

## Morphometric Study of Glenoid Cavity of Human Scapula

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### Abstract

**Introduction:** Present study aims to determine the various dimensions of the glenoid cavity and to note the variation in its shape. **Material and Methods:** 123 dry, adult human scapulae were used for present study. Out of which, 60 belong to right side and 63 on left side. Length and breadth of glenoid cavity were measured by using the vernier caliper. Glenoid cavity index was calculated. We also noted the different shapes of glenoid cavity. **Results:** In present study, most common shape of glenoid cavity was pear shaped (51.22%) followed by inverted comma shaped (34.15%), followed by oval shape (14.63%). The average length of glenoid cavity on right side was 35.55±3.48 mm and on left side was 35.04±3.61 mm. The average breadth of glenoid cavity on right and left side were 22.51±2.51 mm and 22.81±2.88 mm respectively. Mean glenoid cavity index on right side was 63.62±6.73% and that of left side was 65.19±6.44%. **Conclusion:** Anatomical knowledge of shapes and dimensions of glenoid cavity are important for orthopaedic surgeons, anatomists, anthropologists and forensic experts.

**Keywords:** Glenoid Cavity; Glenoid Cavity Index; Shape of Glenoid Cavity.

### Introduction

The scapula is a thin and flat bone placed on the posterolateral aspects of the thoracic cage. It has three angles, superior, inferior and lateral angle. The lateral angle is broad and truncated which bears the glenoid cavity also known as glenoid fossa, directed forwards, laterally and slightly upwards. The capsule of shoulder joint is attached along the margins of the glenoid cavity. The shoulder joint is formed by articulation of the glenoid cavity and head of humerus. The shoulder joint is more prone to dislocation than any other joint because of laxity of the capsule and the disproportionate area of the articular surfaces.

Knowledge of morphometry of glenoid fossa is essential for treating glenohumeral osteoarthritis [1]. The glenoid rim presents a notch in its anterosuperior

part, due to which various shapes of glenoid cavity are described like pear shaped, oval or inverted comma shape [2-4]. The anatomical basis and variation of shape and size of glenoid cavity of scapula is of fundamental importance in understanding the rotator cuff disease, shoulder dislocation and to decide the proper size of the glenoid component in the shoulder arthroplasty [5]. Present study aims to determine the various dimensions of the glenoid cavity and to note the variation in its shape.

### Material and Methods

The present study was conducted on 123 dry, adult human scapulae (60-right side and 63-left side) collected from students of First year MBBS, BPTH and from Dept of anatomy Dr. Ulhas Patil Medical College, Jalgaon. Out of which 60 were of right side and 63 of left side.

All the bones were fully ossified, dry and without any damage. The Length and breadth of glenoid cavity were measured by using the vernier caliper. We also noted the different shapes of glenoid cavity like pear-shaped, inverted comma and oval shaped (Figure 1). Glenoid cavity index was calculated in percentage by using the following formula,

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Received | 17.05.2018, Accepted | 22.05.2018

$$\text{Glenoid cavity index} = \frac{\text{Maximum breadth of glenoid cavity}}{\text{Length of glenoid cavity}} \times 100$$

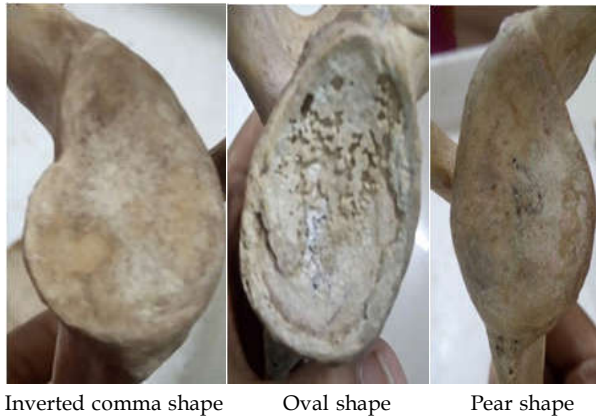


Fig. 1: Different shapes of glenoid cavity



Fig. 2: Dimensions of glenoid cavity

Following measurements were taken in millimetres.

- i. Length of glenoid cavity (Figure 2) – It was taken from most prominent on the supraglenoid tubercle to the inferior margin of glenoid cavity. It was measured from point a to b.
- ii. Breadth of glenoid cavity (Figure 2) – It was taken along the maximum breadth of the articular margin of the glenoid cavity perpendicular to glenoid cavity height. It was measured from point c to d.

## Results

All the parameters were studied and analyzed by using standard computer programme. Range, mean and standard deviation were calculated for each parameter. The analyzed data was tabulated as follows –

Table 1 shows that majority of bones had pear-shaped glenoid cavity (51.22%), followed by inverted comma shaped (34.15%), followed by oval (14.63%).

Table 2 shows that the average length of glenoid cavity on right side was  $35.55 \pm 3.48$  mm and on left side was  $35.04 \pm 3.61$  mm. The average breadth of glenoid cavity on right and left side were  $22.51 \pm 2.51$  mm and  $22.81 \pm 2.88$  mm respectively. Mean glenoid cavity index on right side was  $63.62 \pm 6.73\%$  and that of left side was  $65.19 \pm 6.44\%$ . p value more than 0.005 shows that there were no significant difference between right and left side.

Table 1: Different shapes of glenoid cavity

Shape	Right side		Left side		Total	
	Frequency	Percentage	Frequency	Percentage	Frequency	Percentage
Pear	30	50	33	52.38	63	51.22
Inverted comma	18	30	24	38.10	42	34.15
Oval	12	20	6	9.52	18	14.63

Table 2: Observations of various dimensions of glenoid cavity

Parameter	Range		Mean $\pm$ SD		t value	p value
	Right	Left	Right	Left		
Length (mm)	27-42	27-43	$35.55 \pm 3.48$	$35.04 \pm 3.61$	0.78	0.43
Breadth (mm)	17-30	17-30	$22.51 \pm 2.51$	$22.81 \pm 2.88$	0.60	0.54
Glenoid cavity index (%)	48.8-79.3	42.9-81.1	$63.62 \pm 6.73$	$65.19 \pm 6.44$	1.33	0.18

**Discussion**

In present study various shapes and dimensions have been measured and compared with findings of previous workers showed in Table 3 and Table 4. Present study correlates with other studies.

In present study mean length of glenoid cavity on right side was 35.55±3.48mm and on left side was 35.04±3.61mm. The mean of breadth of glenoid cavity on right and left side were 22.51±2.51mm and 22.81±2.88mm respectively. Our findings of dimensions of glenoid cavity are nearer to the findings of Mamatha T. et al. (2011)[6], Rajput HB et al. (2012)[7], Sinha P. et al. (2016)[8] and Jawed Akhtar Md et al. (2016)[9] studies.

In an another study by Chhabra N. et al.(2015) [5], they observed slightly higher values than present study. The mean glenoid cavity index found in our study was 63.62±6.73% on right side and 65.19± 6.44% on left side. Our findings more or less similar to Chhabra N. et al.(2015)[5] and Jawed Akhtar Md et al.(2016)[9] studies.

In present study pear-shaped glenoid cavity was found in 50% of sample of right side and 52.38% of the left side followed by inverted comma shaped

found 30% in right side and 38.10% in left side, followed by oval shaped found 20% in right side and 9.52% in left side. Our findings similar with Mamatha T. et al.(2011)[6], Rajput HB et al.(2012)[7] and Jawed Akhtar Md et al.(2016)[9] studies.

They observed majority of bones had pear shaped glenoid cavity followed by inverted comma followed by oval shaped. But our study does not correlate with Chhabra N. et al.(2015)[5] and Sinha P. et al.(2016) [8]studies.

They reported pear shaped glenoid cavity was most common followed by oval shaped and inverted comma shaped was least common.

**Conclusion**

The knowledge of different shapes and dimensions are useful to orthopaedic surgeons for arthroplasty, reduction of dislocation, treatment of arthritis and rotator cuff disease, etc.

It is also useful to anatomists, anthropologists and forensic experts. Anatomical knowledge of glenoid is important to evaluate the pathological conditions like osseous Bankert lesion and osteochondral defects.

**Table 3:** Comparison between previous and present study on glenoid cavity

Author	Length(mm)		Mean ± SD Breadth(mm)		Glenoid cavity index (%)	
	Right	Left	Right	Left	Right	Left
Mamatha T. et al.(2011) [6]	33.67±2.82	33.92±2.87	23.35±2.04	23.05±2.30	-	-
Rajput HB et al.(2012) [7]	34.76±3.0	34.43±3.21	23.31±3.0	22.92±2.80	-	-
Chhabra N. et al.(2015) [5]	38.46±2.81	39.03±3.18	25.04±2.69	24.85±2.46	65.11±5.11	63.67±3.76
Sinha P. et al. (2016) [8]	33.64±3.01	34.44±3.27	23.22±2.85	23.31±3.12	-	-
Jawed Akhtar Md et al.(2016) [9]	36.03±3.15	35.52±3.12	23.67±2.53	23.59±2.47	66.13±8.67	66.73±7.47
Present study (2018)	35.55 ± 3.48	35.04 ± 3.61	22.51 ± 2.51	22.81 ± 2.88	63.62 ± 6.73	65.19 ± 6.44

**Table 4:** Comparison between previous and present study on different shapes of glenoid cavity

Author	Side	Shape		
		Pear shape (%)	Inverted comma (%)	Oval (%)
Mamatha T et al. (2011)[6]	Right	46	34	20
	Left	43	33	24
Rajput HB et al.(2012) [7]	Right	49	35	16
	Left	46	39	15
Chhabra N. et al.(2015) [5]	Right	47	22	31
	Left	55	13	32
Sinha P. et al. (2016) [8]	Right	23	9	08
	Left	42	6	13
Jawed Akhtar Md et al.(2016) [9]	Right	51.59	34.92	13.49
	Left	49.02	37.25	13.73
Present study (2018)	Right	50	30	20
	Left	52.38	38.10	9.52

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