

Correlation of Stature of Adult Individual with the Length of Clavicle

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Abstract

Besides determination of race, sex, age of the unknown individual, estimation of stature enhances the reliability of identification process. It is easier to get those data when the whole body or entire skeleton is available to the forensic anthropologist. However, in cases of deliberate mutilation and disposal in parts, interference by wild animals, bomb blast by terrorist attack, recovery of the whole body or complete skeleton may not be possible. In those cases, the forensic anthropologists have to give his opinion on the available supplied material. Although approximate stature of the individual can be estimated from most of the long bones using either multiplication factors or regression formulae, only few have taken attempt to correlate stature with length of clavicle.

Keywords: Stature; Long bones; Clavicle; Estimation; Correlation.

Introduction

Estimation of stature is an essential part of identification process of unknown individuals, especially in case of situations where human bodies are found either as skeletal remains or in mutilated conditions. Approximate stature can be estimated if multiple long bones of limbs are available, but from any other single bone, it always remains a daunting task for any anthropological/forensic examiner, especially clavicle which lies horizontally in the body. In the past, Terry, Oliver, and Thieme have tried to estimate the stature of the individual from clavicle, outside India.[1-3] Similarly, in India, only few studies have been conducted so far by Singh & Sohal, Jit & Singh, Yadav and Khaka on estimation of stature from

clavicles.[4-7] Considering the paucity of studies with conflicting results, the present authors have made an attempt to correlate stature of the individual from the maximum length of clavicle.

Aims & Objectives

1. To correlate stature of individual with maximum length of clavicle.
2. To obtain the regression formulae to estimate stature from adult clavicle, for both sexes.
3. To compare reliability of maximum length of clavicle with other parameters namely, mid clavicular circumference, vertical diameter of clavicle, saggital diameter of clavicle, caliber index of clavicle, cross sectional index of clavicle and weight of clavicle, for determination of stature.

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Materials & Methods

In the present study, total 100 clavicles of both sides of 70 male and 30 female individuals

were taken from the dead bodies that came for medico-legal autopsies at Lady Hardinge Medical College & Smt. S.K. Hospital, New Delhi from the period Jun' 2004 to Apr' 2006.

Instruments & Equipments used

1. Calibrated autopsy table.
2. Forceps.
3. Scalpel with blade.
4. Beakers.
5. Sodium Bicarbonates.
6. Box for keeping clavicles.
7. Osteometric board.
8. Vernier Caliper.

Method used

1. Identification of the sex of the individual.
2. Measurement of stature of the individual.
3. Removal of the clavicle from the dead body.
4. Maceration of soft tissues attached to clavicle.
5. Cleaning and drying of the clavicles.
6. Measurement of various parameters including maximum length of clavicle,

initially by osteometric board, and then rechecked by vernier caliper.

Observation & Results

Table 1 shows length of the clavicles of both sides in Male individuals where as Table 2 shows length of the clavicles of both sides in Female individuals. The mean length of left clavicle was found more than the mean length of right clavicle in both the male and female individuals. In case of male subjects, the standards of errors were 5.15 for left clavicle, and 5.93 for right clavicle. Similarly, in case of female subjects, the standards of errors were 5.04 and 3.09 for left and right clavicles respectively.

When standards of errors of maximum length of clavicle were compared with standards of errors of mid clavicular circumference, vertical diameter of clavicle, saggital diameter of clavicle, caliber index of clavicle, cross sectional index of clavicle and weight of clavicle, it was observed that standards of errors of maximum length of clavicle is minimum for both male and female as well as for both left and right clavicles.

Basing on the maximum lengths of clavicles for both sexes of both sides, separate linear equations are derived. Linear regression

Table 1: Showing Length of the Clavicles of Both Sides in Male Individuals

	Left Clavicle	Right Clavicle
Total No.	33	37
Range	138.74 mm-161.29 mm	137.98 mm- 164.73 mm
Mean	149.74 mm	146.18 mm
Standard error	5.15	5.93

Table 2: Showing Length of the Clavicles of Both Sides in Female Individuals

	Left Clavicle	Right Clavicle
Total No.	17	13
Range	106 mm-137.65 mm	104.23 mm- 135.29 mm
Mean	118.44 mm	115.60 mm
Standard error	5.04	3.09

Table 3: Showing Comparison with Standards of errors of Other Parameters

Sl. No.	Parameters	Male		Female	
		Left Clavicle	Right Clavicle	Left Clavicle	Right Clavicle
1	Mid clavicular circumference	7.01	6.73	8.35	9.39
2	Vertical diameter of clavicle	6.67	6.22	8.33	9.07
3	Saggital diameter of clavicle	6.92	6.73	8.35	9.39
4	Caliber index of clavicle	7.19	6.65	8.42	8.36
5	Cross sectional index of clavicle	7.21	6.75	8.29	9.41
6	Weight of clavicle	6.92	6.65	8.12	7.26
7	Maximum length of clavicle	5.15	5.93	5.04	3.09

equations thus obtained are:

For male individual

$46.259 + 0.790 \times \text{Maximum length of left clavicle}$

$34.982 + 0.988 \times \text{Maximum length of right clavicle}$

For female individual

$54.714 + 0.808 \times \text{Maximum length of left clavicle}$

$35.082 + 0.973 \times \text{Maximum length of right clavicle}$

Discussion

Studies conducted by Terry, Oliver, Thieme outside India are not based on the materials from India; hence their formulae cannot be applied for Indian population. In India, few studies conducted by Singh & Sohal, Jit & Singh, Yadav and Khaka on estimation of stature from clavicles showed conflicting results.[4-7] Singh & Sohal have suggested multiplication factor for only male individuals. Thus, it cannot be applied for female individuals. Again, as there is variation in maximum length of clavicles of left and right side, same multiplication factor cannot be applied to both sides' clavicles. Yadav in Rohtak derived multiplication factor for both sides in both sexes. But he also suggested that

multiplication factor is of little use in stature estimation. Khakha analyzed various parameters of clavicle of both sides of both sexes separately and also derived linear regression equation for each parameter of the clavicle. He found that maximum length was the best parameter for stature estimation from clavicle because of minimal standards of errors.

In the present study, we have also analyzed various parameters of clavicle of both sides of both sexes separately and also derived linear regression equation for each parameter of the clavicle. We found that maximum length was the best parameter for stature estimation from clavicle because of minimum standards of errors and maximum correlation coefficient, as reported by Khakha.

Conclusion

Thus, if only the clavicle is recovered, then anthropologist/forensic examiner can estimate the stature of the individual with a reasonable degree of accuracy. However, as our study is on Delhi based heterogeneous group of population, similar studies on homogenous group of population may yield better results. Out of seven parameters, maximum length of clavicle was found the best parameter to estimate the stature of unknown individual. For estimation of stature from clavicle, sex and side of the clavicle must

be considered for applying the regression formula.

Regression formulae for estimating stature from the clavicle

For male individual

46.259 + 0.790 X Maximum length of left clavicle

34.982 + 0.988 X Maximum length of right clavicle

For female individual

54.714 + 0.808 X Maximum length of left clavicle

35.082 + 0.973 X Maximum length of right clavicle

N.B.: We are hereby regret the sad dismissal of Dr. Avnish Kumar Singh, the co-author.

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