



## DETERMINATION OF SEX OF ADULT HUMAN CLAVICLE BY CURVE AND ANGLES.

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### ABSTRACT

**Introduction:** The clavicle is (collar Bone) a typical long bone of upper limb which extends from the root of the neck to the shoulder, which lies horizontally.

**Aim:** The purpose of the study was to measure curves, the medial and lateral angles in dry fully ossified macerated clavicle bones.

**Materials and Methods:** The present study was carried out on 100 dry fully ossified macerated clavicles (50 male & 50 female). The results obtained were statistically analyzed.

**Results:** In the present study, the average medial angle was found to be  $143.68^\circ$  in the present study, the average medial angle was found to be  $143.68^\circ \pm 6.17^\circ$  &  $153.72^\circ \pm 4.46^\circ$  of right & left side of male respectively and  $152^\circ \pm 5.66^\circ$  &  $150.68^\circ \pm 3.72^\circ$  of right & left of female respectively. The lateral angle was found to be  $139.24^\circ \pm 5.38^\circ$  and  $150.04^\circ \pm 4.43^\circ$  of right & left side of male respectively and  $148.48^\circ \pm 9.32^\circ$  &  $149.72^\circ \pm 3.88^\circ$  of right and left side of female respectively.

**Conclusion:** Any increase or decrease in the both angles of the both sexes of the both sides associated with clinical conditions i.e. osteoporosis, fracture deformities etc. The present study will be useful for various orthopedic procedures and diagnoses, in the fields of general human osteology and forensic anthropology.

**KEYWORDS :** Anthropology, Clavicle, Forensic, Osteology

### INTRODUCTION

The clavicle is a typical long bone with shaft and two ends. It is membranous with the two primary centers and first to ossify and fully ossified at the age of 28 years. Its medial end articulates with sternum to form sternoclavicular joint and the lateral end forms the acromioclavicular joint.<sup>1</sup> Morphometric measurement of clavicle helps to determine the age, sex, stature and race of an individual. These measurements are also helpful in different specialties like anthropology, forensic medicine, archaeology, anatomy and orthopedic procedure.

The female clavicle is shorter, thinner, less curved, smoother and its acromial end is at a lower level than the sternal end. In male acromial end is in level with or slightly higher than the sternal end when the arm is pendent. The clavicle is considered to be an important bone clinically.<sup>2</sup> The present study is undertaken with the view to study the sexual differences in adult human clavicle by morphometric parameters i.e. angle & curves in both sexes and both sides. Morphometric study will help the orthopedic surgeon and orthopedic implant manufacturers in deciding the correct size and shape of the implant for the treatment of clavicle fracture by open reduction procedures.<sup>2</sup>

### Materials and Methods

This was an observational descriptive type of study which was performed on 100 fully ossified adult human clavicles in both sexes in the Department of Anatomy, SGT Medical College with the calibration of Department of Anatomy, PGIMS, Rohtak.

Instrument used for taking measurement were graph paper, pen, pencil, eraser, goniometer, scale. Statistical analysis was done using service provisioning system software (Version 21.0)

### Parameters Studied Were:

Medial and lateral angles: Angle between the horizontal axis of shaft and vertical axis of the curve by using goniometer.

### Angles of clavicle:

Deepest point of the medial curvature is marked by 'c' and that of lateral end is marked by 'd'. Central point of medial end is marked by 'a' and that of lateral end by 'b'. Joining the points measured the 'acd'

as medial angle and 'cdb' as lateral angle by using goniometer. The horizontal limb a goniometer was fixed parallel to oblique axis of the shaft & the vertical axis fixed on the curvature of the clavicle.

### Result:

In the present study, in left clavicle, the average medial angle was  $153.72^\circ \pm 4.45^\circ$  in males and  $150.68^\circ \pm 3.71^\circ$  in females. In right clavicle, the average value of medial angle was found to be higher in females ( $152^\circ \pm 5.66^\circ$ ) in comparison to males ( $143.68^\circ \pm 6.17^\circ$ ). In left clavicle, the average value of medial angle was found higher in males ( $153.72^\circ \pm 4.46^\circ$ ) than females ( $151.68^\circ \pm 3.72^\circ$ ). (Table 1)

In the present study, the average lateral angle in right clavicle was found higher in females ( $148.48^\circ \pm 9.32^\circ$ ) than males ( $139.24^\circ \pm 5.37^\circ$ ). In left clavicle, the average lateral angle was found higher in males ( $150.68^\circ \pm 3.72^\circ$ ) in comparison to females ( $150.04^\circ \pm 4.43^\circ$ ). (Table 1)

In the present study, the average value of curvature was found to be higher in males ( $303.74^\circ \pm 8.73^\circ$ ) in comparison to females ( $300.42^\circ \pm 7.36^\circ$ ) in left sided clavicles. In right sided clavicles, the average value of curvature was found to be higher in females ( $300.51^\circ \pm 12.04^\circ$ ) in comparison to males ( $282.88^\circ \pm 11.43^\circ$ ). p-value were significance for all above curvatures i.e.  $p < 0.05$ . (Table 1)

### Discussion:

Medial angle is remained stationary till the age of 60 year, after that it decreases in males and females. In the present study, the mean values of medial angle was  $143.86^\circ$  and  $153.22^\circ$  in right and left sides of clavicles in males and  $152^\circ$  and  $150^\circ$  in right and left sided clavicles of females which were correspondence the findings of Parsons et al<sup>3</sup>, Terry et al<sup>4</sup>, Olivier et al<sup>5</sup> and Kaur et al<sup>6</sup> except in the right hands of males. In the present study, the medial angle was found higher in right sided clavicles of females than right sided clavicle of males while the medial angle was higher in left side males than left sided clavicle of females. In sexual differences, present study findings did not coincide with the findings of previous authors.

In right sided clavicles of males, the mean lateral angle was  $139.24^\circ$  which were similar to the findings of Terry et al<sup>4</sup> in American Negroes and American Whites while lesser than the study of Parsons et al<sup>3</sup>, Olivier et al<sup>5</sup>, Kaur H et al<sup>6</sup>. In left sided clavicles of males in present

study, mean lateral angle was found 148.48° correspondence to the findings of Parsons et al<sup>3</sup>, Kaur H et al<sup>6</sup> and higher than Terry et al<sup>4</sup>, Olivier et al<sup>5</sup>. The mean value of lateral angle in females was correspondence to the study of Parsons et al and higher than the study of Terry et al<sup>4</sup>, Olivier et al<sup>5</sup>.

Parsons et al<sup>3</sup> (1916) called the sum of two angles as index of curvature. In present study, the index of curvature in right clavicles of males was lesser than the findings of Parsons et al<sup>3</sup>, Terry et al<sup>4</sup>, Olivier et al<sup>5</sup> and Kaur H et al<sup>6</sup> whereas in left clavicles, the present result was similar to the findings of Parsons et al<sup>3</sup> and higher than the study of Terry et al<sup>4</sup>, Olivier et al<sup>5</sup>, Kaur et al<sup>6</sup>. In females right clavicles of present study, the index of curvature was found lesser than the study of Parsons et al<sup>3</sup> and higher than the findings of Terry et al<sup>4</sup> and Kaur H et al<sup>6</sup>. In left sided clavicles, the index of curvature of present study was similar to Kaur H et al<sup>6</sup> and lesser than Parsons et al<sup>3</sup> and higher than Terry et al<sup>4</sup>.

**Conclusion:** The knowledge of angles of clavicle is of extreme importance in determination of sex by morphometric parameters. The determination of sex from the clavicle has a great medic-legal significance to the toxicologists. It also helps the anthropologists in their study of evolution of mankind and migration of races.

**Table 1: Showing medial and lateral angles index of curvature in clavicles bones.**

Parameters	Side	Male Mean ±SD	Female Mean ±SD	P -value
Medial angle	Right	143.68	1525.65	.0001
	Left	153.72	150.683.71	.12
Lateral angle	Right	139.245.37	148.489.32	.0001
	Left	150.04	149.723.87	.787
Index of Curvature	Right	282.92±11.4	300.48±12.04	0.001
	Left	303.76±8.73	300.4±7.36	0.001

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