

Original ARTICLE

Evaluation of morphological variation in shape and size of scapulae

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ABSTRACT

Background: The scapulae are a pair of triangular, large, flat bones that are situated dorsally in the ribcage in relation with the second to seventh ribs. The present study was conducted to evaluate scapulae of both genders. **Materials & Methods:** The present study was conducted on 50 scapulae bones of both gender. We classified scapula into three types; pear shaped or inverted comma shape in presence of a glenoid notch & oval in absence of notch. We calculated Superior-Inferior Glenoid Diameter (SI), Anterior-Posterior Glenoid Diameter-1 (AP-1), Anterior-Posterior Glenoid Diameter-2 (AP-2) and Glenoid cavity index (GCI). **Results:** Pear type was present in 25, inverted comma in 15 and oval in 10 scapulae. The difference was significant ($P < 0.05$). The mean length on left side was 134.6 mm and on right side was 136.2 mm, width was 97.5 mm and 98.4 mm on both sides, superior-inferior glenoid diameter was 35.7 mm and 36.3 mm on both sides, anterior-posterior glenoid diameter-1 was 24.6 mm and 23.2 mm in both sides, anterior-posterior glenoid diameter-2 was 16.7 mm and 17.2 mm in both sides and glenoid cavity index was 65.4 mm and 66.2 mm in both sides. The difference was significant ($P < 0.05$). **Conclusion:** Authors suggested that common type of scapula was pear type followed by inverted comma and oval shaped.

Key words: comma, oval, scapula

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INTRODUCTION

The scapulae are a pair of triangular, large, flat bones that are situated dorsally in the ribcage in relation with the second to seventh ribs.¹ The scapula has three borders, three processes, and three angles. The Glenoid (Gk. Gléne "socket") fossa is oriented at the lateral angle of the bone. Scapula a bone of shoulder girdle is among the interesting bones of our body because of variations present in it.² Its lateral angle becomes truncated and broadened that bears the glenoid cavity which articulates with the head of the humerus in the shoulder joint. The glenoid cavity which is also known as the head of the scapula is connected with the head of the humerus to form shoulder joint.³ The exact dimensions of the scapula and its geometry, however, are of fundamental importance in the pathomechanics of rotator cuff disease, total shoulder arthroplasty and recurrent shoulder dislocation. Determination of sex using scapular measurements is very useful in medicolegal cases, natural disasters and in circumstances where other bones are fragmented or not available.⁴ Scapular measurements can be used for comparative anatomy, for surgical procedures and for manufacturing prosthesis. The

dimensions of scapula are important in case of rotator cuff diseases, shoulder arthroplasty and in recurrent shoulder dislocation. Scapular indice is also useful to compare racial differences.⁵ The present study was conducted to evaluate scapulae.

MATERIALS & METHODS

The present study was conducted in the department of Anatomy. It comprised of 50 scapulae bones of both gender. Ethical clearance was obtained prior to the study.

We classified scapula into three types; pear shaped or inverted comma shape in presence of a glenoid notch & oval in absence of notch. We calculated Superior-Inferior Glenoid Diameter (SI): Maximum distance from inferior point on the glenoid margin to the most prominent point of supraglenoid tubercle, which is also the maximum height of glenoid cavity. Anterior-Posterior Glenoid Diameter-1 (AP-1): represents the maximum breadth of articular margin of the glenoid cavity perpendicular to glenoid cavity height Anterior-Posterior Glenoid Diameter-2 (AP-2): It is the anterior-posterior diameter (breadth) of the top half of the glenoid

cavity at the mid-point between the superior rim and the mid equator.

Glenoid cavity index (GCI): was calculated with the help of following formula. $GCI = \frac{\text{Anterior-Posterior Glenoid Diameter} - 1 \times 100}{\text{Superior-Inferior Glenoid Diameter}}$. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

RESULTS

Table I Type of scapula

Type	Number	P value
Pear	25	0.05
Inverted comma	15	
Oval	10	

Table I, graph I shows that pear type was present in 25, inverted comma in 15 and oval in 10 scapulae. The difference was significant (P< 0.05).

Graph I Type of scapula

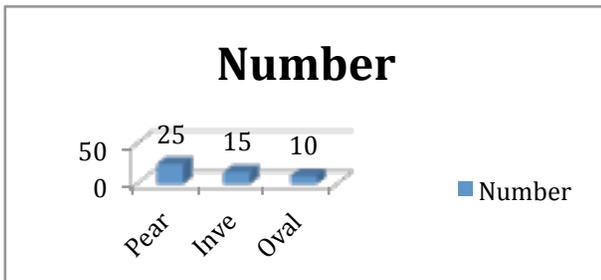
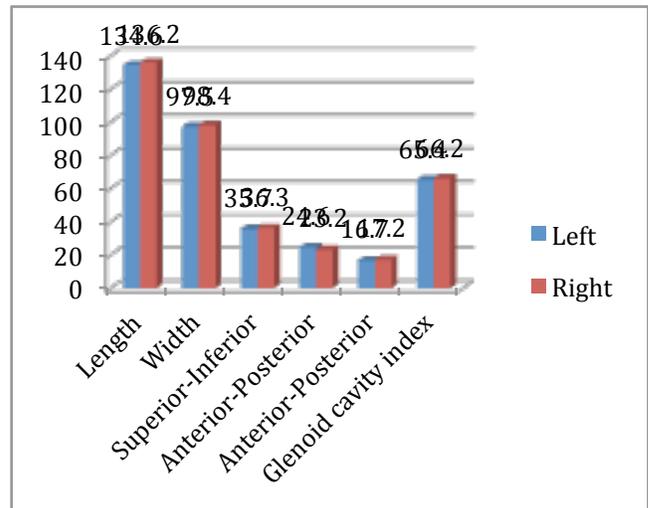


Table II Different parameters of scapulae

Parameters	Left	Right	P value
Length	134.6	136.2	0.09
Width	97.5	98.4	0.92
Superior-Inferior Glenoid Diameter	35.7	36.3	0.64
Anterior-Posterior Glenoid Diameter-1	24.6	23.2	0.12
Anterior-Posterior Glenoid Diameter-2	16.7	17.2	0.25
Glenoid cavity index	65.4	66.2	0.75

Table II, graph II shows that mean length on left side was 134.6 mm and on right side was 136.2 mm, width was 97.5 mm and 98.4 mm on both sides, superior-inferior glenoid diameter was 35.7 mm and 36.3 mm on both sides, anterior-posterior glenoid diameter-1 was 24.6 mm and 23.2 mm in both sides, anterior-posterior glenoid diameter-2 was 16.7 mm and 17.2 mm in both sides and glenoid cavity index was 65.4 mm and 66.2 mm in both sides. The difference was significant (P< 0.05).

Graph II Different parameters of scapulae



DISCUSSION

The shoulder joint is the most frequently dislocated joint in the body. Dynamic factors of the rotator cuff muscles and the static factors of the glenohumeral ligaments, the labrum and the joint capsule play a role in gleno-humeral joint stability. Alignment of the humerus and the glenoid articular surfaces is one of the predisposing factors for glenohumeral joint instability, which is one of the predisposing factors for rotator cuff pathology.⁶ Dislocations may also be associated with fracture of the glenoid cavity; for the management of this, prostheses and arthroplasty are required. The knowledge of the normal anatomical features and variations in shape and size of the glenoid fossa are required for better understanding of shoulder joint arthroplasty are prerequisites for complete understanding of the mechanics of shoulder joint. This information has clinical application in shoulder arthroplasty, glenohumeral instability and rotator cuff tear management.⁷ The present study was conducted to evaluate scapulae.

In this study, pear type was present in 25, inverted comma in 15 and oval in 10 scapulae. Wael et al⁸ found that the pear shaped glenoid cavity was most common type followed by inverted comma shaped and the oval glenoid cavity was least common type. Mean length and breadth of scapula was 136.07±14.1mm & 97.13 ± 10.63mm respectively. Mean SI diameter was 36.71±4.14 mm, mean diameter AP-1 was 24.85±3.50 mm, mean diameter AP-2 was 16.27±3.24 mm and GCI was 65.40±8.14%. Results of our study shows that there are variations in the shape of glenoid cavity and in Indian population pear shaped glenoid cavity is most

common. There are minor differences in the dimensions of the glenoid cavity of right and left side but the differences are statistically insignificant.

We found that mean length on left side was 134.6 mm and on right side was 136.2 mm, width was 97.5 mm and 98.4 mm on both sides, superior-inferior glenoid diameter was 35.7 mm and 36.3 mm on both sides, anterior-posterior glenoid diameter-1 was 24.6 mm and 23.2 mm in both sides, anterior-posterior glenoid diameter-2 was 16.7 mm and 17.2 mm in both sides and glenoid cavity index was 65.4 mm and 66.2 mm in both sides.

Polgaj et al⁹ found that most common shape of glenoid fossa was Pear shape that is 44% (42.9% on right, 45.5% on left), followed by oval shape in 34% (35.7% on right, 31.8% on left side) and inverted comma shape in 22% scapulae (21.4% on right side, 22.7% on left side). The mean measured values in total scapulae were; SI diameter was 34.24±3.27 mm, AP-1 diameter was 23.93±2.67 mm, AP-2 diameter was 12.96±1.84 mm and glenoid cavity index was 70.12±7.13 mm.

Sitha et al¹⁰ the found that the length of the scapula was ranging from 135-167mm. The mean length of the scapula and the standard deviation observed were 141.34 mm and 8.5 mm respectively. Maximum number of scapulae were in the range of 135 to 145 mm while least number were in the range of 165 mm to 175mm. [ii] Breadth of the scapula: The breadth of scapula were ranging from 90.3 mm to 110.2mm. The mean and standard deviation were 103.3 and 6.9 respectively. The breadth range of 100mm to 105 mm had the maximum number of scapulae, followed by 105mm to 110mm, followed by the minimum number were noted in the range of 90 to 100 mm range. [iii] Infraspinous length: The infraspinous length was ranging 101.5 to 110.7 mm. The mean and standard deviation were 106.7 and 3.5 respectively.

CONCLUSION

Authors suggested that common type of scapula was pear type followed by inverted comma and oval shaped.

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