

Original Research Article

A study on morphometry of coracoid process of scapula in north Indian population

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ABSTRACT

Background: Coracoid process is a part of scapula and plays an important role in shoulder function. It arises from the antero-lateral aspect of the scapula. The aim of our study is to record the various morphometric parameters of the coracoid process.

Methods: The study was performed on 50 pairs of human scapula of known sex in Department of Anatomy at PGIMS Rohtak. The parameters recorded were length, breadth, thickness, height and types of coraco-glenoid space by using vernier calipers. These parameters were compared in both sexes on both the sides.

Results: Type I (round bracket) coraco-glenoid space was found to be predominant. Statistically significant difference was noted in all four parameters between males and females except in thickness on right side. Though all the four parameters have higher values on right side in comparison to left side but the difference was statistically insignificant.

Conclusions: The study provides valuable information regarding the role of these parameters in etiology of subcoracoid impingement syndrome which will be helpful in its management to the surgeons.

Keywords: Coracoid, Coraco-glenoid, Subcoracoid impingement syndrome

INTRODUCTION

The phylogenic, ontogenic and racial variations of the scapula, make it as one of the most interesting bones for research.¹

The scapula is a large, flat and triangular bone which lies on the posterolateral aspect of the chest wall, covering parts of the second to seventh ribs. It has costal and dorsal surfaces; superior, lateral and medial borders; inferior, superior and lateral angles and three processes, the spine, its continuation the acromion and the coracoid process. The coracoid process arises from the upper border of the head of the scapula and is bent sharply so as

to project forwards and slightly laterally.² It plays important role in shoulder functions. The coracoacromial anatomy includes acromion, coracoacromial ligament and tip of coracoid process. It is the variation in height and length of coracoid process which is responsible for altered size and shape of space between coracoacromial arch and rotator cuff.³

The coracoid process also forms an important part of the scapular glenoid construct and is involved in many surgical procedures on the glenohumeral joint.⁴

Its detailed morphometry is useful in surgical procedures such as hardware fixation, drill hole placement and

prosthetic positioning.⁵ This study might also be useful to Forensic experts in determination of gender from these parameters.

Since there is dearth of literature regarding the morphometric values of coracoid process in North Indian population, so, the present study was planned to study the different types of coraco-glenoid space and to record various morphometric parameters of the coracoid process in dry scapula of North Indian population.

METHODS

The present study was conducted on 50 pairs of dry human scapulae in the Dept. of Anatomy, Pt. B.D. Sharma PGIMS, Rohtak (Haryana) in the year 2016-17. Out of 50 pairs, 30 belonged to males and 20 were of females. Bones with clear and intact features were included in this study.

Coraco-glenoid space was classified into Type I (round bracket), II (square bracket) and III (fish hook) as suggested by Gallino et al.⁶ Various morphometric parameters of coracoid process were measured using digital vernier caliper accurate up to 0.01 mm. The parameters taken were as follows

- Maximum length: Distance between most anterolateral to most posteromedial extension of coracoid process.³ (Figure 1).
- Maximum breadth: Distance from lateral border to medial border of coracoid process.³ (Figure 2).
- Maximum thickness: Measured in superoinferior direction 1cm posterior to tip of coracoid process.³ (Figure 3).
- Maximum height: Distance between supraglenoid tubercle to top of ascending portion of coracoid process.³ (Figure 4).

Data obtained was analysed using SPSS 17.1 software. The Independent t-test was employed in the assessment of side and gender differences. p-value ≤ 0.05 was considered significant.

RESULTS

Type of coraco-glenoid space: In a study of 100 dry scapulae of known sex from North Indian population, three type of coraco-glenoid space were observed

- Type I-round bracket (Figure 5) was 44%,
- Type II- square bracket (Figure 6) was 38%,
- Type III- fish hook was (Figure 7) 18%.

However, on left side, different pattern was observed i.e. Type I (Round bracket) > Type III (Fish hook) > Type II (Square bracket) coraco-glenoid space (Table 1, Table 2).

Table 1: Incidence of different types of coraco-glenoid space in males and females.

Gender	Type I (round) (%)	Type II (square) (%)	Type III (fish-hooked) (%)
Males (n=60)	27 (45%)	25 (42%)	8 (13%)
Round bracket > Square bracket > Fish-hooked			
Females (n=40)	17 (42.5%)	13 (32.5%)	10 (25 %)
Round bracket > Square bracket > Fish-hooked			
Total	44	38	18
Round bracket > Square bracket > Fish-hooked			

Table 2: Incidence of different types of coraco-glenoid space on right and left sides.

Side	Type I (round) (%)	Type II (square) (%)	Type III (fish-hooked) (%)
Right (n=50)	25 (50%)	23 (46%)	2 (4%)
Round bracket > Square bracket > Fish-hooked			
Left (n=50)	19 (38%)	15 (30%)	16 (32%)
Round bracket > Fish-hooked > Square bracket			
Total	44	38	18
Round bracket > Square bracket > Fish-hooked			

Table 3: Comparison of all the parameters between males and females on both sides with p value.

Parameter	Mean ± SD		p-value
	Males n=30	Females n=20	
Length (R)	37.21 ± 3.93	34.06 ± 3.76	0.00
Length (L)	36.86 ± 4.10	32.56 ± 2.89	0.00
Breadth (R)	15.28 ± 1.70	13.51 ± 1.75	0.00
Breadth (L)	15.13 ± 1.73	13.08 ± 1.07	0.00
Thickness (R)	8.20 ± 1.20	7.64 ± 0.94	0.07
Thickness (L)	8.23 ± 1.06	7.32 ± 0.81	0.03
Height (R)	20.62 ± 2.57	19.91 ± 3.08	0.03
Height (L)	20.59 ± 3.63	18.78 ± 2.50	0.04

Maximum length of coracoid process: The mean length of coracoid process was observed to be 35.54 mm in the present study. It was more in males in comparison to females with statistically significant difference (Table 3). The mean length was more on right side in comparison to left side but the difference was statistically insignificant (Table 4).

Maximum breadth of coracoid process: The mean breadth of coracoid process was observed to be 14.5 mm in the present study. It was more in males in comparison to females with statistically significant difference (Table 3).

The mean breadth was more on right side in comparison to left side but the difference was statistically insignificant (Table 4).

Maximum thickness of coracoid process: The mean thickness of coracoid process was observed to be 7.95 mm in the present study. It was more in males and on right side in comparison to females and on left side but the difference was statistically insignificant (Table 3 and 4).

Maximum height of coracoid process: The mean height of coracoid process was observed to be 20.1 mm in the present study. It was more in males in comparison to females with statistically significant difference (Table 3). The mean height was more on right side in comparison to left side but the difference was statistically insignificant (Table 4).

Table 4: Comparison of all the parameters between right and left sides in both males and females with p value.

Parameter	Mean ± SD		p-value
	Right	Left	
Length (M)	37.21 ± 3.93	36.86 ± 4.10	0.72
Length (F)	34.06 ± 3.76	32.56 ± 2.89	0.16
Breadth (M)	15.28 ± 1.70	15.13 ± 1.73	0.96
Breadth (F)	13.51 ± 1.75	13.08 ± 1.07	0.36
Thickness (M)	8.20 ± 1.20	8.23 ± 1.06	0.68
Thickness (F)	7.64 ± 0.94	7.32 ± 0.81	0.26
Height (M)	20.62 ± 2.57	20.59 ± 3.63	0.96
Height (F)	19.91 ± 3.08	18.78 ± 2.50	0.21

Table 5: Comparison of parameters of coracoid process in regional and international populations.

Authors	Population	Length (mm)	Breadth (mm)	Thickness (mm)	Height (mm)
Present study	North Indian	35.54	14.50	7.95	20.10
Piyawinijwong et al ¹⁰	Thai	37.50	13.50	6.6	8.5
Rajan et al ³	North Indian	40.43	13.77	7.03	15.6
Coskun et al ¹¹	Turkish	19.40	-	7.83	14.6
Gumina et al ⁹	Italian	38.15	-	-	7.19
Gallino et al ⁶	Egyptian	41.10	-	-	-
Pahuja and Singh ¹²	Indian	41.00	-	7.40	-



Figure 1: Maximum length of coracoid process.



Figure 3: Maximum thickness of coracoid process.



Figure 2: Maximum breadth of coracoid process.



Figure 4: Maximum height of coracoid process.



Figure 5: Type-I (round bracket) coraco-glenoid space.



Figure 6: Type-II (square bracket) coraco-glenoid space.



Figure 7: Type-III (fish hooked) coraco-glenoid space.

DISCUSSION

Numerous paths of open surgical or arthroscopic access to the shoulder refer to the coracoid which has been aptly defined by Matsen et al as “the lighthouse of the shoulder”.⁷ It has been observed that the position of the apex of the coracoid process varies from one individual to another.⁸ We have not found any study regarding coracoid process in scapula of known sex.

Type of coraco-glenoid space: High incidence of Type I - Round bracket (44%) followed by type II -Square bracket (38%) and low incidence of Type III -Fish hook (18%) coraco-glenoid space was observed in the present study.

Our results were close to those of Gumina et al⁹ which were 45%, 34% and 21% respectively.

Maximum length of coracoid process: The mean length of coracoid process was observed to be 35.54 mm in the present study. Our findings are very close to the findings of Piyawinijwong et al in Thai population according to which, mean length was 37.5 mm.¹⁰ Gumina et al reported mean length to be 38.15 mm in Italian population (Table 5).⁹

Maximum breadth of coracoid process: The mean breadth of coracoid process was observed to be 14.5 mm in the present study. Our findings are very close to the findings of Rajan et al in North Indian population according to which, mean breadth was 13.77 mm.³

Piyawinijwong et al reported mean breadth to be 13.5 mm in Thai population (Table 5).¹⁰ Maximum thickness of coracoid process: The mean thickness of coracoid process was observed to be 7.95 mm in the present study. Our findings are very close to the findings of Coskun et al in Turkish population according to which, mean thickness was 7.83 mm.¹¹ Pahuja and Singh reported mean thickness to be 7.4 mm in Indian population (Table 5).¹²

Maximum height of coracoid process: The mean height of coracoid process was observed to be 20.1 mm in the present study. Our findings are higher in comparison to other studies.^{3,9-11} Out of all studies, Rajan et al reported highest value for maximum height of coracoid process i.e. 15.6 mm in North Indian population (Table 5).³

CONCLUSION

In the present study on 100 scapulae, Type I (Round bracket) coraco-glenoid space was found to be predominant. Statistically significant difference was noted in all the five parameters between males and females except in thickness on right side. Though all the five parameters have higher values on right side in comparison to left side but the difference was statistically insignificant. The above data may not only help the orthopaedic surgeons while understanding aetiopathogenesis of the subcoracoid impingement syndrome but also during the surgical management of this syndrome. These findings might also be useful to forensic experts in determination of gender from these parameters.

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Ethical approval: Not required

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