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SEX DETERMINATION USING MORPHOMETRIC MEASUREMENTS OF ADULT DRY HUMAN CLAVICLES IN TELANGANA REGION.

Anatomy

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ABSTRACT

INTRODUCTION: Bones form the basic frame work of human body and they provide valuable information about the biological identity of the deceased. Determination of sex is primary criteria of identification of an individual in forensic anthropology. Clavicles have extended period of skeleton growth up to third decade that impart an additional advantage in the determination of sex.
AIMS AND OBJECTIVES: To study the accuracy of morphometric dimensions of clavicle in sex determination
To study the parameters of clavicles for bilateral asymmetry
MATERIALS AND METHODS: The present study was an observational study, conducted on 100 dry adult human clavicles of known sex (54 males, 46 female) obtained from cadaveric dissection. The Length, Weight, Mid shaft circumference of both male and female clavicles were measured to determine the sex.
RESULTS: The mean length of right and left clavicles were 143.31±13.47, 145.18±9.32 mm in males and 128.69±8.0, 131.56±8.32 mm in females. The mean weight of right and left clavicles were in males 20.50±4.52, 20.52±3.70 grams and 12.70±4.19, 12.24±3.47 grams in females. The mean mid shaft circumference values of right and left clavicles were 35.62±8.13, 35.94±2.88 mm in males and 30.35±2.43, 30.31±3.25mm in females. Side specific significance was found for length both in male and female clavicles.
CONCLUSIONS: The mean values of these parameters were significantly higher in males than in females. These values may serve as a database for determination of sex of clavicles of unknown sex. These findings help the Anatomists, Orthopaedic surgeons and Forensic anthropologists in their professional endeavours.

KEYWORDS

Clavicle; Length; Weight; Midshaft circumference

INTRODUCTION:

Sex determination is an important element in establishing identity of unknown from skeletal remains [1]. Accuracy of sex determination is directly proportional to the number of bones available [1].The skeletal remains like pelvis, skull, clavicle, limb bones, sternum & patella have been used for identification of unknown individual [2].

The clavicle is subcutaneously placed horizontal long bone extending from manubrium sternum to acromian process of scapula. In females clavicles are shorter, thinner, less curved. In males are heavier, muscular markings are prominent. The clavicles are relatively resistant to environmental degradation and have been proposed as a reliable bone to determine sex [2].

The morphometric dimensions of clavicles like length, weight, midshaft circumference are very important for both clinical in case of fracture fixation of internal /external medullary devices as well as forensic anthropological perspectives [3].

AIMS AND OBJECTIVES:

To study the accuracy of morphometric dimensions of clavicle in sex determination
To study morphometric dimensions of clavicles for bilateral asymmetry

MATERIALS AND METHODS:

The present study was an observational study, conducted on 100 dry adult human clavicles of known sex (54 males, 46 female). The clavicles were collected from Anatomy departments of various medical colleges, Hyderabad, Telangana**.**

INCLUSION CRITERIA:

Fully ossified, dried adult human clavicles

EXCLUSION CRITERIA:

Broken and deformed clavicles.

The following parameters like length, weight, mid shaft circumference were measured to determine the sex.

Maximum length of clavicle: Measured from the sternal end to acromial end with Vernier calliper while measuring clavicle was positioned flat on a surface.(Table/Fig-1)

Weight of clavicle: Measured with the help of electronic weighting balance (Lante scale). (Table/Fig-2)

Mid shaft circumference: While taking the length the middle point of length of clavicle is marked with a pencil, circumference was measured with the help of graph paper. (Table/Fig-3)

For each of these parameter Range, Mean, Standard deviation, Standard error, Demarking points and p-value were calculated. The collected data were analysed and subjected to statistical analysis using SPSS version 26.0.

Figure No-1: Showing measurement of length of clavicle.

Figure No-2: Showing measurement of weight of clavicle.

Figure No-3: Showing measurement of midshaft circumference of clavicle.

RESULTS:

The present study was conducted on 100 dry adult human clavicles of known sex (54 male, 46 female). The findings of the study were represented in table no-1.

Table No -1: Showing comparison of morphometric parameters of male & female clavicles

Parameter	Male (54)		Female (46)	
Length in mm	Right (27)	Left (27)	Right (23)	Left (23)
Range	121-170	124-160	119-142	120.5-150.5
Mean	143.31	145.18	128.69	131.56
SD	13.47	9.32	8.00	8.32
SE	2.6	1.8	1.7	1.73
Calculated range (mean ± 3SD)	104.9-183.72	117.32-173.14	103-152.69	106.6-156.52
Demarking point	> 152.69	>156.52	< 104	< 117.22
P- value	0.001	0.001	0.001	0.001
Weight in grams				
Range	14-28	14.8-26.4	6.57-20.74	6.63-17.32
Mean	20.50	20.52	12.70	12.24
SD	4.52	3.70	4.19	3.47
SE	0.86	0.71	0.87	0.72
Calculated range	6.94-34.12	9.42-31.62	1-25.27	2-22.65
Demarking point	> 37.6	> 40.06	< 11.2	< 27.3
P- value	0.01	0.01	0.01	0.01
Mid shaft circumference in mm				
Range	22-55	32-42	27-35	24.5-36
Mean	35.62	35.94	30.35	30.31
SD	8.13	2.88	2.43	3.25
SE	1.52	0.55	0.50	0.62
Calculated range (mean ± 3SD)	11.23-60	27.3-44.58	23- 37.64	20.5-40.06
Demarking point	> 37.6	> 40.06	< 11.2	< 27.3
P- value	0.001	0.001	0.001	0.001

In general, the mean values of length, weight, mid shaft circumference were found to be higher for males than in female clavicles. Side specific significant statistical analysis was found to exist for length in both male & female clavicles. The mean length of left clavicles were more than the right clavicles in both male and female clavicles.

DISCUSSION:

Sex determination using skeletal remains is the most important component in forensic identification and anthropologic research [4]. The present study was conducted to determine the sex of dry adult human clavicles using morphometric parameters like length, weight, mid shaft circumference. The values of present study were compared with previous studies and are represented in table no.2, 3, and 4.

Table No-2: Showing comparison of length values of present study with the previous studies.

S. no	Author & Year	Region	Total no of samples		Male		Female	
			M	F	Right	Left	Right	Left
1	S.Ishwar kumar et al. 2016[2]	South Africa	66	34	153.52± 8.79	151.82 ±10.96	138.02 ± 7.36	141.04 ±5.72
2	Anuradha D et al. 2019 [3]	Punjab	300	300	147.83± 10.45	151.66 ±7.83	134.85 ±8.83	131.32 ±8.43
3	Bindhu S et al. 2015 [4]	Karnataka	25	25	141.9±7.6	145.4± 7.2	127.2± 8.9	129±1 1.6
4	Mireya A et al.2019 [5]	Spain	115	80	155.12± 10	157.02 ±10.3	132.38 ±7.9	134.81 ±7.4
6	Gyanraj S et al. 2020[6]	Odisha	57	43	143.28± 4.67	142.84 ±4.67	128.37 ±5.86	127.52 ±5.96
6	Ramamurthi et al.2016[7]	Tamilnadu	50	40	143±8.6	149±8.2	126.2± 8.7	130±1 2.6
7	Khaleel N et al.2014[8]	South India	185	135	142.9±10.59	143.8± 9.55	131.12 ±12.22	131.1± 9.02
8	Jagmanhender et al.2016[9]	Chandigarh	390	136	148.52± 8.88	151.87 ±8.98	135.22 ±8.27	138.22 ±8.30
9	Present study 2021	Telangana	54	46	143.31± 13.47	145.18 ±9.32	128.69 ±8.0	131.56 ±8.32

In our study the mean length of right and left clavicles were 143.31±13.47, 145.18±9.32 in males and 128.69±8.0, 131.56±8.32 in females. These findings were in accordance with studies done by Gyanraj S et al [6], Ramamurthi et al [7].

Table No-3: Showing comparison of weight values of present study with the previous studies.

S. no	Author & Year	Region	Total no of samples		Male		Female	
			M	F	Right	Left	Right	Left
1	Anuradha et al. 2019 [3]	Punjab	300	300	21.45± 4.75	17.83± 4.61	13.52± 3.52	13.66± 3.95
2	Jagmanhender et al.2016[9]	Chandigarh	390	136	33.12± 5.73	31.95 ±5.77	23.09± 4.43	22.05± 4.51
3	Jit I & Singh S et al. 1966 [10]	North India	236	112	21.46	21.32	12.83	12.84
4	Singh S & Gangrade 1968 [11]	Varanasi	160	37	21.46	21.32	12.83	12.84
5	Present study 2021	Telangana	54	46	20.50± 4.52	20.52± 3.70	12.70± 4.19	12.24± 3.47

In the present study the mean weight of right and left clavicles were in males 20.50±4.52, 20.52±3.70 and 12.70±4.19, 12.24±3.47 in females. These findings were close to results of several studies like Jit I & Singh S et al. 1966 [10]. Singh S & Gangrade 1968 [11].

Table No -4: Showing comparison of midshaft circumference values of present study with the previous studies.

S. no	Author & Year	Region	Total no of samples		Male		Female	
			M	F	Right	Left	Right	Left
1	Shoba etal.2019[1]	Karnataka	85	75	37.14± 4.1	37.04± 4.2	30.5±3.3	30.3±3.3
2	Ishwar kumar et al. 2016[2]	South Africa	66	34	38.60± 3.55	38.68± 3.82	33.58± 2.52	34.93± 3.28
3	Anuradha et al. 2019 [3]	Punjab	300	300	37.95± 3.21	36.59± 2.94	32.14± 3.39	29.74± 4.09
4	Mireya A et al.2019 [5]	Spain	115	80	38±3.6	37.2±3.7	31.36± 2.3	30.3±2.06
5	Gyanraj S et al. 2020[6]	Odisha	57	43	42.83± 2.19	42.14± 2.01	37.67± 1.82	37.22± 1.42
6	Jagmanhender et al.2016[9]	Chandigarh	390	136	38.52± 3.28	37.24 ±3.38	32.66± 2.57	31.76± 2.70
7	Present study 2021	Telangana	54	46	35.62± 8.13	35.94± 2.88	30.35± 2.43	30.31± 3.25

The mean mid shaft circumference values of right and left clavicles were 35.62±8.13, 35.94±2.88 in males and 30.35±2.43, 30.31±3.25 in females in our study. These findings were in accordance with findings of several studies done by Shoba et al. 2019[1].

Over all accuracy of sex determination using multi variate analysis in our study was 89% of male clavicles and 87%of female clavicles. There was considerable overlap between male and female clavicular measurements due to genetic, nutritional, socio economic difference in the individual. The prediction of sex determination can further increased by using other parameters like angles, and volume and other radiographic procedures like CT -scans

CONCLUSION:

The present study was focussed on sex determination adult dry human clavicles using morphometric parameters like length, weight and mid shaft circumference. The mean values of these parameters were significantly higher in males than in females. These values may serve as a database for determination of sex of clavicles of unknown sex.

The findings of present study helps the Anatomists, Orthopaedic

surgeons in case of intra medullary nail fixation, and Forensic anthropologists in their professional endeavours.

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CONFLICTS OF INTEREST: None

STUDY LIMITATION: The sample size was limited (100) and concentrated on length, weight, midshaft circumference of clavicles. It will be beneficial to conduct similar studies with larger sample size and by taking other parameters

REFERENCES:

1. Shobha, Vijayakumar BJ, Pravinkumar NK, Vasudeva Murthy CR. Sexing of human clavicles of north Karnataka zone by measuring their mid-shaft circumference. Int J Anat Res. 2019; Vol 7(1.1):6123-27.
2. Ishwarkumar S, Pillay P, Haffajee M.R, Rennie C. Sex Determination Using Morphometric and Morphological Dimensions of the Clavicle within the KwaZulu-Natal Population. Int. J. Morphol. 2016; 34(1):244-251.
3. Anuradha D, Gaurav A, Ravi Kant Sharma. Morphometric Variation of Adult Human Clavicle – A Tool for Gender Determination. IJMDS. 2019; Vol 8(2), DOI: 10.18311/ijmds/2019/23769.
4. Bindhu S, Blessina S. Sexual Dimorphism Of Clavicle In South Indian population: A Cross Sectional Study. Int J Anat Res. 2015; Vol 3(3):1249-51.
5. Mireya A, Carme R, Ana C, Daniel T. Sexual dimorphism of the clavicle in a modern Spanish sample. Eur. J. Anat. 2015; 19(1):73-83.
6. Gyanraj S, Sudeepa D, Satyanarayan S, Minati P.Gender Variation of Clavicle in Eastern Odisha. Int J Anat Res. 2020; Vol 8(1.3):7386-89.
7. Ramamurthi KS. Sexual Dimorphism of Adult Human Clavicles in Tamilnadu Population Sch. J. App. Med. Sci. 2016; 4(10C):3711-3713.
8. Khaleel N, Jayachandra P, Shaik Hussain S, Khalid B, Mohammad A. Morphometry of Clavicle. J. Pharm. Sci. & Res.2014; Vol. 6(2):112-114.
9. Jagmahender Singh S, Pathak RK. Variability in anatomical features of human clavicle: Its forensic anthropological and clinical significance. Translational Research in Anatomy.2016; 3-4 5-14.
10. Jit I, Singh S. The sexing of adult clavicles. Ind J of Med Res.1966; 54:551-7.
11. Singh S, Gangrade KC. The sexing of adult clavicles demarking points for Varanasi zone. J of Anat Soc of In.1968b; 17:89-100.
12. Levis Vaseem M, Prajith T M. Determination of Sex From Adult Clavicle – An Autopsy based Regional Study.Indian J of Forensic Med Toxicol. 2020; Vol.14: No. 3.
13. Ailadda K, Apichakan S, Panya T, Sitthichai I. Morphometry of Isan-Thai Clavicles as a Guide for Sex Determination. Int. J. Morphol.2017; 35(1):172-177.
14. Standring S.Upper arm. In: Gray H, Standring S, Ellis H, Berkovitz BKB, Editors Gray's Anatomy: The anatomical bases of clinical practice. 39th ed. Edinburgh: Elsevier Churchill Livingstone. 2005. pp 817-819.