IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 20, Issue 7 Ser.12 (July. 2021), PP 28-31
www.iosrjournals.org

A Study on Morphometric Measurements and Indices of Human Scapulae with Its Significance

J. Sujitha Jacinth [1], A. Vikraman[2]
[1] *Associate Professor, Department of Anatomy, Rajah Muthiah Medical College, Annamalai University, Chidambaram, India.*
[2] *Second MBBS, Rajah Muthiah Medical College, Annamalai University, Chidambaram, India.*

Abstract:
The objective of this study is to analyze the morphometric data of scapulae and to compare with previous studies and discuss their evolutionary aspect.
Background*: The scapula is a large, flat triangular bone with three angles, three borders and two surfaces. A prominent spine subdivides the posterior surface into a small superior supraspinous fossa and a much larger, inferior infraspinous fossa. The various morphometric measurements of the scapulae play a major role in identifying age, sex race and can be used in comparative studies.*
Materials and Methods: *This study was performed in Department of Anatomy, Rajah Muthiah Medical College, Annamalai University. 40 scapulae of both sides were taken for study. Length, breadth and infraspinous length were calculated with the help of Vernier caliper and readings were noted and analysis were done.*
Results*: Mean scapular length in the present study was 133 mm with standard deviation of 13.08, Mean scapular breadth was 96.25 mm with standard deviation of 7.13 mm, mean infraspinous length in the was 105.3 mm with standard deviation of 10.32 mm, mean scapular index in the present study was 72.6 mm with standard deviation of 3.84 mm and mean infraspinous index in the was 91.72 mm with standard deviation of 5.42 mm.*
Conclusion: *These morphometric values calculated can be used to study characteristics such as age, sex race and can be used in comparative studies.*
Key Word*: Scapulae, Scapular length, Scapular breadth, Infraspinous length*

Date of Submission: 08-07-2021 Date of Acceptance: 23-07-2021

I. Introduction

The scapula is a large, flat triangular bone with three angles, three borders and two surfaces. A prominent spine subdivides the posterior surface into a small superior supraspinous fossa and a much larger, inferior infraspinous fossa [1]. Although the scapula has attachment of as many as 15 muscles, the shape of the scapulae is not due to the forces applied during the development but is a mammalian character [2].

From the evolutionary point of view scapula has undergone modifications especially in its shape. Scapular index which indicates the relationship of breadth to the length of the bone has been used to note such modifications. The changes in the scapular shape are more in the infraspinous region than the supra spinous region. Hence infraspinous index relating the breadth of scapula to infraspinous length also has to be taken into account. [3]

II. Material And Methods

This study was performed in Department of Anatomy, Rajah Muthiah Medical College, Annamalai University. 40 scapulae(both right and left sides) of unknown age and sex were used for this study. The bones taken for study is free from any physical damage and were complete in all aspects.
The following measurements were taken,
Scapular length: It was taken from summit of the superior angle to the summit of the inferior angle
Scapular breadth: It was taken from point of intersection of scapulae on the medial border to the middle of the outer border of the glenoid cavity
Infraspinous length: It was taken from point of intersection of scapulae on the medial border to the summit of the inferior angle
Scapular index: Breadth/Length*100
Infraspinous index: Breadth/infraspinous length*100

III. Result

The data that were collected during this study were presented in the table

Table no 1: Shows the distribution in the length of scapulae in the study sample.

S. No	Length (mm)	No. Of Scapulae	Percentage
1	115-125	8	20
2	126-135	16	40
3	136-145	6	15
4	146-155	8	20
5	>156	2	5

Table no2: Shows the distribution in the breadth of scapulae in the study sample.

S. No	Breadth (mm)	No. Of Scapulae	Percentage
1	85-95	22	55
2	96-100	4	10
3	101-105	12	30
4	106-110	1	2.5
5	111-115	1	2.5

Table no 3: Shows the distribution in the infraspinous length of scapulae in the study sample.

S. No	Infraspinous length (mm)	No. Of Scapulae	Percentage
1	85-95	4	10
2	96-100	12	30
3	101-105	8	20
4	106-110	6	15
5	>111	10	25

Table no 4: Shows the distribution in the infraspinous index of scapulae in the study sample.

S. No	Infraspinous Index (mm)	No. Of Scapulae	Percentage
1	85-90	16	40
2	91-95	12	30
3	96-100	4	10
4	101-105	7	17.5
5	>106	1	2.5

Table no 5: Shows the distribution in the scapular index of scapulae in the study sample.

S. No	Scapular Index (mm)	No. Of Scapulae	Percentage
1	65-70	12	30
2	71-75	22	55
3	76-80	3	7.5
4	81-85	2	5
5	86-90	1	2.5

IV. Discussion

The length, breadth and infraspinous length of scapula were measured and compared with other studies as per the morphometric values given below

Scapular Length: Mean scapular length in the present study was 133 mm with standard deviation of 13.08 while Flower WH's study done on European race showed mean scapular length of 155.44mm[4]. Thus, the scapular length of European region is higher than that of our study. The findings of the present study are less than that of the studies done by Singhal *et al.* & Krishnaiah *et al.* where they found a mean length and standard deviation of 141.7±8.9 mm and 143.27±11.44 mm in Gujarat & Nalgonda region respectively [5][6].

Scapular Breadth: Mean scapular breadth in the present study was 96.25 mm with standard deviation of 7.13 mm while Flower WH's study done on European race showed mean breadth of 101.42mm which is less than when compared with our study [4]. It is also less than the findings obtained by Krishnaiah *et al.* on Nalgonda region where they found a mean breadth of 105.6±5.08[6]. The findings of the present study are almost similar when compared with Singhal *et al.* [5] findings of mean breadth and standard deviation of 96.4 mm and 7mm respectively on Gujarati population.

Infraspinous Length: Mean infraspinous length in the present study was 105.3 mm with standard deviation of 10.32 mm while

Flower W H's study of European race showed mean infraspinous length to be 113.46 mm which is more than the present study [4]. The findings of present study are less than that of Krishnaiah *et al.* findings of infraspinous length of 107.71±7.6 mm in people of Nalgonda region [6].

Scapular Index: Mean scapular index in the present study was 72.6 mm with standard deviation of 3.84 mm. In other studies, the mean scapular index ranged from a minimum of 57.3 in Peruvian population [4] to a maximum of 73.99 in Nalgonda region [6]. Thus, scapular index value found in the present study is less than the findings of scapular index of 73.99±4.6 as observed by Krishnaiah *et al*. in Nalgonda region [6]. It is also nearer to the scapular index values of Negroes [4]. However, the values obtained are slightly higher when compared to that of Gujarat region scapular index of 68.5±4 [5].

Infraspinous Index: Mean infraspinous index in the present study was 91.72 mm with standard deviation of 5.42 mm. while this index varies from 75.1 in Peruvian race [7] to 100.9 in Negroes [4]. Present study infraspinous index of 91.72 ±5.42 was more or less corresponding to that of Peruvians infraspinous index of 91.74 [4]. It was less than that of Krishnaiah *et al.* infraspinous index of 98.33±5.86 in Andhra Pradesh [6]. However, the findings of the present study were less when compared to Singhal *et al.* findings of infraspinous index of 94.6±7.6 on Gujarat region [5].

Evolutionary Aspect: During the evolution of the upper extremity, the scapula, more than any other bone of the shoulder girdle, reflects momentous alterations that have been brought about by increased functional demands of a prehensile limb. Changes in posture provided the stimulus which initiated the numerous morphologic changes. Rhachitomous amphibians possessed massive scapulae with the glenoid cavity pointing laterally. The articulating surface was screw-shaped, and the limbs were held in the coronal plane horizontal to the ground.

In the Reptilia the scapula with the entire girdle migrated a great distance from the skull in order to permit a more efficient mode of locomotion. The scapula was still broad and massive in the primitive forms. However, later with increased efficiency in locomotion, there was a trend toward reduction of this bone, the glenoid cavity shifting from a position directed laterally to one directed posteriorly and inferiorly. As a result of the change in posture, the coracoid's function decreased. Hence, a gradual reduction in its size is noted in this group. Up to this stage in evolution of the pectoral girdle no evidence of a spine on the dorsal surface of the scapula is found except in the Therapsids whose posture is not unlike that of the mammals.

Posture was responsible for the development of the scapular spine which is found in all mammals except the very primitive forms, the Monotremes. With rearrangement of some and disappearance of other muscles, the need of a pro-coracoid and coracoid no longer existed. Therefore, the former element disappeared entirely, while the latter was reduced to the coracoid process. The shape of the scapula is dependent upon posture and the functional requirements of the muscles attached to it. It is broad and massive in forms which need large powerful serratus anterior muscle to support heavy bodies in a quadruped position.

In mammals which have partially or completely freed the pectoral limbs, the shape of the scapula exhibits a trend towards the pattern found in man. These alterations are brought about by change in posture from the pronograde to the orthograde and highly specialized functional requirements of a prehensile limb. The most significant scapular change is in the relation of length to breadth of a bone. Pronograde forms disclose a long narrow scapula, while in the ascent toward man it becomes broader.

This morphologic change is most obvious in the primates. That portion of scapula below the spine demonstrates the most pronounced alterations, those in the region above the spine being insignificant. Morphologic modifications in the scapula can be expressed by a scapular index, a ratio of the breadth (measured along the base of the spine) to the length (measured from the superior from the inferior angle). The scapular index is high in the pronograde in which the scapula is long, narrow and slender. The index progressively decreases in the successive stages of development approaching man (orthograde).

This is the result of a gradual increase in the breadth of the scapula and elongation of the bone below the level of the spine, giving rise to a progressive increase in the "infraspinous index". Inman, Saunders and Abbott, in their comprehensive study of the function of the shoulder joint, observed that lengthening of the scapula below the spine changed the relation of the axillary border of the scapula to the glenoid fossa, thereby altering the angle of pull of the muscles attached to this region, a feature of great significance in the mechanism of the shoulder.

In the primates, as one approaches man, the increasing importance of the role of the deltoid muscle is reflected in the prominence of the outer end of the spine, the acromion process. Whereas in pronograde forms the acromion process is insignificant, in orthograde it is a massive structure overlying the humeral head [8]

V. Conclusion

These morphometric values calculated can be used to study characteristics such as age, sex, race and can be used in comparative studies.

References

[1]. Richard L Drake. Gray's Anatomy for students .4th ed. Page: 690
[2]. Barden CR. Skeleton. American Journal of Anatomy.1905; 4:265-73.
[3]. Inman, Saunders JB, Abbot. Observation on the junction of the shoulder joint. Journal of bone & joint surgery 1944; 1:30.

[4]. Flower WH, Garson JG. The scapular index as a race character in man. Journal of anatphysiol 1879; 14(1):13-17.
[5]. Singhal. A study of measurements and indices of human scapula at Jamnagar Medical College. Int J Res Med. 2013; 2(1):65-8.
[6]. Krishnaiah M, Nagaraj S, Kumar P, Sherke AR. Study of scapular measurements and scapular indices of Andhra Pradesh region. IOSR-JDMS. 2014; 13(6):117-120.
[7]. The scapular index as a race character in man. Available from: http://19thcenturyscience.org/HMSC/HMS C-Reports/Zool
[8]. https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2505211/

J. Sujitha Jacinth, et. al. "A Study on Morphometric Measurements and Indices of Human Scapulae with Its Significance." *IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)*, 20(07), 2021, pp. 28-31.