A Study of Association Between Acromion Types and Shoulder Pathology

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Abstract

Background and aim: Shoulder impingement and rotator cuff tear are commonly seen shoulder pathology. Pathological changes in soft tissue around shoulder can be due to intrinsic degenerative in tendons or extrinsic mechanical compression due to Acromion types. Arthroscopic acromioplasty is still standard procedure done for shoulder impingement pathology and during rotator cuff repair. Our primary objective was to determine acromion types, its prevalence rate with shoulder pathology.

Methods: Total 85 patients who met inclusion criteria were included in the study. Acromion types were classified according to Bigliani et al type I acromion has flat undersurface, type II acromion has curved undersurface, type III acromion has hooked undersurface on Supraspinatous outlet view radiographs. Types of Acromion were co-related with shoulder pathology and age group.

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

Conclusions: In our study type 2 acromion is more frequently seen in shoulder pathology involving rotator cuff tear and impingement syndrome. Acromion morphology does not vary with age.

Background

Shoulder joint is one of the important joint in human body. Shoulder joint is complex and mobile joint. Acromion process is important structure around shoulder. Shoulder impingement and rotator cuff tear are commonly seen 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. Sub-acromion space consists of Supraspinatous tendon sub-acromion bursa. Supraspinatous tendon lies beneath inferior border of acromion. When shoulder is abducted and internal rotated, Supraspinatous tendon comes close to inferior border of acromion⁽⁷⁾. Changes in acromion morphology have been postulated that might be one of causes for impingement syndrome and rotator cuff tears⁽²⁾. Acromioplasty is surgical procedure where in part of acromion process which is in contact with rotator cuff tendon is shaved or removed. The part of acromion process which is in contact with rotator cuff tendon produces friction during shoulder abduction or rotation movement thereby produces damage to tendon. Arthroscopic acromioplasty is still standard procedure done for shoulder impingement pathology and during rotator cuff repair. Bigliani was first person who described acromion morphology. According to Bigliani et al^[3] Acromion is classified as type I acromion has flat undersurface, type II acromion has curved undersurface, type III acromion has 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 literature ^(1,4). Few of the authors have stated that hook shaped acromion has higher prevalence rate with rotator cuff tears and shoulder impingement syndrome ^(3,4,8). Few studies results showed that acromion morphology varies with aging ^(9,10), But results are ambiguous, role of acromion is doubtful. Our primary objective was to determine acromion types, its prevalence rate with shoulder pathology. Secondary objective was to find co-relation between acromion morphology and age group, association between shoulder pathology with age group, gender and side affected.

Materials And Methods

Study was conducted in tertiary referral hospital after obtaining ethical clearance from institution. This was prospective study which included cases from January 2019 to December 2019. Total 85 patients who met inclusion criteria were included in the study. Patients with shoulder pathology diagnosed based on ultrasound shoulder or MRI shoulder. Detailed clinical examination and work up was done for patient diagnosed with shoulder impingement syndrome or rotator cuff tear. Required radiographs- Supraspinatous outlet view and shoulder anteroposterior view was taken. For standard anteroposterior view patient was made to stand and affected shoulder is at the centre and arm held in neutral position elbow extended and forearm supinated, patient is slightly tilted around 10 degrees towards the affected side so that scapula is parallel to x-ray cassette. For Supraspinatous outlet view affected shoulder was tilted 40–45 degree away from x-ray cassette and x-ray beam was passed 10–15 degree cranio-caudal tangential to scapula.

Acromion types were classified according to Bigliani et al ⁽³⁾(Fig. 1) type I acromion has flat undersurface, type II acromion has curved undersurface, type III acromion has hooked undersurface on Supraspinatous outlet view radiographs⁽³⁾. Types of Acromion will be classified based on radiographs and will be co-related 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 shoulder joint.

Results

Table 1
Overall Distribution

		Frequency	Percent
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

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

Table 2
Types of Acromion

Variable	Group 1	Group 2
Acromion Types (According to Bigliani)	Impingement	Rotator cuff tear
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
		type1	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	

Around 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.

In our study mean age for type1 acromion is 46.5years type 2 acromion is 24.8 years and type 3 acromion is 43.1 years.

Table 4
Association between shoulder pathology and age

		Diagnosis		Total	P value
		Impingement	Rotator Cuff Tear		
AGE	less than 51 years	35(81.4%)	8(18.6%)	43	0.001
	More than 51 years	8(19.0%)	34(81.0%)	42	

81% of study participants aged less than 51 years had impingement and this association between diagnosis and age was found to be statistically significant.

Table 5
Association between shoulder pathology and gender

		Diagnosis		Total	Pvalue
		Impingement	Rot Cuff Tear		
sex	Male	32(64.0%)	18(36.0%)	50	0.002
	Female	11(31.4%)	24(68.6%)	35	

64 % of male participants had Impingement and this association between diagnosis and gender was found to be statistically significant.

Table 6
Association between shoulder pathology and affected side

		Diagnosis		Total	Pvalue
		Impingement	Rot Cuff Tear		
which side	Left	25(64.1%)	14(35.9%)	39	0.02
	Right	18(39.1%)	28(60.9%)	46	

60.9% of Rotator Cuff injury happened to right side and this association between diagnosis and side was found to be statistically significant.

Statistical Analysis:

All the data from our study was evaluated by chi-square test and SPSS software version 22 IBM was used. P value < 0.05 is considered as statistically significant.

Discussion

In our study acromion was classified according to Bigliani classification. As per Bigliani et al³ acromion was classified depending on undersurface of the acromion. Type 1 acromion has flat undersurface, type 2 acromion has curved undersurface and type 3 acromion has hooked undersurface. In our study overall patients with shoulder pathology had type 2 acromion more in number.

In shoulder impingement syndrome group type 1 acromion was seen in 27.9% patients, type 2 acromion was seen in 62.8% and type 3 acromion was seen in 9.3%. In 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⁽¹¹⁾, Paraskevas et al⁽¹²⁾, Getz et al⁽¹³⁾, Nicholson et al⁽¹⁴⁾ study where in all these study type 2 acromion was more common. In our study population overall we found type 1 acromion accounted 23.5%, type 2 acromion was seen in 64.7% and type 3 acromion was seen in 11.8%.

Balke et al⁽¹¹⁾ study reported that mean age group for impingement patients was 49 years and for rotator cuff tear group patients was 60 years. In our study mean age group of shoulder impingement was 39.6 years and mean age group of rotator cuff tear was 58.6 years. 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 is seen in relatively young individuals around 30–50 years age group whereas degenerative rotator cuff tear are seen in older age group 50–70 years.

Balke et al⁽¹¹⁾ study 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 male are affected more than females whereas in rotator cuff tear females are more than males. Around 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 impingement syndrome group left shoulder was more compared to right shoulder where as in rotator cuff tear group right shoulder was more affected than left shoulder. So 60.9% of Rotator Cuff injury was seen in right side and this association between diagnosis and side was found to be statistically significant.

Some of studies reported that acromion type varies with age factor. Wang et al ⁽⁹⁾ studied acromion morphology on 272 patients, acromion morphology was determined by Supraspinatous outlet view radiographs. Study showed that there is significant increase in number of type 3 acromion in patient's age more than 50 years and also decrease in number of type 1 acromion in patients age more than 50 years. Study concluded that there is 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 co-relation between acromion type and age. Around 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 age more than 50 years was less which again showed that there was no co-relation between acromion type and age. Our results compared with studies of Getz et al ^[13], Nicholson et al ⁽¹⁴⁾, Vahakari et al ⁽¹⁵⁾ in these study also there were no co-relation between acromion type and age.

Limitation of our study: sample size was small inference drawn from the study cannot be generalized for larger population. We included patients who presented to orthopaedic opd with shoulder pathology. So 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. Acromion morphology does not vary with age. Impingement syndrome was seen in young patients.

Declarations

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Authors' contributions.

-	Contributor 1	Contributor 2	Contributor 3	Contributor 4
Concepts	√			
Design	√	√		
Definition of intellectual content	√	√		
Literature search	√	√	√	
Data acquisition	√	√	√	
Data analysis	√	√	√	√
Statistical analysis	√			√
Manuscript preparation	√	√		
Manuscript editing	√	√	√	√
Manuscript review	√	√	√	√

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Figures

Type 1 acromion

Type 2 acromion

Type 3 acromion

Figure 1

Three types of acromion x-ray image 1) Type 1- Flat, 2) Type 2 Curved, 3) Type 3-Hooked

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