

## The Prevalence of os Acromiale in Patients with Massive Rotator Cuff Tears

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### ABSTRACT

**AIM:** Os acromiale is a rare shoulder condition, which may be symptomatic. The rate of rotator cuff disease in the presence of os acromiale is unknown. The aim of this study was to investigate the prevalence of os acromiale in patients with massive rotator cuff tears and in those with cuff tear arthropathy.

**MATERIAL AND METHODS:** Prospective data collection was performed on all patients who were treated for massive rotator cuff tear and/or cuff arthropathy in our unit in period of one year. In particular presence or absence of os acromiale, size of rotator cuff tear and signs of arthritic changes were noted. These were detected by various ways including plain radiograph, computed tomography, magnetic resonance imaging or arthroscopy.

**RESULTS:** We found that 16 out of 135 (12%) of patients with massive rotator cuff tears had an associated os acromiale. Furthermore, 26 out of 82 (32%) patients with cuff arthropathy had an associated os acromiale.

**CONCLUSION:** Our study provides evidence that os acromiale is associated with massive rotator cuff tears and cuff arthropathy. It may suggest that os acromiale plays a role in pathophysiology of massive tears and that it may need to be addressed in addition to

repair of the rotator cuff tear when managing patients with both os acromiale and massive rotator cuff tears.

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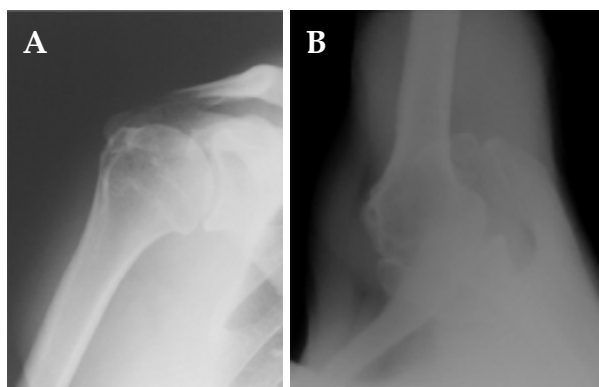
**Key words:** Os acromiale; Rotator cuff; Massive tear; Arthropathy

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### INTRODUCTION

Os acromiale, a condition characterised by fusion failure of the acromion ossification centers, has a reported prevalence of ranging from 1% to 15%<sup>[1,2]</sup>. There are four separate ossification centers including basi-acromion, meta-acromion, mesa-acromion and the pre-acromion. Fusion of pre-acromion, mesa-acromion and meta-acromion usually occurs between the ages of 15 and 18 whereas scapular spine is reported to fuse with basi-acromion earlier (by age of 12)<sup>[1]</sup>. Traditionally os acromiale has been classified into 3 types. Pre-acromion os acromiale is failure of union between pre-acromion and mesa-acromion, whereas meso-acromion os acromiale, which is the commonest type, is failure of fusion between mesa and meta-acromion. Similarly failure of union between meta-and basi-acromions is termed meta-acromion os acromiale.

Most patients, however, are asymptomatic and diagnosis is made incidentally while investigating the shoulder for unrelated pathology. In a minority symptoms may arise as result of motion of the unfused fragment leading to pain at the acromioclavicular joint or os site<sup>[3]</sup>. Patient may also present with impingement type symptoms due to the inferior tilting of unstable os fragment with deltoid contraction. Narrowing of the supraspinatus outlet, and secondary impingement, may also result from spur formation at the interference between the two unfused os fragments<sup>[3]</sup>.



**Figure 1** AP view X ray of a patient with massive rotator cuff tear and os acromiale (A), axillary view X ray of a patient with massive rotator cuff tear and os acromiale (B).

Os acromiale is also seen in many patients presenting with rotator cuff tears. The question of whether the incidence of os in patients with rotator cuff tears is higher than that of general population, is however, controversial<sup>[4,5]</sup>. This could be a relevant finding as it may provide some understanding for aetiology of tears in this population group and therefore, alter the management strategy. If there is an association between rotator cuff tears and os acromiale, addressing the cuff tear without paying attention to the os acromiale may lead to recurrence or failure of the rotator cuff repair. Massive rotator cuff tears are tears greater than 5 cm in size and involve two or more rotator cuff tendons with associated retraction and scarring of the remaining tendon. Cuff tear arthropathy is a condition that occurs when there is [HYPERLINK "http://orthopedics.about.com/cs/shoulderreplace/a/arthritis.htm"](http://orthopedics.about.com/cs/shoulderreplace/a/arthritis.htm) severe shoulder arthritis in the setting of a large [HYPERLINK "http://orthopedics.about.com/od/rotatorcuff/tp/rotatorcuff.htm"](http://orthopedics.about.com/od/rotatorcuff/tp/rotatorcuff.htm) rotator cuff tear. The purpose of this study was to investigate the prevalence of os acromiale in patients with massive rotator cuff tears and in those with cuff tear arthropathy.

## MATERIALS AND METHODS

Prospective data collection was performed on all patients who were treated for massive rotator cuff tear and/or cuff arthropathy in our unit from 2007 to 2008 inclusively. There were 135 patients with massive rotator cuff tears who underwent arthroscopic rotator cuff repairs and 82 patients who had reversed anatomy shoulder replacement for cuff arthropathy. All these patients, 217 in number, had plain radiographs: antero-posterior (Figure 1A) and axillary (Figure 1B) views and ultrasound imaging prior to their surgery. Some also underwent further imaging in the form of computerized tomography (CT) or magnetic resonance imaging (MRI).

In particular presence or absence of os acromiale and its type, were noted by various methods including plain radiograph, CT, MRI, arthroscopy (in those who underwent arthroscopic rotator cuff repair) and/or open surgery (in those who underwent reverse anatomy shoulder replacement). Where os acromiale was present, assessment of stability was performed during surgery (either arthroscopic in those with arthroscopic rotator cuff repair or open surgery in those who underwent reverse anatomy shoulder replacement). Shape, size, characteristics of the rotator cuff tear were also recorded and stored in our computerized database.

## RESULTS

Out of the 217 patients with massive rotator cuff tears and cuff

arthropathy, os acromiale was detected in 42 patients (19%). Os acromiale was seen in 16 out of the 135 patients with massive rotator cuff tears (12%) and in 26 out of the 82 patients with cuff arthropathy (32%) (Table 1). Average age in the 42 patients with os acromiale was 70 (range 51 to 81). In those with os acromiale and massive rotator cuff tear mean age was 68 (range 51 to 77) whereas in those with os acromiale and cuff arthropathy, it was 73 (range 62-81). There were 22 females and 20 males with os acromiale.

The os acromiale was meso-acromion in 28 patients (67%), pre-acromion os in 8 patients (19%) and meta-acromion os in 6 patients (14%). In those with os acromiale and massive cuff tears there were 12 patients with meso-acromion (75%) and 4 (25%) with pre-acromion. Fifteen out of the 26 (58%) patients with cuff arthropathy and os acromiale had meso-acromion os, 4 (15%) had pre-acromion and 7 (27%) had meta-acromion.

## DISCUSSION

The reported incidence of os acromiale in the literature in anatomical and radiological studies ranges between 1.3% and 8%<sup>[6]</sup>. It occurs bilaterally in between 33.3% and 62% of all cases<sup>[2,6]</sup>. Most os acromiales are, however, asymptomatic presence of which is commonly an incidental finding on a plain axillary radiograph, a computed tomography scan, or a magnetic resonance image. They may, however cause symptoms as a result of dynamic impingement with deltoid contraction<sup>[7]</sup>. Os acromiales have also been associated with rotator cuff pathology, including rotator cuff tears<sup>[3,5,8-11]</sup>.

Descriptions of the prevalence of os acromiale in symptomatic patients are few. Furthermore, since it is a rare entity, there are no prospectively controlled studies available and the published studies are generally of small numbers of patients<sup>[12-14]</sup>. As most studies examining the prevalence of os acromiale do not comment on the prevalence of rotator cuff tears, the rate of rotator cuff disease in the presence of os acromiale remains largely unknown<sup>[2,3,6,8]</sup>.

There are a number of reports which suggest that os acromiale may not be associated with an increased prevalence of rotator cuff tears<sup>[4,5,15]</sup>. Mudge *et al*<sup>[5]</sup> found nine patients with an os acromiale out of 145 with tears of the rotator cuff (6.2%). Similarly Boehm *et al* reported similar prevalence of os acromiale in patients with rotator cuff tears as compared to the general population<sup>[4]</sup>. Furthermore, Ouellette *et al* could not detect any significant difference of rotator cuff tears rate in patients with or without os acromiale<sup>[15]</sup>.

In our unit database, we have found 12% prevalence of os acromiale in patients with massive rotator cuff tears (16/135) and 31.5% prevalence of os acromiale in patients with cuff tear arthropathy (26/82). These prevalences are much higher than in the reported in normal persons, patients with impingement syndrome or all sizes of rotator cuff tears. These rates are also higher than those reported by Boehm *et al*<sup>[8]</sup> and Ouellette *et al*<sup>[15]</sup>. Boehm *et al* do not indicate the size of the rotator cuff tears in their study (they only report number of tendons involved)<sup>[8]</sup>, therefore one cannot deduce the rate of os acromiale in those with massive rotator tears from their data. Ouellette *et al*<sup>[15]</sup> study was a retrospective study and only consisted of 84 patients, 42 patients with os acromiale and 42 without. Furthermore, presence of rotator cuff tear was only confirmed by arthroscopy in 31 out of the 84 patients. Additionally as they analysed the rate of rotator cuff tear in patients with os acromiale (as supposed to rate of os acromiale in patients with rotator cuff tears) there is still a possibility that some of these patients with os acromiale but without rotator cuff tear at the time of the study, would have gone on to develop rotator cuff tears after.

**Table 1** Prevalence of os acromiale.

	General population <sup>[4,11]</sup>	Massive rotator cuff tear	Cuff tear arthropathy
Os acromiale	8%	12%	32%

Comparison of our findings with the prevalence quoted in the most recent osteological studies of 8%<sup>[2]</sup> and 8.2%<sup>[12]</sup> raises the question as to whether an os acromiale is a pathological condition of the shoulder, causing impingement and damage to the rotator cuff.

As we observe higher prevalence of os acromiale in patients with massive cuff tears (12%) and cuff tear arthropathy (32%) compared to the normal population (7%-8%), questions must be raised as to whether the presence of an os acromiale is relevant in patients with pain in the shoulder and whether it can cause tears of the rotator cuff. Our study is not without limitation, it is a descriptive study of the prevalence of os acromiale without a follow-up on the cohort of patients with os acromiale to explore the natural course of the pathology. Nevertheless the finding of higher occurrence of os acromiale with increasing severity of rotator cuff disease should guide us in our treatment approach.

## CONCLUSIONS

Our study provides evidence that os acromiale is associated with massive rotator cuff tears and cuff arthropathy. It may suggest that os acromiale plays a role in pathophysiology of massive tears and that it may need to be addressed in addition to repair of the rotator cuff tear when managing patients with both os acromiale and massive rotator cuff tears.

## CONFLICT OF INTERESTS

The authors declare no conflicts of interest.

## REFERENCES

1. Peckett WR, Gunther SB, Harper GD, Hughes JS, Sonnabend DH. Internal fixation of symptomatic os acromiale: a series of twenty-six cases. *J Shoulder Elbow Surg* 2004; **13**: 381-385. DOI: 10.1016/S1058274604000400.

2. Sammarco VJ. Os acromiale: frequency, anatomy, and clinical implications. *J Bone Joint Surg Am* 2000; **82**: 394-400.
3. Abboud JA, Silverberg D, Pepe M, Beredjikian PK, Iannotti JP, Williams GR et al. Surgical treatment of os acromiale with and without associated rotator cuff tears. *J Shoulder Elbow Surg* 2006; **15**: 265-270. DOI: 10.1016/j.jse.2005.08.024.
4. Boehm TD, Rolf O, Martetschlaeger F, Kenn W, Gohlke F. Rotator cuff tears associated with os acromiale. *Acta Orthop* 2005; **76**: 241-244.
5. Mudge MK, Wood VE, Frykman GK. Rotator cuff tears associated with os acromiale. *J Bone Joint Surg Am* 1984; **66**: 427-429.
6. Macalister A. Notes on Acromion. *J Anat Physiol* 1893; **27**: 244-245.
7. Warner JJ, Beim GM, Higgins L. The treatment of symptomatic os acromiale. *J Bone Joint Surg Am* 1998; **80**: 1320-1326.
8. Boehm TD, Matzer M, Brazda D, Gohlke FE. Os acromiale associated with tear of the rotator cuff treated operatively. Review of 33 patients. *J Bone Joint Surg Br* 2003; **85**: 545-549.
9. Hutchinson MR, Veenstra MA. Arthroscopic decompression of shoulder impingement secondary to Os acromiale. *Arthroscopy* 1993; **9**: 28-32.
10. Jerosch J, Steinbeck J, Strauss JM, Schneider T. [Arthroscopic subacromial decompression--indications in os acromiale?]. *Unfallchirurg* 1994; **97**: 69-73.
11. Wright RW, Heller MA, Quick DC, Buss DD. Arthroscopic decompression for impingement syndrome secondary to an unstable os acromiale. *Arthroscopy* 2000; **16**: 595-599. DOI: 10.1053/jars.2000.9239.
12. Edelson JG, Zuckerman J, Hershkovitz I. Os acromiale: anatomy and surgical implications. *J Bone Joint Surg Br* 1993; **75**: 551-555.
13. Sterling JC, Meyers MC, Chesshir W, Calvo RD. Os acromiale in a baseball catcher. *Med Sci Sports Exerc* 1995; **27**: 795-799.
14. Swain RA, Wilson FD, Harsha DM. The os acromiale: another cause of impingement. *Med Sci Sports Exerc* 1996; **28**: 1459-1462.
15. Ouellette H, Thomas BJ, Kassarian A, Fritz B, Tetreault P, Palmer WE et al. Re-examining the association of os acromiale with supraspinatus and infraspinatus tears. *Skeletal Radiol* 2007; **36**: 835-839. DOI: 10.1007/s00256-007-0305-7.

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