

Morphometric Analysis of Adult Acromion Process of Scapula in South Indian Population

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Abstract

Background: Morphometric analysis of the acromion process is important in shoulder joint pathologies and the structures passing through the subacromion space or structures present underneath the coracoacromial arch are more prone to undergo impingement and end with impingement syndrome of the shoulder joint. Knowledge on the morphometry of the acromion process is essential before planning surgical treatment of the impingement syndrome such as, acromioplasty or acromionectomy. The present study is aimed to focus on the morphometric analysis of the acromion process. **Subjects and Methods:** The present study was carried on 100 dry adult scapulae in which 50 were right and 50 were left. The following parameters were measured; length of the acromion, width of the acromion, coracoacromial distance and the acromioglennoidal distance. All the parameters were measured using vernier caliper. **Results:** The mean length of the acromion process was 42.55mm and 41.43mm on the right and the left sides respectively. The mean width of the acromion process was 23.12mm and 22.8mm on the right and the left sides respectively. The mean coracoacromial distance was 34.16mm and 34.15mm on the right and the left sides respectively. The average acromioglennoidal distance was 24.48mm and 24.52mm on the right and the left sides respectively. **Conclusion:** The morphometric data of this study will be of great importance for the orthopaedic surgeon while treating the impingement syndrome and other surgeries of shoulder joint.

Keywords: Acromion Process, Acromioplasty, Impingement Syndrome, Rotator Cuff

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Introduction

The scapula is a large, flat and triangular bone which lies on the posterolateral aspect of the chest wall. It extends from 2nd to 7th rib. The scapula bears three processes; the spinous process, the acromion process and the coracoid process. The acromion and coracoid are the two large scapular processes of the scapula which extend beyond the margin of the glenoid cavity and also superior to the head of the humerus.^[1] Acromion process is an elongated and flattened process of scapular spine. It is located in the upper lateral end of scapula. Acromion is one of the important components of the coracoacromial arch and it forms the superior boundary of the subacromial space. The coracoacromial ligament extends from the tip of the acromion to the coracoid process and forms protective coraco-acromial arch over the shoulder joint.^[2]

The subacromion space gives passage to the tendons of rotator cuff muscles of the shoulder joint and Biceps brachii.

Any abnormalities or variations leading to the reduction in the subacromion space may disturb the relationship of the subacromion structures and lead to impingement syndrome. Structural abnormalities of the coracoacromial arch have been noted to reduce the subacromion space. Acromioplasty or acromionectomy are common surgical procedures to treat the impingement syndrome. The lateral end of coraco-acromial ligament is attached to the tip of the acromion process. The shoulder impingement syndrome can be produced by any condition limiting the narrow space available underneath the coraco-acromial arch may be developmental or congenital.^[3-5]

The morphometric parameters of the acromion process significantly contribute to the anatomy of the coracoacromial arch and subacromion space. Hence, the morphometry of acromion process play an important role in the diagnosis and the treatment plan of the impingement syndrome.^[6] The important parameters of the region may change according to

the gender, ethnicity and lateralization which will significantly increase the surgical achievement.^[7] Thus, the present study was carried out on the morphometric analysis of acromion process in South Indian population.

Subjects and Methods

The present study was conducted on 100 adult dry scapulae in which 50 were left and 50 were right scapulae. The scapulae were collected from the departmental bone bank. Undamaged, normal adult bones were included in the study. Scapulae with missing parts or processes, damaged and with anatomical variations like epiphyseal non fusion were excluded from the study.

The morphometric parameters were measured using vernier calipers. The length and width of the acromion process were measured. The length of the acromion was measured along the middle of the acromion process anteroposteriorly, from the tip of the acromion to the acromian angle. The width of the acromion was measured across the middle of the acromion from lateral to medial borders. The acromioglennoid distance was measured between the tip of the acromion and the supraglenoid tubercle. The coracoacromial distance was measured between the tip of the coracoid process and the tip of the acromion process.



Figure 2: Showing the width of the acromion process



Figure 1: Showing the length of the acromion process

Results

The average length of the acromion process was 42.55 ± 5.21 mm on the right side and 41.43 ± 4.94 mm on the left side. The average width of the acromion process was 23.12 ± 1.66 mm on the right side and 22.8 ± 1.95 mm on the left side.



Figure 3: Showing the coracoacromial distance

Table 1: Showing the range, mean and standard deviation of all the parameters.

Parameter	Range (mm)		Mean and standard deviation (mm)	
	Right	Left	Right	Left
Length of acromion	31.5 – 53.5	32.5 - 49.5	42.55 ± 5.21	41.43 ± 4.94
Width of acromion	20.1 – 25.3	19.2 – 28.1	23.12 ± 1.66	22.8 ± 1.95
Coracoacromial distance	29.1 -41.3	29.6 -41.1	34.16 ± 3.72	34.15 ± 3.77
Acromioglennoid distance	20.1 – 31.3	19.8 – 30.9	24.48 ± 2.11	24.52 ± 2.05



Figure 4: Showing the acromioglennoid distance

The average coracoacromial distance was 34.16 ± 3.72 mm on the right side and 34.15 ± 3.77 mm on the left side. The average acromioglennoid distance was 24.48 ± 2.11 mm on the right side and 24.52 ± 2.05 mm on the left side. The range, mean and standard deviations are tabulated in [Table 1].

Discussion

The proper knowledge on the morphometric parameters of the acromion process is very much essential for the orthopaedic surgeon while dealing with the surgical procedures to treat the impingement syndrome. Thus the present study was on the morphometric parameters of acromion process as well as its distance from the coracoid process and the supraglenoid tubercle.

Impingement syndrome is one of the causes for chronic disability of the shoulder joint. The rotator cuff muscles are impinged beneath the coracoacromial arch has been recognized. The surgical procedures like acromionectomy and lateral acromionectomy are usually carried out to treat the impingement syndrome, but the outcome is not satisfactory. This stimulated the researchers to focus on the complete morphometry of the acromion in relation with coracoacromial arch in the genesis of the impingement syndrome.^[3,8] Literature suggests that, the lateral acromionectomy is giving unsatisfactory outcome with lots of complications.^[3] Instead of lateral acromionectomy, anterior acromioplasty is suggested, where the anterior edge & the undersurface of anterior most part of acromion process along with coracoacromial ligament was removed. Another surgical technique is acromioplasty where the undersurface of the acromion was shaved so that it gets flattened.^[8]

In the present study, the acromion process length was observed to be 42.55 ± 5.21 mm and 41.43 ± 4.94 mm on the right and the left sides respectively. The width of the acromion process was 23.12 ± 1.66 mm and 22.8 ± 1.95 mm on the right and the left sides respectively. Susmitha Saha et al., had done a study on North Indian population and found that the acromion process length, width and thickness as 41.07mm, 21.82mm and 6.58 mm respectively.^[9] Sitha et al., had studied on Thais population and noticed acromial length and width as 40.0 mm and 23.0 mm respectively, which are similar with the results of the present study.^[10]

Nicholson et al., had studied in American population and found the average acromial length, width and thickness as 40.6 mm, 18.4 mm and 6.7 mm in females respectively. In males the length, width and thickness was 48.5 mm, 19.5 mm and 7.7 mm respectively.^[11] These results show that the width of the acromion is lesser in American when compared with Indians and Thais populations. In Greek population the acromial length was found as 46.1 mm, width as 22.3 mm and the thickness as 8.8 mm.^[5] In Nepalese population the acromial length as 46.6 mm in right side and 45.57 mm in left side.^[12] The length of the acromion is longer in Greek and

Nepalese population when compared with the present study.

The coracoacromial distance in the present study was observed to be 34.16 ± 3.72 mm and 34.15 ± 3.77 mm on the right and the left sides respectively. Paraskevas et al., had found the coraco acromial distance as 28.1 mm in Greek population.^[5] Sushma Saha et al., observed the coracoacromial distance as 28.43mm.^[9] The results of the present study were much higher than these two studies. Singh J et al. observed the coracoacromial distance as 37.5 mm in Indian population.^[13] Mansur et al., observed the coraco acromial distance as 39.21mm.^[12] These results were much higher than the results of the present study.

The average acromioglennoid distance in the present study was 24.48 ± 2.11 mm on the right side and 24.52 ± 2.05 mm on the left side. These findings were in contrast with the finding of the other studies of Nepalese and Greek population. Mansur et al., observed the acromio glennoid distance as 31.38 mm on right side and 31.97 mm on left side in Nepalese population and in another study the acromioglennoid distance was observed as 17.7mm in Greek population. The present study results were similar with the findings of the other Indian studies where Singh et al., and Shilpa Gosavi et al., found the acromioglennoid distance as 27mm and 22.6mm respectively.^[6,13]

The anatomical measurements of the acromion process is very important as it may guide the orthopaedic surgeons during shoulder joint surgeries and also plays a role in revealing possible evolutionary changes during the adoption of bipedal gait in human beings in anthropology.^[5]

Conclusion

The morphometric measurements of the acromion process are of great use to the orthopaedic surgeons while planning for the shoulder surgeries like acromioplasty. Literature suggests that, ethnic variations in the morphometric parameters of the acromion process. So, the morphometric data presented in this study may serve as reference for the clinicians of the south Indian region.

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