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The anthropometric study of mandible in Maharashtra

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Abstract:

The anthropometric study of mandible is important for individual identity like age, sex, stature, race etc. The knowledge of different measurements on mandible is also important to the dental surgeons in maxillofacial surgeries, reconstructive surgery of mandible and plastic surgery of face. In the present study, 280 cadaver mandibles including 200 male and 80 female mandibles were studied. We have measured the mandibular body height at second molar, height of the left ramus, mandibular ramus height up to incisura mandibularis with the help of spreading calliper (vernier). The observed values of males were compared with female mandibles for sexual dimorphism on the basis of percentage beyond demarking point; these parameters were found to be very useful in sex determination.

Keywords : Anthropometry, Mandible, Ramus.

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Introduction :

Anthropometry is an advanced branch in research field where the study of human skeleton is carried out to establish individual identity like sex, age, stature, race, etc (1-3). Anthropometry helps us to know the developmental and functional changes in the human body. Anthropometric study also helps us to know the morphological variations and the asymmetry of bone.

Traditionally the skull is a single most bone studied in physical anthropology. The main objective of human as well as primate skulls is studied by means of exact measurement(4,5). For sexing of mandibles, the dimensional methods are better than the descriptive features with anatomical basis.

The human mandible has always been a difficult bone to determine sex confidently by nearly looking at the usual morphological features(6). Variability in the technique and landmarks used by previous workers necessitated the detail study on mandible. The knowledge of different measurements on mandible is also important to the dental surgeons in maxillofacial surgeries, reconstructive surgery of mandible and plastic surgery of face(7). With the above aim in the present study, we tried to minimize errors by repeating the observations on two separate occasions.

Material and Method :

After obtaining Institutional Ethics Committee approval, 280 cadaver mandibles of Maharashtra zone were studied, out of that 200 were males and 80 females. The mandibles and instruments required for this research were used from the dissection hall. All mandibles used for the study were of adults above 20 years of age. The fractured, fragmented bones were discarded and only the complete intact mandibles were used for the measurements.

Technique of taking mandibular measurements :

Technique of taking mandibular measurements and landmarks on the bone was taken from books on practical anthropometry by various authors (8-10) and the measurements were taken with the help of spreading vernier calliper (Fig. 1). The bony points were first localized and then the measurements repeated twice on the two separate occasions and the mean was taken to get accurate results and then recorded. A straight distance between two bony points was measured (Fig. 2). As per method, the demarking points were obtained by calculated range which was worked out by adding and subtracting ±3 SD to the mean value of each parameter.
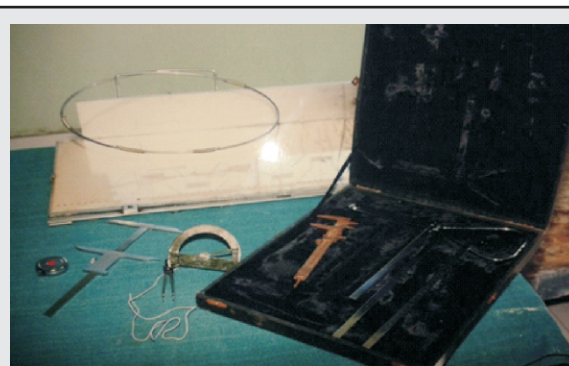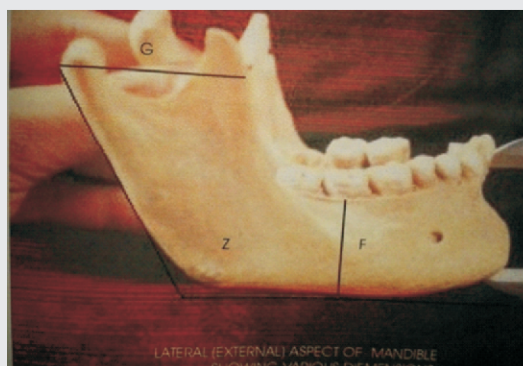

Figure 1: Vernier callipers for Mandibular measurement

Figure 2: Various Mandibular measurements

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Table I: Statistical analysis of Mandibular body height at M2

Detailed measurements	Male	Female
No. of bones	200	80
Range (mm)	19-30	16-26
Mean (mm)	24.93	21.12
S.D.	2.36	1.95
I.P.	26	19
% of identified bones	28%	7.5%
Calculated range (mm)	17.85	15.27
Mean ± 3 S.D.(mm)	32.01	26.97
D.P.	26.97	17.85
% Beyond D.P.	28%	2.5%

It is seen from the Table I that the mean Mandibular height at M2 of male mandibles was 24.93mm and that of females was 21.12mm. There is quite an overlap between male and female values, the calculated range for male (±3 SD) being 17.85mm- 32.01mm and for female 15.27mm-26.97mm. On the basis of demarking point, 28% male and 2.5% female mandibles could be accurately sexed. So this parameter is of some value for sexual dimorphism of human skeleton.

Table II: Statistical analysis of height of the left ramus of mandible

Detailed measurements	Male	Female
No. of bones	200	80
Range (mm)	48-70	45-62
Mean (mm)	62.49	51.78
S.D.	4.82	3.58
I.P.	61	50
% of identified bones	55%	20%
Calculated range	48.03	41.31
Mean ±3 S.D.(mm)	76.95	62.52
D.P.	60.71	49.15
% Beyond D.P.	64%	20%

It is seen from the Table II that the mean height of the left ramus of male mandibles was 62.49mm and that of females 51.78mm. There is quite an overlap between male and female values, the calculated range for male (±3 SD) being 48.03-76.95mm and for female 41.31-62.52mm. On the basis of demarking point, 64% male and 20% female mandibles could be accurately sexed. So this parameter is of some value for sexual dimorphism of human skeleton.

Table III: Statistical analysis of Mandibular ramus height upto incisura mandibularis

Detailed measurements	Male	Female
No. of bones	200	80
Range (mm)	36-57	34-48
Mean (mm)	49.53	39.58
S.D.	4.04	3.52
I.P.	48	36
% of identified bones	66%	12.5%
Calculated range (mm)	37.41	29.02
Mean ±3 S.D.(mm)	61.65	50.14
D.P.	50.14	37.41
% Beyond D.P.	46%	27.5%

It is seen from the Table III that the mean Mandibular ramus height up to incisura mandibularis in males was 49.53mm and that of females 39.58mm. There is quite an overlap between male and female values, the calculated range for male (±3 SD) being 37.41mm- 61.65mm and for female 29.02mm- 50.14mm. On the basis of demarking point, 46% male and 27.5% female mandibles could be accurately sexed. So this parameter is of some value for sexual dimorphism of human skeleton.

Discussion :

For sexing of skulls dimensional methods are better than the descriptive features with anatomical basis. Sex identification of skeletal material is of prime importance in anthropometry and is of vital concern in medicolegal cases. The statistical analysis of 3 measurements of adult 280 unknown mandibles were differentiated on the basis of the appearance of muscular marking, size of mandible, evertion and inversion of gonial angles and presence and absence of ramal flexure on the posterior border of ramus at occlusal plain (7). As per Hardlicka (8), the muscular markings are prominent in males than in females and size of mandible is larger in males than in females. For medicolegal purpose, in determination of sex, 100% accuracy is required. Maximum and minimum limits of parameter values determined on the basis of mean ±3 SD which is named demarking point (D.P). There is considerable overlap between male and female values of a particular measurement, so difficulty arises in discriminating them on that measurement basis. The maximum and minimum measurements in this overlapping zone have been named as identification points (I.P.) (5,11). The calculated range for 100% accuracy is measured by mean ± 3 SD. On the basis of DP, 28% male and 2.5% female mandibles could be sexed with 100% accuracy (Table I), 64% male and 20% female mandibles could be sexed with 100% accuracy (Table II), and 46% male and 27.5% female mandibles could be sexed with 100% accuracy (Table III). Hardlicka A claimed to be

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able to make correct sex identification in 80% cases, this increased to 90% when the lower jaw is present (8). Variability in the techniques and landmarks used by previous workers necessitated the detailed study of mandible.

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