

MORPHOMETRIC ANALYSIS OF GLENOID FOSSA OF SCAPULASangeeta Gupta¹, Rachna Magotra², Manmeet Kour³**HOW TO CITE THIS ARTICLE:**

Sangeeta Gupta, Rachna Magotra, Manmeet Kour. "Morphometric Analysis of Glenoid Fossa of Scapula". Journal of Evolution of Medical and Dental Sciences 2015; Vol. 4, Issue 45, June 04; Page: 7761-7766,

DOI: 10.14260/jemds/2015/1129

ABSTRACT: The study was conducted on sixty scapulae obtained from the department of Anatomy, Government Medical College, Jammu. The shape of the glenoid cavity was observed in all the scapulae. It was inverted comma shaped, tear drop shaped, oval and round shaped. The shape on the two sides was compared. Morphometry of the glenoid cavity was done and compared on right and left side. The dimensions of the glenoid fossa provide important information for designing and fitting of glenoid component for shoulder arthroplasty. An understanding of variations of glenoid cavity is essential for evaluating pathological conditions like osseous Bankart lesions and osteochondral defects. **INTRODUCTION:** Shoulder arthroplasty is a common mode of treatment to treat shoulder pathologies like shoulder arthritis. Knowledge about the shape and morphological parameters is essential for success of shoulder arthroplasty as otherwise there would be loosening of the joint necessitating the need for revision surgery. The articular surfaces for shoulder joint are the glenoid cavity (or fossa) of scapula and head of humerus. The glenoid fossa is a shallow ovoid depression on the lateral angle of the scapula. It is also called as the glenoid cavity or the head of the scapula. There is variation in the shape of the glenoid fossa. The glenoid rim presents a small notch on its anterior and upper part.⁽¹⁾ The glenoid notch prevents the attachment of fibrocartilaginous glenoidal labrum to the glenoidal rim, which can be detached leading to Bankart, s lesion.⁽²⁾ A knowledge of the shape and morphometry of glenoid fossa is essential for treating glenohumeral osteoarthritis.⁽³⁾ Morphometric analysis of glenoid fossa is also essential when total shoulder prosthesis has to be used. It is also essential for evaluating Bankart lesion, osteochondral defects, shoulder instability etc. Thorough scanning of available literature revealed that there is dearth of literature regarding morphometry of glenoid fossa. Therefore a curious desire developed to conduct this study. Our study would provide morphometric data, providing an anatomical baseline, which will be of immense help to anthropologists, osteologists, anatomists, and orthopedicians.

KEYWORDS: Scapula, Glenoid fossa, Morphometry.

INTRODUCTION: MATERIAL AND METHOD: Sixty adult scapulae of unknown sex were taken from the Department of Anatomy, Government Medical College, Jammu. Dry adult scapulae of either sex, taken for study were free from physical deformity or abrasion and were complete in all aspects i.e., the upper and lower ends were intact, so as to give the correct measurements. Those scapulae which were having any pathology of the glenoid region e. g. old healed fracture were excluded from the study. These scapulae were labelled from 1 to 60 with suffix R (right) or L (Left) for right and left side respectively. The shape of the glenoid fossa (Cavity) or head of the scapula was noted in all. The shape was determined by either the presence of a (Distinct or indistinct) notch on the upper and anterior part of glenoidal rim or its absence. Morphometry of the glenoid cavity was done by taking two measurements with the help of a Vernier Calliper which were:

1. Maximum Superior-Inferior glenoid diameter.
2. Maximum Anterior-Posterior glenoid diameter.

ORIGINAL ARTICLE

OBSERVATION: The following observations were made from the morphological study of glenoid fossa of sixty scapulae obtained from the department of Anatomy Government Medical College Jammu:

1. Side of scapula- Out of sixty scapulae, thirty were of the right side and thirty were of the left side. (Fig-1).
2. Shape of the glenoid cavity-The glenoid cavity was observed to be of following shapes based on the presence of a notch on anterior glenoid rim:
 - a. Inverted comma shaped – The glenoid cavity has a distinct notch as shown in figure-2
 - b. Pear shaped or Tear drop shaped-The glenoid cavity was having an indistinct notch as shown in figure-3.
 - c. Ovoid or oval or Round shaped-The glenoid cavity had no notch as shown in figure-4.
 - d. The results were compared on the two sides (Right and left) in all the scapulae.
 - e. It was observed that in 38% the glenoid cavity was inverted comma shaped i.e. seen in 12 scapulae on the right side and 11 scapulae on the left side. Pear shaped glenoid cavity was seen in 42% of scapulae i. e. 13 on the right side and 12 on the left side. Ovoid shape of the glenoid cavity was seen in 20% of scapulae i.e. 5 on right side and 7 on the left side (Table-1) (Pie chart).
3. Morphometry of the glenoid fossa-Two diameters were taken:
 - a. Superior-Inferior glenoid diameter -Maximum Superior – Inferior length of the glenoid cavity was measured with the help of Vernier Calliper. Mean, Range and Standard Deviation of this diameter calculated (in cms) on right and left side. (Table-2) It was observed that Mean of the Superior-Inferior diameter was 3.49 cm on the Right side (Range 2.6 cm-4.3cm) and 3.30 cm on the Left side (Range 2.6cm-4) The Standard deviation on the Right side was 0.440 and on the Left side was 0.330.
 - b. Anterio-Posterior glenoid diameter-Maximum Anterio-Posterior length of the glenoid cavity was measured with the help of Vernier Calliper. Mean, Range and Standard Deviation of this diameter calculated (in cms) on right and left side. (Table-3). The Mean of the Antero-Posterior diameter of glenoid cavity was 2.31 cm on the Right side (Range 1.8 cm -3cm) and 2.06 cm on the Left side (Range 1.4cm-2.5cm) The Standard deviation on the Right side was 0.310 and on the Left side was 0.300.

DISCUSSION: The present study has been undertaken on a series of 60 adult scapulae (R: L=30:30) obtained from the Department of Anatomy, Government Medical College, Jammu. The shape of the glenoid cavity and its various morphometric parameters were taken and statistical indices worked out. The shape of the glenoid cavity was due to presence of a notch on the upper and anterior wall of glenoid cavity. This notch is consequently a common finding and not a rare anatomical variant. When the notch is present, the shape of the glenoid cavity can be described as pear shaped or inverted comma, when absent the cavity is round or oval shaped. Glenoid labrum in the area of the notch is not fixed to the bony margins of the glenoid cavity but bridges the notch itself. Such an attachment of the labrum could make the shoulder joint less resistant to the dislocating forces. Earlier Prescher.⁽⁴⁾ had studied this parameter and classified shape of glenoid cavity into pear and round shaped as one with and without a distinct notch. Coskun et al.⁽⁵⁾ classified the shapes of glenoid cavity as pear and round shape. Mamatha et al.⁽⁶⁾ observed the presence of glenoid notch, i.e. both distinct and indistinct as 80% on right side and 76% on left side. Moreover, occurrence of oval on right side was 20% and left

ORIGINAL ARTICLE

side was 24%. Results of present study are in accordance with those of Mamatha et al,⁽⁶⁾ as in present study glenoid cavity was categorised as inverted comma, pear and round shaped (Table-4). The dimensions of the glenoid fossa provide important information for designing and fitting of glenoid component for shoulder arthroplasty. The mean superior-inferior diameter of scapula was found to be 3.40 ± 0.38 cm, (Range=2.6-4.3), with mean of 3.49 ± 0.432 cm (Range=2.6-4.3) on right side; and 3.30 ± 0.33 as mean (Range=2.6-4cm) on left side. (Table-5) Ozer et al,⁽⁷⁾ measured the superior-inferior diameter of male and female glenoid cavities separately. The Mean and Standard Deviation of male glenoid was 3.87 ± 0.27 cm while that of female glenoid was 3.37 ± 0.30 cm respectively. Mamatha et al.⁽⁶⁾ also measured the superior-inferior diameter. The results on right side varied from 2.5cm to 4.2cm with an average of 3.36cm and Standard Deviation of 0.28. On the left side the superior-inferior diameter varied from 2.6 to 4cm with a Mean and Standard Deviation of 3.39cm and 0.28cm respectively. Results of present study are similar to Cho et al.⁽⁸⁾ and Mallon et al.⁽⁹⁾

The Mean antero-posterior glenoid diameter of scapula was found to be 2.19 ± 0.29 cm (Range=1.4-3cm) with Mean of 2.31 ± 0.3 cm (Range=1.8-3 cm) on right side; and 2.06 ± 0.295 cm as Mean (Range=1.4-2.5cm) on left side (Table-6). Earlier Von Schroeder et al.⁽¹⁰⁾ Piyawinijwong et al.⁽¹¹⁾ Coskun et al.⁽⁵⁾ and Burke,⁽¹²⁾ also measured antero-posterior diameter of glenoid cavity of scapula. Results of present study are more in accordance with those of Coskun et al,⁽⁵⁾ and results of other studies are slightly higher than the present study.

SUMMARY: Anatomical considerations of variations of glenoid cavity are crucial for understanding specific abnormalities of shoulder joint like glenohumeral instability, shoulder dislocation, rotator cuff injuries, Bankart, s lesion, osteochondral defects etc. The dimensions of the glenoid fossa provide important information for designing and fitting of glenoid component for shoulder arthroplasty. The present study was undertaken to furnish morphological and morphometric data providing an Anatomical baseline, during surgical and arthroscopic procedures on shoulder joint. After compilation of the morphometric parameters of the glenoid fossa of scapulae we were of the conclusion that all our values were slightly less than those of the work done by other authors.

REFERENCES:

1. Breathnach A S Frazers; Anatomy of the human skeleton 6th e d London J and A Churchill Ltd 1965; pp 63-70.
2. Prescher A and Klumpen T.; The glenoid notch and its relation to the shape of glenoid cavity of the scapula J Anat 1997; 190: 457-460.
3. Watch G Badet R Boulahia A Khoury A; Morphologic study of the glenoid in primary glenohumeral osteoarthritis The Journal of Arthroplasty 1999; 14(6): 756-760.
4. Prescher A.; Anatomical basics, variations and degenerative changes of the shoulder joint and shoulder girdle. Eur J Radiol 2000; 35(2); 88-102.
5. Coskun N, Karaali K, Cevikol C, Demirel B M and Sindel M.; Anatomical basics and variations of the scapula in Turkish adults. Saudi Med J 2006; 27(9): 1320-1325.
6. Mamatha T, Pai S R, Murlimanju B V, Kalthur SG, Pai M M and Kumar B.; Morphometry of glenoid cavity. Online J Health Allied Scs 2011; 10 (3): 7.
7. Ozer I, Katayama K, Sagir M and Gulec E.; Sex determination using the scapula in medieval skeletons from East Anatolia. Coll Anthropol 2006; 30(2): 415-419.

ORIGINAL ARTICLE

8. Cho B P and Kang H S.; Articular facets of the coracoclavicular joints in Koreans. *Acta Anat (Basel)* 1998; 163 (1): 56-62.
9. Mallon W J, Brown H R, Vogler J B 3rd and Martinez S.; Radiographic and geometric anatomy of the scapula. *Clin Orthop Relat Res* 1992; (227): 142-154.
10. Von Schroeder H P, Kuiper S D and Botte M J. Osseous anatomy of the scapula. *Clin Ortho Relat Res* 2001; (383): 131-139.
11. Piyawinijwong S, Sirisathira N and Chuncharunee A. The scapula: Osseous Dimensions and Gender Dimorphism in Thais. *Siriraj Hosp Gaz* 2004; 56(7): 356-365.
12. Burke R M. Can we estimate stature from the scapula? A test considering sex and ancestry, 2008; B S University of Idaho.

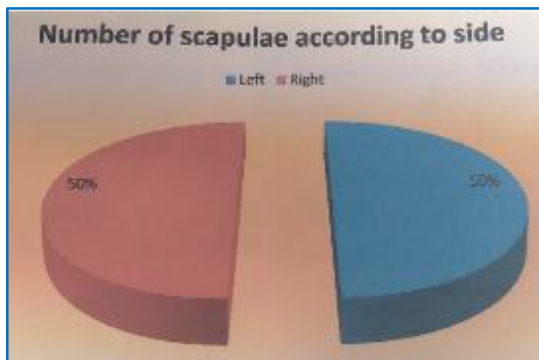


Fig. 1



Fig. 2: Inverted Comma Shaped Glenoid Cavity



Fig. 3: Pear Shaped Glenoid Cavity



Fig. 4: Ovoid Shaped Glenoid Cavity

ORIGINAL ARTICLE

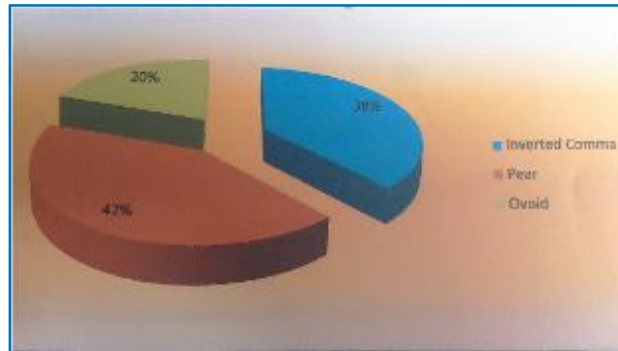


Fig. 5: Pie Chart Showing Distribution of Shape of Glenoid Cavity

Sl. No.	Shape	Right Glenoid	Left Glenoid	Percentage
1	Inverted Comma	12	11	38
2	Pear	13	12	42
3	Ovoid	5	7	20

Table 1: Shape of Glenoid Cavity

Sl. No.	Parameters	Right	Left	Total Avg.
1	Mean	3.49	3.30	3.40
2	Range	2.6-4.3	2.6-4	2.6-4.3
3	Std. Dev.	0.440	0.330	0.385

Table 2: Statistical Measurement of Superior-Inferior Diameter of Glenoid Cavity (in cms.)

Sl. No.	Parameters	Right	Left	Total Avg.
1	Mean	2.31	2.06	2.19
2	Range	1.8-3	1.4-2.5	1.4-3
3	Std. Dev.	0.310	0.300	0.305

Table -3 Statistical Measurement of Anterio-posterior Diameter of Glenoid Cavity (in cms.)

Authors	Inverted Comma/Distinct Notch		Pear		Ovoid/Round	
	Right	Left	Right	Left	Right	Left
Prescher	55%				45%	
Coskun et al	-		28%		72%	
Mamatha	34%	33%	46%	43%	20%	24%
Present	40%	37%	43%	40%	17%	23%

Table 4: Showing comparison of Shape of Glenoid Cavity

ORIGINAL ARTICLE

Authors	Race	Mean(cm)	Range(cm)	SD
Mallon et al		3.5		0.4
Von Schoreder et al	Canadian	3.6	--	0.4
Piyawinijwong et al	Thai	3.36	2.7-4.3	--
Cho et al	Korean	3.52	--	--
Burke	--	3.9	3.2-4.8	0.35
Coskum	Turkish	3.36	--	0.3
Present study	North Indian	3.40	2.6-4.3	0.38

Table 5: Showing Comparison of Superior-Inferior Diameter of Glenoid Cavity

Authors	Race	Mean(cm)	Range(cm)	SD
Von Schroeder et al	Canadian	2.9	2.5-3.4	0.3
Coskum et al	Turkish	2.4	--	0.25
Piyawinijwong et al	Thai	2.7	2.1-3.3	0.31
Burke	--	2.81	2.1-4.6	0.31
Present Study	North Indian	2.19	1.4-3.0	0.29

Table 6: Showing comparison of Antero- posterior diameter of Glenoid Cavity

AUTHORS:

1. Sangeeta Gupta
2. Rachna Magotra
3. Manmeet Kour

PARTICULARS OF CONTRIBUTORS:

1. Associate Professor, Department of Anatomy, Government Medical College, Jammu.
2. Assistant Professor, Department of Anatomy, Government Medical College, Jammu.

FINANCIAL OR OTHER

COMPETING INTERESTS: None

3. Assistant Surgeon, Department of Anatomy, J & K Health Services.

NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:

Dr. Rachna Magotra,
242/7, Channi,
Himmat-180015,
Jammu.
E-mail: drmagotrarachna@gmail.com

Date of Submission: 13/05/2015.
Date of Peer Review: 14/05/2015.
Date of Acceptance: 27/05/2015.
Date of Publishing: 02/06/2015.