

Assessment of Fusion of the Hyoid Bone in Various Age Groups

Received: 21 August 2022, **Revised:** 17 September 2022, **Accepted:** 19 October 2022

Dr. Mahindra Kumar Anand

“Professor, Department of Anatomy, Santosh Medical College & Hospital, Santosh Deemed to be University, Ghaziabad”.

Dr. Swati Yadav

“Assistant Professor, Department of Anatomy, Santosh Medical College & Hospital, Santosh Deemed to be University, Ghaziabad”.

Dr. Swati Yadav- Corresponding Author

Keywords

Hyoid, Fusion, Unilateral, Bilateral, Non-Fusion.

Abstract

Background: At a certain age, the larger cornua of the hyoid bone fuses with the body. Estimating the age of unknown dead bodies can be greatly aided by the fusion of the hyoid bone.

Aim of study: To analyze the fusion of hyoid bone in different age-groups was the aim of the study.

Materials and Methods: 64 cases in all were analyzed. Extreme care was taken when removing the hyoid bone to prevent it from breaking and being mistaken for a fracture. Researchers looked at the bone's structure and how the larger cornua and hyoid bone fused. The samples were divided into categories with five-year age gaps. There were 28 females and 36 males in the study group. Ages groups 18-25, 30-35 and 40-45 years had equal proportion of male and female cases. In 29 cases, there was unilateral fusion, 21 cases there was bilateral fusion, and 14 cases there was no fusion.

Conclusion: Based on the findings of the current study, we can say that young people commonly have non-fusion of the greater cornua with the body of the hyoid bone.

1. Introduction:

A specific age is reached when the body and the larger cornua of the hyoid bone merge. In order to determine the age of unknown dead bodies, the hyoid bone fusion might be a great aid. Additionally, if the “hyoid bone” is fused, fracturing of the bone is more likely in mechanical asphyxia where the neck is compressed. Forensic pathologists are therefore very interested in the timing of hyoid fusion as well as its shape and morphometry [1-3]. In addition, the “hyoid fusion” has been investigated in relation to the pathophysiology of sleep apnea in vulnerable persons and mastication [4]. Hyoid bone has been observed in numerous examinations. The population investigated and the methodologies used

are observed to depend on the age at which the “greater cornu” merges with the body [5]. While some authors claim that the hyoid bone only fuses beyond the age of 40, other scholars have noted that the bone fuses much earlier. Previous research focused on 170 removed hyoid bones from dead persons that ranged in age from 20 to 65 and were of Indian descent [6]. Therefore, it was intended for the current study to examine the fusion of the “hyoid bone” in various age groups.

2. Materials and Methods:

The department of human anatomy at the medical centre was where the current study was carried out. Dead bodies between the ages of 18 and 65 were

Journal of Coastal Life Medicine

chosen for the study. A total of 64 cases were examined. We only looked at cases with known ages. Hyoid fractures and cases of neck compression were excluded from the study.

To remove the hyoid bone, the neck structures have to be carefully dissected. In order to prevent the bone from breaking and being mistaken for a hyoid bone fracture, the hyoid bone was removed with the utmost care. In order to dispose of the soft tissues adhering to the bone, the “hyoid bone” from each patient was put in a wooden box with a label on it and buried in the ground for four weeks. The “hyoid bone” was removed, cleaned, and allowed to air dry after four weeks.

Researchers looked at the bone's structure and the larger cornua's union with the hyoid body. To store the data, a master chart was created.

Statistical Analysis: Data were statistically analyzed using the Windows version of SPSS. Both the “Chi-square test” and the “student's t-test” were used to confirm the data's significance. “The significance was set at $p < 0.05$ in advance”.

3. Results:

“Table 1 shows the age distribution of study participants”. 64 cases altogether were a part of the study group. 36 males and 28 females comprised up the entire group. The highest numbers of cases were observed in the age group 18-25 and 40-45 years. Numbers of males were more in each age group except for age group 30-35.

“Table 1: Age distribution of the study group according to sex”

“Age-group(years)”	“Tetanolo of Patients(n)”	“Males”	“Females”
18 to 25	11	6	5
25 to 30	5	3	2
30 to 35	8	3	5
35 to 40	8	4	4
40 to 45	11	6	5
45 to 50	6	4	2
50 to 55	3	2	1
55 to 60	9	5	4
60 to 65	3	3	0
Total	64	36	28

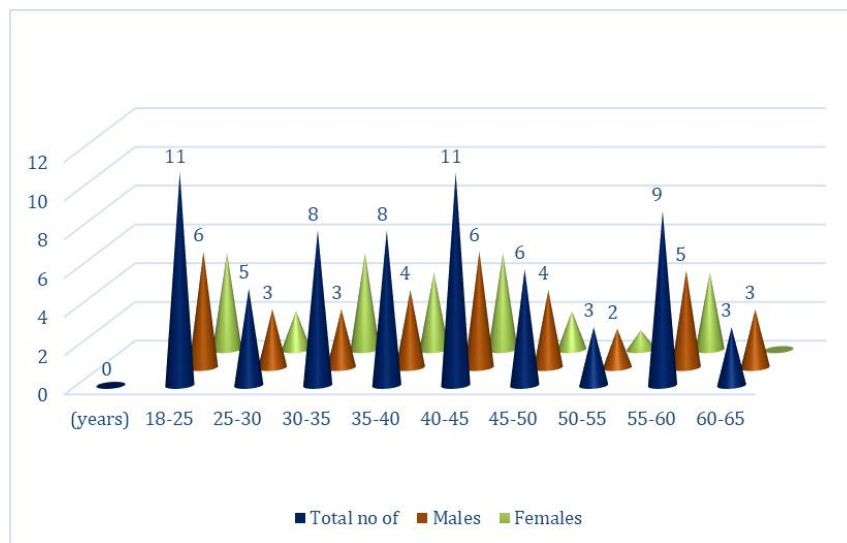


Figure. 1: “Showing Age distribution according to sex of the study group”

Table 2 displays the hyoid's fusion in different age groups. A total of 29 cases of unilateral fusion, 21 cases of bilateral fusion, and 14 cases of non-fusion were found, according to our observations. In the age groups of 61 to 65 years, there were 1 cases of bilateral fusion. Majority of cases of unilateral fusion were observed in the age group of 25 to 30 years (7 cases) followed by 55 to 60 years (6 cases). Similarly, 7 cases of bilateral fusion were seen in 40 to 45 years age group followed by 5 cases in 50 to 55 years. In the age range of 18 to 25 years, non-fusion was seen in 3 cases. Additionally, three individuals in the 35-to-40-year age group had 1 cases of non-fusion (Fig 2). ($p \leq 0.05$) The outcomes were statistically significant.

Table2: Fusion in different age-groups.

“Age groups (years)”	“Unilateral fusion”	“Bilateral fusion”	“Non-fusion”
18 to 25	4	1	3
25 to 30	7	2	2
30 to 35	2	3	0
35 to 40	5	1	1
40 to 45	2	7	2
45 to 50	1	0	1
50 to 55	1	5	2
55 to 60	6	1	1
60 to 65	1	1	2
Total	29	21	14

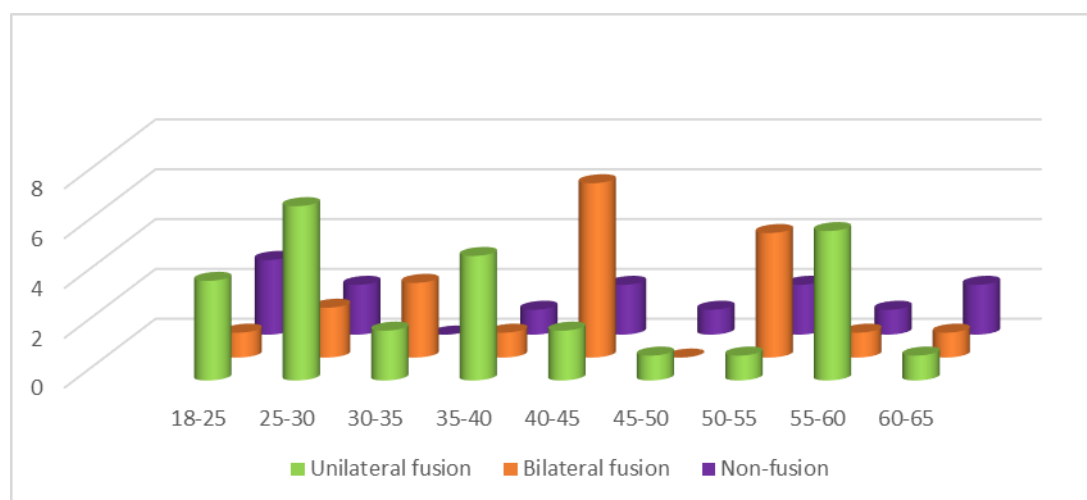


Figure2: “Showing fusion of hyoid bone in different age groups”

4. Discussion:

In the current study, we examined the hyoid bone fusion in various age groups. We found that there were more instances of unilateral hyoid bone fusion than bilateral or non-fusion (“unilateral, n=29, bilateral, n=21, non-fusion, n=14”). Other academics' studies that were similar to ours showed similar outcomes.

The age at which the larger cornua fused with the body of the hyoid bone was the subject of a study by Gupta A et al. Hyoid bone age at fusion can be used to estimate an individual's age, especially in cases of unidentified dead individuals where only skeletal remains are present. If the hyoid bone is fused, a victim of neck compression is more prone to experience hyoid fracture. According to Indian scholars, hyoid bone fusion happens after the age of 40. Hyoid bone fusion was seen to occur earlier in studies conducted by foreign workers (30-40 years).

A total of 170 removed hyoid bones from deceased individuals between the ages of 20 and 65 were examined. Approximately 5 years earlier in females than in males, fusion took place. Males fused unilaterally at an average age of 37.14 years and bilaterally at an average age of 52.60 years. Females fused unilaterally at an average age of 35.10 years and bilaterally at “an average age of 47.25 years”. After the age of 60, all of the hyoid bones fused. There were no apparent variations in the “fusion on the right and left sides”.

“315 hyoid bones from individuals of known age and sex were photographed using digitized radiography, and Miller KW et colleagues used an image analysis system to take a set of 30 measures”. It was also noted to what extent the larger cornua fused with the hyoid body. According to a statistical study of this data, the morphologies of hyoid bones are distributed continuously, with the majority of them being highly symmetrical. Previous studies have hypothesised that non-fusion occurs more frequently in women than in males based on smaller samples. Our results, on the other hand, indicate that non-fusion rates between men and women are comparable. The larger cornua exhibits the biggest length differences, according to an analysis of sexual dimorphism. The form of the hyoid varies significantly across the sexes as well. For instance, women's greater cornua distal ends are noticeably longer than men's [7, 8].

Between “mouth breathing (MB)” and “nasal breathing (NB)” patients, Ucar FI et al examined changes in “craniofacial morphology, head posture, and hyoid bone position”. “34 skeletal Class I participants with a mean age of 14.8±2 years (range: 13–16 years)” were mouth breathing patients. The NB group consisted of 32 patients with skeletal Class I relationships (mean 14.5±1.6 years; range: 13.8-17.4 years). For the craniofacial analysis, 27 measures (15 angular and 12 linear) were used. Additionally, eight measurements of the head posture and the position of the hyoid bone were assessed throughout 12 measurements (four measurements). Statistics revealed that MB patients

Journal of Coastal Life Medicine

had lower sagittal measurements than NB patients, including “SNA, ANB, A to N perp, convexity, IMPA, and overbite measurements”. In contrast to the NB group, MB patients had considerably higher “vertical measurements including SN-MP and PP-GoGn, S-N, and anterior facial height”, but their “odontoid proses and palatal plane angles (OPT-PP) and true vertical lines and palatal plane angles (Vert-PP) were lower”. There were no statistically significant variations between the two groups' hyoid bone positions. The authors came to the conclusion that MB patients had more retrognathic maxillae.

Additionally, in “MB patients”, the “palatal plane” showed a posterior rotation. However, there were no appreciable variations between MB and NB individuals' hyoid bone positions. Using digital images, Kim DI et al. carried out a study on the “sex-based morphometry of the hyoid bone in Koreans”. We looked at the hyoid bones of 52 males and 33 girls. They used a computer software to extract 34 measurements from images of each person, and SPSS 11.0 was used to do statistical analysis on the data. Of the 34 measurements, there were significant sex differences in 21 of them. The following were the three measurements' discriminant functions (X(1)–X(3)): Discriminant functions can be utilised to tell men from women in a statistically meaningful way because they are accurate in both groups at 88.2% [9,10].

Conclusion:

Based on the results of the present investigation, we infer that the bigger cornua does not fuse with the hyoid bone's body in cases of young age. Additionally, the age group of 40 to 45 years saw the highest prevalence of both unilateral and bilateral fusion.

References

1. Holloran RL, Lundy JK. Age and ossification of the hyoid bone: forensic implications. *J Forensic Sci* 1987;32:1655–9.
2. Mukhopadhyay PP. Predictors of hyoid fracture in hanging: Discriminant function analysis of morpho- metric variables. *Leg Med* 2010;12(3):113-16.
3. Mukhopadhyay PP. Morphometric features and sexual dimorphism of adult hyoid bone: A popula- tion specific study with forensic implications, *J Fo- rensic Legal Med* 2010;17(6):321-24.
4. Kanetaka, H., Shimizu, Y., Kano, M. Kikuchi, M. Synos- tosis of the joint between the body and greater cornu of the human hyoid bone. *Clinical Anatomy*, 2011;24:837–842
5. Shimizu Y, Kanetaka H, Kim YH, Okayama K, Kano M, Kikuchi M. Age related morphological changes in human hyoid bone. *Cells Tissues Organs* 2005; 180:185–92.
6. Gupta A, Kohli A, Aggarwal NK, Banerjee KK. Study of age of fusion of hyoid bone. *Leg Med* 2008;10:253–6.
7. Gupta A, Kohli A, Aggarwal NK, Banerjee KK. Study of age of fusion of hyoid bone. *Leg Med (Tokyo)*. 2008 Sep;10(5):253-6. doi: 10.1016/j.legalmed. 2008. 03.002. Epub 2008 Apr 28.
8. Miller KW, Walker PL, O'Halloran RL. Age and sex- related variation in hyoid bone morphology. *J Fo- rensic Sci.* 1998 Nov;43(6):1138-43.
9. Ucar FI, Ekizer A, Uysal T. Comparison of craniofa- cial morphology, head posture and hyoid bone po- sition with different breathing patterns. *The Saudi Dental Journal*. 2012;24(3-4):135-141.
10. Kim DI, Lee UY, Park DK, Kim YS, Han KH, Kim KH, Han SH. Morphometrics of the hyoid bone for human sex determination from digital photographs. *J Fo- rensic Sci.* 2006 Sep;51(5):979-84.