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STUDY OF MORPHOMETRY OF CLAVICLE – LENGTH AND ANGLES

Anatomy

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ABSTRACT

Back ground: The clavicle is complex bone, and is most frequently fractured bone of human skeleton. Most of the factures occur at the middle third of the shaft of the bone. The present study was done to measure in length and angles (medial and lateral angles) of clavicle. The angles of clavicle are very important for anatomists, orthopedicians, surgeons and forensic anthropologists. **Materials & Methods:** 60 dry clavicles collected from dept of Anatomy at NRI Medical College, Chinnakakani, Guntur Dt. Length, medial and lateral angles of clavicle were studied. **Results:** The average mean length of clavicle on right side 14 cm and on left side 7 cm. The range of medial angle on right side medial angle was 154° and lateral angle was 150° and on left side medial angle was 155°, lateral angle was 150°. **Conclusion:** The study of length and angles of clavicle is important for clinicians, anatomists, orthopedics and also far anthropologists.

KEYWORDS:

Clavicle, Clavicle length, medial and lateral angles.

Introduction:
The clavicle is a subcutaneous, horizontally placed long bone. The clavicle is the bony connection between the upper limb and the trunk. It consists of medial sternal end and lateral acromial end and shaft Trotter M and Peterson [1] The two ends are weight bearing ends, by articulating with sternum on medial end and acromial on lateral end.(Ellis, Rumaus, Moore & Dalley)[2,3,4]

Clavicle is the first foetal bone to undergo primary ossification and it is the last bone to completerly ossify (stranding et al 2005)[5]

Parsons and Oliver [6,7], found that length of left clavicle was usually greater than that of right.

Similar observations were recorded by Jit and Singh [8]

Terry [9], noted the length of clavicle in female American Negroes and male American whites, the left bone was longer than the right but not statically significant

Huang et al [10] recorded medial and lateral angle of clavicle with specific relevance to screw and plate fixation.

Daruwall ZJ et al [11], correlated sternal and acromial angles with medial and lateral depths and results were: sterna angle is larger in women than in men and acromial angle is also larger in women.

The female clavicle was found to be shorter, less curved, thinner and smoother than the male. Male bones are heavier and the muscular markings are more prominent than in females chavda et al[12]

M.A McGraw et al[13], stated that, males and females attain 80% of their total clavicle length by 12 and 9 year of age.

R Sudha et al [14], studied, differences between the length of the clavicles and curvatures angles of both side in south Indian population.

The shaft is gently curved with convexity forwards in its medial two thirds and concavity forwards in its lateral third.

The clavicle having two curvature that are lateral and medial curvatures. Lateral curvature is shorter and medial curvature is longer and shows a slight difference between genders.

Attention to the length and curvature is needed when using a plate and to the weight and diameter when using an intramedullary nail. The purpose of this study was to measure length, medial angle and lateral angles. To know about comparative differences between curvatures of the right and left clavicles.

Materials and methods:
60 unpaired clavicles of unknown sex and age was studied from the bones, collected from Dept of Anatomy, NRI Medical College, Chinnakakani, Guntur Dt.

To measure the length and curvatures of the clavicle, Parson's method was followed. The clavicle was placed on a white paper with right and left ends lies on same plane. Outline of clavicle was drawn on paper with the help of diaptograph.

The mid points at the sterna and acromial ends were obtained on the contour of the clavicle and were marked as points 'a' and 'b' and were joined by a straight line: the central axis of the bone was draw as a curved line, midway between the anterior and posterior borders throughout the length of the clavicle. This curved line has two convexities, the medial two thirds was convex anteriorly while the lateral one third was convex posteriorly. The deepest points on the two curves of the bones where the convexities were the maximum, were marked as points 'c' and 'd' which were joined by a straight line. Finally these points were joined with midpoints 'a' and 'b' at the corresponding ends with lines 'c' 'a' and 'd' 'b', thus two angles were formed: and inner or medial angle 'c d b' which gave the curvature of medial two thirds, and an outer or lateral angle 'a c d' 'which indicated the curvature of the lateral one third. These angles were measured with the help of a protractor. (Fig 1,2).



Fig 1: Measuring instruments

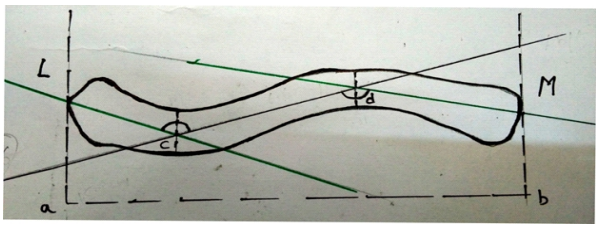


Fig 2: Contour of the right clavicle as seen from above

L- Lateral end, M- Medial end;
bdc- medial angle,
acd- lateral angle;
ab - Length of clavicle,

Observations:

Sample size	Length of Clavicle (average) in cm		Angles			
60 dry bones	Right length	Left length	Medial angle		Lateral angle	
			Right	Left	Right	Left
	14	7	154°	155°	150°	150°
SD (Standard Deviation)	1.5	1.43	4.47°	3.35°	8°	7.3°

The average mean length of right clavicles are 14±1.5cm and left was 7±1.43cm. The range of medial angle of right clavicle was 154±4.47o and left was 155± 3.350 . The rang of lateral angle of right clavicle was 150±80 and left was 150±7.3o .

Discussion:

Parson reported that left clavicle is longer than right in 54%, right longer than left in 34% and in 12% are equal length, in 100 paired bones.

According to Khaleel Nagarchi et al [15], the average mean length was on right 14.2 ± 10.59cm on left 14.3 ± 9.55 cm. The range of medial angle was 135° - 163°. The range of lateral angle was 122° - 162°.

Toon Huysmans et al [16] stated, that the average length is 16.3 ± 11cm for general population.

According to J.Walters [17] study the mean angle differences between the medial and lateral ends of the clavicle to the shaft were 25.2° and 35.8° for the medial and lateral angles.

Ahmad et.al [18] recorded mean length of 136.2mm and range was 112.6 – 172.0cm in a radiographic study.

In study of Terry R J found that the mean medial and lateral angles of clavicle of American Negros were 152.32° and 141.24° on right side and 152.60° and 144.68° on left side.

The same study was done by Kaur H, et al [19] and he recorded that the average medial angle of clavicle was 151.68 on right and 151.89° on left side. Singh and Gandgrade [20] measured the length of the bone and supported their previous observations.

The comparison of the average length and angles of clavicles are given below.

Length of Clvicle:

Author	Sample size	Length of clavicle (average) cm	
		Right	Left
Parson	200	14.65	14.5
Terry in American Negros	100	14.88	14.71
Terry in American whites	50	15.41	15.29
Khaleel Nagarchi	320	11.70 – 12.2	9.55 – 9.62
Oliver	170	14.68	14.60
Singh and Gangrade	97	13.59	13.86
R Sudha	113	13.74	13.76
Present study	60	14	7

Angles of clavicle:

Author	Sample size	Medial angle		Lateral angle	
		Right	Left	Right	Left
Parson	200	154	154	149	149.5
Terry AN	100	152.32	153.60	141.24	144.68
Oliver	170	150.6	151.40	143.40	143.00
Kaur	165	151.68	151.89	143.96	148.46
R Sudha	113	147.5	146	142.05	144
Present study	60	154	155	150	150

In the present study, the average length of clavicle is near to Parson, Terry and Oliver. The angles of clavicle are near to Parson, Terry, Oliver, and Kaur.

Conclusion:

These variations could be due to racial, genetic or mechanical factor. In the present study, it was observed that the medial and lateral angle of left clavicle was more as compared to right side and the length was more on right than left. This difference was not present in fetuses, newborns and children in which the bone of any side may be longer than that of the other side. With use of right hand, the curve of the right clavicle in adults became greater than that of left side which lead to a shorter right bone as compared to the left.

These findings may assist forensic investigators, anthropologists and anatomists in the identification of individuals.

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