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Stature from Human Sternum in Females

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ABSTRACT
An essential aspect of medico-legal proceedings is stature estimation. Securing the regression formula for calculation of stature of adult females by assessing the length of manubrium and meso-sternum is the objective of this study. Through dissection and maceration of soft tissues, 50female sterna were obtained from known corpses aged between 14years and 60years. For manubrium the resultant regression formula is Y=130.6 + 5.2x length of manubrium with standard error of ±5.3 and coefficient correlation is 0.3. For meso-sternum the resultant regression formula is Y=126.76+3.6x length of meso-sternum with standard error of ±4.0 and coefficient correlation is 0.49.Due to the greater coefficient correlation, the length of meso-sternum appears to be a perfect instrument for assessment of stature. This study thus verifies that, to determine the stature of a person meso-sternum is a consistent instrument.
Key words: *manubrium, meso-sternum, female, stature.*

INTRODUCTION

In medico-legal practice, determination of the identity of the particular person is essential both in cases of living and in dead. The mystifying problems in case of identification are always solved out by forensic science experts. Their assistance is greatly required in mass disasters like air crash, fire accidents, explosions etc. Mutilation of body parts, more progressed stages of decomposition, ruined fragments or remnant bony parts are some of the tools which could turn the process of establishing the identity into a more complex procedure. Yet, distinguishing the origin of skeletal remains, whether they belong to human or any other species is still a greater task as like assessment of correct sex, age, stature etc.

In such circumstances of intricacies, expertise in finding out the identity is indispensable in legal medicine. Calculation of the stature from the skeletal remains is one among the conventional procedures which could be undertaken. This is because stature is a vital decisive factor by which identification could be done. Thus, it is mandatory for the experts to estimate the stature from the dissected body parts and skeletal remains.

Numerous components such as the nutrition, genetic make-up, psychology, and the environment of an individual govern the stature. Various formulae have evolved to determine the stature in relation to the osteometric measurements of the various available body parts. These formulae are effective, as length of different body parts have a consistent association with the body length. The task becomes quite simpler when the entire skeleton is available.

Using the sternum which is usually left over even in cases of highly decomposed bodies[1] and which is a superficial bone, this present analysis is a sincere effort to estimate the stature of a person. The sternum has also got the advantage of acquiring it in a safe manner from the corpses during autopsies,

with no residual damages to it. Owing to the above features sternum was selected for the study as a recognizing element in stature estimation.

MATERIALS AND METHODS

The sterna from 50 known corpses aged between 14years to 60years, were collected during medico-legal autopsies and were used for this study. Dissection was done along the costochondral junction and the sternoclavicular joints [2] were disarticulated. The sternum was then taken out after removing the attached soft tissues by manual method.

Stature estimation can be done either by anatomical method or by mathematical method. In the former method that is by anatomical method, all the bones obtained are placed in anatomical position and the total length is measured with addition of appropriate grant for the soft tissues. This method gives a more exact value of the stature with the only drawback that, it is possible only when the entire skeleton is available. The mathematical method overcomes this disadvantage, as this method can be used even in the presence of a single bone. It works on the principle of proportions of long bones to the height of an individual. There are two ways by which this can be used, either by devising prediction equation or by computing multiplication factor for reconstruction of stature[3]. Thus, mathematical study was favorable and is used in this study.

Fig.1 shows the Osteometric Parameters used for analysis.

1. Length of Manubrium
2. Length of Meso-sternum

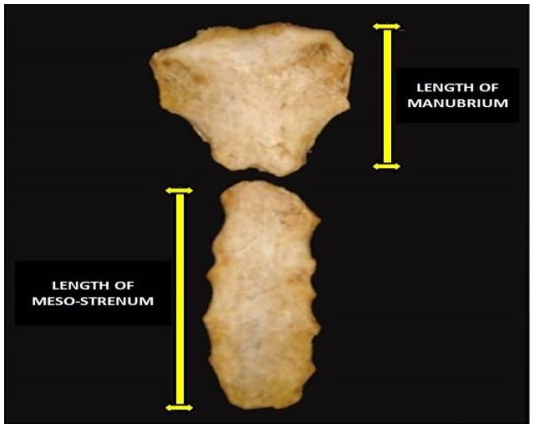

Figure 1: Measurements of Sternum.

Measurements were taken by using digital vernier caliper. Fig.2 and 3 show the method of measuring the parameters.

Figure 2: Measuring the length of manubrium.

Figure 3: Measuring the length of Meso-sternum.

Data collected were recorded, tabulated and statistically analyzed.

OBSERVATION AND RESULTS:

The lowest stature for females in this sample was 142cm and the highest stature was 167cm. The mean was 154.9cm with a standard deviation of 6.4cm and the median was 155cm. The regression formulae used were as follows:

1. Y = 126.76+3.6X (For length of Meso-sternum)
2. Y = 130.6+5.2X (For length of Manubrium)

In the above formulae the 'Y' is the calculated stature. 'X' are the measurements of sternum.

Statistically analysed data of few bodies are given in the Table1.

Table 1: Correlation between the stature and the sternal measurements in females.

Sex	Stature (cm)	LMS (cm)	Regression Y= 126.76 +3.6X	S.E	LM (cm)	Regression Y= 130.6 +5.2X	S.E
F	156	8.1	156	0	4.7	155	+1
F	157	8.5	157	0	4.5	154	+3
F	154	8.1	156	-2	5.0	157	-3
F	147	5.7	147	0	5.0	157	-10
F	162	8.6	158	+4	4.1	152	+10
F	145	6.0	148	-3	4.2	152	-7
F	157	8.7	158	-1	4.1	152	+5
F	157	7.7	154	+3	4.0	151	+6
F	150	7.2	153	-3	4.6	155	-5
F	163	6.2	163	0	4.2	152	+11

F-female, Meso-sternum-Body of sternum, S.E-Standard error, Y-Calculated stature, X-Sternal parameters. LMS-Length of Meso-sternum. LM-Length of Manubrium.

The regression formulae Y =126.76+3.6X in females with a range of standard error of ±4 helps in estimation of stature from the length of meso-sternum. Thus the stature can be calculated with 68% assurance pertaining to the above error. The assurance can be made 95% when the standard error of estimate is multiplied by 2 and when the standard error of estimate is multiplied by 3 then there is 98% assurance in estimation of the stature. The coefficient of correlation was 0.49.

The regression formulae Y=130.6+5.2X in females with a range of standard error of ±5.3 helps in estimation of stature from the length of manubrium. Thus the stature can be calculated with 68% assurance pertaining to the above error. The assurance can be made 95% when the standard error of estimate is multiplied by 2 and when the standard error of estimate is multiplied by 3 then there is 98% assurance in estimation of the stature. The coefficient of correlation was very much constrained with 0.3.

Thus estimation of stature from length of body of sternum seems to be more trustworthy than the value calculated from the length of manubrium since there is only a narrow range of standard error of estimate.

DISCUSSION

Numerous researchers [4], [5], [6] have established the stature from long bones and have succeeded in that by formulating several mathematical solutions. Yet the task remains unfinished when flat bones are considered.

Using the regression formula Y=130.6+5.2X in females and with a standard error of ±5.3 and co-efficient correlation of 0.3, stature can be estimated with the help of manubrium but this is not accurate when compared to the regression formulae derived from the length of meso-sternum.

As a result of the present study the regression formula obtained to estimate the stature from the length of the meso-sternum Y = 126.76+3.6X in females is comparatively more dependable than that derived by T.H.Bijoy singh and A.Momochand from Imphal, India[7] (Table 2).

Table 2: Comparison between the study of T.H.Bijoy Singh and present study.

Results of study by T.H.Bijay singh and A.Momochand			Present Study	
Study Group	Regression Formula	S.E	Regression Formula	S.E
Females	Y=150.6+0.16X	±4.8	Y=126.76+3.6X	±4.0
Co-efficient of Correlation: Female = 0.3			Co-efficient of Correlation: Female = 0.49	

Y-Stature of the individual, X-length of the body of sternum. SE-Standard error.

CONCLUSION

The distinctiveness of an individual depends and varies as per provincial and biological variations. This fact has been verified in the past [8],[9] and in this present study. Hence, the strongest suggestion that has been derived from this study is that, regional wise in depth studies are essential in assessing the stature. However, this study demonstrates that sternum is one of the perfect means in estimation of the stature of an individual, either in presence or in absence of long bones [10].

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