of the patients with rotator cuff tear during surgery. Magnetic resonance imaging (MRI) scans have been used as a diagnostic tool for predicting the presence of SSC tear. But it is difficult to diagnose the SSC tear correctly. The purpose of this study is to evaluate the significance of various preoperative MRI findings to predict SSC tear confirmed at arthroscopic surgery.

MATERIALS AND METHODS:

We retrospectively reviewed 48 consecutive shoulders (47 patients, 27 males and 20 females, mean age of 62.9 years old) that underwent arthroscopic operations including rotator cuff repair, SLAP repair, Bankart repair, debridement, and distal clavicle resection from April, 2009 to March, 2011. We defined complete SSC tear as the full-thickness tear and incomplete SSC tear as the tendon detachment larger than 5mm of joint side from the insertion under arthroscopic examination.

Preoperative MRI examination was performed using T2-weighted images. SSC discontinuity was evaluated using the oblique coronal and axial planes. SSC discontinuity was defined as abnormal high signal that extended through the entire thickness of the tendon. A tear of the superior glenoid labrum anterior and posterior (SLAP) was evaluated using the oblique coronal plane and dislocation, subluxation and tear of the long head of biceps tendon (LHB) were evaluated using the axial plane. We examined the presence of two periarticular fluid. First, superior SSC recess is an evagination of the glenohumeral joint around or through the glenohumeral ligament and extends superiorly and anteriorly over the SSC1) (Figure, left panel). Superior SSC recess fluid was examined with oblique sagittal planes. Second, subcoracoid bursa effusion was diagnosed when a discrete fluid collection was identified inferior to the coracoid process and anterior to the SSC with oblique sagittal plane2) (Figure, right panel). Fatty degeneration in the muscle was evaluated according to Goutallier’s classification method. Statistical analyses were performed using Pearson χ² test. Statistical significance was set at p<0.05.

RESULTS:

Of the 48 shoulders, 38 had rotator cuff tear which was detected by arthroscopic evaluation, including 8 shoulders with complete SSC tear and 10 with incomplete SSC tear. The rate of detection of the SSC discontinuity by axial and sagittal MRI was significantly higher in complete SSC tear group than in incomplete and no SSC tear groups (sensitivity 87.5% and 50.0%, specificity 97.5% and 97.5%, respectively) (Table). SSC discontinuity by axial MRI had the highest sensitivity and specificity in detecting complete SSC tear compared with other signs. LHB tear was not associated with SSC tear, but LHB subluxation or dislocation showed significantly higher prevalence in complete and incomplete SSC tear groups (3 of 18) than in no SSC tear group (0 of 30). With regard to superior SSC recess fluid, SSC tear groups had a higher incidence and, particularly, all the shoulders with incomplete SSC tear had positive sign (sensitivity, 100%; specificity, 50.0%). On the other hand, subcoracoid bursa effusion was not associated with complete or incomplete SSC tears. Fatty degeneration of SSC on MRI, judged by Goutallier’s classification, was more prominent in shoulders with complete SSC tear than in incomplete tear and no SSC tear.

All of the shoulders with SSC tear displayed at least one sign on above MRI examination. When we calculate the number of positive MRI signs at each shoulder, no SSC tear had 0.9 ± 0.84, incomplete SSC tear had 1.9 ± 1.10 and complete SSC tear had 3.5 ± 1.07.

Table. Correlation of MRI finding and arthroscopically confirmed SSC tear.

<table>
<thead>
<tr>
<th>MRI finding</th>
<th>Arthroscopic finding</th>
<th>P value</th>
</tr>
</thead>
<tbody>
<tr>
<td>no tear</td>
<td>incomplete</td>
<td>complete</td>
</tr>
<tr>
<td>discontinuity</td>
<td>axi</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>sag</td>
<td>30</td>
</tr>
<tr>
<td>LHB tear</td>
<td>30</td>
<td>0</td>
</tr>
<tr>
<td>LHB subluxation</td>
<td>30</td>
<td>0</td>
</tr>
<tr>
<td>SC effusion</td>
<td>19</td>
<td>5</td>
</tr>
<tr>
<td>SLAP</td>
<td>28</td>
<td>10</td>
</tr>
<tr>
<td>fatty degeneration</td>
<td>28</td>
<td>10</td>
</tr>
<tr>
<td>+</td>
<td>2</td>
<td>0</td>
</tr>
</tbody>
</table>

Figures. Sagittal images of MRI of the left shoulder. Left panel shows superior SSC recess fluid (arrow). Right panel shows subcoracoid bursa effusion (arrowhead).

DISCUSSION:

In our study, SSC tear were found in 47.4% of shoulders with rotator cuff tear (18 of 38 rotator cuff tear) and the rate is similar to that of the report by Adams et al1). In our result, the presence of SSC discontinuity, LHB subluxation or dislocation, superior SSC recess fluid, and fatty degeneration of SSC were suggested the presence of complete SSC tear. We also reported SSC discontinuity had the highest sensitivity. Tung et al reported SSC discontinuity was found 15 of 16 shoulders with SSC tear1). Therefore, we have suggested that the presence of SSC discontinuity is useful for screening of complete SSC tear.

In the present study, subcoracoid bursa effusions were not associated with complete and incomplete SSC tears, whereas the presence of superior SSC recess fluid was associated with SSC tear, particularly in incomplete tear group. In a study of Grainger et al, all 13 patients with subcoracoid bursa effusion had supraspinatus and/or infraspinatus tear, without SSC tear1). Superior SSC recess lies between the SSC muscle and the anterior surface of the scapula, extends above the superior margin of the SSC tendon and communicates with glenohumeral joint but not with the subcoracoid bursa3). On the other hand, the vast majority of SSC tears start on the articular and cephalad aspect of the tendon insertion5). Given these clinical and anatomical findings, we postulate that an incomplete (articular side) SSC tear may result in the effusion in superior SSC recess because of reactive inflammation.

The number of positive signs on MRI examination is associated with SSC tear size and we can suggest that there are incomplete or complete SSC tear when there are at least 2 signs.

SIGNIFICANCE:

The presence of SSC discontinuity, LHB lesion, and fatty degeneration of SSC are suggested to the presence of complete SSC tear, especially SSC discontinuity to be useful for screening. Whereas superior SSC recess fluid is associated with incomplete SSC tear.

REFERENCES: