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DOI:

10.4103/JOASP.JOASP_53_20

A study of association between acromion types and shoulder pathology

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Abstract

INTRODUCTION: Shoulder impingement and rotator cuff tear are commonly seen in shoulder pathology. Pathological changes in the soft tissue around the shoulder can be due to intrinsic degenerative in tendons or extrinsic mechanical compression due to acromion types. Changes in acromion morphology have been postulated, which might be one of the causes of impingement syndrome and rotator cuff tears. But few study results have shown that role of the acromion is doubtful. Our primary objective was to determine acromion types and their prevalence rate with shoulder pathology.

MATERIALS AND METHODS: Our study was a prospective study. Eighty-five patients who met the inclusion criteria were included in the study. According to Bigliani *et al.*, acromion types were classified as type 1 acromion that has a flat undersurface, type 2 acromion that has a curved undersurface, and type 3 acromion that has a hooked undersurface on supraspinatous outlet view radiographs. Types of acromion were correlated with shoulder pathology (shoulder impingement and rotator cuff tear).

RESULTS: Out of 85 patients with shoulder pathology, 43 patients had impingement shoulder syndrome and 42 patients had rotator cuff tear. Mean age for the impingement shoulder syndrome group was 39.6 years and for the rotator cuff tear group it was 58.6 years. Overall right shoulder is affected more as compared with the left shoulder. Type 2 acromion was seen in 64.7% study population, type 1 was seen in 23.5%, and type 3 was seen in 11.8%.

CONCLUSION: In our study, type 2 acromion is more frequently seen in shoulder pathology involving rotator cuff tear and impingement syndrome.

Keywords:

Acromion types, rotator cuff tear, shoulder impingement syndrome

Introduction

Shoulder joint is one of the important joints in the human body. Shoulder joint is a complex and mobile joint. Acromion process is an important structure around the shoulder. Shoulder impingement and rotator cuff tear are commonly seen in shoulder pathology. Pathological changes can be due to intrinsic degenerative in tendons or extrinsic mechanical compression due to Acromion types. Neer in 1983 stated that 95% of rotator cuff tear is caused by mechanical compression^[1,2] Since then considerable studies^[3-6] are there to define morphological

characteristics of acromion based on cadaveric study and radiographs. Subacromion space consists of supraspinatous tendon subacromion bursa. Supraspinatous tendon lies beneath inferior border of acromion. When shoulder is abducted and internally rotated, supraspinatous tendon comes close to inferior border of acromion.^[2,7] Acromioplasty is a surgical procedure where part of acromion process which is in contact with the rotator cuff tendon is shaved or removed. The part of acromion process which is in contact with the rotator cuff tendon produces friction during shoulder abduction or rotation movement, thereby producing damage to tendon. Arthroscopic acromioplasty is still a standard procedure done for shoulder impingement pathology and during rotator

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How to cite this article: Venkataraman S, Ethiraj P, Shanthappa AH, Vellingiri K. A study of association between acromion types and shoulder pathology. *J Orthop Spine* 2022;10:92-5.

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Received: 21 August 2020

Accepted in revised form:

24 December 2021

Published: 22 February 2023

cuff repair. Bigliani was the first person who described acromion morphology. Changes in acromion morphology have been postulated that might be one of the causes of impingement syndrome and rotator cuff tears. According to Bigliani *et al.*,^[3] acromion is classified as type 1 acromion that has a flat undersurface, type 2 acromion that has curved undersurface, and type 3 acromion that has a hooked undersurface. These acromion types are better appreciated on outlet view radiographs.^[3] The association between acromion morphology, shoulder impingement, and rotator cuff pathology has been described in the literature.^[1,4] Few of the authors have stated that hook-shaped acromion has a higher prevalence rate with rotator cuff tears and shoulder impingement syndrome.^[3,4,8] Few study results showed that acromion morphology varies with aging.^[9,10] But results are ambiguous, and the role of the acromion is doubtful. Our study might help in contributing the association between acromion types and shoulder pathology. Our primary objective was to determine acromion types and their prevalence rate with shoulder pathology.

Materials and Methods

The study was conducted in a tertiary referral hospital after obtaining ethical clearance from the institute. This was a prospective study that included cases from January 2019 to December 2019. A total of 85 patients who met the inclusion criteria were included in the study. Patients with shoulder pathology diagnosed based on ultrasound shoulder or magnetic resonance imaging shoulder. Detailed clinical examination and workup were done for the patient diagnosed with shoulder impingement syndrome or rotator cuff tear.

Required radiographs

Supraspinatous outlet view and shoulder anteroposterior view were taken. For the standard anteroposterior view,

the patient was made to stand and affected shoulder is at the center and the arm was held in a neutral position elbow extended and forearm supinated; the patient is slightly tilted around 10° toward the affected side so that scapula is parallel to X-ray cassette. For supraspinatous outlet view, affected shoulder was tilted 40°–45° away from X-ray cassette and X-ray beam was passed 10°–15° craniocaudal tangential to the scapula.

According to Bigliani *et al.*^[3] [Figure 1], acromion types were classified as type 1 acromion that has a flat undersurface, type 2 acromion that has a curved undersurface, type 3 acromion that has a hooked undersurface on supraspinatous outlet view radiographs.^[3] Types of acromion will be classified based on radiographs and will be correlated with shoulder pathology and age group.

Inclusion criteria

1. Patients of age group >20 years.
2. Patient with shoulder impingement syndrome or rotator cuff tears

Exclusion criteria

1. Traumatic shoulder pathology
2. Previous operated shoulder surgery
3. Infective shoulder pathology.
4. Tumors involving the shoulder joint.

Statistical analysis

All the data from our study were evaluated by the chi-square test and SPSS software version 22.0 IBM was used. A value of $P < 0.05$ was considered statistically significant.

Results

The overall distribution is mentioned in Table 1. Out of 85 patients with shoulder pathology, 43 patients had

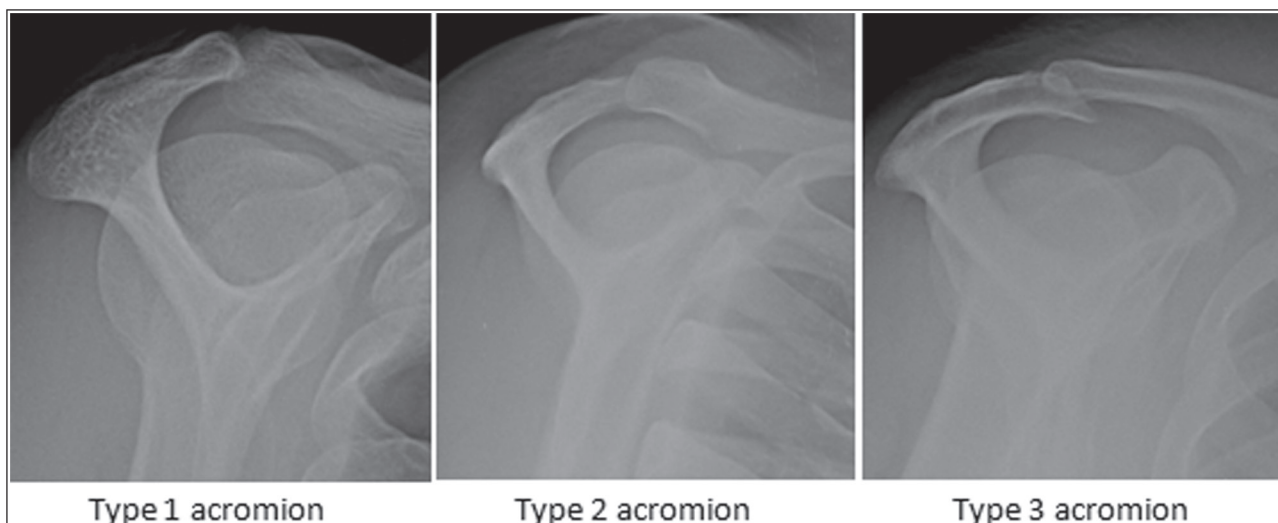


Figure 1: Three types of acromion X-ray image: (1) type 1—flat, (2) type 2—curved, and (3) type 3—hooked

Table 1: Overall distribution

		Frequency	%
AGE in years	Less than 51	43	50.6
	More than 51	42	49.4
Sex	Male	50	58.8
	Female	35	41.2
Affected side	Left	39	45.9
	Right	46	54.1
Dominant hand	Left	29	34.1
	Right	56	65.9
Diagnosis	Impingement syndrome	43	50.6
	Rotator cuff tear	42	49.4
Acromion type	Type 1	20	23.5
	Type 2	55	64.7
	Type 3	10	11.8

Table 2: Types of acromion

Variable	Group 1 Impingement	Group 2 Rotator cuff tear
Acromion types (according to Bigliani)		
Type 1	12	8
Type 2	27	28
Type 3	4	6

Table 3: Association between age and acromion type

		Acromion type			Total	P Value
		Type 1	Type 2	Type 3		
AGE	Less than 51	12(27.9%)	23(53.5%)	8(18.6%)	43	0.06
	More than 51	8(19.0%)	32(76.2%)	2(4.8%)	42	

impingement shoulder syndrome and 42 patients had rotator cuff tear [Table 2]. The mean age group for the impingement shoulder syndrome group was 39.6 years and for the rotator cuff tear group it was 58.6 years. Overall right shoulder is affected more as compared with left shoulder. Type 2 acromion was seen in 64.7% study population, type 1 was seen in 23.5%, and type 3 was seen in 11.8%.

Approximately 53.5% of study participants aged less than 51 years had type 2 acromion and 76.2% of study participants aged more than 51 years had type 2 acromion. However, this association was not statistically significant [Table 3].

In our study, the mean age for type 1 acromion is 46.5 years, for type 2 acromion it is 24.8 years, and for type 3 acromion it is 43.1 years.

Discussion

In our study, acromion was classified according to the Bigliani classification. As per Bigliani *et al.*,^[3] acromion was classified depending on the undersurface of the acromion. Type 1 acromion has a flat undersurface, type 2 acromion has a curved undersurface, and type 3 acromion has a hooked undersurface. In our study,

overall patients with shoulder pathology had type 2 acromion more in number.

In the shoulder impingement syndrome group, type 1 acromion was seen in 27.9% of patients, type 2 acromion was seen in 62.8%, and type 3 acromion was seen in 9.3%. In the rotator cuff tear group, type 1 acromion was seen in 19%, type 2 acromion 66.7%, and type 3 acromion 14.3%. Our results were compared with Balke *et al.*,^[1] Paraskevas *et al.*,^[11] and Getz *et al.*,^[12] Nicholson *et al.*^[13] studies, where all these study type 2 acromion was more common. In our study population overall, we found type 1 acromion accounted for 23.5%, type 2 acromion was seen in 64.7%, and type 3 acromion was seen in 11.8%.

Balke *et al.*^[1] reported that the mean age group for impingement patients was 49 years and for rotator cuff tear group patients it was 60 years. In our study, mean age group for shoulder impingement was 39.6 years and the mean age group for rotator cuff tear was 58.6 years. Approximately 81% of our study participants aged less than 51 years had impingement and this association between diagnosis and age was found to be statistically significant. Inference shoulder impingement was seen in relatively young individuals around 30–50 years age group, whereas degenerative rotator cuff tear was seen in the older age group 50–70 years.

Balke *et al.*^[1] showed that in both impingement group and rotator tear group male patients are more affected than female patients. In our study population, shoulder impingement syndrome in males are affected more than females whereas in rotator cuff tear females are more than males. Approximately 64% of male participants in our study group had Impingement syndrome and this association between diagnosis and gender was found to be statistically significant.

In our study population, when we considered side affected, in the impingement syndrome group left shoulder was more compared to the right shoulder whereas in rotator cuff tear group right shoulder was more affected than the left shoulder. Therefore, 60.9% of rotator cuff injury was seen on the right side and this association between diagnosis and side was found to be statistically significant.

Some of the studies reported that acromion type varies with the age factor. Wang *et al.*^[9] studied acromion morphology on 272 patients; acromion morphology was determined by Supraspinatus outlet view radiographs. The study showed that there is a significant increase in the number of type 3 acromion in patients aged more than 50 years and also a decrease in the number of type 1 acromion in patients aged more than 50 years. The study concluded that there is a possibility that type 1 acromion may progress to type 2 and then further change to type 3 over time. Speer *et al.*^[10] studied type 3 acromion in young asymptomatic athlete shoulder and results showed that type 3 acromion in the study group was low and concluded that acromion type may change with age. Our study results showed that there was no correlation between acromion type and age. Approximately 53.5% of study participants aged less than 51 years had type 2 acromion and 76.2% of study participants aged more than 51 years had type 2 acromion. However, this association was not statistically significant. The percentage of type 3 acromion in patients aged more than 50 years was less, which again showed that there was no correlation between acromion type and age. Our results compared with studies of Getz *et al.*,^[12] Nicholson *et al.*,^[13] and Vahakari *et al.*^[14] In these studies, there was no correlation between acromion type and age.

Limitation of our study.

Sample size was a small inference drawn from the study and cannot be generalized for the larger population. We included patients who presented to orthopedic outpatient department with shoulder pathology. Therefore, there

were no randomization and control groups in our study population to compare acromion types among normal population and shoulder pathology patients.

Conclusion

In our study, type 2 acromion is more frequently seen in shoulder pathology involving rotator cuff tear and impingement syndrome.

Financial support and sponsorship

Nil.

Conflicts of interest

There are no conflicts of interest.

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