

# A study of variations in the morphology and morphometry of scapular glenoid fossa

V Lakshmi<sup>1</sup>, P Kanagavalli<sup>2\*</sup>

<sup>1</sup>Associate Professor, Department of Anatomy, Government Stanley Medical College, Chennai -600001, INDIA.

<sup>2</sup>Associate Professor, Institute of Anatomy, Madras Medical College, Chennai -600003, INDIA.

Email: [drkanagashankar@gmail.com](mailto:drkanagashankar@gmail.com)

## Abstract

**Background:** Scapula (or) shoulder blade is a flat, triangular bone present at the back of the thoracic cage. It bears glenoid fossa on its lateral angle, which articulates with head of humerus to form a synovial ball and socket glenohumeral joint (shoulder joint). It is the most frequent joint to dislocate, because of incongruent articular surfaces. So the present study is mainly aimed at the morphological and morphometry of glenoid fossa. **Materials And Methods:** The study was conducted in 50 adult dry human scapulae, at Madras Medical College, Chennai. The different shapes of glenoid fossa were observed, morphometry of glenoid fossa were measured using vernier caliper and the findings were tabulated. **Results:** In the present study 50 scapulae studied (25 right and 25 left), the average anteroposterior diameter was 23.35 mm (22.8 mm on the right side and 23.9 mm on the left side) and the average superoinferior diameter was 37.3 mm (35.3 mm on the right side and 39.3 mm on the left side). Glenoid Cavity Index was 62.6 mm (64.2 mm on the right side and 60.8 mm on the left side). By the presence or absence of glenoid notch the shape of glenoid fossae were classified into pear, oval and inverted comma shape. In the present study most common shape observed was pear (R-52%, L-56%) followed by inverted comma (R-24%, L-28%) and oval (R-24%, L-16%). **Conclusion:** variations in the morphology and morphometry of glenoid fossa are important for understanding of specific abnormalities of shoulder joint like instability, dislocation, glenoid labral injuries. The findings of present study will provide anatomical knowledge of glenoid fossa during surgical orthopedic

## \*Address for Correspondence:

Dr P Kanagavalli, Associate Professor, Institute of Anatomy, Madras Medical College, Chennai -600003, INDIA.

Email: [drkanagashankar@gmail.com](mailto:drkanagashankar@gmail.com)

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## INTRODUCTION

Scapula is a large flat triangular bone in the posterolateral aspect of thoracic cage. The lateral angle of scapula is truncated to form the glenoid fossa which articulates with the head of humerus to form the shoulder joint. This glenoid fossa may be regarded as head of scapula connected to the plate like body by an inconspicuous neck. Shoulder joint is prone for frequent dislocations due to the small and shallow glenoid fossa. Which is deepened by

fibrocartilaginous rim, glenoid labrum. Therefore, a sound knowledge of variations in the morphology and morphometry of glenoid fossa is essential in diagnosis and surgical management of shoulder pathologies.<sup>1,2,6,7</sup>

## MATERIALS AND METHODS

50 dry human scapulae (right -25; left-25) of unknown sex from the Institute of Anatomy, Madras Medical College were studied for variations in shape and dimensions of the glenoid fossa. Measurements were taken by using digital Vernier callipers. Shape of the glenoid fossa was determined by taking an imprint of the glenoid rim on a white paper.

### The following parameters were measured

Vertical glenoid diameter (Superoinferior diameter).

Transverse glenoid diameter (Anteroposterior diameter).

Shape of the glenoid fossa.

Glenoid cavity index = Transverse glenoid diameter X 100.

Vertical glenoid diameter.

**RESULTS**

In the present study total of 50 dry human scapular glenoid fossa were studied, out of which 25 on the right side, 25 on the left side. vertical glenoid diameter, transverse glenoid diameters were measured and glenoid cavity index was calculated. Shape of glenoid fossae were observed.

**Vertical glenoid diameter:**

The average vertical glenoid diameter on the right side was observed as 35.3mm, the average vertical glenoid diameter on the left side was 39.3mm. The average vertical glenoid diameter on both side was calculated as 37.3mm.

**Transverse glenoid diameter:**

The average Transverse glenoid diameter on the right side was observed as 22.8mm, the average Transverse glenoid

diameter on the left side was observed as 23.9mm, The average Transverse glenoid diameter on both side was calculated as 23.3mm.

**Glenoid cavity index**

The average glenoid cavity index on the right was calculated as 64.2%, The average glenoid cavity index on the left was calculated as 60.8%, The average glenoid cavity index on each side was calculated as 62.2%

**Shape of the glenoid fossa:**

In 50 scapulae studied, by the presence or absence of glenoid notch the shape of glenoid fossae were classified into pear, oval and inverted comma shape. In the present study most common shape observed was pear(R-52%,L-56%) followed by inverted comma(R-24%,L-28%) and oval(R-24%,L-16%).

**Table 1: Parameters**

Side	Vertical glenoid diameter (mm)	Transverse glenoid diameter (mm)	Glenoid cavity index(%)
Right n=25	35.3	22.8	64.2
Left n=25	39.3	23.9	60.8
Average n=50	37.3	23.3	62.6

**Table 2: Shape**

Side	Pear(%)	Oval(%)	Inverted comma(%)
Right (n=25)	52	24	24
Left (n=25)	56	16	28

**Table 3:**

Author	Vertical glenoid diameter (mm)		Transverse glenoid diameter (mm)		Glenoid cavity Index (%)	
	R	L	R	L	R	L
Archana singh <i>et al.</i> , 2019	34.8	33.40	24.3	25.5	69.8	76.3
Mamatha T <i>et al.</i> (R-98,L-104),2011	33.6	33.9	23.3	23.0	69.3	67.8
Neeta Chhabra <i>et al.</i> (R-55,L-71),2015	38.7	39.0	24.8	25.0	64.3	63.6
Rajput HB <i>et al.</i> (R-43,L-57),2012	34.7	34.4	23.3	22.9	67.1	66.5
Gupta <i>et al.</i> (R-30,L-30)	34.9	33.0	23.1	2.6	66.1	62.4
Present study (R-25 ,L-25)	35.3	35.4	22.9	24.0	64.9	67.8

**Table 4: Shape of the glenoid fossa**

Author	Pear		Oval		Inverted comma	
	R	L	R	L	R	L
Archana Singh <i>et al.</i> (R-56, L-54) 2019	43	45	36	32	21	23
Mamatha T <i>et al.</i> (R-98,L-104),2011	46	43	20	24	34	33
Neeta Chhabra <i>et al.</i> (R-55,L-71),2015	47	55	31	32	22	13
Rajput HB <i>et al.</i> (R-43,L-57),2012	49	46	16	15	35	39
Gupta <i>et al.</i> (R-30,L-30)	43	40	17	23	40	37
Present study (R-25 ,L-25)	52	56	24	16	24	28

## DISCUSSION

In the present study mean vertical diameter of the glenoid fossa on the right side is 35.3mm which is higher than the findings of Mamtha T *et al.*, Archana Singh *et al.* and Rajput *et al.*<sup>5,3,8</sup> and lower than Neeta Chhabra *et al.*<sup>4</sup>. Mean vertical diameter of the glenoid fossa on left side is 35.4mm. It is higher than the values measured by Archana *et al.*, Mamatha *et al.*, Rajput HB *et al.* and Gupta *et al.*<sup>3,5,8</sup>. It is lower than the findings of Neeta Chhabra *et al.*<sup>4</sup>. In the present study mean transverse glenoid diameter on the right was measured as 22.9mm which is lower than the findings of Archana Singh *et al.*, Neeta Chhabra *et al.*, Rajput HB *et al.*<sup>3,4,8</sup>, mean transverse glenoid diameter on the left side was measured as 24.0mm, which is higher than the findings of Gupta *et al.*, Rajput *et al.*<sup>(11)(8)</sup>, lower than the findings of Archana Singh *et al.*, Neeta Chhabra *et al.*<sup>3,4</sup>. In the present study mean percentage of glenoid cavity index on the right side was observed as 64.9% which is nearer to the findings of Neeta Chhabra, lower than the findings of Archana Singh *et al.*, Mamatha T *et al.*, Rajput HB *et al.*<sup>3,5,8</sup>. In the present study mean percentage of glenoid cavity index on the left side was 67.8% which is similar to the findings of Mamatha T *et al.*<sup>5</sup>, higher than the findings of Neeta Chhabra *et al.*<sup>4</sup>, Gupta *et al.*<sup>11</sup>, lower than the findings of Archana Singh *et al.*<sup>3</sup>. In the present study the frequent shape of glenoid fossa on both side is pear shape, which correlates with the findings of Neeta Chhabra *et al.*<sup>4</sup>, second frequent shape is inverted comma, which correlates with the findings of Mamatha T *et al.*<sup>5</sup>, least common shape is oval, which correlates with the findings of Rajput HB *et al.*, Gupta *et al.*<sup>8,11</sup>.

## CONCLUSION

Shoulder joint is an inherent instable joint due to the small and shallow glenoid fossa and large humeral head.

Presence of notch on the anterior margin of glenoid rim prevents firm adherence of glenoidal labrum to the rim, leading to labral tears. A sound knowledge of the variations in shape and dimensions of glenoid fossa is essential in diagnosing shoulder pathologies, performing shoulder surgeries and designing and fitting of shoulder prosthesis.

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