ABSTRACT

Purpose. To compare shoulder ultrasonography with arthroscopy for detecting specific rotator cuff tears.

Methods. 96 shoulders in 56 men and 34 women aged 28 to 65 (mean, 42) years with rotator cuff problems underwent a shoulder ultrasonography by a single radiologist, and then a shoulder arthroscopy by a single surgeon. The ultrasonographic and arthroscopic findings were compared with regard to tendon-specific tears and disparities in diagnosis.

Results. For detection of supraspinatus tendon tears, ultrasonography attained a sensitivity of 89%, specificity of 43%, positive predictive value of 76%, and negative predictive value of 100%. For detection of subscapularis tendon tears, ultrasonography attained a sensitivity of 30%, specificity of 100%, positive predictive value of 100%, and negative predictive value of 78%. Sensitivity, specificity, and predictive values were good in larger full-thickness tears, but were significantly reduced in sub-centimetre and partial-thickness tears, particularly of the subscapularis tendon.

Conclusions. Surgeons should be aware of the potential disparities between ultrasonographic and arthroscopic findings and be prepared to adjust the surgical procedure during arthroscopy.

Key words: arthroscopy; rotator cuff; shoulder; ultrasonography

INTRODUCTION

Shoulder ultrasonography is a cost-effective and non-invasive tool for investigation of rotator cuff pathologies.1-5 Shoulder arthroscopy enables direct visualisation and thus is regarded as the gold standard to confirm diagnoses. Differentiation of the anterior (subscapularis) and superior (supraspinatus) tendon tears has important implications in preoperative planning. Few studies have reported the possible diagnostic errors of ultrasonography for rotator cuff tears.1,6-11 We compared shoulder ultrasonography...
with arthroscopy for detecting specific rotator cuff tears.

MATERIALS AND METHODS

Between May 2006 and October 2007, 56 men and 34 women (96 shoulders) aged 28 to 65 (mean, 42) years with rotator cuff problems underwent a shoulder ultrasonography by a single radiologist, and then a standard diagnostic shoulder arthroscopy (including a subacromial bursoscopy) via a posterior portal by a single surgeon. The patient was placed in a beach-chair position, and the affected joint was inflated using an Arthrex inflation pump with normal saline at pressure of 40 to 50 mm Hg. The integrity of the rotator cuff was recorded, as were the tendons involved, presence of full or partial thickness (articular or bursal surface) tears, and the size of any tear. The ultrasonographic and arthroscopic findings were compared with regard to tendon-specific tears (involving supraspinatus versus subscapularis tendons), disparities in diagnosis, and implications for surgical treatment.

RESULTS

For detection of supraspinatus tendon tears, ultrasonography attained a sensitivity of 89%, specificity of 43%, positive predictive value of 76%, and negative predictive value of 100% (Table). The relatively low specificity and positive predictive value were due to a high false positive value. In 19 cases, ultrasonography revealed either full-thickness or partial-thickness tears, but arthroscopy did not do so. Seven of the cases were described as full-thickness tears of <1 cm and 10 others as possible sub-centimetre tears. In 3 cases, ultrasonography suggested a full thickness tear of <1 cm, but arthroscopy showed a small partial-thickness tear.

For detection of subscapularis tendon tears, ultrasonography attained a sensitivity of 30%, specificity of 100%, positive predictive value of 100%, and negative predictive value of 78% (Table). The relatively low sensitivity and negative predictive value were due to a high false negative value. In the 19 false negative cases, one was a full-thickness tear and 18 were partial-thickness tears. All partial-thickness tears detected by arthroscopy involved the superior fibres of the subscapularis tendon. No full-thickness tears of the subscapularis tendon detected by ultrasonography turned out to be partial-thickness tears on arthroscopy or vice versa.

DISCUSSION

Shoulder ultrasonography enables dynamic visualisation and thus better understanding of problems with rotator cuff.¹ It requires radiological expertise to interpret the findings. The reliability of ultrasonography for rotator cuff pathologies performed by surgeons using portable machines has been reported.¹,¹²,¹³ Although this enables a speedy diagnosis and preoperative planning, interpretation of the ultrasound scans may be influenced/biased by the prior clinical examination by the surgeon.¹ In our study, clinical examination was performed by the surgeon and then conventional ultrasonography was performed by the radiologist on the same day. This avoided bias from the surgeon and also enabled a speedy diagnosis and preoperative planning.

Sensitivity and specificity for each of the rotator cuff tears have been reported, but few studies analysed the errors resulting from ultrasonography.¹⁴⁻¹⁹ In our study, most of the false positive supraspinatus tears were sub-centimetre tears. Only 3 supraspinatus tendons were full-thickness tears of <1 cm on ultrasonography and turned out to be small partial-thickness tears on arthroscopy. Nonetheless, this did not significantly change the treatment.⁸

Correlation between ultrasonography and arthroscopy for medium and large supraspinatus

<table>
<thead>
<tr>
<th>Modality</th>
<th>Supraspinatus tendon</th>
<th>Subscapularis tendon</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>No tear</td>
<td>Partial-thickness tear</td>
</tr>
<tr>
<td>Ultrasonography</td>
<td>22</td>
<td>9</td>
</tr>
<tr>
<td>Arthroscopy</td>
<td>41</td>
<td>12</td>
</tr>
</tbody>
</table>

Table

Shoulder ultrasonography versus arthroscopy
tears was good. A higher false positive rate (misinterpretation) of intra-substance tears and calcification noted on ultrasonography may be due to difficulty in diagnosing such tears by arthroscopy. Partial articular side tears, partial articular supraspinatus tendon avulsion, and combined tears are difficult to diagnose using ultrasonography and can account for the false negative cases.10,20

In our series, most full-thickness tears of the subscapularis tendon (which are clinically important and should be repaired operatively) were diagnosed correctly by ultrasonography. The misses among subscapularis tears were partial-thickness tears, and mostly involved the superior fibres. This did not significantly influence treatment.10

In our study, errors in measuring tear size by ultrasonography were not analysed, as the patients underwent arthroscopy after ultrasonography in a mean of 56 days. There may be progression or healing of small tears during this period; measurement errors occur most commonly in large or massive cuff tears.10

Although treatment options for rotator cuff tears are evolving,22 shoulder ultrasonography remains a reliable tool in preoperative planning, and clinicians should realise its possible errors.23–25 Its sensitivity, specificity, and predictive values in larger full-thickness tears are good, but in sub-centimetre and partial-thickness tears (particularly those of the subscapularis tendon), corresponding values were significantly reduced. False positive and false negative diagnoses of rotator cuff tears based on ultrasonography are likely to involve minor abnormalities of the cuff structure. Surgeons should be aware of the potential disparities between ultrasonographic and arthroscopic findings and be prepared to adjust the surgical procedure during arthroscopy.

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