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# Morphometric study of acromion process of scapula -An Institutional study.

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**ABSTRACT**

**Background:** chronic shoulder pain is the most common complaint in patients between 60-69 yrs of age. 36-74% of these patients have pain due to shoulder impingement syndrome. The anatomy of subacromial space has to be known in order to treat this syndrome .An arthroscopic surgical procedure called as acromioplasty is done, for which various acromial dimensions are required.

**Aims and objectives:** To calculate various morphometric parameters of acromion process i.e. acromial length, acromial breadth, acromion thickness, distance between acromion tip and coracoids tip, distance between acromion tip and dorsum of coracoid and distance between acromion tip and superior glenoid tubercle.

**Materials and Methods:** The study was conducted on 50 dry unpaired adult human scapulae.All the important morphometric parameters were studied using vernier calliper.

**Result:** The mean values of length, breadth and thickness of acromion were 45.68 mm, 24.21 mm and 6.67 mm, respectively. The acromion thickness was less than 8mm in 78.66% and greater than 8mm in 21.2% cases. The mean value of distance between acromion tip and coracoid tip was found to be 37.85.The mean value of distance between acromion tip and dorsum of coracoid was found to be 39.46. The mean value of distance between acromion tip and superior glenoid tubercle was found to be 30.78.

**Conclusion:**While dealing with a patient of chronic shoulder pain, the clinicians should have a proper knowledge about the variations in the dimensions of acromion process of scapula and its implication in rotator cuff injuries.The results showed that about 21.2 % cases had acromion thickness of greater than 8mm,which makes these people more prone to Impingement syndrome and patients of choice for Acromioplasty.

## I. INTRODUCTION

Chronic shoulder pain is the most common complaint in patients 60-69years of age accounting for 7-34% in general population.Many causes of shoulder pain have been seen in these patients.[1,2] 36 % to 74% of these patients have a condition called as shoulder impingement syndrome[3], the symptoms of which are pain in overhead abduction of arm and weakness of rotator cuff muscles.

For a proper understanding of impingement syndrome the anatomy of the subacromial space has to be known. The subacromial space is a narrow space between the coracoacromial arch and proximal humerus. The space contains rotator cuff tendons, tendon of biceps brachii, subacromial bursa and coracoacromial ligament.[4]

Four types of shoulder impingement syndrome have been identified,which are subacromial,coracoid, internal and suprascapular. Among these subacromial type is most common.[5]In the subacromial impingement syndrome, the subacromial space is narrowed due to which there is compression and inflammation of supraspinatus tendon,a part of rotator cuff muscles, as it passes through. As this muscle is involved in arm elevation the patient complains of pain during elevation of arm.The impingement syndrome needs to be corrected,as if left untreated it can cause secondary osteoarthritis.[6]Conservative measures are used first followed by surgery such as acromioplasty for which the dimension of the acromion process gains importance.Therefore in our study we intend to see the different dimensions of the acromion process and the subacromion space to get an idea about acromioplasty.

## II. MATERIALS AND METHODS

The present study was conducted on 50 unpaired dried adult human scapulae collected from

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the department of anatomy, GMC Srinagar.The scapulae included in this study were completely ossified adult human scapulae, exact age and sex of the bones were not known.There were 10 right sided scapulae and 40 left sided scapulae. Fixed points were marked on each bone to measure different dimensions.With the help of a digital vernier calliper(accurate to 0.01 mm) and a metric precision tape different parameters were measured.To minimize error, each measurement was done twice, and the mean of the two values was taken as the final value.

The points marked on each scapula are mentioned below and shown in the given figure 1:

**A:** Superior most point on acromion
**B:**Inferior most point on acromion
**C:** Outermost point on acromion
**D:** Innermost point on acromion
**E:** A point 1cm inside to point C and 1cm below point A on acromion
**F:**Point on the coracoid tip
**G:** Posterior most point on horizontal part of coracoid
**H:** Point on the top of superior glenoid tubercle

After marking the points on each scapula following dimensions were taken:

**AB:** Acromion length
**CD:**Acromion breadth
**E:** At point E, acromion thickness
**AF:** Distance between acromion tip and coracoidtip
**AG:**Distance between acromion tip and dorsum of coracoid
**AH:** Distance between acromion tip and superior glenoid tubercle.


Figure 1 : Points to measure linear dimensions

## III. RESULTS

In the present study, 50 dry unpaired scapulae were evaluated for various morphometric parameters of the acromion process. Among 50 scapulae, 19 were of right side and 31 were of left side. The mean value of acromial length was 45.68 mm in total sample and acromial width was 24.21 mm. The mean value of distance between acromial tip and coracoid tip(AF) was 37.85 mm.The mean value of distance between acromial tip and supraglenoid tubercle(AH) was 30.79mm.The mean value of the distance between acromion tip and dorsum of coracoid(AG) was 39.46mm. Mean acromial thickness was 6.67mm. The acromial thickness was categorised as less than or more than 8mm as the people with acromion thickness are more vulnerable to impingement syndrome.It was less than 8mm in 78.66% and more than 8mm in 21.26% cases.The minimum,maximum,mean and standard deviation of the above parameters is shown in table 1given below:

| S.no | parameters | Number of scapula | Minimum Value (mm) | Maximum Value (mm) | Mean(mm) | Standard deviation |
|---|---|---|---|---|---|---|
| 1 | Length (AB) | 50 | 21 | 55 | 45.68 | 7.833348 |
| 2 | Width (CD) | 50 | 15 | 32 | 24.21 | 3.763045 |

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| | | | | | | |
|---|---|---|---|---|---|---|
| 3 | Coracoacromial distance(AF) | 50 | 17 | 50 | 37.85 | 7.368056 |
| 4 | Distance between tip of acromion and dorsum of coracoid process (AG) | 50 | 22 | 50 | 39.46 | 7.292724 |
| 5 | Acromio glenoid distance(AH) | 50 | 18.9 | 39 | 30.79 | 4.829486 |
| 6 | Acromion thickness (E) | 50 | 4 | 10 | 6.67 | 1.406843 |

Table 1: various parameters of acromion process of scapula

## IV. DISCUSSION

In the current study, the mean acromial length is 45.68mm which is comparable to Nepalese, Greek and Turkish scapulae but less than Chilean and Egyptian scapulae. The mean acromial breadth is 24.21mm in our study which is comparable to Nepalese and Chilean scapulae , more than Greek scapulae, however it is less than Egyptian scapulae.

Mean acromial thickness is 6.67mm which is comparable to Egyptian scapulae ,but less than Greek and Canadian scapulae.People with acromion thickness more than 8mm are more vulnerable to impingement syndrome.The acromial thickness was less than 8mm in 78.66% and more than 8mm in 21.2%.According to Rockwood acromioplasty, in the first step a portion of anterior acromion which projects beyond the clavicle is removed and in second step, there is need to smoothen the under-surface of acromion in order to convert it to less than 8mm thickness.Mohammed et al found acromion thickness 7.5mm in control and 8.6mm in patients with rotator cuff tear using MRI[12].

The distance between tip of coracoid and acromion(AF), tip of acromion and superior glenoid tubercle(AH), acromion tip and dorsum of coracoid(AG) , will determine the subacromial space.Compression of this space will increase the chances of subacromial impingement syndrome[13].Mean AF was found to be 37.85mm which is comparable to Nepalese and Chilean scapulae but more than Greek and Egyptian scapulae.

| Author (population) | Length (AB) (mm) | Breadth (CD) (mm) | Distance AF (mm) | Distance AG (mm) | Distance AH (mm) |
|---|---|---|---|---|---|
| Mansur et al. [6] (Nepalese) | 46.02 | 26.93 | 39.21 | 39.39 | 31.90 |
| Collipal et al. [7] (Chilean) | 69.12 | 25.12 | 39.76 | 39.15 | 28.43 |
| Coskun et al. [8] (Turkish) | 44.70 | - | 17.8 | - | - |
| Paraskevas et al. [9] (Greek) | 46.10 | 22.30 | 28.10 | - | 17.70 |
| El-Din et al. [10] (Egyptian) | 52.81 | 32.05 | 31.34 | - | 27.39 |
| Von Schroeder et al. [11](Canadian) | 48 | 21.9 | 27 | | 16 |

Table 2:Comparison of linear acromial dimensions in different populations.

## V. CONCLUSION

It can be concluded that while dealing with a patient of chronic shoulder pain, the clinicians should have a proper knowledge about the variations in the dimensions of acromion process of scapula and its implication in rotator cuff injuries.The results showed that about 21.2 % cases had acromion thickness of greater than 8mm,which makes these people more prone to impingement syndrome and patients of choice for acromioplasty.

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