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RESEARCH ARTICLE

SCAPULAR MEASUREMENTS AND INDICES, AN OBSERVATIONAL STUDY AT GMC SRINAGAR, KASHMIR

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ABSTRACT

Scapula, the triangular flat bone links the axial skeleton to the appendicular skeleton of upper limb along with clavicle. It shows modifications in its shape in the evolutionary process from quadrupeds to bipeds. Present study was carried out with the objectives of determining important measurements like breadth, length, infraspinous length of scapulae and finding out indices like scapular index and infraspinous index which may help in comparative anatomy and defining the race. The scapular measurements can be used for comparative anatomy and manufacturing of prosthetic products and surgical procedures such as prosthetic positioning. Further in depth studies about scapular measurements, including radiological may help in determining the race just by using the indices. These indices are used both in comparative anatomy and the study of characteristic of race, sex and age in man. This study was carried out in the department of anatomy of Government Medical College, Srinagar Jammu and Kashmir. Total of 60 human scapulae were studied. Data obtained from the study was analyzed and results were calculated. The mean and SD of Scapular breadth were 98.16mm and 11.60 respectively. The breadth range of 100mm-105mm (28.3%) had the maximum number of scapulae while the minimum number were noted in the 115mm-120mm (3.33%) range. The mean length of the scapula and SD observed were 137mm and 20.09mm respectively. Maximum number of scapulae was in the range of 140mm to 150mm while least number was in the 100mm to 110mm range. The Scapular index was in the range of 63.80mm-95mm. Mean and standard deviation were 72mm and 11.41mm respectively. Maximum number of scapula were found in two groups i.e, in the range of 65mm to 70 mm (35%) and 70mm to 75mm (35%), while only 1 was in the range of 90mm to 95mm (1.6%) and no scapula was in the range of 85mm to 90mm.Infraspinous index was in the range of 79.04mm to 125mm. Mean and standard deviation were 92.83mm and 15.86mm respectively. Maximum number of scapula was found in range 85mm to 95 mm (45%) while as minimum number of scapula were in the range of 115mm to 125mm (1.6%). Mean infraspinous length was 106.76mm. Measurements like scapular length, breadth and infraspinous length and indices like scapular and infraspinous index can be used in comparative anatomy.

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INTRODUCTION

The Human Scapula or shoulder blade is a flat triangular bone which is paired and overlies the posterolateral framework of the thoracic wall. Scapula extends from T2 to T7. Scapula has a body with subscapular fossa on its costal aspect, and supraspinous and infraspinous fossa on its dorsal aspect. The triangular spine, the acromion process and the coracoid process also lies in its dorsal aspect. It consists of three angles, superior, inferior and lateral; the lateral angle is truncated and bears the glenoid cavity (Standring, 2008).

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From the evolutionary point of view, the human scapula represents two bones that have become fused together: the (dorsal) scapula proper and the (ventral) coracoids (Minn, 2009). The shape of the scapula is a mammalian character and not due to the forces applied during development as it has attachment of as many as 15 muscles (Barden, 1905). Shape of the scapula is peculiar and has always been a point of attraction to many anatomists. The alterations in the scapular shape can be best expressed by scapular index, which indicates the relationship of length to breadth of the bone. Experimental studies have found that scapular index is extremely high in pronograde, where the scapula is long and narrow, but due to increasing breadth, it progressively falls as we approach the orthograde, such as man, in which the forelimb has been

completely freed (Available from: 19thcenturyscience.org/ HMSC/HMSC-Reports/Zool-47/.../0082.pdf. Accessed March 14th, 2012). The changes that occur in the scapular shape are more in the infraspinous region as compared to the supraspinous region. Hence infraspinous index ,which indicates the breadth of scapula to infraspinous length also has to be taken in account (Inman, Saunders, 1944).The study was carried out for determining the scapular index and infraspinous index by measuring the breadth, length and infraspinous length of scapulae of Kashmir region available at Government Medical College Srinagar.

MATERIALS AND METHODS

The study was conducted on 60 dry scapulae available at Postgraduate Department of Anatomy, Government Medical College Srinagar. A total of 60 scapulae of both right and left side were studied. Only bones complete in all aspects were studied. Measurements were taken in mm with the help of Vernier Caliper.

Instruments:- Osteometricboard, vernier caliper, white paper, lead pencil.

Method:- The scapula was fixed on the osteometric board and points were marked over it and errors in the measurement were minimized. Measurements were taken by vernier caliper in mm; following points were marked as shown in Fig 1

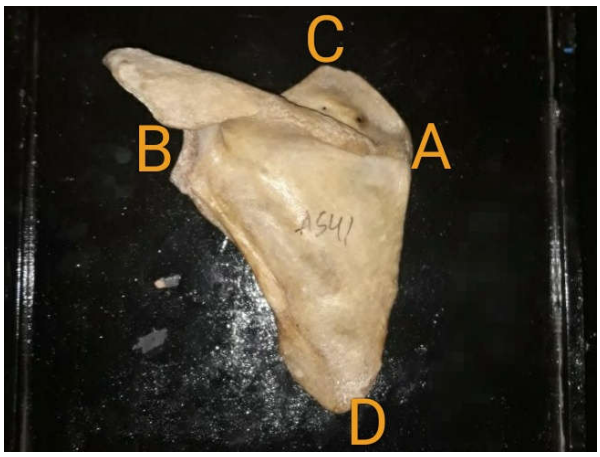

Fig. 1.

Fig. 2. Shows procedure of measurement of scapular length from point C to point D

Fig. 3. Shows procedure of measurement of scapular breadth from point A to point B

A= Point of intersection of spine of scapula to the medial border (fig1)

B= Middle of the outer border of the Glenoid cavity (fig1)

C= Summit of the superior angle (fig1)

D= Summit of the inferior angle (fig 1)

Measurements to be taken

Scapular breadth: is taken as the distance between the points A and B.

Scapular length: is taken as the distance between the points C and D.

Infraspinous length: is taken as the distance between the points A and D. All the measurements are taken with the help of vernier caliper in millimeters. Using these readings scapular index and infraspinous index is calculated as follows;

Scapular Index = (Breadth X100)/ Length

Infraspinous Index = (Breadth X100)/ Infraspinous length

Data was analysed and results were tabulated.

RESULTS

A total of 60 scapula were studied

Table 1. Showing distribution of scapula as per its breadth

N=60

Breadth in mm	Number of scapula	Percentage (%)
80-85	8	13.3
85-90	5	8.3
90-95	6	10
95-100	12	20
100-105	17	28.3
105-110	7	11.66
110-115	3	5
115-120	2	3.33

In the present study, breadth of scapula was ranging from 81.12mm to 117.2mm. The mean and SD were 98.16mm and 11.60 respectively. The breadth range of 100mm-105mm (28.3%) had the maximum number of scapulae while the minimum number were noted in the 115mm-120mm (3.33%) range.

Table 2:- Showing distribution of scapulae as per its length

N=60

Length in mm	Number of scapula	Percentage (%)
100-110	2	3.33
110-120	9	15
120-130	11	18.3
130-140	6	10
140-150	20	33.33
150-160	9	15
160-170	3	5

The mean length of the scapula and SD observed were 137mm and 20.09mm respectively. Maximum number of scapulae was in the range of 140mm to 150mm while least number was in the 100mm to 110mm range

Table 3. Showing distribution of scapula as per its scapular index (Breadth/length) X100)

N=60

Scapular index	Number of scapula	Percentage (%)
60-65	3	5
65-70	21	35
70-75	21	35
75-80	11	18.3
80-85	3	5
85-90	0	0
90-95	1	1.6

Table 4. Showing distribution of scapula as per its infraspinous index. [(Breadth/Infraspinouslength) X100]

N=60

Infraspinous index	Number of scapula	Percentage (%)
75-85	10	16.6
85-95	27	45
95-105	20	33.33
105-115	2	3.33
115-125	1	1.6

The correlation between breadth and length of scapula is expressed as scapular index which was in the range of 63.80mm-95mm. Mean and standard deviation were 72mm and 11.41mm respectively. Maximum number of scapula were found in two groups i.e, in the range of 65mm to 70 mm (35%) and 70mm to 75mm (35%), followed by 75mm to 80m (18.3%), followed by 80mm to 85mm (5%) and 60mm to 65mm (5%) , while only 1 was in the range of 90mm to 95mm (1.6%) and no scapula was in the range of 85mm to 90mm.

The correlation between breadth and infraspinous length of scapula is expressed as Infraspinous index which was in the range of 79.04mm to 125mm. Mean and standard deviation were 92.83mm and 15.86mm respectively. Maximum number of scapula was found in range 85mm to 95mm (45%) followed by 95mm to 105mm (33.33%), followed by 75mm to 85 mm (16.6%), followed by 105mm to 115mm (3.33%),followed by 115mm to 125mm (1.6%).

DISCUSSION

The present study deals with the scapular breadth, length and indices in Kashmir region. Similar studies have been carried out in other races and other groups of population. The findings of the present study are compared with various studies carried out on other geographic populations.

The Scapular Breadth: The Scapular breadth was ranging from 80mm to 120mm in present study, while other studies showed it 83-126 mm. The mean scapular breadth in various studies[6-9] deviates from 92-104 mm. In present study mean scapular breadth is 98.16mm which is nearer to the study by Von Shroeder 2001.

The Scapular Length

The Scapular length in present study was ranging from 100mm to 170mm and mean Scapular length was 137 mm with SD 20.09,While Flower WH's study of European race showed mean length to be 155.44mm. Thus the scapular length of European region is higher than that of Kashmir region (Flower, 1879).

Scapular index

Mean scapular index observed in present study was 72mm with standard deviation of 11.41. In other studies, the mean scapular index ranged from a minimum of 57.3mm in Peruvian population to a maximum of 71.7mm in the Negroes. Thus our study scapular index value is nearer to Negroes.

Infraspinous index

Mean infraspinous index observed in present study was 92.83 with the standard deviation of 15.86, while this index varies from 75.1 in Peruvian race to 100.9 in Negroes.

Table 5. Comparison of scapular index in present study with other studies

Sr.no	Authorities	No.of Scapulae observed	Race/ Region	Mean Scapular index
1	Broca, 1878	46	European	65.91
2	Broca, 1878	2	Bushman	60.96
3	Broca, 1878	2	Peruvian	68.02
4	Broca,1878	50	Negro	68.16
5	Flower, 1879	200	European	65.2
6	Flower, 1879	6	Bushman	66.7
7	Flower, 1879	2	Peruvian	57.3
8	Flower, 1879	6	Negro	71.7
9	Flower, 1879	6	Tasmanian	60.3
10	Flower, 1879	4	Eskimos	61.6
11	Flower, 1879	12	Australian	68.9
12	Flower, 1879	21	Andaman	69.8
13	Turner, 1893	25	European	64.9
14	Turner 1893	-	Maori	63.9
15	Inman 1944	-	-	64.0
16	Sheridan, 2000	-	-	68.1
17	Present study	60	Kashmir	72

Table 6. Comparison of infraspinous index in present study with other studies

Sr.no	Authorities	No.of scapulae observed	Race/ Region	Mean infraspinous index
1	Broca, 1878	46	European	87.79
2	Broca,1878	2	Bushman	83.18
3	Broca, 1878	2	Peruvian	91.74
4	Broca, 1878	50	Negro	93.88
5	Flower, 1879	200	European	89.4
6	Flower, 1879	6	Bushman	90.7
7	Flower, 1879	2	Peruvian	75.1
8	Flower, 1879	6	Negro	100.9
9	Flower, 1879	6	Tasmanian	81.4
10	Flower, 1879	4	Eskimos	80.5
11	Flower,1879	12	Australian	92.5
12	Flower, 1879	21	Andaman	92.7
13	Turner 1893	25	European	89.4
14	Turner 1893	-	Maore	88.5
15	Inman 1944	-	-	120
16	Present study	60	Kashmir	92.83

Present study infraspinous index was more corresponding with that of Andaman region. These indices are used both in comparative anatomy and the study of characteristic of race, sex and age in man (from: 19thcenturyscience.org/ HMSC/ HMSC-Reports/Zool-47/.../0082.pdf. Accessed March 14th, 2012; Hrdlicka, 1942; Comas, 1960; Montagu, 1960; Krogman, 1986).

Conclusion

The scapular measurements can be used for comparative anatomy and manufacturing of prosthetic products and surgical procedures such as prosthetic positioning. The present study showed mean scapular index to be 72mm (range=60mm to 95mm) and mean Infraspinous index to be 92.83mm (range= 75mm to 125mm). These two indices are nearer to studies of Negros and Andaman population respectively. Further in depth studies about scapular measurements, including radiological may help in determining the race just by using the indices.

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