

STUDY ON MORPHOMETRIC FEATURES OF GLENOID CAVITY ON VIETNAMESE ADULTS

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SUMMARY

Objectives: To study the morphometry of glenoid cavity on Vietnamese adults. **Materials and methods:** The study was performed on 15 Vietnamese adult corpses preserved at Department of Anatomy, Ho Chi Minh City University of Medicine and Pharmacy. The glenohumeral joints were dissected to measure superior-inferior and anterior-posterior diameters of glenoid cavity, and also classify the shape of the glenoid cavity. **Results:** The superior-inferior diameter of glenoid cavity in males and females were 30.682 ± 2.714 mm and 24.375 ± 2.875 mm, respectively. The upper anterior-posterior diameters of the glenoid in males and females were 17.273 ± 2.930 mm and 13.500 ± 1.309 mm, respectively. The lower anterior-posterior diameters of the glenoid in males and females were 21.682 ± 2.275 mm and 17.125 ± 3.044 mm, respectively. There were 3 types of glenoid cavity's shape: Type 3 (66.7%), type 2 (30%) and type 1 (3.3%). The differences between the right and left shoulder were not statistically significant with $p > 0.05$. **Conclusion:** The parameters of glenoid cavity in females tended to be lower than in men, but not statistically significant with $p > 0.05$. The glenoid cavity had 3 morphological shapes, mostly were oval-shaped (shape 3).

* Keywords: Glenohumeral joint; Glenoid cavity; Shoulder althroplasty.

INTRODUCTION

The shoulder joint (glenohumeral joint) is formed by the articulation of the head of the humerus with the glenoid cavity (fossa) of the scapula. It is structurally classified as a synovial ball and socket joint and functionally as a diarthrosis and multiaxial joint. This joint is considered to be the most mobile joint in the body with a wide range and variety of motion and thus often occurs anomalies related to excessive movements [1]. Injury in glenohumeral joint is one of the most common clinical problems in shoulder, mainly caused by

trauma or recurrent dislocation. Among them, the dislocation associated with glenoid fracture is one of the most prevalent injuries and glenoid cavity replacement is considered the gold treatment for these cases [2]. The main difficulty in glenoid cavity replacement is the design and installation of reconstructing components to correspond with glenoid cavity. Therefore, the study of the parameters and shape of glenoid cavity is crucial, especially in replacement surgery. As a basis, we conducted this study: *To investigate morphometric features of glenoid cavity in Vietnamese adults.*

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MATERIALS AND METHODS

1. Materials

30 glenoid cavities from 15 Vietnamese adult corpses, including 11 male and 04 female corpses, were preserved at the Department of Anatomy, Ho Chi Minh City University of Medicine and Pharmacy. The glenoid cavities were not damaged or degenerative.

2. Methods

* *Study design:* Descriptive study.

+ Superior-inferior glenoid diameter: Distance between the most prominent point and most inferior point of glenoid cavity (AB).

+ Lower anterior-posterior glenoid diameter: Maximum distance between anterior margin and posterior margin, perpendicular with AB.

+ Upper anterior-posterior glenoid diameter: Distance between anterior margin and posterior margin, perpendicular at point between upper quarter and lower three-fourth of AB.

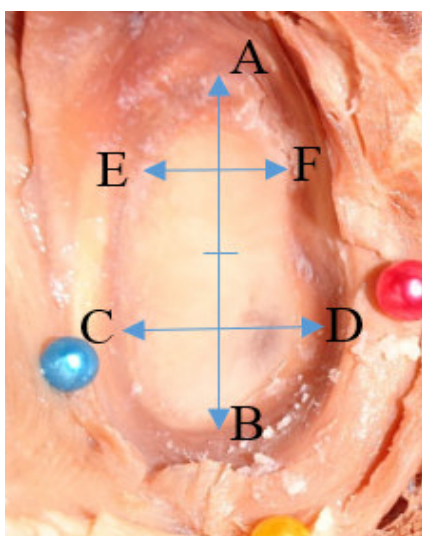


Figure 1: Glenoid cavity parameters.

- Morphometric classification of glenoid cavity by Andreas Prescher and Thomas Klumpen [3]:

+ Shape 1: Glenoid cavity (pear-shaped) with a distinct glenoid notch at the anterior margin.

+ Shape 2: Glenoid cavity (pear-shaped) with slight glenoid notch.

+ Shape 3: Glenoid cavity (oval) without glenoid notch.

* *Dissection method:*

Dissect the glenohumeral joint to expose glenoid cavity according to Gray's dissection guide for human anatomy [4].

RESULTS

1. Superior-inferior glenoid diameter

Table 1: Superior-inferior glenoid diameter.

Specimens		Diameter (mm)			p
		$\bar{X} \pm SD$	Min	Max	
Sex	Male (n = 22)	30.682 ± 2.714	26.0	36.0	> 0.05
	Female (n = 8)	24.375 ± 2.875	21.0	30.0	
Side	Right (n = 15)	28.200 ± 4.212	21.0	35.0	
	Left (n = 15)	29.800 ± 3.569	22.0	36.0	
Mean		29.000 ± 3.921	21.0	36.0	

Our study determined the superior-inferior glenoid diameter on Vietnamese adult preserved corpses. In 30 glenoid cavities, mean superior-inferior glenoid diameter was 29.000 ± 3.921 mm. The parameter seemed to be lower on right side and in females but not statistically significant.

Recently, there have been other researches on glenoid cavity's parameter in many populations with variety of methods including direct measurement on dry scapula, fresh corpses, formol-embalmed corpses, or using CT-scan in live individual. It can be seen that our result was lower than other findings on Chinese, France and Japan populations.

Table 2: Superior-inferior glenoid diameter in recent studies.

Authors	Specimens (mm)		Diameter (mm)	
	Right	Left	Right	Left
Rajput, et al (2012) [5]	43	57	34.76 ± 3.0	34.43 ± 3.21
Mamatha, et al (2011) [6]	98	104	33.67 ± 2.82	33.92 ± 2.87
Kavita, et al (2013) [7]	67	62	35.2 ± 3.0	34.7 ± 2.8
Neta, et al (2015) [8]	55	71	38.46 ± 2.81	39.03 ± 3.18
Our study	15	15	28.200 ± 4.212	29.800 ± 3.569

2. Anterior-posterior glenoid diameter

Table 3: Upper anterior-posterior glenoid diameter.

Specimens		Diameter (mm)			p
		$\bar{X} \pm SD$	Min	Max	
Sex	Male (n = 22)	17.273 ± 2.930	12.0	24.0	> 0.05
	Female (n = 8)	13.500 ± 1.309	12.0	16.0	
Side	Right (n = 15)	16.467 ± 3.461	13.0	24.0	
	Left (n = 15)	16.067 ± 2.763	12.0	20.0	
Mean		16.267 ± 3.084	12.0	24.0	

In our study, upper anterior-posterior glenoid diameter in males ranged from 12.0 - 24.0 mm, mean 30.682 ± 2.714 mm. Meanwhile, mean diameter in females had lower trend (13.500 ± 1.309 mm) but there was no statistical significance with p > 0.05. In 30 glenoid cavities, mean upper anterior-posterior glenoid diameter was 16.267 ± 3.084 mm. Compared with other studies on foreign populations, Vietnamese population had lower upper anterior-posterior glenoid diameter.

Table 4: Upper anterior-posterior glenoid diameter in recent studies.

Authors	Specimens (mm)		Diameter (mm)	
	Right	Left	Right	Left
Rajput, et al (2012) [5]	43	57	14.10 ± 2.54	13.83 ± 2.45
Mamatha, et al (2011) [6]	98	104	16.27 ± 2.01	15.77 ± 1.96
Kavita, et al (2013) [7]	67	62	16.8 ± 1.8	16.3 ± 2.0
Neta, et al (2015) [8]	55	71	18.7 ± 2.22	18.6 ± 2.07
Our study	15	15	16.467 ± 3.461	16.067 ± 2.763

Table 5: Lower anterior-posterior glenoid diameter.

Specimens		Diameter (mm)			p
		$\bar{X} \pm SD$	Min	Max	
Sex	Male (n = 22)	21.682 ± 2.275	17.0	25.0	> 0.05
	Female (n = 8)	17.125 ± 3.044	13.0	23.0	
Side	Right (n = 15)	20.600 ± 3.660	13.0	25.0	
	Left (n = 15)	20.333 ± 2.768	15.0	24.0	
Mean		20.467 ± 3.191	12.0	25.0	

In our study, lower anterior-posterior glenoid diameter in males ranged from 17.0 - 25.0 mm, mean 21.682 ± 2.275 mm. Whereas mean diameter in females showed lower values (17.125 ± 3.044 mm) but there was no statistical significance with $p > 0.05$. In a total of 30 glenoid cavities, mean upper anterior-posterior glenoid diameter was 20.467 ± 3.191 mm. Compared with other studies on foreign populations, Vietnamese population had smaller lower anterior-posterior glenoid diameter.

Table 6: Lower anterior-posterior glenoid diameter in recent studies.

Authors	Specimens (mm)		Diameter (mm)	
	Right	Left	Right	Left
Rajput, et al (2012) [5]	43	57	23.31 ± 3.0	22.92 ± 2.80
Mamatha, et al (2011) [6]	98	104	23.35 ± 2.04	23.05 ± 2.30
Kavita, et al (2013) [7]	67	62	25.07 ± 2.7	24.9 ± 2.0
Neta, et al (2015) [8]	55	71	25.04 ± 2.69	24.85 ± 2.46
Our study	15	15	20.600 ± 3.660	20.333 ± 2.768

Glenoid cavity may also be a risk factor of shoulder dislocation, and it has been reported that low superior-inferior glenoid diameter is a factor for dislocation. Similarly, small anterior-posterior glenoid diameter may lead to weaken glenohumeral joint. Therefore, along with recovery of the glenoid labrum, the diameters and injuries of glenoid cavity should be taken into account in reconstruction surgery of glenohumeral joint.

3. Shape of glenoid cavity

Table 7: Classification of glenoid shape.

Shape	Side (n, %)		Total	p
	Left	Right		
1	1 (3.3)	0 (0.0)	1 (3.3)	> 0.05
2	4 (13.3)	5 (16.7)	9 (30.0)	
3	10 (33.3)	10 (33.3)	20 (66.7)	
Total	15 (50.0)	15 (50.0)	30 (100.0)	

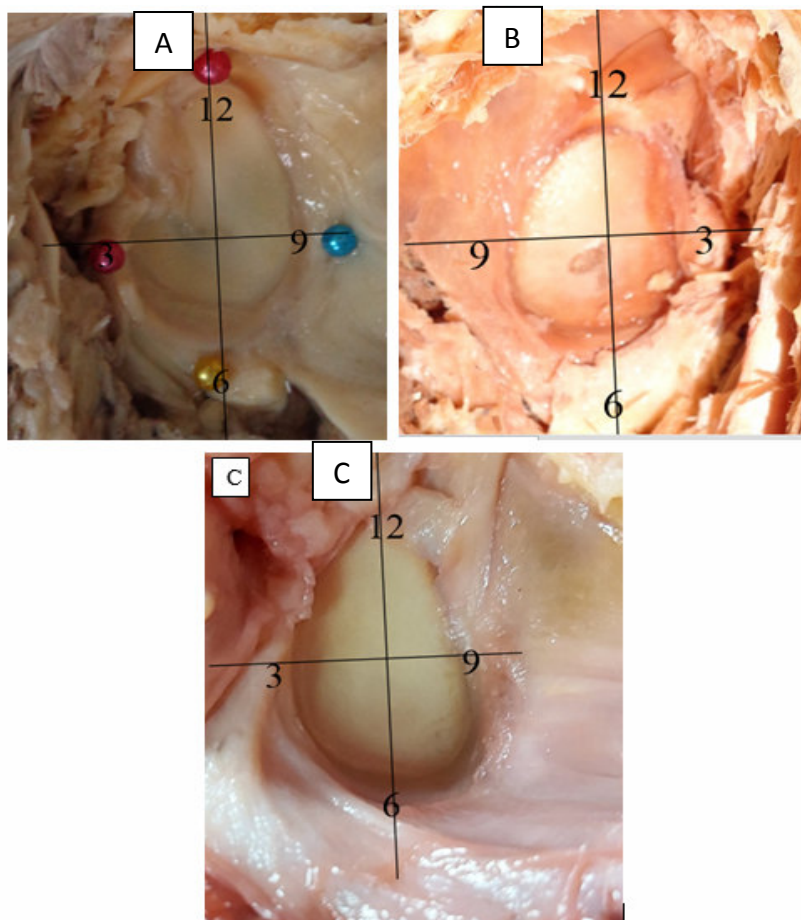


Figure 2: Shapes of glenoid cavity.

A: Pear-shaped with a distinct glenoid notch at the anterior margin; B: Pear-shaped with slight glenoid notch; C: Oval without glenoid notch.

In our research, based on classification by Andreas Prescher and Thomas Klumpen, we found 3 shapes of glenoid cavity. Among them, oval-shaped cavity (shape 3) mainly appeared in 20/30 glenoid cavities (66.7%), whereas only 1 glenoid cavity was shape 1 (3.3%). There was no statistical significance between two sides with $p > 0.05$.

Table 8: Shape of glenoid cavity in recent studies.

Authors	Number of glenoid cavities		Shape 1 (%)	Shape 2 (%)	Shape 3 (%)
	Right	Left			
Rajput, et al (2012) [5]	Right	43	35	49	16
	Left	57	39	46	15
Mamatha, et al (2011) [6]	Right	98	34	46	20
	Left	104	33	43	24

Kavita, et al (2013) [7]	Right	67	11	58	30
	Left	62			
Neta, et al (2015) [8]	Right	55	22	47	31
	Left	71	13	55	32
Our study	Right	15	0	5	10
	Left	15	1	4	10

The distribution of Vietnamese glenoid cavity's shape was different from other foreign populations. In detail, most glenoid cavities of Vietnamese population were in shape 3 whereas this shape accounted for the lowest incidence in other international studies. Besides, shape 2 was the most common in other studies but not in our study.

CONCLUSION

Understanding about morphometry of glenoid cavity has important clinical meaning, especially in joint reconstruction surgery. Although our sample size was limited, our research results initially provided basic indicators of morphometry of glenoid cavity in Vietnamese population: The diameters seemed to be smaller than that in other foreign populations; shapes also had some differences in proportion. In conclusion, our study not only provided useful data about glenoid cavity, but also suggested further and extensive studies to acquire profound and comprehensive knowledge of glenohumeral joint anatomy and applications in treatment.

REFERENCES

1. Baruffi S, T Martins, M Varacallo. Shoulder arthrocentesis technique, in StatPearls [Internet]. StatPearls Publishing 2020.
2. Karelse A, et al. The pillars of the scapula 2007; 20(4):392-399.
3. Prescher A, TJJoa Klümpen. The glenoid notch and its relation to the shape of the glenoid cavity of the scapula 1997; 190(3):457-460.
4. Morton DA, KD Peterson, KH Albertine. Gray's dissection guide for human anatomy. Churchill Livingstone Elsevier 2007.
5. Rajput HB, KK Vyas, BDJNJMR Shroff. A study of morphological patterns of glenoid cavity of scapula 2012; 2(4):504-507.
6. Mamatha T, et al. Morphometry of glenoid cavity 2011; 10(3).
7. Kavita P, JJIJoA Singh, Pharmaceutical, B Sciences. Morphology of coracoid process and glenoid cavity in adult human scapulae 2013; 2(2):62-65.
8. Chhabra N, S Prakash, BJIJAR Mishra. An anatomical study of glenoid cavity: Its importance in shoulder prosthesis 2015; 3(3):1419-1424.