

Clinical Significance Of Morphometry And Morphology Of Acromion Process Of Scapula

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Abstract:

Background: Shoulder impingement syndrome is a painful condition and narrowing of the subacromial space is the most common cause for such an impingement. Morphology of the acromion can be one of the reasons for such subacromial impingement.

Materials and Methods: Present study was carried on 94 (43 right & 51 left) dry scapula of unknown age & sex, obtained from department of anatomy R.N.T. Medical College, Udaipur (Rajasthan). Morphology and morphometry of acromion process was studied.

Results: Acromion process was flat in 36, Curved in 54 and hooked type in 4 scapulae. Hooked type was observed in only left scapulae. Coracoacromial distance was less in hooked type of acromion process as compared to that in other types of acromion process.

Conclusion: Study of morphology and morphometry of scapulae is clinically important for orthopaedic surgeons as hooked type of acromion process can be a cause subacromial impingement syndrome.

Key Word: Acromion morphology, shoulder impingement.

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I. Introduction

Scapula is a large, flat, triangular bone on the posterolateral aspect of the chest wall and extends from second to seventh ribs. Spinous process, acromion process and coracoid process are the three processes on scapula. The subacromial space is limited superiorly by anterior and inferior aspect of acromion, coracoacromial ligament (both forming a protective arch over shoulder joint) and acromioclavicular joint and inferiorly by humeral head. This space is occupied by supraspinatus tendon, subacromial bursa, tendon of long head of biceps and capsule of the shoulder joint¹.

Shoulder impingement syndrome is a painful condition and narrowing of the subacromial space is the most common cause for such an impingement. Morphology of the acromion can be one of the reasons for such subacromial impingement. Bigliani et al have classified acromion process radiologically into three types -Type I or flat, Type II or curved and type III as hooked acromion process and 20 % of the patients of shoulder impingement as per this study had type III or hooked type acromion process². In a similar study by Neer et al 95% of rotator cuff tears are due to mechanical impingement and anterior acromionplasty is the treatment of choice^{3,4}.

Study of morphology and morphometry of acromion process is of importance to orthopaedic surgeons and can be helpful in both diagnosis and management of patients of shoulder impingement syndrome.

II. Material And Methods

Present study was carried on 94 (43 right & 51 left) dry scapula of unknown age & sex, obtained from department of anatomy R.N.T. Medical College, Udaipur (Rajasthan). Scapulae included in the study had intact acromion and coracoid processes.

Scapulae were numbered from 1R-43R & 1L-51L.

Morphology and morphometry of acromion process was studied.

In morphology study, three shapes were observed based on classification by Bigliani et al.² According to this classification shapes of acromion process can be -Type I (flat)-Fig1, Type II (curved) -Fig2, Type III (hooked) -Fig3. Photographs of scapulae were taken and observations were recorded on prepared performas.

For morphometry of acromion process, following parameters were noted-

1. Acromioglennoid (AG) distance- Distance between tip of acromion process and supraglenoid tubercle.
2. Acromiocracoid (AC) distance- Distance between tip of acromion process and coracoid process.
3. Length of acromion process (LAP)
4. Breadth of acromion process (BAP)

All the measurements were taken using digital vernier caliper with an accuracy of up to 0.01mm. and records were maintained meticulously on performas.

All the recorded data was entered in the Microsoft Excel sheet and statistically analyzed.

III. Result

Total scapulae observed - 94 (43 right and 51 left)

Total scapulae - 94

Shape of acromion process

- Flat - 36
- Curved - 54
- Hooked – 4

Table no 1

Scapulae	LAP	BAP	ACD	AGD
left- 51 scapulae	45.15mm	25.011mm	34.64mm	29.74mm
Right- 43 scapulae	44.489mm	26.40mm	36.215mm	32.07mm

Total left scapulae - 51

Shape of acromion process

- Flat - 20 scapulae
- Curved - 27 scapulae
- Hooked - 4 scapulae

Mean of various diameters in left scapulae

Table No 2

Total scapulae-51	LAP	BAP	ACD	AGD
Flat- 20	44.657mm	24.316mm	34.554mm	30.076mm
Curved- 27	45.65mm	25.791mm	34.738mm	29.432mm
Hooked-4	46.212mm	24.18mm	32.01mm	25.41mm

Total right scapulae – 43

Shape of acromion process

- Flat -16
- Curved - 27
- Hooked - Nil

Mean of various diameters in right scapulae

Table No 3

Total scapulae-43	LAP	BAP	ACD	AGD
Flat- 16	45.464mm	27.060mm	35.783mm	32.135mm
Curved- 27	43.758mm	25.917mm	36.539mm	32.022mm

IV. Discussion

Bigliani et al has classified acromion process according to its shape in three types but Farley et al has described a fourth type of acromion process also, which is convex downward^{2,5}. This classification of Farley et al has not gained much importance as incidence of this fourth type is very less⁵. Present study has followed Bigliani's et al classification².

In present study curved (Type II) acromion process was the commonest shape observed in about 62% (58 out of 94) scapulae which corresponds to the study done by Sinha et al , Vinay G and Sivan S and Singroha et al^{6,7,8}. While in a study done by Prasad et al and Kumar Panigrahi and Mishra flat shape was the commonest type observed^{9,10}. Prasad et al studied 70 scapulae and observed flat acromion process in 57.12% and curved in 40% scapulae while Panigrahi et al observed flat acromion process in 76% scapulae^{9,10}. In the present study type II shape was commonest on both right and left side but in the study done by Prasad et al⁹Type I was more

common on right side and type II on left side. In our study we observed hooked or type III acromion process in four left scapulae and in none of the right scapulae. Natsis et al had observed in 28% and Kumar Panigrahi and Mishra in 17.51% of scapulae a hooked type III acromion process¹¹.

Morphology of acromion process have a pivotal role in mechanical compression and subacromial impingement. Such an impingement can be due to structural narrowing of subacromial space such as in type III hooked type of acromion process¹².

Robert et al, Balke et al, and Sambandam et al have also observed increased incidence of type III acromion process in patients with rotator cuff tears and impingement syndromes^{13,14,15}.

Shape of the acromion process in subacromial impingement syndrome can be best visualized radiologically in a Y (outlet view)¹⁶.

In a study by Natsis et al enthesophytes are significantly more common in type III acromions and are particularly associated with subacromial impingement syndrome and rotator cuff tears. In type I, the incidence of enthesophytes is very small and so acromial types rotator cuff tears are also rare¹¹.

In a study by Farley et al also surgically proven rotator cuff tears had an association with a type III acromion and statistically significant associations with a thickened coracoacromial ligament and acromioclavicular enthesophytes⁵.

Acromiocracoid distance in the present study was found to be 34.64 mm on left side and 36.215 mm on right side which is comparable to study done by Sinha et al⁶ where the values are 35.94±5.58mm while in a study done by Kumar Panigrahi & Mishra¹⁰. it was found to be 37.49±4.87 on right side & 37.23±4.48 on left side. In other studies findings were as follows

Table No 4

Author	Coracoacromial distance in mm	Acromioglennoid distance in mm	Sample size
Ravindranath et al., 2018 ¹⁷	29.83±4.74	26.18±3.14	130
Saha et al., 2016 ¹⁸	28.4326±5.30	26.2145±3.33	200
Prasad et al (2019) ⁹	30.9±5.4 29.61±3.88 (R) 32.15±6.44 (L)	24.9±3.7 mm 25.81±3.36 (R) 18.07-35.27 (L)	70
Present study (2023)	34.64 (L) 36.215 (R)	29.74 (L) 32.07 (R)	94

In all above, studies coracoacromial distance is quite less than the present study. Such variations can be due to racial or regional differences. Acromioclavicular distance in hooked type of acromion process was less i.e., 32.01mm as compared to curved type -34.738mm and flat type-34.554mm. Low values of coracoacromial distance have a significance in shoulder impingement syndrome.

Acromioglennoid distance in the present study was 29.74mm on left side and 32.07mm on right side which is higher in values as compared to other studies mentioned above. Higher values on right side can be due to right handedness and more mobility⁹.

There was not much significant difference in length, breadth and acromioglennoid distance of acromion process on right and left side in the present study.

V. Conclusion

Study of morphology and morphometry of acromion process will be helpful to orthopaedic surgeons dealing with shoulder impingement syndromes in evaluating the causes and planning treatment of such patients.

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Figure 1: Flat Type



Figure 2: Curved Type



Figure 3: Hooked Type