Estimation of Stature from Mandible

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Abstract

Objective

To investigate feasibility of estimation of stature from mandibular arch length

Materials and methods

This prospective study was carried on 85 male cadavers. Stature and mandibular arch length of each corpse was measured. The data were subjected to statistical analysis. The measured statures were regressed against mandibular arch length using linear regression analysis.

Results

High correlation was found between stature and mandibular arch length (r = 0.71). The equation estimating stature from mandibular arch length was derived as stature = 91.36 + 6.7911 X mandibular arch length. It is feasible to estimate stature from mandibular arch length.

Key words

Stature, height, mandible, identification

Introduction

In forensic practice, determination of stature is important and frequently used parameter in the identification of unknown and commingled human remains. The procedure to estimate body height is to use its components[1]. Most of the studies relating to estimation of stature have used measurements of long bones to formulate regression equations or multiplication factors. However, few attempts have been made to estimate body height from other body parts such as hand length, foot length, skull measurements, odontometry, cephalo-facial dimensions and spine length with variable results [2-7]. Moreover, an alternative parameter is desirable in certain instances especially in cases of limb dysplasia, limb deformity and postmortem destruction or in mutilation cases. Hence with this background the present study was undertaken to reconstruct stature in male by using mandibular arch length (MAL) as a parameter.

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Materials and methods

The present prospective study was conducted at Department of Forensic Medicine, Indira Gandhi Govt. Medical College & Hospital, Nagpur, which is a tertiary-care teaching hospital located in the central part of India, through January 2008 to June 2008. The study includes 85 men. At autopsy, stature of body was recorded in a standardized way. Neck was opened with the conventional incision and mandible was exposed by cutting muscle attachments. The length of mandibular arch was recorded on left side with flexible steel-tape in a fashion described by Chimurkar (8). Mandibular arch length was measured as a distance from the outer border of the gonion to the most anterior point on the convexity of mandibular symphysis. The dimensions were taken in centimeters. The subjects having skeletal or spinal deformity or having injury to mandible were excluded from the study. The data were analyzed using regression analysis and correlation coefficient.

Results

The study was composed of 85 men with their age ranging from 20 to 58 years (mean age 32.08, standard deviation 9.35). The mean, median, standard deviation and maximum & minimum value for stature and mandibular arch length are shown in table no. 1. Results of regression analysis and correlation coefficient are given in table no. 2. The value "b" indicates the regression coefficient value, "r" correlation coefficient and "a" as a constant. Using regression formulae of y (stature) = a (constant) + b_1 (regression coefficient for the first variable) X 1 (first variable) + b_2 (regression coefficient for the second variable) X 2 (second variable) +

……. b_n (regression coefficient for the n^{th} variable) X n (n^{th} variable), one can calculate the height from the mandibular arch length as given in table no. 2. The standard error of estimate (S.E.) refers the error that may arise from estimating stature. Table no. 2 also provides the value of multiplication factor formulated for male.

Discussion

Identification of decomposed and mutilated bodies or skeletal parts remains challenge for forensic physicians and investigating officers. Determination of stature can help in fixation of partial identity of the individual and at times it is of immense help especially in circumstances when isolated body part, say for example skull or mandible, is submitted. Mandible is often studied for determination of sex, age and race but seldom studied for estimation of stature (9-11). Dr A. C. Mohanty's textbook of Legal Medicine mentions that stature from mandible can be estimated by multiplying length of mandible (distance between symphysis menti and angle of mandible) with 16 as multiplication factor. But it is not mentioned in the book whether the straight distance between mandibular angle and symphysis menti should be taken or length of mandibular arch should be taken (12). Considering the findings of present study, the author had noted 15.28 as multiplication factor. Thus stature can be estimated in simple way by multiplying mandibular arch length with the stated multiplication factor. Analyzing statically, a high correlation between mandibular arch length and stature was observed (r = 0.71). With the given regression equation, stature can be estimated with small standard error of about 3.91 cm. Therefore the method appears statically valid and practical means to estimate stature.

The method of using mandibular arch length has several advantages since the anatomical landmarks used in the study are well defined and easy to locate. In addition, the method is simple, easy to apply and requires routinely used equipments.

The drawbacks of the present study are – firstly only male population was studied and therefore the applicability remains limited. Secondly only one dimension was evaluated. In view of this, further research is desirable utilizing multiple dimensions and with combined use of data in an attempt to improve the accuracy and practical utility.

Conclusion

Estimation of stature is imperative for identification in forensic practice. The result of present study indicates that estimation of stature from mandibular arch length is feasible. Mandibular arch length correlates positively with stature and therefore it can be utilized as a reliable parameter to estimate stature of an unidentified individual with small standard error of about 3.91 cm.

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Table 1: the descriptive statistics of stature and mandibular arch length (MAL) in centimeters

Variable	Minimum	Maximum	Median	Mean	SD
Stature	149	176	165	164.62	5.55
MAL	9.5	11.8	10.8	10.78	0.58

Table 2: statistical analysis of mandibular arch length versus stature, multiplication factor and regression equation for estimation of stature

b	r	a	SE	MF
6.7911	0.71	91.35	3.91	15.28
Regression equation Stature = 91.36 + 6.7911 X MAL				

b = regression coefficient, r = correlation coefficient, a = constant, SE = standard error of estimate, MF = multiplication factor, MAL = mandibular arch length