Feature Article
The Relationship Between Acromial Morphology and Conservative Treatment of Patients With Impingement Syndrome
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ABSTRACT
This study assessed the predictive value of acromial morphology in the treatment outcome of patients with impingement syndrome. Sixty-five patients with impingement syndrome were treated by a single orthopedic surgeon according to the same protocol and initially received the same conservative modalities. The incidence of acromial types in the nonoperative group was significantly different from those in the operative group ($P = .008$). A large proportion (88.9%) of the patients with type I acromions responded to conservative measures, while fewer (73.1%) patients with type II acromions responded to conservative measures. The majority (58.3%) of patients with type III acromions required surgical intervention. Acromial morphology appears to have a predictive value in determining the success of conservative measures and the need for surgery in patients with impingement syndrome.

Acromial morphology has been classified into three types based on the shape of the acromion. Type I acromions have a flat undersurface, while type II acromions have a smooth curved undersurface. Type III acromions have a hooked undersurface and have been implicated as the causative factor in impingement syndrome leading to rotator cuff pathology.¹⁻⁴ Patients with acromial types II and III have less sub-acromial space available for cuff tendons and more theoretical impingement, which probably accounts for the association of type III acromions with rotator cuff tears.

Neer et al⁵,⁶ subdivided impingement syndrome into three stages. In the most severe stage of impingement syndrome, stage III, impingement led to a rotator cuff tear. Treatment of impingement syndrome initially involves the use of multiple conservative modalities. Patients who do not respond to conservative measures often require surgical treatment.

This study assessed the relationship between acromial type and treatment of patients with impingement syndrome.

MATERIALS AND METHODS
Sixty-five consecutive patients with impingement syndrome were diagnosed and treated by the senior author. All patients had a positive impingement sign, Jobe's test, and lidocaine impingement test.

Patients initially were treated with the same protocol, which included oral anti-inflammatory medications, physical therapy, and subacromial injections of corticosteroid (40 mg). Physical therapy consisted of a minimum of 6 weeks of treatment. Physical therapy consisted of rotator cuff strengthening (emphasizing shoulder joint depressors), range of motion exercises, joint mobilization, and modalities.

Patients who failed to demonstrate significant improvement despite conservative measures for 6 months underwent surgery. All surgical procedures were performed by the same orthopedic surgeon and consisted of an acromioplasty with or without a rotator cuff repair.

Supraspinatus outlet view radiographs were included as part of the standard shoulder series and were reviewed for each patient. Acromial type was identified for each patient.
Grading of acromial types was performed using Bigliani’s classification system. Patients were graded individually and as a group to minimize observer variability.

**RESULTS**

Sixty-five patients (33 men and 32 women) comprised the study population. Average patient age was 48.5 years (range: 28-88 years). Average total follow-up for all patients in the study was 24.2 months (range: 13-72 months). Patients were divided into two groups depending on whether they were treated with conservative measures only (nonoperative group) or failed conservative treatment and required surgery (operative group).

**Nonoperative Group**

Forty-eight (73.8%) patients comprised the nonoperative group. In these patients, symptoms resolved with conservative measures alone at an average of 3.8 months. Average patient age was 47.8 years. There were 23 men and 25 women.

All patients in the nonoperative group had significant improvement in their symptoms with conservative treatment alone. Only 5 (8%) patients had some mild residual discomfort, which was tolerable, and they did not wish further treatment. The remaining patients had complete resolution of all of their symptoms.

**Operative Group**

Seventeen (26.2%) patients who failed conservative management and went on to acromioplasty comprised the operative group. Average patient age was 50.5 years. There were 10 men and 7 women. This group included 8 (47%) patients with rotator cuff tears who underwent rotator cuff repair in addition to acromioplasty. All of the patients with rotator cuff tears had type III acromions.

Table 1 shows the distribution of the three acromial types between the two groups. The difference in the distribution of acromial types in the two groups was statistically significant (chi-square, P= .008).

**TABLE 1**

<table>
<thead>
<tr>
<th>Acromial Type</th>
<th>Nonoperative Group</th>
<th>Operative Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>I</td>
<td>50.0% (n=24)</td>
<td>17.6% (n=3)</td>
</tr>
<tr>
<td>II</td>
<td>39.6% (n=19)</td>
<td>41.2% (n=7)</td>
</tr>
<tr>
<td>III</td>
<td>10.4% (n=5)</td>
<td>41.2% (n=7)</td>
</tr>
</tbody>
</table>

*The difference in the distribution of acromial types was significant, P=.008.*

**TABLE 2**

<table>
<thead>
<tr>
<th>Acromion Type</th>
<th>Treatment</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>I</td>
</tr>
<tr>
<td>Conservative</td>
<td>88.9% (n=24)</td>
</tr>
<tr>
<td>Surgical</td>
<td>11.1% (n=3)</td>
</tr>
</tbody>
</table>

*The success of conservative management decreased with increasing acromial type, while the need for surgery increased with the acromial type (P=.008).*

Discussion

Curved or hooked acromions are associated with a higher likelihood of rotator cuff pathology. As a patient ages, a degenerative spur may form at the inferior margin of the acromion that can further encroach on the subacromial space, leading to advanced impingement syndrome. Although the varying shapes of the acromion have been classified, no relationship between acromial type and the treatment results of impingement syndrome has been established.

Initial treatment for impingement syndrome involves conservative modalities. Patients usually respond to anti-inflammatory medications, physical therapy, and subacromial injections within 3-6 months. Regardless of acromial type, conservative treatment should be the initial treatment for impingement syndrome, since the overall success rate is fairly high.

In this study, the success rate of conservative management overall was 73.8%. Patients whose symptoms persisted >6 months were offered surgery. The high success rate of conservative treatment has led many to believe that conservative modalities usually will suffice. However, acromial type must be considered when initiating a treatment plan so that the patient's expectations are not unrealistic.

The surgical management of impingement syndrome involves removing the anteroinferior edge of the acromion, converting it to a type I acromion with a smooth, flat undersurface. This acromioplasty removes the offending area of the acromion that has "impinged" on the rotator cuff tendons. In stage III impingement syndrome in which a rotator cuff tear is present, repair of the rotator cuff is often required.

Impingement syndrome leading to rotator cuff pathology is believed to be caused primarily by direct mechanical "impingement" of the anteroinferior edge of the acromion directly on the
tendons of the rotator cuff. This has been designated the “extrinsic” theory of rotator cuff pathology.

Proponents of the “intrinsic” theory of rotator cuff disease believe there is degeneration within the substance of the tendons, which leads to tears and cuff dysfunction, while the changes in the acromial shape are secondary to the cuff disease. This study, demonstrating the relationship between acromial morphology and the severity of impingement syndrome, supports the extrinsic theory of rotator cuff pathogenesis, with the more severe acromial types (type III) leading to more severe cases of impingement syndrome that are refractory to conservative management.

Rotator cuff tears previously were shown to be associated with type III acromions. In this study, all of the known rotator cuff tears in the surgical group were associated with type III acromions, which supports this relationship. However, the relationship of rotator cuff tears and the need for surgery cannot be determined conclusively based on our study population as the incidence of rotator cuff tears in our patients was not known. The majority of our patients responded to conservative measures, obviating the need for further studies.

Our study demonstrates a significant relationship between acromial morphology and the nonoperative treatment of patients with impingement syndrome. Acromial morphology appears to have some predictive value in determining the nonoperative treatment course for patients with impingement syndrome. The majority of patients with type I acromions can be managed by conservative measures, while the need for surgical intervention increases in patients with acromial types II and III. A significantly greater number of patients with type III acromial morphology will fail conservative measures and require surgery.

Acromial morphology can help define the nonoperative treatment prognosis of patients with impingement syndrome and may allow for the selection of certain patients for more aggressive treatment. As the severity of the acromial type increases, the success of conservative management alone decreases and the need for surgical intervention increases.

REFERENCES


