Scholars Journal of Applied Medical Sciences (SJAMS)
Abbreviated Key Title: Sch. J. App. Med. Sci.
ISSN 2320-6691 (Online)
ISSN 2347-954X (Print)

A Unit of Scholars Academic and Scientific Society, India
www.saspublishers.com

Anatomy

Glenoid Cavity of Scapula in Indian population: A Morphometric Analysis

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Original Research Article

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Article History
Received: 10.10.2017
Accepted: 25.11.2017
Published: 30.1.2018

DOI:
10.36347/sjams.2018.v06i01.022

Abstract: Morphology of Glenoid cavity is variable among different population. Accordingly with the knowledge of dimensions of glenoid cavity a successful shoulder arthroplasty can be achieved with reduced complication. To study the morphology of glenoid cavity, 64 cadaveric specimens and 46 dry specimens of scapula were examined and dimensions were measured with digital vernier caliper. The glenoid cavities were shaped into oval, pear and comma according to the glenoid notch. In the present study we have found that, pear shape bearing the highest with a frequency of approx 53% followed by oval shape (33%) and inverted comma (14%). Both the antero-posterior diameter as well as the superior-inferior diameter was found less in Indian population compared to the other studies. These dimensions of glenoid cavity with different morphological variations among Indian population can be used for further references in anthropometry as well as in shoulder arthroplasty.
Keywords: Scapula, Glenoid Cavity, Glenoid Notch, Shoulder Joint, Morphometry.

INTRODUCTION

Shoulder joint is one of the most vulnerable joint with increasing frequency of requiring surgical reconstructions, most commonly following Primary glenohumeral osteoarthritis followed by rotator cuff tear, arthropathy, post-traumatic, arthritis, avascular necrosis and rheumatoid arthritis[1,2].

Keeping in mind with increasing incidence of surgical reconstruction & increasing demand of prosthesis, the knowledge of dimensions of glenoid cavity is gaining importance for a successful shoulder arthroplasty with reduced complication.

Morphology of Glenoid cavity is highly variable among different population[3]. Because of high variability of the glenoid cavity of scapula in different population, it has become important to understand the dimensions in different population. Keeping this in mind, the study was taken up to find out the various shapes and dimensions of glenoid cavity among Indian population.

MATERIALS & METHODS

The study was performed at the Agartala Government Medical College, Agartala. A total of 64 cadaveric specimens and 46 dry specimens of scapula belonging to Indian population were examined of which 58 were from the right side, and 52 were from the left. The age & sex of all specimens could not be determined but the observed specimens were mature. Inappropriate & Damaged specimens of Scapula were excluded from the study.

The shape of the glenoid cavity was grouped in to pear, oval & inverted comma. The dimensions of the glenoid cavity of Scapula were measured using the digital vernier caliper.

The Height (Maximum supero-inferior diameter) of glenoid cavity was measured from the upper margin of glenoid cavity near the supra glenoid tubercle to lower margin of glenoid cavity near the infra glenoid tubercle. The width of the glenoid cavity was measured at two levels. The Maximum width of glenoid cavity perpendicular to the height of the glenoid cavity was noted as AP1 (Antero-posterior 1 diameter) which was observed in the lower part of the glenoid cavity. The width in the upper smaller part of the glenoid cavity was noted as AP2 (Antero-posterior 2 diameter) which was taken midway between the upper margin and mid equator. The result was analyzed using EPI INFO 7 software.

RESULTS

Fig-1: Different shapes of glenoid cavity: a) Pear, b) Oval, c) Inverted comma

It was observed that pear shape bearing the highest shape with a frequency of approximately 53% (58 Nos.: 47 % on the left side & 53 % on right side), followed by oval shape 33% (36 Nos.: 42 % on the left side & 58 % on the right side) and inverted comma 14 %(16 Nos.: 63 % on left side & 37 % on right side)

Table-1: Different Shape of glenoid cavity of Scapula

	Side		
Shape	Nos. on Left (%)	Nos. On Right (%)	Total Nos. (%)
Inverted Comma	10(62.5)	6(37.5)	16(14.0)
Oval	15(41.6)	21(58.3)	36(33.0)
Pear	27(46.5)	31(53.4)	58(53.0)
	52(47.2)	58(52.7)	110(100.0)

The mean height of the glenoid cavity was observed as 33.9±2.1 mm. The mean height on the right side was 34.1±2.1 mm and it was found slightly higher than the mean height on the left side 33.6±2.1 mm. The average maximum width (AP1) of the glenoid cavity was 23.5 mm. On right and left side of scapula the width (AP1) was found to be as 23.5±2.6 mm & 23.6±2.1 mm respectively. The average width of the scapula at upper part of the glenoid cavity (AP2) was 14.01 mm with values of 14.4±2.2 mm on the right side & 13.8±2.0 mm on the left side. The difference in height and the width of glenoid cavity of scapula on both sides were not statistically significant (p value > 0.05).

Table-2: Observations on various dimensions of glenoid cavity of scapula

Parameter	Right (mm)	Left (mm)	Mean±SD (mm)	Range (mm)	t value	p value
Height	34.1±2.1	33.6±2.1	33.9±2.1	28.3-37.3	-0.99	0.32
AP1	23.5±2.6	23.6±2.1	23.5±2.4	15.1-28.5	0.19	0.84
AP2	14.4±2.2	13.8±2.0	14.0±2.1	9.4-19.5	-0.67	0.50

DISCUSSION

The anatomical basis and variation in shape & size of glenoid cavity of scapula is important to understand the rotator cuff disease, dislocation of shoulder and to decide the proper size of the glenoid component in the shoulder arthroplasty [4].

The morphology of the glenoid cavity is highly variable & there is no general agreement to classify the different forms [3]. Various shape of the glenoid cavity has been described by various authors on the basis of presence of glenoid notch. It was observed that if the notch is distinct, than the glenoid labrum is not fixed to the margin, rather it bridges the notch itself with formation of a sublabral recess of joint cavity in some cases & making the joint less resistant to external forces[5].

The shape of the glenoid cavity is generally described in to pear or tear drop shape, oval & inverted comma shape[6,7]. From the present study it was observed that, pear shape being the most common with a frequency of approximately 53%, followed by oval shape 33% and inverted comma 14%. Similarly, pear shape as the commonest type was described by Mamatha *et al*. (44.5%), Gosavi *et al.* (49.91%), and Rajput *et al*. (47.5%) & inverted comma shape as the least common type was observed by Gosavi *et al.* (12.05%).

Conversely, the pear shape (72%) being the commonest shape of glenoid cavity followed by pear shape (28%) was described in a study on Turkish adult by Coskun N *et al*.[8] The oval shape as the least common type was observed by Mamatha *et al*. (22%) & Rajput *et al*. (15.5%)

Prescher & Klumpen described the shapes in to two types; pear & oval shape with frequency of 55% & 45% respectively [5]. The mean height of the glenoid

cavity was 33.9 mm in the present study. Similar height of glenoid cavity in Indian population was observed by Mamatha *et al*.[7] (33.79 mm), Rajput *et al*.[4] (34.59 mm), Dhindsa *et al*.[9] (34.24 mm) and a slightly higher values by Gosavi *et al*.[6] (35.16). Higher values of height of glenoid cavity was also reported by Iannotti *et al*.[10] (39 mm) & Middernsche *et al*.[11] (37.3 mm).

In the present study though the height on the right side was observed more than the left side, the difference was not statistically significant. Similar findings were observed by Gosavi *et al*.[6] but right sided values were observed less in a study by Mamatha *et al*.[7]

The average maximum width (AP1) of the glenoid cavity was 23.5 mm in the present study. Similar values of AP1 were also observed by Mamatha *et al*. Rajput *et al*. Dhindsa *et al.* as 23.2mm, 23.1mm & 23.7 mm respectively[4,7,9]. Higher values of AP1 was observed by Iannotti *et al*. & Middernsche *et al*. as 29 mm & 27.9 mm respectively[10,11].

The average width of the scapula at upper part of the glenoid cavity (AP2) was 14.01 mm in the present study which is nearer to the values observed by Rajput *et al*.(14.5 mm) & Gosavi *et al*.(14.6 mm) but less than the values observed by Mamatha *et al*.(16.02 mm) & Iannotti *et al*.(23 mm)[4,6,7,10].

From the present study as well as considering the other studies on dimensions of glenoid cavity on Indian population, all the dimensions were found to be smaller among Indian population. Smaller dimensions of glenoid component among Indian population need consideration of availability of smaller dimension of Glenoid component of prosthesis which was also supported by the other studies [7].

CONCLUSION

These dimensions of glenoid cavity with different morphological variations among Indian population can be used for further references in anthropometry as well as in successful shoulder arthroplasty. Therefore, consideration of smaller size of prosthesis among Indian population should be kept in mind.

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