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SHORT COMMUNICATION
КРАТКОЕ СООБЩЕНИЕ

Glenoid cavity morphometric study in human scapula


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Abstract. Relevance. Scapula is one of the bones that takes part in the formation of shoulder joint and has variable morphology. It is weak joint because glenoid cavity is variable in vertical diameter and transverse diameter. Hence glenoid cavity is shallow and gives rise to frequent dislocation of shoulder joint. Aim of the present study was to know various dimensions of glenoid cavity like vertical diameter and horizontal diameter and their variations in percentages. **Materials and Methods.** Fifty unknown dry human scapulae from the department of anatomy (Mahatma Gandhi Medical College, Sitapura, Jaipur, Rajasthan, India) constituted the materials for the present study. Each scapula was studied for glenoid cavity. The vertical diameter and horizontal diameters were studied from each above scapula. Twenty five scapulae were from right side and twenty five were from left side. The different shapes of glenoid cavity were observed. The shapes were pear shaped, inverted comma shaped and oval shaped. **Results and Discussion.** In the present study pear shaped glenoid cavity was found in 56 %, Inverted comma shape was found in 26 % and oval shape was observed in 18 %. The most common shape was pear shape (56 %) and least common shape was oval shape (18 %). The mean glenoid height was 35.52 mm. The maximum glenoid height was 41.22 mm and minimum glenoid height was 30.19 mm. The mean glenoid width was 20.77 mm. The maximum glenoid width was 24.31 mm and minimum glenoid width was 17.93 mm. **Conclusion.** Study showed that glenoid cavity has varied morphology. This varied morphology will be of great useful in various clinical and surgical procedures like hip replacement and in posterior glenoid osteotomy.

Key words: glenoid cavity, morphometry, prosthesis, artificial components, glenoid height, glenoid width

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Conflict of interest statement. The authors declare no conflict of interest.

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Introduction

Glenoid cavity has been described in various standards of anatomical text books having different shapes, namely pear shaped, round, or in the form inverted comma shaped [1, 2]. At the anterior margin of glenoid cavity is located Glenoid notch according to Fick (1904) [3, 4]. Von Langer called Glenoid Notch as Incisura Acetabuli in 1882 [5]. In 1882 Frazer also has mentioned Glenoid notch in 1958 He has stated that location of the glenoid notch is the line of junction between ‘scapular’ and ‘coracoids’ parts of glenoid cavity [6], it is called as “*enchancrure glenoidienne*” in French literature in (1967) [7]. It is observed from Mamatha and colleagues’ studies showed that, the vertical diameter of glenoid cavity of shoulder joint is stronger and broader [8]. It is observed that in some conditions like osteoarthritis rheumatoid arthritis, post traumatic arthritis, osteonecrosis and in fractures, glenoid cavity can cause excruciating shoulder pain, limitation of movements and disability, which may invite surgery like replacement surgery where there is removal of damaged parts and replaced by artificial components known as Prosthesis [9—12]. Here replacement of head of humerus can be done known as Hemiarthroplasty or removal and replacement of both ball and socket (glenoid cavity) known as Shoulder Arthroplasty. Hence it is important to know the morphology of glenoid cavity for proper fitting of prosthesis [8, 13]. Glenoid cavities are of different shapes due to the presence of notch. On anterior aspect glenoid cavity as seen by Rajput et al studies [14]. It is observed that in some conditions like osteoarthritis rheumatoid arthritis, post traumatic arthritis, osteonecrosis and in fractures, glenoid cavity can cause excruciating shoulder pain, limitation of

movements and disability, which may invite surgery like replacement surgery where there is removal of damaged parts and replaced by artificial components known as Prosthesis. Here replacement of head of humerus can be done known as Hemiarthroplasty or removal and replacement of both ball and socket (glenoid cavity) known as Shoulder Arthroplasty. Hence it is important to know the morphology of glenoid cavity for proper fitting of prosthesis [8, 13]. Since highly fluctuation of morphology, it is important to know the appropriate fixation of glenoid component of scapula to prevent loosening [15—17].

Materials and methods

Fifty unknown dry scapulae from the department of anatomy (Mahatma Gandhi Medical College, Sitapura, Jaipur, Rajasthan, India) constituted the materials for the present study. Out of 50 scapulae, 25 were of right side and 25 were of left side. Shapes of glenoid cavity, like oval shaped, inverted comma shaped, and pear shaped were observed with the help of vernier calliper, measurements of width and height of glenoid cavity were measured. Then Maximum, Minimum of height and width of the glenoid cavity were calculated. The mean glenoid height and the mean glenoid width were calculated. All the results of above findings were tabulated in table which is given below under results.

Results and discussion

The morphological and morphometric study of glenoid cavity in 50 unknown dry Scapula (25 right and 25 left) is given in Table 1.



Fig 1. Height of glenoid cavity

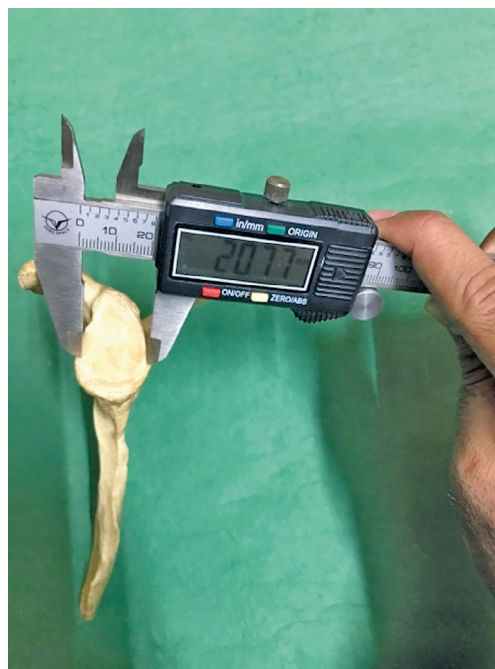


Fig 2. Width of glenoid cavity

Table 1

Shapes of Glenoid Cavity

Shapes	Right Side	Left Side	Total	
			N=50	%
Oval Shape	13	15	28	56 %
Inverted Comma shape	7	6	13	26 %
Pear Shape	5	4	9	18 %

• In the present study oval shapes of glenoid cavity was found in 56 %, Inverted comma shape was in 26 % and oval shape was in 18 %.

• The most common shape was pear shape (56 %) and least common shape was oval shape (18 %), Table 1.

The mean glenoid height was 35.52 mm. The maximum glenoid height was 41.22 mm and minimum glenoid height was 30.19 mm (Table 2).

Table 2

Glenoid Height

Parameter	Right Side (mm)	Left Side (mm)	Total (N=50)
Mean	35.85	35.20	35.52
Maximum	41.22	38.72	41.22
Minimum	30.19	31.12	30.19

The mean glenoid width was 20.77 mm. The maximum glenoid width was 24.31 mm and minimum glenoid width was 17.93 mm (Table 3).

Table 3

Glenoid Width

Parameter	Right Side (mm)	Left Side (mm)	Total (N=50)
Mean	21.09	20.46	20.77
Maximum	24.31	24.12	24.31
Minimum	17.93	18.12	17.93

Andreas Prescher and Thomas Klumpen (1996) conducted a study on 236 scapulae between 1985—1996 at Anatomical Institute of the Rheinisch-westfallischen Technischen Hochschule (RWTH) in Aachen, Germany [18]. Out of them 118 were belonging to male and 118 were also belonging to females. The scapulae were from Germany. The study showed presence of notches in 55 % (129) scapulae having pear shaped glenoid cavity. In 45 % of scapulae (107), notch was absent in glenoid cavity. They were oval in outline. Out of 107 scapulae, 57 scapulae were belonging to females (53 %) and 50 scapulae were belonging to

males (47 %). This sexual difference was not significant. 41 pairs showed asymmetrical glenoid cavities. There were clear differences between sexes, (27) 66 % were in females while in males only 14 (34 %).

Manisha and colleagues (2019) conducted a study on 100 unpaired dry human scapulae regarding their morphometry and morphological study. Out of them 50 scapulae were belonging to right side and 50 on the left side. The materials were from department of anatomy SRM Medical College and Research Center, Potheri, Tamilnadu. The transverse diameter, in upper segment, transverse diameter in lower segment of the glenoid cavity and their shapes were studied measured and documented. Their study showed both inverted comma shaped and pear shaped were than on the left side while incidence of oval shaped on the left side was more than

on the right side. The SI diameter of glenoid cavity on the right side was more than on the left side. This was statistically significant. The antero posterior diameter of glenoid cavity on the right side was greater than left but statistically insignificant [19].

Pranoti and colleagues (2016) carried out a study on 53 unknown dry unpaired dry scapulae of unknown sex at Sikkim's Manipal Gangtok institute of Medical Sciences. Out of 53 scapulae, 23 were belonging to right side and 32 were belonging to the left side. Their study showed 34.12 mm±3.16 mm of mean superior— inferior diameter, the mean anterior posterior diameter was 23.28±2.99 mm and Anterior posterior diameter 18.04 mm± 2.57 mm. The mean surface area of glenoid cavity was 5.56 mm± 1.3 mm [20].

Table 4

Incidences of various authors on different shapes of glenoid cavity

No	Authors	Specimen numbers	Pear shaped (%)	Oval shaped (%)	Inverted coma (%)
1	Rajput et al (2013)	R-43 L-57	49 % 46 %	16 % 15 %	35 % 39 %
2	Mamatha et al (2011)	R-98 L-104	46 % 43 %	20 % 24 %	34 % 33 %
3	Kavitha et al (2013)	R-104 L-67	58 % 58 %	30 % 30 %	11 % 11 %
4	Neetha et al (2015)	R-55 L-71	47 % 55 %	31 % 32 %	22 % 13 %
5	Parnoti Sinha et al (2016)	R-21 L-32	23 % 42 %	08 % 13 %	09 % 06 %
6	Present Study	R-25 L-25	20 % 16 %	52 % 60 %	28 % 24 %

Present study done on 50 unknown dry human scapulae (25 right and 25 left) at Mahatma Gandhi Medical College, Sitapura, Jaipur, of Rajasthan. This study showed three types of shapes of glenoid cavity, they were 56 % pear shaped glenoid cavity, 26 % Inverted comma shape and 18 % oval shaped.

Andreas Prescher and Thomas Klumpen (1996) conducted a study on 236 scapulae between 1985— 1996 notch was observed in 129 scapulae (55 %) and there were pear shaped glenoid cavity [16]. However, notch was absent in 107 (45 %) scapulae, in these shapes of glenoid cavity were oval. There was no

sex difference in the incidences of notches. In Raaj M S and colleagues (2019) studied, pear shaped and inverted comma shaped incidences were more on the right side than on the left side [17]. In Pranoti Sinha and colleagues studies (2016), 32 scapulae were examined on the left side and 21 on the right side [18]. Their study showed 22 (41.5 %) pear shaped, oval shaped in 7 (13.20 %) and 3 (5.66 %) were comma shaped on the left side and on the right side 21 glenoid cavities were examined, incidences were pear shaped in 12 (22.64 %), 4 (7.54 %) were oval, and 5 (9.43 %) were comma shaped.

In the present study pear shaped glenoid cavity was found in 56 %, Inverted comma shape was 26 % and oval shape was 18 %. The most common shape was pear shaped (56 %) and least common shape was oval shape (18 %) as seen in Table 1. Our studies are almost similar to Parnoti Sinha and colleagues studies (2016) [20]. These differences may be due to numerical or population difference.

Regarding the dimension of the glenoid cavity: in Pranoti and colleagues studies, mean superior-inferior diameter was 34.12 ± 3.16 mm, the mean anterior posterior diameters of — 1, and — 2 were 23.28 mm and 18.04 mm respectively. Glenoid cavity mean surface was 5.56 ± 1.3 mm [20].

Present study showed the mean glenoid height was 35.52 mm. The maximum glenoid height was 41.22 mm and minimum glenoid height was 30.19 mm. as shown in Table 2. The mean glenoid cavity width was 20.77 mm. The maximum glenoid width was 24.31 mm and minimum glenoid width was 17.93 mm as shown in Table 3.

Conclusion






This study is of paramount surgical importance, especially in total hip replacement and arthroplasty. It is important to know the variations of dimension of the glenoid cavity in the pathological conditions like osseous Bankart lesions and ostochondral defects. The study is also important for replacement surgery to fit artificial components.

This study will be of great help in replacement procedures and in disease conditions of glenoid cavity.

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Морфометрическое исследование суставной впадины лопатки человека

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Аннотация. *Актуальность.* Лопатка — одна из костей, принимающих участие в образовании плечевого сустава и имеющая вариабельную морфологию. Это слабый сустав, так как суставная впадина имеет переменный диаметр по вертикали и поперечному диаметру. Следовательно, суставная впадина неглубокая и приводит к частым вывихам плечевого сустава. Цель настоящего исследования состояла в том, чтобы узнать размеры суставной впадины, такие как вертикальный диаметр и горизонтальный диаметр, и их вариации в процентах. *Материалы и методы.* Материалом для настоящего исследования послужили 50 неизвестных сухих лопаток человека с кафедры анатомии (Медицинский колледж Махатмы Ганди, г. Ситапура, Джайпур, Раджастхан, Индия). Каждая лопатка исследована на наличие суставной впадины. Измеряли вертикальный диаметр и горизонтальный диаметр от каждой вышеперечисленной лопатки. Исследовали двадцать пять правосторонних и двадцать пять левосторонних лопаток. Наблюдались различные формы суставной впадины. Формы были в форме груши, перевернутой запятой и овальной формы. *Результаты и обсуждение.* В настоящем исследовании гленоидная полость в форме груши была обнаружена в 56 %, форма перевернутой запятой была обнаружена в 26 % и овальная форма наблюдалась в 18 %. Наиболее распространенной формой была груша (56 %), а наименее распространенной формой была овальная форма (18 %). Средняя высота гленоида составила 35,52 мм. Максимальная высота гленоида составляла 41,22 мм, а минимальная высота гленоида составляла 30,19 мм. Средняя ширина гленоида составила 20,77 мм. Максимальная ширина гленоида составила 24,31 мм, а минимальная ширина гленоида — 17,93 мм. *Выводы.* Исследование показало, что суставные впадины имеют разнообразную морфологию. Эта разнообразная морфология будет очень полезна при различных клинических и хирургических процедурах, таких как замена тазобедренного сустава и задняя гленоидная остеотомия.

Ключевые слова: полость сустава, морфометрия, протез, искусственные компоненты, высота сустава, ширина сустава

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