# Journal of Advanced Medical and Dental Sciences Research 

@Society of Scientific Research and Studies

# Original Research 

# Morphometric analysis of clavicle 

${ }^{1}$ Mohd Ajmal, ${ }^{2}$ Israr Ahmad Khan, ${ }^{3}$ Mohd Imran<br>${ }^{1}$ Assistant Professor, Department of Anatomy, Muzaffarnagar Medical College, Muzaffarnagar, UP, India;<br>${ }^{2}$ Assistant Professor, Department of Anatomy, Government Medical College, Shahdol, MP, India;<br>${ }^{3}$ Assistant Professor, Department of Anatomy, Jawaharlal Nehru Medical College, AMU, Aligarh, UP, India


#### Abstract

: Background: The clavicle, one of the bones of shoulder girdle is a subcutaneous bone and lies horizontally at the root of the neck. The present study was conducted to assess morphometry of clavicle. Materials \& Methods: 64 dry clavicles of both genders were taken and length and medial and lateral angles of both left and right side was measured. Results: Out of 64 clavicles, 44 were of males and 20 were of females. The mean length of clavicle in males on left side was 13.5 cm and on right side was 14.0 cm . The mean length of clavicle in females on left side was 12.3 cm and on right side was 12.0 cm . The mean medial angle of clavicle in males was 140.5 degree and in females was 145.2 degree and lateral angle was 147.2 degree in males and 150.4 degree in females. The difference was significant ( $\mathrm{P}<0.05$ ). Conclusion: The length of clavicle was less in females as compared to males but the medial and lateral angles were more in females.


Key words: clavicle, morphology, morphometric
Received: 20-10-2019
Accepted: 22-11-2019
Corresponding author: Mohd Ajmal, Assistant Professor, Department of Anatomy, Muzaffarnagar Medical College, Muzaffarnagar, UP, India

This article may be cited as: Ajmal M, Khan IA, Imran M. Morphometry analysis of clavicle. J Adv Med Dent Scie Res 2019;7(12): 279-282.

## INTRODUCTION

Clavicular morphology has been a subject of interest for researchers for a long time. ${ }^{1}$ This has been studied extensively by orthopaedic surgeons for better management of clavicular fractures. Anatomic and forensic experts have studied clavicle to explain development, gender and age related differences. ${ }^{2,3}$ The clavicle, one of the bones of shoulder girdle is a subcutaneous bone and lies horizontally at the root of the neck. ${ }^{4}$ It keeps the upper limb away, so that it can swing clearly from the side of the trunk. It transmits the weight of the upper limb through the coracoclavicular ligament and medial $2 / 3$ rd of the bone to the axial skeleton. It has a shaft and two ends-medial or sternal end and lateral or acromial end. The length of female clavicle is shorter than the male. ${ }^{5}$ The clavicle gradually changes its shape from tubular (medially) to flat (laterally). It is probably the most common bone which is fractured in adults and children by an indirect violence due to a fall on an outstretched hand. It constitutes $44-66 \%$ of all shoulder fractures. ${ }^{6}$
Human clavicle fractures account for $3 \%-10 \%$ of all fractures and for $35-44 \%$ of fractures around the shoulder. Middle-third fractures account for $80 \%$ of
all clavicular fractures; whereas, fractures of the lateral and medial third of the clavicle account for $15 \%$ and $5 \%$, respectively. ${ }^{7}$
Fixation of clavicular fracture has shown improved benefits over the conservative methods, several studies have reported poor outcome after conservative treatment of severely displaced midclavicular fractures resulted in shoulder shortening, non-union, or function deficits. The design of fixation devices depends largely on anatomical characteristics of clavicle. ${ }^{8}$ The present study was conducted to assess morphometry of clavicle.

## MATERIALS \& METHODS

The present study was conducted on 64 dry clavicles of both genders. The study was approved from institutional ethical review committee.
The length of the clavicle is measured as the straight maximum distance between the two ends. For the measurement, Vernier Caliper was used. Parson's method was followed to measure the angles. The clavicle was placed on a white board with right and left ends in the same horizontal plane. The midpoint of the sternal and acromial ends was marked as points ' $a$ ' and ' $b$ '. They were joined with a straight line. The
central axis was a curved line and it was equidistant from the anterior and posterior border throughout the length of the clavicle. This curved line has two
convexities. Results thus obtained were subjected to statistical analysis. P value less than 0.05 was considered significant.

## RESULTS

## Table I Distribution of clavicles

| Total- 64 |  |  |
| :---: | :---: | :---: |
| Gender | Males | Females |
| Number | 44 | 20 |

Table I shows that out of 64 clavicles, 44 were of males and 20 were of females.

Table II Assessment of length of clavicle

| Gender | Mean (cm) |  |
| :---: | :---: | :---: |
|  | Left | Right |
| Male | 13.5 | 14.0 |
| Female | 12.3 | 12.0 |

Table II, graph I shows that mean length of clavicle in males on left side was 13.5 cm and on right side was 14.0 cm . The mean length of clavicle in females on left side was 12.3 cm and on right side was 12.0 cm . The difference was significant $(\mathrm{P}<0.05)$.

## Graph I Assessment of length of clavicle



Table III Angles of the clavicle

| Angles (degree) | Males | Females | P value |
| :---: | :---: | :---: | :---: |
| Medial | 140.5 | 145.2 | 0.05 |
| Lateral | 147.2 | 150.4 | 0.02 |

Table III, graph I shows that mean medial angle of clavicle in males was 140.5 degree and in females was 145.2 degree and lateral angle was 147.2 degree in males and 150.4 degree in females. The difference was significant ( $\mathrm{P}<0.05$ )


## DISCUSSION

Clavicular morphology has been a subject of interest for researchers for a long time. ${ }^{9,10}$ This has been studied extensively by orthopaedic surgeons for better management of clavicular fractures. Anatomic and forensic experts have studied clavicle to explain development, gender and age related differences. ${ }^{11}$ This paired long bone placed horizontally with shaft and two ends has double curvature of shaft which separates the clavicle into medial two third and lateral one third. The medial two-third of the shaft is rounded and has four surfaces. ${ }^{12}$ The anterior surface is convex forward; this provides space for the neurovascular bundle of upper limb and the posterior surface is smooth. ${ }^{13}$ The present study was conducted to assess morphometry of clavicle.
In present study, out of 64 clavicles, 44 were of males and 20 were of females. Qui et al ${ }^{14}$ measured the variation of length, medial and lateral angle in east Indian population. In this observational crosssectional study, 54 dry adult clavicle ( 25 males, 29 females) were collected from the first year medical students of various colleges of West Bengal (east India). The length, medial and lateral angles were measured. The average mean length of left sided clavicle was slightly more in both male and female than the right side. But this difference was statistically nonsignificant as p-value was 0.768 (male) and 0.74 (female). In male, the average lateral angle of left side was more than the right side but not so in case of female where the right side was more than the left side. This difference was statistically significant in case of both male ( p -value $=0.0008$ ), and female ( p value $=0.0001$ ). In case of medial angle, it was more in left side in both males and females. The difference was also significant in both males ( p -value 0.0001 ) and females.
We found that mean length of clavicle in males on left side was 13.5 cm and on right side was 14.0 cm . The
mean length was 12.3 cm in left females and 12.0 cm in right females. Alexender et al ${ }^{15}$ in their study eighty-one unpaired clavicles of unknown sex were studied, 42 clavicles were of right side and 39 clavicles of left side. The length of clavicle was measured by a vernier calliper; the middle point of this length was taken as the point where midclavicular circumference was measured with the help of a measuring thread and the angle of curvature of clavicle was measured by using protractors. The average lengths of the left and right clavicles were $15.23 \pm 1.12 \mathrm{~cm}$ and $15.43 \pm 1.01 \mathrm{~cm}$ respectively. The average medial angle of curvature of left clavicle was $155.33^{\circ} \pm 4.39^{\circ}$ and that of right clavicle was $153.40^{\circ}$ $\pm 3.96^{\circ}$. The mean total angle of curvature of left clavicle was $293.54^{\circ} \pm 9.55^{\circ}$ and the average total angle of curvature of right clavicle was $290.05 \pm 8.94^{\circ}$. The average midclavicular circumference of left clavicle was $3.88 \mathrm{~cm} \pm 0.33 \mathrm{~cm}$ and that of right clavicle was $3.94 \mathrm{~cm} \pm 0.33 \mathrm{~cm}$. The right clavicle was longer than the left clavicle, the average medial angle of curvature of left clavicle was greater than medial angle of right clavicle, the average lateral angle of curvature of left clavicle was more than the average lateral angle of curvature of right clavicle and the mean of midclavicular circumference of right clavicle was greater than that of left clavicle.
We found that mean medial angle of clavicle in males was 140.5 degree and in females was 145.2 degree and lateral angle was 147.2 degree in males and 150.4 degree in females. Kumari $S$ et $\mathrm{al}^{16}$ in the year 2018 in East Indian population reported that the medial angle was more in left side than the right side.

## CONCLUSION

Authors found that the length of clavicle was less in females as compared to males but the medial and lateral angles were more in females

## REFERENCES

1. Johnson D, Strong GT, Collins P, Healy JC. Pectoral girdle and upper limb. In: Susan Stranding (ed). Gray's Anatomy: The anatomical basis of clinical practice. 39 th edition. Elsevier Churchill Livingstone. London, 2005:817-819.
2. Toogood P, Horst P, Samagh S, Feeley BT. Clavicle fractures: A review of the literature and update on treatment. Phys Sports med. 2011;39(3):142-50.
3. Nagarchi K, Pillai TJ, Hussain Saheb S, Brekeit K, Alharbi M. Morphometry of clavicle. Journal of Pharmaceutical Science and Research. 2014;6(2):11214.
4. Sudha R. Study of clavicle: Length and curvatures in South Indian population. National Journal of Clinical Anatomy. 2014;3(4):198-02.
5. Parsons FG. On the proportions and characteristics of the modern English clavicle. J Anat.1916;51:71-93.
6. Gullapalli A. Study of morphometry of clavicle-length \& angles. International Journal of Scientific Research. 2017;6(7):318-19.
7. Terry RJ. The clavicle of the American Negro. Am J Phys Anthropol. 1932;16:351-79.
8. Olivier G. Anthropologie de la Clavicule.III, La Clavicule due Francis. Bulltins et. Memories de la societe. D' Anthropologie.1951;2:121-57.
9. Jit I, Singh S. Estimation of stature from clavicles. Indian J Med Res. 1956;44(1):137-55.
10. Haque MK, Mansur DI, Krishnamurthy A, Karki R, Sharma K, Shakya R. Morphometric analysis of clavicle in Nepalese population. Kathmandu Univ Med J. 2011;9(35):193-97.
11. Kaur H, Harjeet Sahni D. Length And Curves Of The Clavicle In Northwest Indians', J Anat. Soc. India 2002;51(2):199-209.
12. King PR, Scheepers S, Ikram A. Anatomy of the clavicle and its medullary canal: A computed tomography study', European Journal of Orthopaedic Surgery and Traumatology 2014 doi:10.1007/s00590-012-1130-9.
13. Liu P. Minimally Invasive Fixation of Displaced Midclavicular Fractures With Titanium Elastic Nails' 2010;24(4): 217-223.
14. Qiu XS. 2016. Anatomical study of the clavicles in a Chinese population', BioMed Research International . doi: 10.1155/2016/6219761.
15. Alexander AG, Russa AD. Morphometric parameters of clavicles among adult Black people in Tanzania. Anatomy Journal of Africa. 2018 May 12;9(1):170712.
16. Kumari S, Verma M, Narayan RK. Role of clavicle curvature in fracture stabilization: A study in East Indian population. International Journal of Anatomy and Research. 2018;6(4.1):5811-14.
