



## A MORPHOMETRIC AND MORPHOLOGICAL VARIATION IN THE CLAVICLE: CONGENITAL PSEUDOARTHROSIS CLAVICLE

**R. Yasodai**

Senior Lecturer, Department Of Anatomy, RVS Dental College & Hospital, Coimbatore

**B. Ashwini Devi\***

Senior Lecturer, Department Of Anatomy, RVS Dental College & Hospital, Coimbatore \*Corresponding Author

### ABSTRACT

The term CONGENITAL PSEUDOARTHROSIS CLAVICLE is the rare malformation, that can be diagnosed at birth and its due to failure disturbance of union of ossification. The treatment can be observation or even surgically done

**KEYWORDS :** Congenital, Pseudoarthrosis

### INTRODUCTION:

Clavicle is the only long bone present horizontally present in the body. Congenital failure of formation (ossification) of the central portion of the clavicle produces a painless prominence in the anterior superior chest in the absence of trauma. The resultant synovial pseudoarthrosis usually develops on the right side. Functional impairment is uncommon in children. A case of pseudoarthrosis of the clavicle causing thoracic outlet syndrome is reported.

### AIM:

In this study to find the rare anatomically structurally morphology anomalies of the clavicle and its clinical associated problems.

### MATERIALS AND METHOD:

The material for present study consisted of clavicle obtained from department of Anatomy, RVS DENTAL COLLEGE, COIMBATORE. To find a Morphological and Morphometric Study of Clavicle.

**Observation:** In this study, found the morphologically variation of the clavicle, it is very rare anomalies called pseudoarthrosis clavicle. and its gross variation and lengths were measured and calculated.

To estimate mean value of various anatomical dimensions of clavicle.

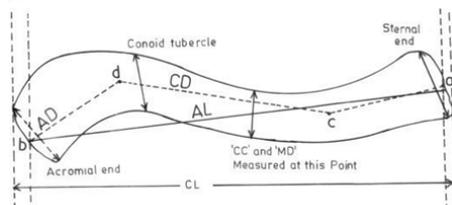
To assess degree of sexual dimorphism, bilateral asymmetry and activity-pattern specific variations in the clavicle.

To highlight inter-disciplinary significance, if any various morphometric and non-metric features of clavicle.

### METHODOLOGY:

The outline/contour of each clavicle was drawn on a paper sheet.

The medial and lateral angles were measured with protractor; and two curvature depths were estimated with a foot ruler on the outlined figure of the bone.



**Fig. 1. Graphical representation of different clavicular measurements considered in present study.**

### Metric measurements

**2.1.1. Dimensions (i) Clavicular length (CL):** It is measured as the maximum distance between the outermost tips of the sternal and acromial ends of clavicle placed on an osteometric board (ignoring curves of the bone) accurate to within 0.5 mm

### (ii) Articular Length of Clavicle (AL):

It is the straight distance between the mid-points of the sternal and acromial articular ends of clavicle measured with the help of a

spreading caliper with pointed ends, accurate to within 0.5 mm as per the technique used by Parsons (iii) Mid-point Circumference (CC):

The midpoint of clavicular shaft is marked between acromial and sternal ends of clavicle placed in anatomical position on the osteometric board and circumference is measured at this point with a strip of graph paper marked in millimeters, accurate to be within 0.5 mm

### (iv) Weight of Clavicle (WC):

The completely cleaned, dried but still wet clavicles were weighed with the help of an electronic weighing machine ("Δicosel" EK-6000G, Bombay Burmah Trading Corporation Limited) accurate to be within 0.5 g

### 2. Diameters

**(vii) Sternal Diameter (SD):** It is the straight distance between the highest and lowest point of sternal articular surface in sagittal plane, measured with Mitutoyo's Digitmac vernier caliper accurate to be within 0.5 mm.

**(viii) Acromial Diameter (AD):** It is the straight distance between the highest and lowest point of acromial articular surface in sagittal plane, measured with Mitutoyo's Digitmac vernier caliper accurate to be within 0.5 mm.

**(ix) Middle Diameter (MD):** It is measured as a linear distance between anterior and posterior surfaces of clavicle diaphysis measured at mid-point (level of mid-circumference) using Mitutoyo Digitmac vernier caliper.

**(x) Conoid Diameter (CD):** It is measured as a linear distance between anterior and posterior surfaces of diaphysis measured at level of conoid tubercle in sagittal plane (near acromial end) using Mitutoyo Digitmac vernier caliper

### 2.1.4. Angles

Different angles of the clavicle were measured on its outlined contour on a paper sheet. Each clavicle was placed on a drawing sheet in such a position that its anterior and posterior borders are in the same horizontal plane. The midpoints of medial and acromial ends were marked as „a“ and „b“, respectively. The central axis of the clavicle was drawn as a curved line, midway between the anterior and posterior borders throughout the length of the clavicle. The double curvature of the clavicle is visible in outlined contour with two distinct convexities; the medial two-thirds portion was convex anteriorly while the lateral one-third portion was posteriorly convex. The deepest points on the two curves of the clavicle where the convexities were the maximum, were marked as points „c“ and „d“ and they were joined by a straight line. The points „c“ and „d“ were joined with midpoints „a“ and „b“ at the corresponding ends to form lines „ac“ and „bd“, thus forming two angles; a medial angle „acd“ which gave the curvature of medial two-thirds, and a lateral angle „bdc“ which represented the curvature of the lateral one-third. The sum of the two angles constituted the total curvature of clavicle.

**(xi) Lateral Angle (LA):** The angle „cdb“ which represent the curvature of the lateral one-third portion of clavicle was measured as

lateral angle of clavicle with the help of a protractor

**(xii) Medial Angle (MA):** The angle „acd“ which represent the curvature of the medial two-third portion of clavicle was measured as the medial angle of clavicle with the help of a protractor



**A) SHOWING DIFFERENCE OF RIGHT AND LEFT SIDE OF THE CLAVICLE**

**B) SHOWING CONGENITAL PSEUDOARTHROSIS CLAVICLE**

#### observations

Following five morphological traits of each clavicle were noted down:

2.2.1. Rhomboid fossa (RF) It is a normal variant of the clavicle represented by a costal impression (depressed or pitted) on its inferior aspect; about 2–3 cm away from the sternal end where costo-clavicular ligament or rhomboid ligament connects the bone to the first rib. It is generally present in both sexes and may be of large, medium or small size.

Arbitrarily, an approximate size of more than 25 mm along its long axis was considered as large, 15–25 mm as medium and less than 15 mm was taken as small

2.2.2. Perforations (PF) These are vascular openings present on postero-superior edge of the bone, at about mid-point or lateral third portion of clavicular shaft.

#### 2.2.3. Nutrient foramen (NF)

It is a foramen present at the lateral end of the sub-clavian groove and is, generally, found located near the central half of the length of the bone. The presence, number and size of these foramina and their size were noted. Carrol criterion was followed to estimate the size of the [nutrient](#) foramen, according to which if a foramina accepts a wire probe of 0.8 mm or more, it is a „large“ foramina. It was marked as „medium“ if a wire probe of diameter more than 0.5 but less than 0.8 mm was insertable in the foramina and was designated as „small“ if no wire probe of diameter greater than 0.2 mm was acceptable by the pore in the bone.

#### 2.2.4. Sub-clavian groove (SCG)

It is an obvious structure sharply defined on the inferior surface of the clavicle, starting from the medial end and then gradually deepening and becoming well defined laterally. If present, it may be large, medium or small, based on arbitrary visual observations

#### 2.2.5. Type of clavicle (TC)

The clavicle with a length of 140 mm or more was taken as „long“ and lesser than it was considered as „small“; whereas the clavicle having robustness index of 25 or more was assumed to be „robust“ and less than this value was taken as „smooth“.

Thus, four different combinations of shape and size of the clavicle viz. short and smooth, short and robust, long and smooth or long and robust were noticed using this arbitrarily formed criterion.

#### Statistical analyses.

Independent *t*-test was applied to statistically and discriminant function analysis Clavicle lengths, circumference, weight and diameters were used in Function-I. Total six combinations of variables were scrutinized in multivariate DFA (Function-I to VI). The percent directional asymmetries in different clavicular variables were calculated. it is stastically <0.01

#### CONCLUSION

In the above study, we find only one clavicle anatomical variation, the knowledge of the variation is very important for the clinicals and the best way to treat the patient's outcome, to prevent from the thoracic outlet syndrome and other related issue, best way to do the surgery.

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