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MORPHOLOGICAL STUDY OF GLENOID CAVITY IN DRY HUMAN SCAPULA

Anatomy

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ABSTRACT

Introduction: Scapula is flat triangular bone which is situated on the postero-lateral part of the chest wall.
Materials & Methods: Total 100 scapulae were included in the study, 48 scapulae from right side & 52 from left side. The various dimensions of glenoid cavity and shapes of glenoid cavity were observed.
Results: The length of scapulae varied from 28.78mm to 42.22mm on right side, 29.71mm to 43.09mm on left side. Width of scapula varies from 19.26mm to 28.64mm & 18.5mm to 27.02mm right and left scapula respectively.
Conclusion: The knowledge of shape & size of glenoid cavity is helpful for shoulder arthroplasty.

KEYWORDS

Scapula, Glenoid cavity.

INTRODUCTION

Scapula is flat triangular bone of shoulder girdle which is situated on the postero-lateral part of the chest wall overlapping the second to seventh rib. At the lateral angle of scapula present the glenoid cavity also known as head of the scapula which is articulate with the head of humerus form shoulder joint.[1]

The vertical diameter of the glenoid cavity is the larger and wider its below than above.[2]

The vertical axis of glenoid cavity is important factor for the movement of the head of humerus during abduction and when the arm is raised to the shoulder height, the head slides into the upper smaller part of the glenoid cavity which is deepened by glenoid labrum.[3]

The glenoid rim presents a notch in its front and upper part. Due to this notch various shapes of glenoid cavity are formed like pear, oval and inverted comma shapes. Dislocation of the shoulder joint and fracture with glenoid during trauma are quite common.

The knowledge of various dimensions and shape of glenoid cavity are important for understanding the shoulder dislocation and to decide the proper size of glenoid component in the shoulder arthroplasty and patho-mechanics of rotator cuff disease.[4]

The aim of this study is to analyse the Morphometric data and shape of glenoid cavity, which will helpful for management of shoulder pathology and for successful arthroplasty.

MATERIALS AND METHODS

The study was done on 100 dry unpaired human scapulae, 48 belong to right side and 52 belong to left side irrespective of age and sex. The scapulae were obtained from Department of Anatomy of various medical colleges of Ahmedabad. The scapula with intact glenoid cavity and normal anatomical features were included and bones which were broken or had any deformities were excluded from study. The measurements of the glenoid cavity were taken with the help of digital vernier calliper.

The following parameters of glenoid cavity were taken:
Superior-Inferior glenoid diameter (SI) - was taken from the inferior point on the glenoid margin to most prominent point on the supraglenoid tubercle.

Anterior- Posterior diameter was measured at two levels;
Anterior- Posterior diameter 1(A-P 1) - was taken at maximum width of the articular margin of the glenoid cavity.

Anterior- Posterior diameter 2(A-P 2) – was taken at the level of glenoid notch.

Shape of glenoid cavity – was observed by the outer raised rim of the glenoid cavity. Three types of glenoid cavity were observed; 1.Inverted coma shape 2.Oval shape and 3.Pear shape.

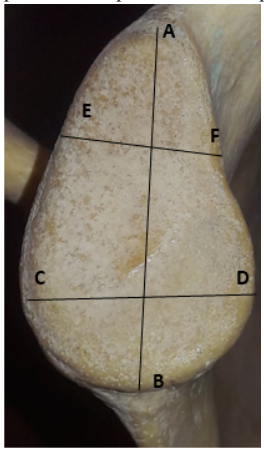


Fig.2: Various points of measurement on glenoid cavity. AB-SI diameter, CD- AP diameter1, EF- AP diameter2.

RESULTS

Total 100 scapulae were studied, out of these 48 of right side and 52 of left side. Various dimensions of glenoid cavity like SI, AP1, AP2 diameters were measured and mean, maximum, minimum and standard deviation were calculated. The results of the study are following;

Superior - Inferior glenoid diameter (SI) - In present study it was observed that the mean of SI glenoid diameter of right side was 34.44±2.07mm, which varied from 28.78mm to 42.22mm. The SI diameter of left side varied from 29.71mm to 43.09mm with mean of 34.69±3.01mm.

Anterior-Posterior glenoid diameter 1(A-P1) - The A-P1glenoid diameter of right side varied from 19.26mm to 28.64mm with the mean of 22.99±2.77mm. On the left side it is varied from 18.5mm to 27.02mm with the mean of 23.61±4.53mm.

Anterior-Posterior glenoid diameter 2(A-P2) - The A-P2glenoid diameter of right side varied from 12.74mm to 22.19mm with the mean of 17.48±1.82mm. On the left side it is varied from 12.39mm to 17.48mm with the mean of 17.48±2.00mm.

Shape of glenoid cavity – In the present study out of 48 scapulae of the

right side had 13(27.08%) inverted comma shape, 17(35.41%) oval shape and 18(37.5%) pear shape while on the left side out of 52scapulae, inverted comma shape was found in 7(13.46%), oval shape in 8(15.38%) and pear shape was observed in 37(71.53%).



Inverted comma shape **Pear shape** **Oval shape**

DISCUSSION

In the present study various dimensions and shape of glenoid cavity have been observed and compared with other study. In present study the mean SI glenoid diameter was 34.44±2.07mm on right side and 34.69±3.01mm on left side. The measurements of SI diameter of right glenoid were slightly lower than left glenoid. These findings are similar to those observed by Hina B Rajput et al.2 Mamtha et al.5and Kavita et al.6 , they reported the mean value of SI glenoid diameter of right side 34.67±3.0mm, 33.67±2.82mm, 35.2±3.0mm and left side 34.43±3.21mm, 33.92±2.87mm, 34.7±2.8mm respectively. Kusum R Gandhi et al.3and Neeta Chhabra et al.4have reported the mean value of SI glenoid diameter 38.78±4.43mm,38.46±2.81mm on right side and 40.30± 5.12mm, 39.03±3.18mm on left side respectively, which is higher than present study.

The mean Anterior-Posterior glenoid diameter 1in present study was 22.99±2.77mm on right side and 23.61±4.53mm on left side. This finding is similar to study done by Mamtha et al.5, Rajput HB et al.2 and slightly lower than the values observed by Kusum R Gandhi et al.3, Kavita et al.6 and Neeta Chhabra et al.4

Table:1 Comparisons of Superior-Inferior diameter, Anterior-Posterior diameter -1, Anterior-Posterior diameter-2 with other studies.

SN.	Observers	No. of specimens		Mean S-I diameter(mm)	Mean A-P diameter 1(mm)	Mean A-P diameter 2(mm)
1	Mamtha et al.2011(5)	Right	98	33.67±2.82	23.35±2.04	16.27±2.01
		Left	104	33.92±2.87	23.05±2.30	15.77±1.96
2	Rajput HB et al. 2012(2)	Right	43	34.76±3.0	23.31±3.0	15.10±2.54
		Left	57	34.43±3.21	22.92±2.80	13.83±2.45
3	Kusum R Gandhi et al.2013(3)	Right	64	38.78±4.43	26.47±3.79	20.28±3.80
		Left	59	40.30±5.12	27.85±3.86	21.28±3.86
4	Kavita etal.2013 (6)	Right	67	35.2±3.0	25.07±2.7	16.8±1.8
		Left	62	34.7±2.8	24.9±2.0	16.3±2.0
5	Neeta Chhabra et al. 2015(4)	Right	55	38.46±2.81	25.04±2.69	18.70±2.22
		Left	71	40.30±3.18	24.85±2.46	18.6±2.07
6	Present Study 2019	Right	48	34.44±2.07	22.99±2.77	17.48±1.82
		Left	52	34.69±3.01	23.61±4.53	17.48±2.00

The mean Anterior- Posterior diameter 2 in present study was 17.48±1.82mm on right side and 17.48±2.00mm on left side. These values are approximately similar to those authors which mention in table-1except Kusum R Gandhi et al.3 who reported the AP diameter 2 on right side 20.28±3.80mm and 21.28±3.86mm on left side, which is slightly higher than present finding.

Similar studies has been carried out by other authors, some authors mention measurements of male and female scapula separately in their study. The average SI diameter of male glenoid measured by Churchill et al.7 and Luis Rios Frutos8, measured the SI diameter of male and female glenoid cavity separately. The mean SI diameter of male glenoid measured by Churchill et al.7was 37.5±2.2mm, and by LR Frutos 8 was 36.08±2.05mm, The mean SI diameter of female glenoid measured by Churchill et al.7was32.6±1.8mm, and by LR Frutos 8 was 31.7±1.7mm. The mean AP-1 diameter of male glenoid measured by Churchill et al.7was 27.86±1.6mm, and by LR Frutos 8was 26.3±1.5mm, diameter of female glenoid measured by Churchill et al.7was23.6±1.5mm, and by LR Frutos 8 was 22.31±1.4mm.

In our study the sex of scapulae was not known, so we could not measure them separately.

Table:2 Comparison of different shapes of glenoid cavity.

SN.	Observers		No. of specimens	Inverted comma shape(%)	Oval shape (%)	Pear shape (%)
1	Mamtha et al.2011(5)	Right	98	34	20	46
		Left	104	33	24	43
2	Rajput HB et al. 2012(2)	Right	43	35	16	49
		Left	57	39	15	46
3	Kavita etal.2013 (6)	Right	67	11	30	58
		Left	62			
4	Neeta Chhabra et al. 2015(4)	Right	55	22	31	47
		Left	71	13	32	55
5	Present Study 2019	Right	48	27	35	38
		Left	52	13	15	71

In the present study inverted comma shape glenoid cavity was found in 27% on right side and 13% on left side. It is approximately similar to the Kavita et al.6and Neeta chhabra et al.4 and lower than other studies mention in table-2. Oval shape glenoid cavity also similar to the Kavita et al.6and Neeta chhabra et al.4 on the right side and left side it is similar with Rajput HB et al.2 This was recorded 35% on right side and 15% on left side. Pear shape glenoid cavity were recorded in 38% on right side and 71% on left side which is lower than other studies on right side and higher than other studies on left side mention in table-2.

CONCLUSION

The knowledge of shape and size of glenoid cavity are important for orthopedic surgeon in design and fitting of glenoid components during shoulder arthroplasty.

LIST OF ABBREVIATIONS

SD- Standard deviation
SI- Superior- Inferior
AP-Anterior-Posterior
mm- Millimeter

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