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Original Research Article

Symmetry and Isometry of Human Adult Hyoid Bone: A Cadaveric Study

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Abstract

Background: The hyoid bone is of considerable forensic interest because of its susceptibility to fracture during manual strangulation, hanging and other forms of neck compression. It is also frequently injured in road traffic accidents and may cause significant airway concerns. Whatever may be the reasons, why only some hyoid bones fracture and others do not may be related to the nature, magnitude, position of force applied to the neck, age of victim, nature of instrument (ligature or hand) used to strangle and anatomical features of the hyoid bone such as rigidity, shape of the bone and symmetry of greater horns. ***Aim:*** To know the incidence of symmetry and isometry of human hyoid bones in both sexes. ***Materials & Methods:*** Present study includes 60 hyoid bones (male: female, 30:30) collected from the cadavers of known age and sex during autopsies (October 2013 to April 2016) at Mysore Medical College and Research Institute, Mysore. Numbering the bones was done with prefix M/F (M-male, F- female).Their outline was drawn on the graphpaper to study the symmetry and isometry of the bone. ***Results:*** 50% of the hyoid bones were symmetrical (M:F – 45%:54%) while remaining 50% were asymmetrical (M:F – 54%:45%). Anisometric bones were more (58%) as compared with isometric (42%) bones in both the sexes. In males 17 bones were anisometric, 13 bones were isometric where as in females 18 bones were anisometric, and 12 bones were isometric. ***Conclusion:*** Hyoid bone is not bilaterally symmetrical bone.

Keywords: Hyoid bone, isometry, anisometry, symmetry, asymmetry.

INTRODUCTION

The hyoid bone is a rather neglected structure of the human skeleton, which has not been given sufficient attention [1]. It is a part of viscerocranium placed between the tongue and thyroid cartilage to which it is connected by thyro-hyoid membrane. Its name is derived from the Greek word hyoeides meaning 'shaped like the letter Upsilon' "U" [2].

It is an integral component of the hyoid apparatus, because it provides attachment for the muscles of this apparatus which regulates mastication, deglutition and phonation. It consists of a central body and two paired processes the lesser and the greater cornua [3].

MATERIAL AND METHODS

Present study includes 60 specimens (male: female, 30:30) of hyoid bones collected from the cadavers during autopsies (2013 to 2016) at Mysore Medical College and research Institute, Mysore. All specimens were from individuals aged between19 to 80. The damaged hyoid bones in cases of hanging and strangulation were excluded from the study. The specimens were stored in 10% formaldehyde solution.

In these specimens laryngeal cartilages, thyroid gland, infrahyoid muscles and thyro hyoid membranes were dissected out and removed. Initially infrahyoid muscles and thyrohyoid membrane were cut beyond 1 cm of hyoid bone, then muscular and ligamentous structures were removed. During dissection care was taken to preserve the lesser cornua of hyoid bone and then each bone was completely dried in air for a week. Bones were labelled from 1 to 60 with suffix M (male) or F (female). Each hyoid bone was examined for Symmetry/ asymmetry and isometry/ anisometry as follows.

Symmetry

For determining the symmetry of the hyoid bone, the outline of the bone was drawn on graph paper by pencil. The distal ends of the two greater cornua

were joined (AB in Figure 1).Major transverse axis was also drawn (CD in Figure 1).A line was drawn in the mid-sagittal axis of the body intersecting the previous lines at points P and P^1. If the distance CP = PD, then the bone was labelled as symmetrical bone and if not, it was labelled as asymmetrical.

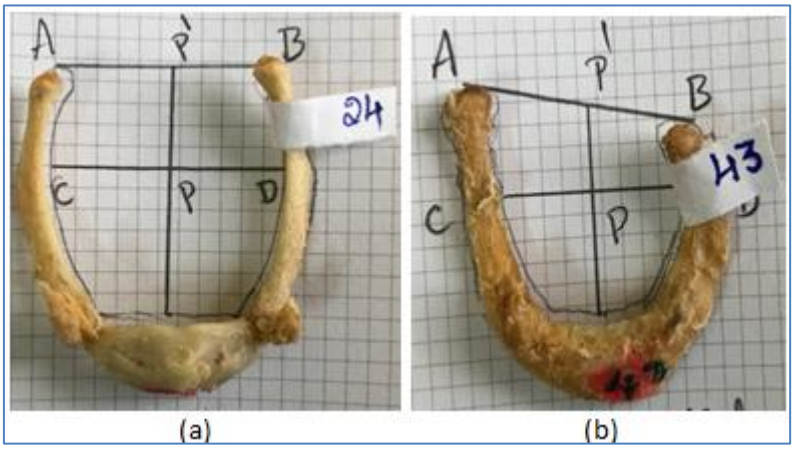

Fig-01: Symmetry of hyoid bones (a) symmetrical and isometric (b) symmetrical and anisometric

Isometry

A bone is isometric if the tips of both greater cornua fallin the same coronal plane. If it is not so, the hyoid boneis anisometric. For this, the bone was kept on graph paper. With body lying parallel to x-axis and then a line was drawn touching the tips of the two greater cornua. If it is parallel to x-axis it is isometric, otherwise anisometric.

Here, it is worth mentioning that the length of two greater cornua may not be necessarily same in isometric bones (Figure 2).

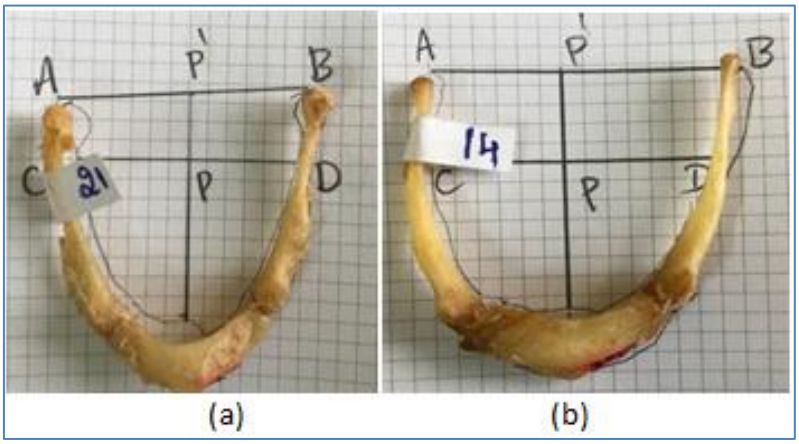

Fig-2: Symmetry and isometry of hyoid bones. (a) Symmetrical but anisometric (b) Isometric but asymmetrical

RESULTS

Symmetry

In the present study, out of 60 bones, 30 (50%) bones were symmetrical and 30 (50%) were asymmetrical [Table 1].

Isometry

In the present study, Out of 60 bones, 25 bones (41.66%) (13 in males and 12 in females) were isometric. Rest of 35 bones (58.33%) (17 in males and 18 in females) were anisometric [Table 1].

Table-01: Incidence of symmetry and isometry in the present study

Sex	isometric		anisometric		asymmetry		symmetry	
	No of bones	%	No of bones	%	No of bones	%	No of bones	%
Male	13	43.33	17	56.66	16	53.33	14	46.66
Female	12	40	18	60	14	46.66	16	53.33
Total	25	41.66	35	58.33	30	50	30	50

DISCUSSION

Table 2 compares the incidence of symmetry and isometry of hyoid bone in male and females with the earlier studies. The present study shows that the incidence of symmetrical bones were more in females and asymmetrical bones were more in males, while in the study conducted by Bhavna kalyan [6] no such difference was observed, the incidence of symmetrical bones were 40% and asymmetrical bones were 60% in both male and females. Where as in other studies [2, 4, 5, 7] the incidence of symmetrical bones were more in males and asymmetrical bones were more in females.

Table-02: Comparison of present study with other studies

Authors	Sample Size	Total	symmetric		asymmetric		isometry		anisometry	
			No	%	No	%	No	%	No	%
Papadopoulos [2]	M- 38 F - 38	76	18 22	47.36 57.89	20 16	52.63 42.10	18 20	47.36 52.63	20 18	52.63 47.36
Leksan *et al*.[4]	M-35 F-35	70	33 27	94.28 77.14	2 8	5.71 22.85				
Jadhav Aswini S [5]	M-51 F-40	91	32 30	62.74 75	19 10	37.25 25	36 32	70.58 80	15 8	29.41 20
Bhavna kalyan [6]	M-15 F-15	30	6 6	40 40	9 9	60 60	2 2	13.33 13.33	13 13	86.66 86.66
Prashanth kumar [7]	M-28 F-22	50	20 13	71.4 59.09	8 9	28.57 40.90				
Present study	M-30 F-30	60	14 16	46.66 53.33	16 14	53.33 46.66	13 12	43.33 40	17 18	56.66 60

The present study shows that the incidence of isometry to be more in males and anisometry of hyoid bones to be more in females, while in the study conducted by Bhavna kalyan [6] no such difference could be seen. The incidence of isometry was 13% in both males and females, for anisometry incidence was 86% in both male and females. Remaining studies [2, 5] the incidence of isometry to be more in females and anisometry to be more in males.

Table 3 compares the incidence of symmetry and isometry in a given population irrespective of sex. As evident from the table 03 the present study shows that the number of symmetrical bone was equal to the number of asymmetrical bones. Where as in the study conducted by Bhavna kalyan [6] the number of asymmetrical bones were more as compared to symmetrical bones. In other studies [2, 4, 5, 7] the number of symmetrical bones were more as compared to asymmetrical bones.

Table-3: Comparison of present study with other studies

Authors	Total	symmetric		asymmetric		isometry		anisometry	
		No	%	No	%	No	%	No	%
Papadopoulos [2]	76	40	52.63	36	47.36	38	50	38	50
Leksan *et al*. [4]	70	60	85.71	10	14.2				
Jadhav Aswini S [5]	91	62	68.13	29	31.86	68	74.17	23	25.27
Bhavna kalyan [1]	30	12	40	18	60	4	13.33	26	86.66
Prashanth kumar [7]	50	33	66	17	34				
Present study	60	30	50	30	50	25	41.66	35	58.33

With regard to isometry, in the present study the number of anisometric bones were more compared to isometric bones. This observation is comparable with study done by Bhavna kalyan [6]. Where as in the study conducted by Papadopoulos reported that the number of isometric bones was equal to anisometric bones. Jadhav Ashwini S [5] found that the number of isometric bones was more compared to anisometric bones. This difference may be due to the racial factors.

CONCLUSION

The incidence of anisometry is more as compared with isometry in the hyoid bones, where as the incidence of asymmetrical bones was equal to the incidence of symmetrical bones. Symmetry/asymmetry and isometry/anisometry of hyoid bones do not depict any sex difference which may be due to racial factors.

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