

Role of Sternal Index in Determination of Gender

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Abstract

A post-mortem study was conducted to differentiate male and female sternum. A total 100 sternums of adult individuals (56 males & 44 females) were obtained from the cases brought for autopsy to the Department of Forensic Medicine & Toxicology, Lady Hardinge Medical College, New Delhi between the periods August 2005 to March 2007. Our study concluded that the sternal index was not reliable for determining sex.

Introduction

Determination of sex from sternum for the purpose of identification is required in many medicolegal cases. Determination of sex is based upon the morphological and morphometrical features. Studies for determination of sex from the various dimensions of adult sternum are rather limited. According to several workers, the sternal index is reliable parameter. However some think that it is of no practical value.

Materials & Methods

The present study was carried upon 100 sternums obtained from known male and female (56 Male and 44 Female) dead bodies brought for medico-legal autopsy. As sex differentiating

features in the bones are well marked only after puberty and pieces of mesosternum complete fusion by the age of 25 years, sternums of individuals above 25 years of age were taken for the present study. The various dimensions were measured using Helio's Dial Caliper, which gives more accurate reading, up to 1/100 of mm. The following dimensions of sternum were measured in millimeters & evaluated.

- Length of manubrium (X)
- Length of mesosternum(Y)
- Manubrio- corpus index or Sternal index (S.I.) = $X / Y \times 100$

The data obtained was analysed statistically to find out the range, the mean and standard deviation. The p value was determined to find out whether the sexual differences between means were significant or not. The data was also analysed statistically to find out the number of cases lying in overlapping zones and to find out the reliability of sternal Index in determination of sex.

Observations and Results

The results of various measurements of sternum of the present study are shown in Table No. I & II.

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Table I. Measurement of the sternum in two sexes

Parameters	Sex	Range (mm)	Mean (mm)	S.D.	Level of significance for the difference between the means
Length of Manubrium (X)	M	38-52	45.749	2.989	P < 0.001
	F	36-49	41.204	3.307	
Length of Mesosternum (Y)	M	79-109	100.279	6.248	P < 0.001
	F	62-91	78.346	6.256	
Manubrium-Corpus Index (X/Y × 100)	M	38-58	46.089	3.750	P < 0.001
	F	45-62	56.703	3.982	

Table II. Number and Percentage of cases falling in overlapping zone.

Parameter	Sex	Number of cases in overlapping zone	Percentage of cases in overlapping zone
Manubrium-Corpus Index (X/Y × 100)	M	34	60.71
	F	40	90.91

In the present study, it was observed that the mean sternal index was 46.089 for males and 56.703 for females. The level of significance of the difference between the means was statistically highly significant ($p < 0.001$) for sternal index (Table I). Out of 56 males sternums, 34 male cases (60.71%) were lying in overlapping zone while of the 44 female cases, 40 cases (90.91%) were lying in overlapping

zone. Only 22 male and 4 female cases were not lying in the overlapping zone (Table II). In spite of significant p value ($p < 0.001$), for the difference between sternal index of male and female (Table II & Figure 1), the sternal index could not be considered as a reliable parameter for sex determination. It could be due to overlapping of maximum sternal indices among both males and females.

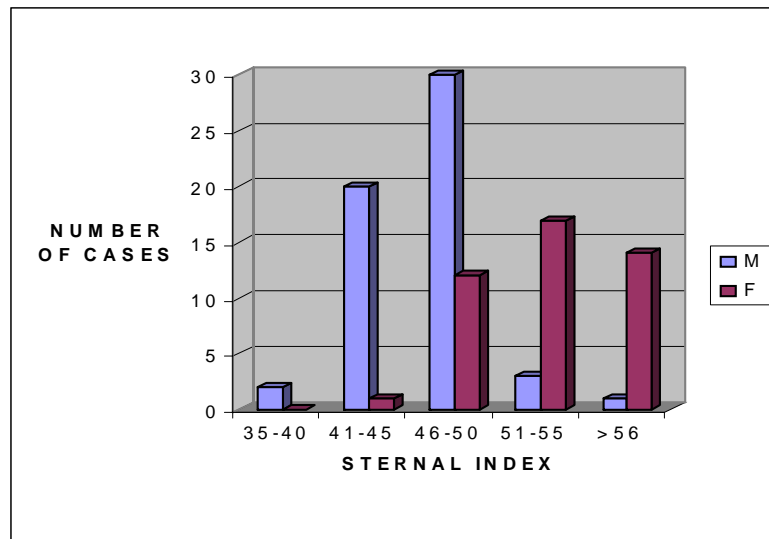


FIG 1. Sternal Index Vs Number of cases lying in Overlapping zone

Discussion

According to Hyrtl's law, manubrio corpus index (sternal index) exceeds 50 in females and

is less than 50 in males.¹ Table No. III gives the observations of various workers regarding the percentage of cases obeying the Hyrtl's law in the two sexes.

TABLE III: NUMBER & PERCENTAGE OF CASES OBEYING HYRTL'S LAW ($X/Y \times 100 = <50$ MALE, >50 FEMALE) AS RECORDED BY VARIOUS WORKERS.

OBSERVER	NUMBER OF CASES	SEX	% OF CASES OBEYING LAW
Dwight (1890)²	142	M	59.10
	86	F	60.40
Patermoller (1890)¹	55	M	65.00
	33	F	-
Krause(1897)¹	-	M	-
	14	F	43
Ashley (African) (1956)³	85	M	64.70
	13	F	69.20
Ashley(European) (1956)³	378	M	52.90
	171	F	69.30
Narayan and Varma⁴ (1958)	126	M	34.12
	27	F	81.48
Jit et al (1980)⁵	312	M	31.08
	88	F	88.64
Dahiphale et al (2000)¹	96	M	52.20
	47	F	100
PRESENT STUDY (2006-07)	56	M	89.28
	44	F	75.00

In the present study it was observed that the mean sternal index in male and female were 46.089 and 56.703 respectively. The average difference between the sternal index in two sexes was 6.613 which was statistically highly significant ($p < 0.001$).

It was also observed that 89.28% male and 75.00% female specimens obey the Hyrtl's law (Table III). However, the overlapping between the manubrio - corpus indices of two sexes was also 74.00% (Out of 100, 34 male and 40 female). Therefore, the law was not reliable when applied to an individual specimen in determining the sex. This is in agreement with Ashley (1956), Jit et al (1980) and Dahiphale et al (2002) who found the law to be 'unreliable.'

Conclusions

1. Manubrio-corpus index (sternal index) was also found to be unreliable in sex determination. The mean sternal index for

male and female were 46.089 and 56.703 respectively.

2. 89.28% male and 75.00% female specimens obey the Hyrtl's law.

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