

A Morphometric Study of the Patterns and Variations of the Acromion of the Scapulae in Maharastrian Population

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Abstract

Introduction: In scapula, the acromion process projects forwards almost at right angles from the lateral end of the spine. The coracoacromial ligament lies between tip of acromion and coracoid process and it forms coraco-acromial arch. Below the arch there is space it gives passage to the tendons of muscles forming musculo-rotator cuff. The morphometric study of the acromion process of the scapula is an important factor implicated in impingement syndrome of the shoulder joint. **Methodology:** This study was carried out on the 100 dry human scapulae of unknown age and sex, 50 were from the right side, and 50 were from the left. Measurements were taken using a vernier calliper and recorded in millimeters. **Result:** In this study shows the mean values of acromion length were 44.8mm. The acromion width mean values were 21.7mm. The acromion thickness was 5.7mm. The distances between acromion and coracoid processes were measured at two points. The distance taken from tip of the acromion process to tip of the coracoid process was found 36.5mm. The distance taken at the base of the coracoid to the tip of the acromion process mean value was 23.6mm. The acromio-glenoid distance observed 26.2mm. The three types of acromion process according to slope, flat was seen in 28 (28%), type II curved in 49 (49%) and type III hooked in 23(23%) of the total samples and also it was found the inferior surface of the acromion smooth in 74 (74%) and rough in 26 (26%) samples. Morphological shapes of the tip of the acromion were recorded as: cobra-shaped, square tip and intermediate-shaped. **Conclusion:** Knowledge of the morphometric values of scapula and acromion process is important for clinicians in understanding and curing shoulder joint ailments.

Keywords: Scapula; Acromion Process; Morphometry.

Introduction

The scapula (shoulder blade) is a triangular flat bone that lies on the posterolateral aspect of the thorax, overlying the 2nd to 7th ribs. The convex posterior surface of the scapula is unevenly divided by the spine of the scapula into a small supraspinous fossa and a much larger infraspinous fossa. The concave costal surface of the scapula has a large subscapular fossa. The triangular body (blade) of the scapula is thin and translucent superior and inferior to the scapular spine [1,2].

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Acromial morphology has been implicated as contributing to impingement. Bigliani, Morrison and April described 3 types of acromion morphology and noted an increase in rotator cuff tears with type - III or hooked acromion. Since this time the Bigliani morphological classification has been the dominant diagnostic tool for the impingement syndrome and rotator cuff tears [2]. Patients with less slope to their acromion have propensity towards impingement because of subacromial stenosis [3]. The Variations seen in acromial morphologic condition are not acquired from age-related changes and spur formation and thus contribute to impingement disease independent of and in addition to age-related processes.

Materials and Methods

A total of 100 dry human scapulae bones were selected from the anatomy department, IIMSR Warudi Badnapur, Dist. Jalna. 50 were from the

right side, and 50 were from the left. The bones belonged to mature specimens, but the exact ages and gender of the specimens were not known. The bones were isolated and inspected macroscopically. Damaged scapulae bones were excluded from this study. Scapulae were grouped according to the morphology of the acromial type. Measurements were taken using a sliding vernier calliper (accurate to 0.1 mm) and recorded in millimeters. Each of the measurement was taken twice and then average was taken to reduce the bias errors. Data was analyzed using SPSS version 13.0 and mean values presented in tables. Descriptive statistics like percentage Mean and standard deviation were used to analyze the data obtained.

Following measurements were taken.

Morphological Evaluation

Morphological shapes of the tip of the acromion were recorded as: cobra-shaped, square tip and intermediate-shaped [3]. Types of acromion according to its slope:-a) Bigliani type I (flat), b) Type II (curved), and c) Type III (hooked). Types of inferior surface of acromion process according to appearance: rough and smooth types.

Osteometric Evaluation

1. The maximum length of the acromion along longitudinal axis
2. *The maximum breadth of acromion:* The distance between the lateral and medial borders at the midpoint of the acromion process.
3. *The thickness of the acromion:* 1 cm posterior to

the anterior border and 1 cm medially to the lateral border.

4. *Acromio coracoid distance-I (AC-I):* Between tip of coracoid process to the tip of the acromion process.
5. *Acromio coracoid distance-II (AC-II):* From the dorsum of the base of coracoid process to the tip of the acromion process
6. *Acromio glenoid distance:* Between Supraglenoid tubercle and the tip of the acromion process.

Results

In the present study we found the mean value of the acromian thickness was 5.7mm in total and 5.7mm in right side and 5.8mm in left side.

The distances between acromian and coracoid processes were measured at two points.

The distance taken from tip of the acromian process to tip of the coracoid process was found 36.6mm in total sample, in right side 36.2mm and 37.2mm in left side.

The distance taken at the base of the coracoid to the tip of the acromian process mean value was 23.6mm in total, 23.7mm left side and 23.9mm in right side.

The acromio-glenoid distance observed 26.2mm in total, 26.5mm in left side and 25.5mm in right side.

We examined the three types of acromion process according to slope, flat was seen in 28 (28%), Curved 49 (49%), Hooked 23(23%) type and also it was found the inferior surface of the acromian smooth in 74 (74%) and rough in 26 (26%) samples.

Table 1: Agedistribution(in years)

P value 0.409 (>0.05)

Group	Min value	Max value	Mean+/-SD
GA	2.6	12	7.49+/-2.80
GA+PEA	2.8	12	6.97+/-2.86

Table 2: Sex distribution

P value 0.178 (>0.05)

Group	Male	Female	Total
GA	15	25	40
GA+PEA	21	19	40
Total	36	44	80

Table 3: Weight distribution (in kg)

P value 0.061 (>0.05)

Group	Min value	Max value	Mean+/-SD
GA	14	40	26.2+/-8.05
GA+PEA	12	35	22.6+/-7.56

Table 4: Duration of surgery (in minutes)

P value 0.135(>0.05)

Group	Min value	Max value	Mean+/-SD
GA	90	140	119.8+/-13.6
GA+PEA	60	180	112.8+/-25.9

Table 5: VAS

P value <0.001

VAS	Min value	Max value	Mean+/-SD
GA	3	6	4.35+/-0.66
GA+PEA	0	5	1.9+/-1.72

Table 6: Rescue Analgesia

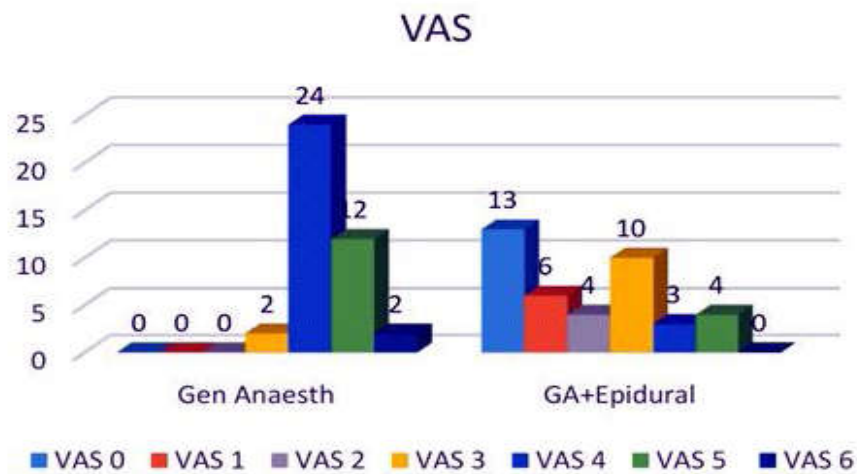
P value=0.018 (<0.05)

Group	No Analgesia	Paracetamol	Pct+Morphine	Total
GA	26	12	2	40
GA+PEA	35	5	0	40
TOTAL	61	17	2	80

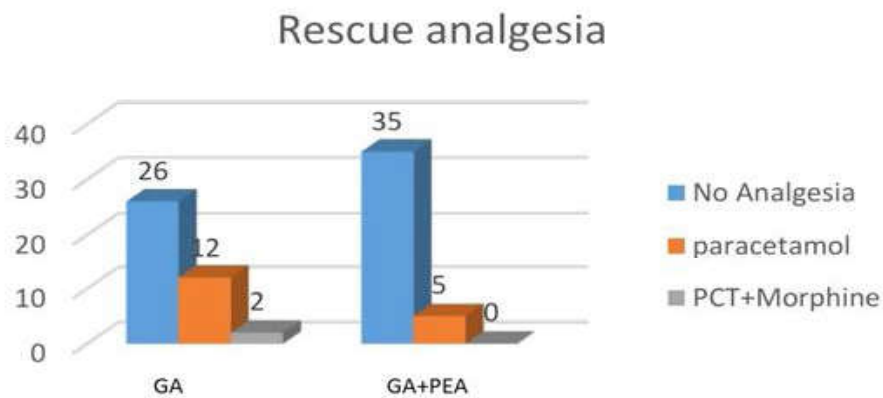
Table 7: Parental satisfaction

P value<0.001

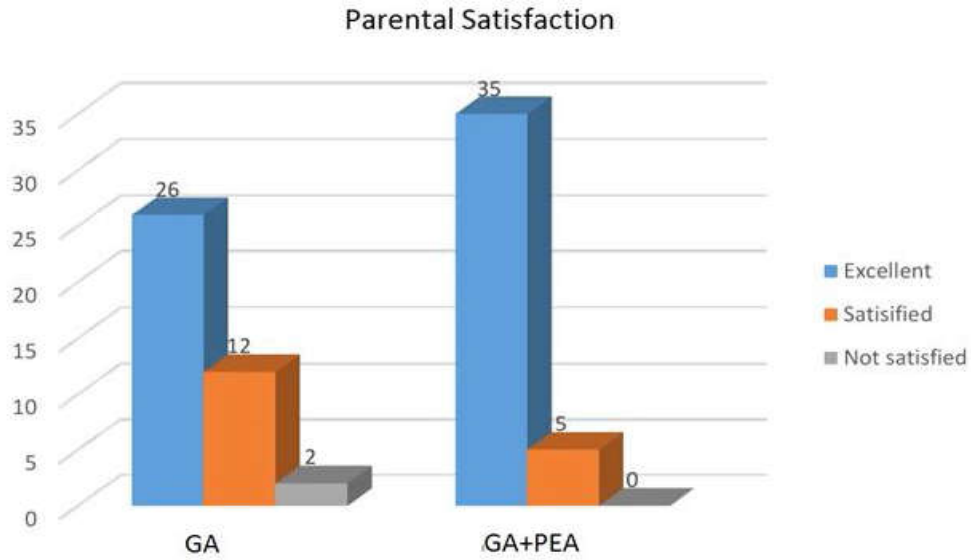
	Excellent	Satisfactory	Not satisfactory	Total
GA	26	12	2	40
GA+PEA	35	5	0	40
Total	61	17	2	80



Graph 1: VAS



Graph 2: Rescue analgesia



Graph 3:

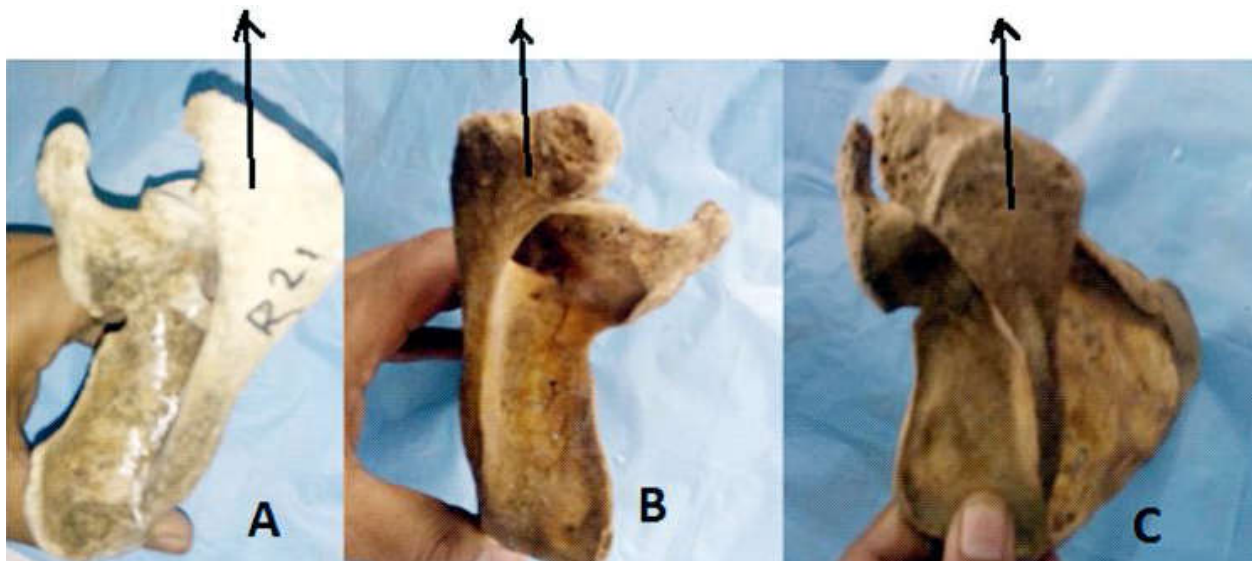


Fig. 1: Showing Morphological shapes of the tip of the acromion (A) intermediate (B) Square tip(C) Cobra shaped



Hooked acromion

Flat acromion

Curved acromion

Fig. 2: Showing Types of the acromion process according to slope

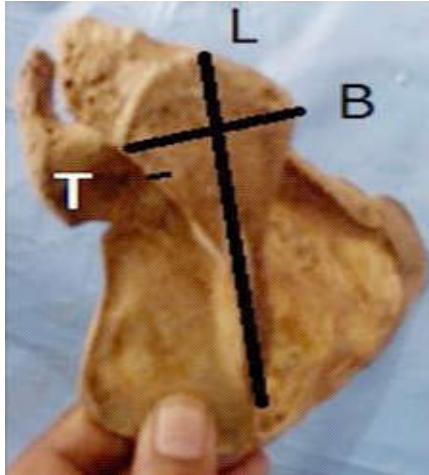


Fig. 3: Showing Acromian. Length(L) Acromian widthch(B) Acromian thickness(T)

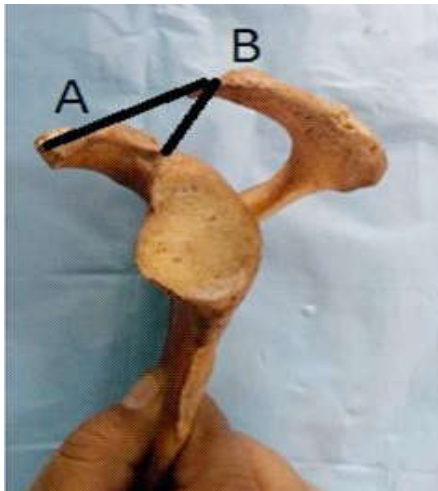


Fig. 4: Showing Acromio-coracoid Distance (A) Acromio-glenoid Distance (B)

Discussion

We found the mean value of Acromian length, Acromian width and Acromian thickness found to be as 44.8 mm, 21.7 mm and 5.7 mm in total samples respectively. Anetzberger and Putz observed acromial length as 47.00 mm [6]. In an another study Mallon et al took his measurements from x-rays films, recorded the Acromian length of 42.0 mm [7]. Similar studies done by Coskun et al had reported the acromian length 44.7 mm width 32.0 mm. Sitha et al observed the same parameters as acromian length 40.0 mm width 23.9 mm thickness [8,9]. These values were very near to the values we found in our study. Mansur et al has observed that the length of the acromion process of right scapulae mean value 46.46 mm and left side mean was 45.57 mm. They had observed that the right acromion process was longer than the left by 0.89 mm [10]. In

our study we found that the length of the acromion process of right scapulae mean value 4.52 cm and left side mean was 4.6 cm. left acromion process was longer than the right by 0.80 cm which was also found to be insignificant.

The breadth of acromion process of right scapulae mean value 2.18cm and left scapulae mean value 2.15cm was reported in the study of Mansur et al. They reported that the right acromion process was wider than the left by 0.60 mm. In our study we found same results as the right acromion was slightly wider (0.3 cm) than the left side, with the difference being insignificant.

The distance taken from the tip of acromian to the tip of the coracoid process mean value found 3.65cm in total sample and 3.66cm right side as well as 3.62cm in left side. The distance taken at the base of the coracoid to the tip of the acromian process mean value was 2.62 cm in total.

The mean value of the acromio-glenoid distance 2.62cm in total samples and 2.55 cm right side, 2.65cm of left side samples respectively. Mansur et al have observed mean values of acromio coracoids distance on the right and left sides as 39.03 mm and 39.39 mm respectively [10]. Their study showed that there were no statistically differences between right and left side ($t = 0.259$, $p = 0.398$). Similarly, the acromio-glenoid distance was found to be varied from distances 2.55 cm and 2.65 cm on right and left sides respectively.

They noticed that acromio-glenoid distances were same on both sides ($t = 0.150$, $p = 0.440$) According to Sitha et al the coraco-acromian distance 29.5 mm and acromio-glenoid distance 18.1mm was observed [9]. The acromio-coracoid and acromio-glenoid distances between both sides in this present study showed no significance difference, were as when compared the mean values with the findings of the Mansur et al the values were slightly less on the other hand the mean values shown by the Sitha et al were much less than our findings. We examined the types of acromion according to its slope. Type - I flat was seen in 28 (28%), type -II curved in 49 (49%) and type - III hooked in 23 (23 %) acromion process. According to Coskun et al type - I flat was seen in 9 (10%), type - II curved in 66 (73%) and type - III hooked in 15 of 90 (17%) acromion process. Among the all three acromian types the curved type was reported more by the coskun et al [8]. In our study we found shape of tip of acromian proceses were cobra shaped 23%, square shaped 31%, intermediate, 46%. Types of inferior surface smooth 74% and rough 26%.

Conclusion

The acromion process plays important role in formation and provides stability to the shoulder joint. Dimensions of scapula and acromion process are important that they differ in morphology and when classified in to different types show linkage to the shoulder girdle pathologies. Variations in the size and shape of the acromion process which were observed in the current study will be of great help for orthopaedic surgeons to understand the shoulder pathology better .

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