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Morphometric Structures and Clinical Importance of the Costa Prima

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Abstract

Aim: This study was undertaken to assess the morphometry and morphology of the costa prima.

Material and Methods: In this study, 40 costae prima (25 right side, 15 left side) of Anatolian adults of unknown gender were used. Total outer length of each costa, interior length from sternal edge to caput costae, the length between caput costae and tuberculum costae, the height from caput costae to surface and the angle of the caput costae for tuberculum costae are measured. The measurements are made with a digital compass and the results were recorded as mm. Finally, the presence of tuberculum musculi scaleni anterior is and sulcus venae subclaviae were assessed for each bone.

Results: Total outer length was 84,71 ± 6,61 mm; interior length from sternal edge to caput costae was 56,27 ± 8,59 mm; the length between caput costae and tuberculum costae was 28,35 ± 3,41 mm; the height from caput costae to surface was 12,29 ± 9,01 mm and the the angle of the caput costae for tuberculum costae was 19,93 ± 11,27º. Tuberculum musculi scaleni anterioris was present in 28 bones and sulcus venae subclaviae was present in 32 bones.

Conclusions: An understanding of the association between costa prima's anatomic structures and morphometric measurements is clinically important. We believe the results of this study will help accumulate data on morphometric measurements regarding to the costa prima and also help with clinical evaluations.

Keywords: Costa prima, morphology, morphometry.

Introduction

The costa prima is the most curved, flattest, and usually the shortest of the ribs. It is located at the top most region of the rib cage and attaches to the first thoracic vertebrae at its posterior aspect and to the sternum at its anterior aspect. Five distinct landmarks are found on the costa prima: head, tubercle, sternal end, and two subclavian grooves. The anterior groove for the subclavian vein and the groove for the subclavian artery and inferior trunk of the brachial plexus. When siding a first rib, the rib's head will point downward when the rib is oriented in the proper anatomical position and the subclavian grooves will be on

the superior surface [1,2]. When the costa prima is sided incorrectly, an angle is visible between the head and the tubercle at the inferior portion of the neck. The current research focuses on that angle and its potential as a sex indicator. The rib anomalies whether pathological or normal variants such as cervical rib, pelvic rib, bifid rib, bicipital ribs etc. often indicate an underlying systemic disorder[2,3]. The articulation of the first rib to only the body of the first thoracic vertebra is unique to humans as the only extant hominoid with this articulation [2-5].

Materials and Methods

In this study, 40 costae prima (25 right side, 15 left side) of Anatolian adults of unknown gender from the collection of the Department of Anatomy, Faculty of Medicine Cukurova University were used. There was no apparent sign of physical or pathological damage in any of the bones were used. Interior length from sternal edge to caput costae, total exterior length of each costa the length between caput costae and tuberculum costae, the height from caput costae to surface and the angle of the caput costae for tuberculum costae are measured (Figure 1). The measurements are made with a digital compass and the results were recorded as mm. Finally, the presence of tuberculum musculi scaleni anterior is and sulcus venae subclaviae were assessed for each bone.

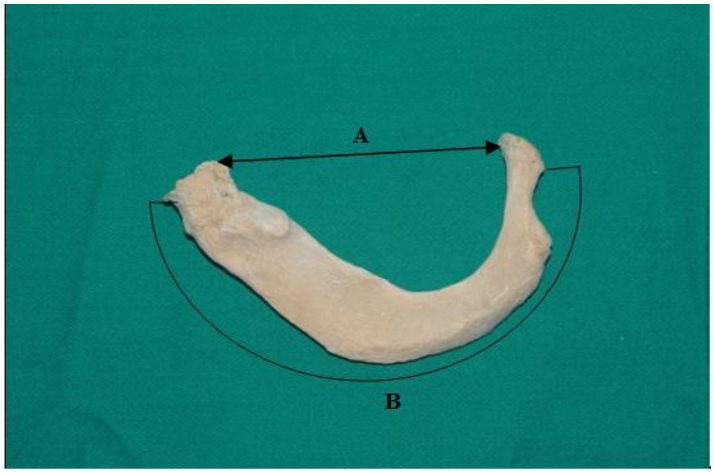

Figure 1. Morphometric measurements of costae prima.

A:Interior lenght from sternal end to head, **B**: Total exterior lenght

Results

Interior length from sternal edge to caput costae was 56,27 ± 8,59 mm; total exterior length was 13,72 ± 1,71 mm; the length between caput costae and tuberculum costae was 28,35± 3,41 mm; the height from caput costae to surface was 12,29 ± 9,01 mm and the angle of the caput costae for tuberculum costae was 19,93 ± 11,27º. The means, standard deviations and ranges of the parameters of the costae prima measurements are shown in Table 1. Tuberculum musculi scaleni anterioris was present in 28 bones (70%) and sulcus venae subclaviae was present in 32 bones (80%) (Table 2).

Table 1. The means, standard deviations and ranges of the parameters of the costae prima measurements.

Parameters (n=40)	Range	Mean±SD
Interior lenght from sternal end to head (mm)	29,50-73,87	56,27 ± 8,59
Total exterior lenght (mm)	9,70-17,40	13,72 ± 1,71
Lenght from head to tubercle from point where head meets neck to where tubercle meets surface (mm)	21,81-34,52	28,35 ± 3,41
Height from head to surface (mm)	00,00-43,53	12,29 ± 9,01
Angle of head relative to tubercle (º)	00,00- 47,54	19,93 ± 11,27

Table 2. Percentaces of the presence of the tuberculum musculi scaleni anterioris and the sulcus venae subclaviae.

Parameters	Number of Bones	Percentaces (%)
Tuberculum musculi scaleni anterioris	28	70
Sulcus venae subclaviae	32	80

Discussion

The goal of this study was to assess the morphometry and morphology of the costa prima. The costa prima is the flattest, the most curved, and generally the shortest of the ribs. Five different landmarks are found on the costa

prima: head, tubercle, sternal end and two subclavian sulcus. In literature there are only a few studies regarding to the ribs, with none focusing on the angle which is formed by the head and tubercles at where the rib is connected to the first thoracic vertebra.

Many skeletal elements have been taken into account for gender verification; yet there is little focus on the ribs. The fourth rib has commonly been used as an example of age determination but it can easily be confused with adjacent ribs [5]. Therefore; the first rib is valuable both for aging and sexing method [6-8].

Estimation of sex has been generally focused on sexually dimorphic features on pelvic girdle, long bones and skull. Numerous areas of skull and pelvis are used in determining the sex. However, in cases where the pelvis and skull are not available or severely damaged for examination, the ribs may provide an alternative method for estimating an individual sex [8,9].

Costa prima has been examined for physical anthropology with most research been focused on the sternal end, especially as an aging technique. The majority of the research examined the costal cartilage and its versatility in aging and sexing individuals[6,9,10,11].

It seems that costa prima can be an important tool when the methods of aging and sexing individuals are combined. Combining the current research with the aging methods determined by McCormick (1980) and Kunos et al. (1999) could prove to be beneficial in forming the biological profile [12-14].

An understanding of the association between costa prima's anatomic structures and morphometric measurements is important for forensic anthropology and orthopaedics. We believe the results of this study will help accumulate data on morphometric measurements regarding to the costa prima and also help with forensic science and clinical evaluations.

With this knowledge, perhaps more research will be performed on the costa prima to allow

for more accurate and thorough sex and age estimates. Further research would help to add more information to the costa prima data bank in addition to the benefits of increasing ancestry diversity and will continue to improve the field's ability to identify the sex of an individual [6,9,10].

References

1. Bass, W.M. Human Osteology: A Laboratory and Field Manual 4th Edition. Colombia, Mo: Missouri Archaelogical Society. 1995.
2. Bharati S, Jothi SS. Morphometric and Morphological Study of First Rib. International Journal of Biomedical Research. 2017, 8(01):49-50.
3. Glass RB, Norton KI, Mitre SA, Kang E. Pediatric ribs: A spectrum of abnormalities. Radiographics 2002, 22:87-104.
4. Ohman JC. The First Rib of Hominoids. American Journal of Physical Antropology.1986, 70(2):209-229
5. Iscan MY. The Aging Process in the Rib: An Analysis of Sex and Race Related Morphological Variation. American J Human Biol. 1991,3:617-623.
6. Elrod, Paige Whitney, "The potential of the angle of the first rib, head to tubercle, in sexing adult individuals in forensic contexts" (2012). LSU Master's Theses. 3714.
7. Schmitt A, Murail P. Is the first rib a reliable indicator of age at death assesment? Test of the method developed by Kunos et al (1999). HOMO. 2003. 54(3): 207-214.
8. Souza AD, Hosapatna M, Ankolekar VH, Souza ASD. The Angle of the First Rib and Its Implication in Forensic Antropology: A Morphometric Study. RRJMHS. 2014, 3(1) :43-46.

9. Kubicha AM, Piontek J. Sex estimation from measurements of the first rib in a contemporary Polish population. Int J legal Med. 2016, 1320:265-272.
10. Kurki H. Use of the First Rib for Adult Age Estimation: A Test of One Method. Int.J.Osteoarchaeol. 2005, 15:342-350.
11. Koçak A, Aktaş EO, Ertürk S, Aktaş S, Yemişcigil A. Sex Determination from sternal end of the rib by osteometric analysis. Legal Medicine. 2003, 5: 100-104.
12. Weaver AA, Schoell LS, Stitzel JD. Morphometric analysis of variation in the ribs with age and sex. J. Anat. 2014, 225: 246-261.
13. McCormick, W.F. Mineralization of the Costal Cartilages as an Indicator of Age: Preliminary Observations. Journal of Forensic Sciences. 1980, 25(4):736-741.
14. Kunos CA, Simpson SW, Russell KF, Hershkovitz I. First Rib Metamorphosis: Its Possible Utility for Human Age-at-Death Estimation. American Journal of Physical Anthropology. 1999, 110:303-323.