

Original Research Article

Sexual dimorphism by anthropometric dimensions in adult human clavicles

Sravanthi Repalle¹, Kondam Ambareesha²

¹Assistant Professor, Department of Anatomy, Kamineni Institute of Medical Sciences, Sreepuram, Narketpally, Nalgonda

²Assistant Professor, Department of Physiology, MNR Medical College & Hospital, Sangareddy, Telangana

*Corresponding author address: Dr. K. Ambareesha, Assistant Professor, Department of Physiology, MNR Medical College & Hospital, Sangareddy, Telangana.

ABSTRACT

Background: The determination of sex is a important requirement in anthropology and forensic medicine. The skeleton remains after putrefaction and decomposition after death. Clavicles is one of the bones which is used for sex determination especially where only skeletal remains are available.

Aim: To study the sexual dimorphism in human adult clavicles.

Materials & Methods: 100 dried clavicles from adult bodies were obtained from Department of Anatomy, Kamineni Institute of Medical Sciences, Narketpally. The clavicles with complete ossification were included in the present study. Bones showing any deformity or degradation were excluded.

Results: Out of 100 clavicles of 60 were males, 40 were female. The length of clavicle in females is greater than males but, breadth of clavicles were greater in males than females.

Conclusion: The determination of sex from adult human clavicles.

Key Words: sexual dimorphism, clavicle, clavicular dimensions, skeletal remains, Morphology.

INTRODUCTION

The determination of skeletal sex is a important requirement in anthropology. The skeleton remains after putrefaction and decomposition after death. Even after soft tissues have been destroyed after death the skeleton remains and maintains its morphological features for long period. According to Krogan, the sexing of bones are as follows: Entire skeleton-100%, skull-92%, pelvis-95%, pelvis and skull-98%, long bones-80%, long bones and pelvis¹-98%. According to Taylor, the sexing of bones as follows: Skull and femur-98%, sacrum and coccyx-97%, coccyx-97.2%, mandible-86%, sternum-80%, atlas and axis-31%, clavicle-28%². According to Hooton that even with the whole skeleton, sex determination was possible in only 90% of cases³. None of the bones can give 100% correct identification of sex. In our study the sexual dimorphism is done with the help of human adult clavicles. When only skeletal remains clavicle is one of the bone helpful for sex determination. Clavicle is a long bone that lies between the shoulder blade and the sternum⁴. The clavicle is the only bone in the body that lies horizontally, one on the left and one on the right. It has a medial end, lateral end, and a shaft. Medial end is rounded and lateral end is flattened. Shaft is divided into medial two third which is forward convexity and lateral one third is forward

concavity⁵. The clavicle is the first bone to begin the process of ossification during the intrauterine life, (fifth and sixth weeks of pregnancy). Ossification of clavicle is at about 21–25 years of age⁶. Clavicle is also known as "Collar Bone". Which lies subcutaneous and has a double-curve- hence its name-Clavis-a Key⁷. Its muscular attachments being well marked in workers and it is thicker and more curved. Female clavicle is less curved, short and smoother than that of males⁸. Rhomboid fossa is a depression in clavicle, which is present in male clavicle and it is another feature used for sex differentiation⁹. In male bones are longer and the muscular attachments are more prominent than that of female bones. . Mid shaft circumference of clavicles are used for determination of sex of clavicle.

MATERIALS AND METHODS

The study was conducted in the Department of Anatomy, Kamineni Institute of Medical Sciences, Narkatpally, and Telangana. 100 dried clavicles from adult bodies of known sexes (60 males and 40 females) were obtained from the above mentioned institute. Inclusion Criteria: Only the clavicles with complete ossification were included in the present study. Exclusion Criteria: Bones showing any deformity or degradation were excluded. The maximum length in cm was measured with the help of an osteometric board and Maximum breadth was measured by a digital caliper. The mid-shaft circumference was also measured with the help of a silk thread and measured with the help of a scale.

The length and mid- shaft circumference of each clavicle was studied. For measuring the length, the clavicle was kept on a table, in such a position that anterior and posterior borders were in the same horizontal plane, the midpoints of sternal and acromial ends were marked and the maximum distance between the two ends of the clavicle was measured with the help of a digital Vernier Caliper (in mm). The procedure for measurement of mid-shaft circumference is by marking the midpoint of the clavicle and its diameter was assessed with the help of a silk thread and measured with the help of a scale.

RESULTS

Total no. of 100 adult clavicle of both sex were studied. The parameters like length, mid shaft circumference of clavicle, rhomboid fossa were measured and statistically analyzed and represented in tables given below. mean, range, standard deviation, demarcating point of each side were calculated and compared among both sexes.

The length of the male clavicle was greater than female clavicle(Table 1)and female clavicle is shorter, lighter, smoother, and less curved than in males. The mid – shaft circumference of the right clavicle varied from 24.20-40.20 mm and that of female rages from 20.10-30.10.The mean circumference of male was found to be 34.50 and SD was 3.27 and that of female was noticed as 24.82 and 2.20 respectively. Rhomboid Fossa is a prominent depression in male clavicles with 90.3% of right side and 84.6% left side, but in females only16.4% right and 20%.left side clavicle Table 2. The data collected were analyzed and subjected to statistical analysis using SPSS software. The mid shaft circumference of the left male clavicles varied from 22.15 – 40.92 mm and that of left female clavicle ranges from 20.10 -32.30 mm. The mean and the SD of male 32.36 and 3.06. and of female is 26.0 and 2.40 respectively table 3.Weight of clavicles- the mean weight of the right clavicle(14.73) was slightly more than that of the left in males(14.03) while they were nearly equal in females i.e. right clavicle(24.65)and left clavicle(24.62)

Table 1: Statistical analysis of length of clavicle

Details of measurements	Right		Left	
	Male	Female	Male	Female
No of bones	30	20	30	20
Range	120-156	96-128.2	111-152	101-121
Mean	132.9	120.4	138.2	121.7
Median	113	101	129	123
Mode	128	110	123	102
Standard Deviation	8.237	3.68	7.53	4.55
Identification Point	> 130	< 100	> 132	< 101
Demarking point.	> 130	< 100.27	> 132.54	< 101.65

P < 0.001 implies that, it is statistically highly significant.

The length of the male right clavicle varied from 120-156mm with a mean of 132.9 and that female varied from 96-128.2mm with a mean of 120.4.

The length of the male left clavicle varied from 111-152mm with a mean of 138.2 and that female varied from 101-121.2mm with a mean of 121.7.

Table 2: Expression of Rhomboid Fossa in male and female

Gender	% of Rhomboid Fossa
Male	
Right	90.2
left	82.4
Female	
Right	16.4
left	18

Rhomboid Fossa is a prominent depression in male clavicles with 90.3% of right side and 84.6% left side, but in females only 16.4% right and 20% left side clavicle

Table 3: Statistical analysis of mid- shaft circumference of clavicle

Details of measurements	Right		Left	
	Male	Female	Male	Female
No of bones	30	20	30	20
Range	22.150- 40.92	20.10- 32.30	24.1- 41.1	22.1- 35.3
Mean	32.36	26.0	32.36	27.0
Median				
Mode	3.06	2.40	4.0	3.0
Standard Deviation				
Demarking point.	> 34.02	< 25.3	> 36.0	< 22.12

P < 0.001 implies that, it is statistically highly significant.

The mid- shaft circumference of male right clavicle varied from 22.150-40.92mm with a mean of 32.36 and that female varied from 20.10-32.30mm with a mean of 26.0

The mid- shaft circumference of the male left clavicle varied from 24.1-41.1mm with a mean of 32.36 and that female varied from 22.1-35.3mm with a mean of 27.0.

DISCUSSION:

The determination of sex is a critical requirement in anthropology. Estimation of sex and age and stature by skeleton is discovered by Krogman and Iscan¹⁰. (Grant) Human clavicle exhibits variability in its shape among individuals with different age, sex, race and occupation.¹¹ According to Trotter M et al that the human clavicle is a long bone and the right sided bones of limbs are usually longer than those of the left side¹². The present study was conducted to determine sex of adult human clavicles. differences between the male and female clavicles, and to find out the differences between right and left clavicle. For determination of sex of clavicle, various parameters including length, midclavicular circumference, by various workers Jit & Kaur¹³. In males clavicle, the difference in length, is more marked but in females it is less markable. Jit et.,al¹⁴. According to Davivongs male bones are massive and heavier than female bones¹⁵. Female clavicle is shorter, thinner, less curved and muscular impressions are less marked. The crests, ridges, and attachment of muscles and ligaments are strongly marked in males. The methods of recording the principal dimensions are established for all skeletal elements and the proportions are expressed as indices (Williams and Warmick, 1989). Haque MK et al shows that mid- clavicular circumference is the most reliable single indicator of sex similar to our findings¹⁶

CONCLUSION

The determination of sex is an important requirement in anthropology and forensic medicine. The skeleton remains after putrefaction and decomposition after death. Clavicles are one of the bones which are used for sex determination especially where only skeletal remains are available. For identification of sex of clavicle, 60 male and 40 female adult, dried clavicles are studied from departments of Anatomy department, Kamineni Institute of Medical Sciences, Narkatpally. Its different measurements are Length, midshaft circumference, and rhomboid fossa, were statistically analyzed. The length and mid-shaft circumference of male clavicles of right and left sides is significantly more than the female clavicle, the values are higher in males than that of females.

ACKNOWLEDGEMENT

We express our sincere gratitude to, Dean, HOD, and other teaching and non teaching staff of Dept. of Anatomy, Kamineni Institute of Medical Sciences, Narkatpally for support to carry over this study.

BIBLIOGRAPHY

1. Krogman W.M.(1962). The human Skeleton in Forensic Medicine. Charles C. Thomas Springfield. Illinois, U.S.A 1st Edition
2. Taylor's Principles and Practice of Medical Jurisprudence 11th Ed. Sir Sydney Smith Vol. 1 pp. 150.
3. Hooton E.A. (1946). Up from the ape Macmillan Co. New York.
4. Williams and Warwick. Editors – Gray's Anatomy 38th Edition, PP : 619-621
5. Susan Standring et al (2004). Editors – Gray's Anatomy The anatomical basis of clinical practice 39th Edition PP : 817-818.
6. Moore, Keith L.; Dalley, Arthur F. (1999). Clinically Oriented Anatomy (4th ed.). Lippincott Williams & Wilkins.
7. Hague MK et al, Study of curvatures of clavicle with its clinical importance, Kathmandu Univ Med J.2011; 36(94) 279-282
8. Jit I, Sahni D 1983. Sexing the clavicles. Journal of Anatomical Society of India, 32(2) : 61 - 72 .
9. Singh S, Gangrade KC (1968) The sexing of adult clavicles demarking points for Varanasi zone. Journal of the Anatomical Society of India 17: 89-100
10. Krogman WM 1973. The Human Skeleton in forensic Medicine: Sexing of Skeletal Remains. Springfield: Charles C Thomas Publishers, 141 – 153.
11. Grant, J. Andermahr, A. Jubel, A. Elsner, J. Johann, A. Prokop, K.E. Rehm, J. Koebke, , Anatomy of the clavicle and intermedullary nailing of midclavicular features Clin. Anat., 20 (2007), pp. 48-56
12. Trotter M, Peterson R R. Morris Human Anatomy. B. J. Anson , 12th edition 244 McGraw Hill, New York. 1953:244.
13. Jith, Kaur, S Gangrade KC (1968) The sexing of adult clavicles demarking points for Varanasi zone.

Journal of the Anatomical Society of India 17: 89-100

14. Jit I, Singh S. The sexing of adult clavicles, Indian journal of medical research 1966; 54-551-571
15. Davivongs, Medicolegal aspects of the Skeleton – Age, Sex, race and stature. Amer. Jour. Phys. Anthropol. N.s. 6 : 315-321
16. Haque MK, Mansur ID, Krishnamurthy A, Karki R, Sharma K, Shakya R. Morphometric analysis of clavicle in nepalese population. Kathmandu Univ Med J (KUMJ). 2011;9(35):193-7