



## “MORPHOLOGICAL AND MORPHOMETRIC STUDY OF SCAPULAR ACROMION PROCESS”

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### ABSTRACT

**BACKGROUND:** The shoulder joint is the most important joint in human body and limitation of this joint movements affects the quality of life. The most common problem of joint replacements is the loosening of the shoulder joint. Rotator cuff muscles, static factors of the glenohumeral ligaments, the labrum and the joint capsule play a important role in stability of the glenohumeral joint. Morphometry of the acromion process is of significant importance and is commonly involved in impingement syndrome of the shoulder joint. As during surgery on shoulder joint the variations of the acromion process must be kept in mind and shape and various distances of the acromion process might benefit the orthopaedic operations. **MATERIAL AND METHODS:** A total of 100 unpaired dry scapula were isolated from the department of Anatomy Patna medical college and Hospital Patna Bihar. Two groups were made according to the side of the scapula and were equally divided into 50 right and 50 left scapula each. Bones were segregated and inspected individually. The shape of the acromion process of scapulae was recorded according to the Bigliani-Morrison-April classification. Dimensions were measured, using a vernier calipers including the size of the scapula and the acromion process.

**RESULTS:** Mean length of scapula on right side was  $12.98 \pm 1.00$  and of left side was  $13.06 \pm 1.20$  cm. Mean Width of right scapulae was  $9.56 \pm 0.66$  and of left was  $9.78 \pm 0.59$  cm. Mean length of acromion of right and left scapulae was observed as  $4.01 \pm 0.52$  and  $4.21 \pm 0.67$  cm respectively. Mean Acromioclavicular distance on right was observed as  $3.11 \pm 0.44$  cm and on left side as  $3.87 \pm 0.45$  cm. 48 % of the acromion process of scapulae were quadrangular, 34 % were boot shaped 8% were leaf shaped and rest 10% were other various shapes. Type I scapulae were 33%, type II as 21% and 46% were type III.

**CONCLUSION:** Features and dimensions of acromion process are associated with the pathology of the rotator cuff also role in it plays a significant role in stability of the shoulder joint. These measurements are useful for orthopedicians while performing procedures on shoulder joint.

**KEYWORDS :** Scapula, acromion process, Morphometry.

### INTRODUCTION

The shoulder joint is the most important joint in human body and limitation of this joint movements affects the quality of life. Severe shoulder injuries and glenohumeral arthritis causes shoulder dysfunction with unwanted results, also to restore normal functions orthopaedic surgeon can perform total shoulder arthroplasty, or reverse shoulder prosthesis, or hemiarthroplasty. The long term success of arthroplasty depends on the design of the prosthesis and its fixation to the bone. The most common problem of joint replacements is the loosening of the shoulder joint. Rotator cuff muscles, static factors of the glenohumeral ligaments, the labrum and the joint capsule play a important role in stability of the glenohumeral joint. A good understanding of the morphometry of the scapula is necessary for designing the prosthesis as the problem is accentuated in the glenoid prosthesis fixation because of the relatively small glenoid articular surface.

In humans scapula is located between 2<sup>nd</sup> to 7<sup>th</sup> ribs in the posterolateral part of the thorax. It is a flat and triangular shaped bone. The scapular spine which originates from the posterior surface of the scapula, is a prolonged to a powerful and flattened process called acromion process located on the boundary between the superior quadrant and the remaining quadrants of the scapula. The anterior third of the acromion process, the coracoacromial ligament, and the coracoid process form a familiar arch called the coracoacromial arch which is a non-elastic structure and it comprises of a subacromial space which is 1 to 1.5 cm wide and has the myotendinous rotator cuff, the subacromial bursa, and the tendon of the long head of the biceps muscle. Morphometry of the acromion process is of significant importance and is commonly involved in impingement syndrome of the shoulder joint. As during surgery on shoulder joint the variations of the acromion process must be kept in mind and shape and various distances of the acromion process might benefit the orthopaedic operations. With this background this study was carried out to study the morphological and morphometrical of the acromion process which is important in orthopaedics surgery of shoulder and scapula.

### MATERIAL AND METHODS

The study was prospective observational study carried out in the department of anatomy at Patna medical college and Hospital patna. A

total of 100 unpaired dry scapula were isolated from the department of Anatomy. Two groups were made according to the side of the scapula and were equally divided into 50 right and 50 left scapula each. Bones were segregated and inspected individually. The shape of the acromion process of scapulae was recorded according to the Bigliani-Morrison-April classification, Type I - flat acromion process, Type II - curved acromion process, and Type III - hook acromion process. Dimensions were measured, using a vernier calipers including the size of the scapula and the acromion process. The anteroposterior length in the longitudinal axis, thickness of the acromion process 1-cm posterior to the anterior border and 1 cm medial to the lateral border, distance between the lateral and medial borders at the midpoint of the acromion process and acromioclavicular distance was measured between the tip of the coracoid process and the tip of the acromion process was measured.

Statistical analysis was done by using SPSS 21.0 software. Student t-test as well as correlation tests were performed for result analysis.

### RESULTS

A total of 100 unpaired dry scapula were included in the study. Two groups according to the side of the scapula were made and were equally divided into 50 right and 50 left scapula each.

Parameters	Right (cm)	Left (cm)	P value
Length of scapula	$12.98 \pm 1.00$	$13.06 \pm 1.20$	NS
Width of scapula	$9.56 \pm 0.66$	$9.78 \pm 0.59$	NS
Length of acromion	$4.01 \pm 0.52$	$4.21 \pm 0.67$	NS
Width of acromion	$2.06 \pm 0.29$	$2.11 \pm 0.32$	NS
Thickness of acromion	$0.71 \pm 0.11$	$0.74 \pm 0.14$	NS
Acromioclavicular distance	$3.11 \pm 0.44$	$3.87 \pm 0.45$	NS

**TABLE 1: VARIOUS PARAMETERS OF RIGHT AND LEFT SCAPULAE**

NS: Not significant

Mean length of scapula on right side was  $12.98 \pm 1.00$  and of left side was  $13.06 \pm 1.20$  cm.

Mean Width of right scapulae was  $9.56 \pm 0.66$  and of left was  $9.78 \pm 0.59$

cm. Mean length of acromion of right and left scapulae was observed as  $4.01\pm 0.52$  and  $4.21\pm 0.67$  cm respectively. Mean Acromiocracoid distance on right was

observed as  $3.11\pm 0.44$  cm and on left side as  $3.87\pm 0.45$  cm.

48 % of the acromion processes of scapulae were quadrangular, 34 % were boot shaped 8% were leaf shaped and rest 10% were other various shapes.

Type	Percentage
Type I	33%
Type II	21%
Type III	46%

**TABLE 2: TYPES OF ACROMION PROCESS**

Type I scapulae in our study were 33% , type II as 21% and 46% were type III.

We found that there was significant correlation between the length of the scapula and the length of the acromion process as well as between the width of scapula and the width of the acromion process ( $P < 0.005$ ).

### DISCUSSION:

Scapula has three borders, three processes, and three angles. The Glenoid fossa is present at the lateral angle of the bone. Lateral angle of the scapula becomes truncated and broadened and bears the glenoid cavity which articulates with the humerus in the shoulder joint. Shoulder joint is formed when the glenoid cavity is connected with the head of the humerus<sup>5</sup>.

It has been shown that rotator cuff lesions are observed mostly in the hooked acromia. In this study 46% of the acromion were type III (62-66% of the cases of rotator cuff tear involve the type III acromion process)

In this study Mean length of scapula on right side was  $12.98\pm 1.00$  and of left side was  $13.06\pm 1.20$  cm. Mean Width of right scapulae was  $9.56\pm 0.66$  and of left was  $9.78\pm 0.59$  cm. Patil G V et al in their study of 224 scapulae observed that the widths of left side to be slightly more than right side they found a mean length of  $136.03\pm 11.49$ mm in male scapulae and  $119.63\pm 8.81$ mm in female scapulae<sup>8</sup>. Singal et al in Gujarati population found a mean breadth of  $96.4\pm 7$ mm<sup>9</sup>.

Paraskevas *et al.*<sup>3</sup>, in their study observed that the mean length, width, thickness of the acromion process as 4.61, 2.23, and 0.88 cm, respectively, and Singh *J et al.*<sup>10</sup>, found the same observations to be 4.61, 2.32, and 0.66 cm, respectively. These observations were in accordance with our study.

Natsis *et al.*, observed that the enthesophytes were significantly more common in the type III acromion process, and this combination is particularly associated with subacromial impingement syndrome and rotator cuff tears<sup>11</sup>.

Edelson in his study observed that slope and length of the acromion process and the height of the arch were utmost closely related with degenerative changes of the scapula<sup>7</sup>.

To conclude features and dimensions of acromion process are associated with the pathology of the rotator cuff also role in it plays a significant role in stability of the shoulder joint. These measurement are useful for orthopedicians while performing procedures on shoulder joint.

### CONCLUSION

Features and dimensions of acromion process are associated with the pathology of the rotator cuff also role in it plays a significant role in stability of the shoulder joint. These measurement are useful for orthopedicians while performing procedures on shoulder joint.

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