



For Patients With Impingement Syndrome, is the Acromion Innocent?

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Introduction

Subacromial impingement syndrome is one of the most common causes of shoulder pain.¹ When nonoperative measures fail to reduce the pain, patients may benefit from surgical decompression. When surgery is selected, the physician must consider the following question: what is the better procedure to perform: an acromioplasty (resection of bone) or bursectomy (resection of soft tissue)?

To help answer this question, we surveyed 500 experts in sports medicine, members of the American Medical Society for Sports Medicine and the American Orthopaedic Society for Sports Medicine and asked them if they agree with the statement, “In a patient with impingement syndrome of the shoulder to be treated surgically, ‘the acromion is innocent’ and unless there is a focal spur, no bone has to be removed.”² Respondents were asked to register agreement or disagreement with that statement according to a seven point, centered and symmetrical scale ranging from, “The statement is false” (one point) to, “The statement is true” (seven points). For this particular statement, the mean score was 3.7, signifying that experts were more inclined to answer, “This statement may be true/false; 50-50.” The mean score was higher for orthopaedic surgeons (4.4) than other correspondents (3.6). The distribution of the responses is shown in Table 1.

The purpose of this article is to review the role of the acromion in subacromial impingement syndrome, to share what the literature has to say about this topic, and lastly to attempt to interpret the expert responses in context.

Question

The etiology of subacromial impingement syndrome is not known with certainty. Some researchers believe that subacromial impingement syndrome is caused primarily by extrinsic (mechanical) compression,^{3,4} whereas others believe that the syndrome is caused primarily by intrinsic tendon degeneration, with subacromial abutment of bone against the cuff being simply a manifestation of tendon dysfunction.^{5,6} Because the etiology is unclear, there is no clearly preferred remedy. Surgeons advising patients who have failed nonoperative treatment can reasonably recommend an acromioplasty (resection of bone), bursectomy (resection of soft tissue only), or combined acromioplasty/bursectomy (resection of bone and soft tissue). Both bone and soft tissue operations can be justified on theoretical grounds.

The so-called extrinsic hypothesis of impingement syndrome hypothesizes that the impingement of the shoulder is due to downward pressure from the acromion pressing on the rotator cuff. This is the theory implicitly espoused by the name *impingement*, which comes from a Latin word *impingo* meaning “to force upon or press upon.”⁷ It has been suggested that prolonged impingement of the rotator cuff by the acromion will damage the surface of the cuff and eventually lead to a complete tear of the rotator cuff.⁸ Accordingly, Neer’s landmark paper in 1972 advised that impingement syndrome should be treated via anterior acromioplasty.⁸

Along those lines, morphological variations in the acromion and its effect on the rotator cuff were described by Bigliani *et al.*⁹ They classified

Table 1. Distribution of responses to the statement “In a patient with impingement syndrome of the shoulder to be treated surgically, ‘the acromion is innocent’ and unless there is a focal spur, no bone has to be removed.”

Percentage of respondents indicating “The statement is false”	13%
Percentage of respondents indicating “The statement is very likely to be false”	19%
Percentage of respondents indicating “The statement is probably false”	16%
Percentage of respondents indicating “The statement may be true/false; 50-50”	15%
Percentage of respondents indicating “The statement is probably true”	14%
Percentage of respondents indicating “The statement is very likely to be true”	15%
Percentage of respondents indicating “The statement is true”	8%

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acromial morphology into three types: type I (flat), type II (curved), and type III (hooked). Hooked acromions were thought to be associated with a higher incidence of rotator cuff impingement and rotator cuff tears, an association that offers indirect evidence that the acromion is the primary abnormality in subacromial impingement.^{9,10}

An alternative theory posits that intrinsic degeneration is the root cause of symptoms in patients with impingement. According to this theory, poor perfusion (due to hypovascularity) is the inciting factor,^{5,6} and with it, the damage inflicted by repetitive use is not matched by necessary repair. It is only when the supraspinatus has degenerated and weakened to the point that it is no longer able to center the humeral head in the glenoid that the subacromial space narrows. That is, the cuff pressing against the undersurface of the acromion is an effect, not a cause of the disease. By that theory, physical impingement is a secondary phenomenon. If the intrinsic theory is correct, the appropriate procedure for impingement is to remove only the bursa (tissue known to be richly supplied by free nerve endings),¹¹ leaving the bone well enough alone.

The question then remains: which theory is correct? And in turn, assuming some surgery is needed, which procedure provides the most benefit? To those who argue that extrinsic compression is the cause, removing part of the acromion should most effectively rid the patient of symptoms. On the other hand, if the problem is caused by intrinsic factors, bursectomy alone should be equally effective and will prevent the complications that may result from unneeded interventions.

Existing Literature

Although subacromial impingement syndrome is the most common cause of shoulder pain, and although there is controversy surrounding the cause (and hence the more appropriate treatment), there is little data directly comparing acromioplasty to bursectomy alone. A thorough literature search reveals only one study directly comparing bursectomy to acromioplasty. Henkus *et al*¹² directly compared the results of bursectomy to acromioplasty in 57 patients suffering from impingement syndrome without a rotator cuff tear who failed conservative treatment. The investigators included patient age, gender, body mass index, type of acromion, and preclinical baseline clinical scores in the demographics. The Simple Shoulder Test score improved by 3.6 for patients treated by bursectomy alone and by 4.4 for patients treated with acromioplasty. The mean Constant score had a mean improvement of 13.9 for bursectomy alone as compared to a mean improved score of 18.5 for acromioplasty. Since patients with different acromions were not randomized into two different groups, a multivariate analysis was used to determine the effect of the procedure on each type of acromion. Type III acromions scored on average 12.6 points less in final Constant score¹³ compared to type I acromions, whereas there were no differences between the type of acromion and the procedure performed in relation to improvement of clinical scores. The authors concluded from the data that the severity of symptoms at baseline and acromion type are better predictors of

outcome than the procedure performed. Overall, there were no statistically significant differences between acromioplasty and bursectomy alone.

Donigan and Wolf completed a systematic review of the literature to determine if bursectomy or acromioplasty is better for impingement syndrome.¹⁴ Only the aforementioned study¹² met the inclusion criteria and directly compared the outcomes of acromioplasty to bursectomy alone. The other studies they reviewed were case series demonstrating improved outcomes from acromioplasty, but there was no comparison to bursectomy alone. From this, Donigan and Wolf concluded that the surgical management of impingement syndrome “is an area that would benefit from prospective, randomized controlled studies using validated outcomes.”

There are several studies evaluating the outcomes of acromioplasty for the treatment of subacromial impingement syndrome using open versus arthroscopic techniques;¹⁶⁻¹⁹ both procedures show clinical improvement with surgery with no significant differences in overall outcome. Surgery may be the appropriate step in patients who fail a trial of nonsurgical treatment for impingement syndrome. Neer described an open acromioplasty in 1972, which has since become the gold standard open procedure.⁸ He stated that the anterior portion of the acromion rubbing on the supraspinatus tendon needed to be removed. The primary goals of the open acromioplasty are to relieve pain and to prevent wear and degeneration of the rotator cuff and biceps tendon. Chin *et al*¹⁵ reported the long-term outcomes in a 25-year follow-up to be 88% positive patient satisfaction. Comparisons were made to the opposite shoulder in this older patient group. There was a mean difference between the opposite shoulder and the operative shoulder in the Simple Shoulder Test with a score of 0.4,¹³ with scores of 8.9 for the operative side and 9.3 for the opposite side.¹⁵

The literature is sparse regarding the outcome of bursectomy alone for the treatment of subacromial impingement syndrome. Budoff *et al*²⁰ conducted a retrospective study of 60 patients who underwent arthroscopic debridement without acromioplasty. The average follow-up was 114 months when they determined UCLA¹³ score, Simple Shoulder test score,¹³ residual pain, and ability to return to recreational activities. According to the UCLA score, there were 31 (50%) excellent and 18 (29%) good results. Of the 49 patients who decided to continue recreational activities, 28 (50%) could do so with no difficulties and 10 (20%) could continue. Budoff *et al* concluded that bursectomy and debridement alone provides effective treatment for subacromial impingement.²⁰

There are, of course, some putative disadvantages to performing acromioplasty and coracoacromial ligament resection, as this operation disrupts the coracoacromial arch. Lazarus *et al*²¹ showed the coracoacromial arch to be an important barrier to the subluxation of the humeral head in the anterosuperior direction. This has been suggested as a cause for rotator cuff pathology by Hsu *et al*.²² For this reason alone, some surgeons believe a bursectomy is a better procedure.^{9,10} In addition, it has been shown that disruption of the coracoacromial arch can lead to anterosuperior instability in patients with massive rotator cuff insufficiency.²³

There have also been studies comparing the outcome of rotator cuff repair with and without acromioplasty. Gartsman and O'Connor²⁴ performed a prospective, randomized study with one-year follow-up comparing arthroscopic rotator cuff repair with and without acromioplasty for full-thickness tears of the supraspinatus tendon. The ASES score¹³ was determined for both groups preoperatively and postoperatively. No statistical difference was shown between the ASES scores postoperatively for patients with and without acromioplasty.²⁴ It can be concluded from the data that an acromioplasty does not improve outcomes following arthroscopic rotator cuff repair. This study, albeit indirectly, lends credence to the belief that the rotator cuff is the source of pain in these patients and not painful impingement against the acromion.

In 2005, McCallister *et al*²⁵ found no difference with and without acromioplasty for full thickness tears in the supraspinatus with open rotator cuff repair in their prospective study. Results also showed that one-tendon tears of the supraspinatus had better outcomes in comparison to two-tendon and three-tendon tears of the rotator cuff,²⁵ once again showing that severity of symptoms might be a better predictor of outcome than whether or not bursectomy alone or acromioplasty is performed.

Expert Opinion

The mean score for “In a patient with impingement syndrome of the shoulder to be treated surgically, ‘the acromion is innocent’ and unless there is a focal spur, no bone has to be removed” was 3.7, which aligns most closely with the response “This statement may be true/false; 50/50.” It is noteworthy that 32% of expert respondents rejected the statement; 13% selected “The statement is false” with an additional 19% answering “The statement is very likely to be false.” On the other hand, 23% of the experts were supportive; 8% were certain that the acromion should be left alone, with an additional 15% voting “The statement is very likely to be true.” That is, there was strong support for both extremes. This broad distribution of responses indicates that this statement is controversial. By that measure, the responses can be read as a call for more research to be completed or disseminated before a uniform standard of care can be adopted.

Future Research

The question, “When a patient with impingement syndrome of the shoulder fails nonoperative management and submits to surgery, should the procedure be an acromioplasty or simple bursectomy?” is a question unusually well-suited to analysis using the prospective, double-blinded, randomized trial approach.

Prospective, double-blinded, randomized trials in surgery are rare for many reasons. It is hard to blind patients who have had surgery to what was done, and it is often hard to justify randomizing patients, as there is often some consensus, justified or not, that one treatment is superior. These objections may not apply to the case of impingement syndrome. With an arthroscopic approach, patients can truly be blinded to

what was done. Also, the counseling physician can genuinely assert that there are theoretical benefits to both approaches, yet the superiority of one over the other is not known. The only justification we can suggest for not doing this study is that the costs (and hassles) of the study may not justify the clinical benefits of discovering which treatment is better. On the whole, because such a trial could also help answer some fundamental questions regarding the etiology of the condition, with implications for nonoperative management as well, such a trial should be done. Furthermore, there is a bigger and better question to be addressed, namely, should *any* surgery be employed for impingement syndrome? To answer that question, a placebo arm would need to be added to the trial, and such a trial is indeed burdened by traditional objections.

Conclusion

The expert panel was ambivalent in its support of the statement, “In a patient with impingement syndrome of the shoulder to be treated surgically, ‘the acromion is innocent’ and unless there is a focal spur, no bone has to be removed.” Likewise, the medical literature does not provide a definitive answer. There are very few studies directly addressing the question posed. Until such data are available, either approach (resecting bone or not) would be justified.

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