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Original Research Article

ANALYSIS OF THE FUSION OF HYOID BONE IN DIFFERENT AGE-GROUPS

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ABSTRACT

Background: The greater cornua of the hyoid bone fuse with the body at a certain age. The fusion of hyoid bone can be of considerable help in estimating the age of unknown dead bodies.

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

Materials and Methods: We studied a total of 50 cases. Hyoid bone was removed with extreme caution so as the bone does not break and be confused with fracture of hyoid bone. The structure of the bone and fusion of greater cornua to body of hyoid were studied. A master chart was prepared to store the data. The samples were placed in categories of five year age intervals.

Results: A total of 30 males and 20 females comprised the study group. Maximum male and female cases were in the age group 40-45 years. Unilateral fusion was observed in 23 cases; bilateral fusion was observed in 19 cases; and non-fusion in 8 cases.

Conclusion: From the results of present study, we conclude that non-fusion of greater cornua with body of hyoid bone is obsereved in cases of young age. Also, unialteral fusion and bilateral fusion is more commonly seen in the age group 40-45 years age group.

KEY WORDS: Hyoid, Fusion, Unilateral, Bilateral, Non-Fusion.

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INTRODUCTION

The greater cornua of the hyoid bone fuse with the body at a certain age. The fusion of hyoid bone can be of considerable help in estimating the age of unknown dead bodies. Also in mechanical asphyxia where there is compression of the neck, fracture of hyoid bone is more likely if it is fused. So time of fusion of hyoid along with its morphology and morphometry is of considerable interest for Forensic Pathologists [1-3]. Apart from this the hyoid fusion has been studied in relation to mastication and pathology of sleep apnea in susceptible individuals [4]. Several investigations have shown hyoid bone. The age at which the greater cornu fuses with the body are seen to be dependent

on the population studied and the methods employed [5]. Some authors have reported that the fusion of hyoid bone occurs only after 40 years of age while other observed that the bone fused at an earlier age. Earlier works was on 170 excised hyoid bones from dead bodies belonging to the age group of 20-65 years of Indian origin [6]. Hence, the present study was planned to analyze the fusion of hyoid bone in different age-groups.

MATERIALS AND METHODS

The present study was conducted in the department of Human anatomy of the medical institute. For the study, we selected dead bodies in the age group of 18-65 years. We studied a total of 50 cases. Only cases of known age were studied. Cases with neck compression or hyoid fracture were excluded from the study. Careful dissection of the neck structures was done to take out the hyoid bone. Hyoid bone was removed with extreme caution so as the bone does not break and be confused with fracture of hyoid bone. The hyoid bone from each patient was placed in a labeled wooden box and buried in the earth for four weeks to remove soft tissues attached to the bone. After 4 weeks, the hyoid bone was taken out, cleaned and air dried. The structure of the bone and fusion of greater cornua to body of hyoid were studied. A master chart was prepared to store the data. The samples were placed in categories of five year age intervals.

The statistical analysis of the data was done using SPSS program for windows. The significance of the data was verified using Chi-square test and Student's t-test. The significance was predetermined at $p<0.05$.

RESULTS

Table 1 shows the age distribution of the study group according to sex. A total of 50 cases were included in the study group. We observed that a total of 30 males and 20 females comprised the study group. Maximum number of cases were found in the age group of 40-45 years, followed by the age group 55-60 years. Maximum male and female cases were in the age group 40-45 years **(Fig 1). Table 2** shows the fusion of hyoid bone in different age groups. We observed that unilateral fusion was observed in 23 cases; bilateral fusion was observed in 19 cases; and non-fusion in 8 cases. Zero case of unilateral fusion was seen in 18-25, 40-45, 45-50, 50-55, and 60-65 years age group. 7 cases of unilateral fusion were seen in age group 25-30 and 55-60 years age group. Similarly, zero case of bilateral fusion was seen in the age group of 18-25, 25-30, 35-40, 45-50,55-60, and 60-65 years. 7 cases of bilateral fusion were seen in the age group of 40-45 years. Non-fusion was seen in 5 cases in the age-group 18-25 years. Also, non-fusion was seen in 3 patients in the age group 35-40 years age group (**Fig 2)**. The results were statistically significant ($p<0.05$).

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

Age group (years)	Total no of patients (n)	Males	Females
18-25	3	2	1
25-30	8	5	3
30-35	5	2	3
35-40	6	3	3
40-45	9	5	4
45-50	3	2	1
50-55	6	4	2
55-60	8	5	3
60-65	2	2	0
Total	**50**	**30**	**20**

Fig. 1: Showing Age distribution according to sex of the study group.

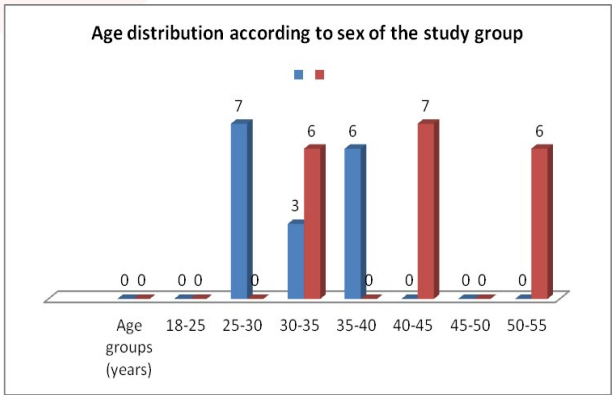
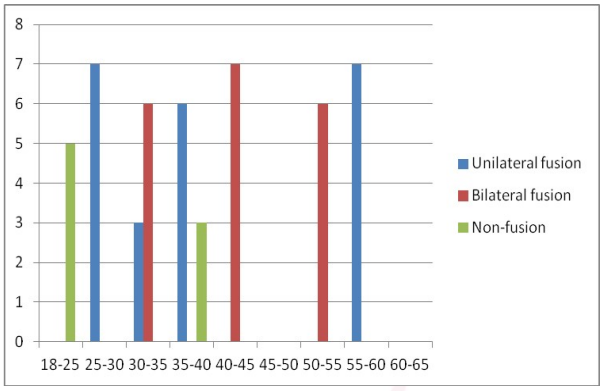


Table 2: Fusion in different age-groups.

Age groups (years)	Unilateral fusion	Bilateral fusion	Non-fusion
18-25	0	0	3
25-30	7	0	1
30-35	3	6	0
35-40	6	0	3
40-45	0	7	0
45-50	0	0	0
50-55	0	6	0
55-60	7	0	0
60-65	0	0	0
Total	**23**	**19**	**8**

Fig. 2: Showing fusion of hyoid bone in different age-groups.



DISCUSSION

In the present study, we analyzed the fusion of hyoid bone in different age groups. We observed that unilateral fusion of hyoid bone was seen in more cases as compared to bilateral fusion and non-fusion (unilateral, n=23; bilateral, n=19; non-fusion, n=8). Similar studies conducted by other authos demonstarted consistent results. Gupta A et al conducted a study to determine the age of fusion of greater cornua with the body of hyoid bone. Age of fusion of hyoid bone can help in determining the age of an individual, especially of unknown dead bodies where only skeletal remains are available. A victim of compression of neck will more likely have fracture of hyoid bone if his hyoid bone is fused. Indian authors have reported that the fusion of hyoid bone occurs after 40 years of age. Studies done by foreign workers observed that hyoid bone fused at an earlier age (30-40 years).

A total of 170 excised hyoid bones from dead bodies belonging to the age group of 20-65 years were studied. Fusion occurred earlier in females as compared to males by about 5 years. The mean age of unilateral and bilateral fusion in males was 38.25 and 53.16 years, respectively. The mean age of unilateral and bilateral fusion in females was 38.00 and 48.50 years, respectively. All the hyoid bones were fused after the age of 60 years. No significant differences were found between the fusion on right and left side. Miller KW et al used an image analysis system was to take a series of 30 measurements on digitized radiographs of 315 hyoid bones from people of known age and sex. The degree of fusion of the greater cornua to the hyoid body was also recorded. Statistical analysis of these data shows that there is a continuous distribution of hyoid bone shapes and the most bones are highly symmetrical. Based on smaller samples, previous researchers have suggested that non-fusion is more common in women than in men. In contrast, our data suggest that men and women have similar non-fusion rates. Analysis of sexual dimorphism shows that the greatest length differences are in the greater cornua. There are also significant sex differences in hyoid shape. For example, the distal ends of the greater cornua of women are significantly longer than those of men [7,8].

Ucar FI et al evaluated differences in craniofacial morphology, head posture and hyoid bone position between mouth breathing (MB) and nasal breathing (NB) patients. Mouth breathing patients comprised 34 skeletal Class I subjects with a mean age of 12.8 ± 1.5 years (range: 12.0–15.2 years). Thirty-two subjects with skeletal Class I relationship were included in the NB group (mean 13.5 ± 1.3 years; range: 12.2–14.8 years). Twenty-seven measurements (15 angular and 12 linear) were used for the craniofacial analysis. Additionally, 12 measurements were evaluated for head posture (eight measurements) and hyoid bone position (four measurements). Statistical comparisons showed that sagittal measurements including SNA, ANB, A to N perp, convexity, IMPA and overbite measurements were found to be lower in MB patients compared to NB. Vertical measurements including SN-MP and PP-GoGn, S-N and anterior facial height were significantly higher in MB patients, while the odontoid proses and palatal plane angle (OPT-PP) was greater and true vertical line and palatal plane angle (Vert-PP) was smaller in MB patients compared to NB group. No statistically significant differences were found regarding the hyoid bone position between both groups. The authors concluded that the maxilla was more retrognathic in MB patients. Additio-nally, the palatal plane had a posterior rotation in MB patients. However, no significant differences were found in the hyoid bone position between MB and NB patients.

Kim DI et al conducted a study focused on sex-based morphometry of the hyoid bone in Koreans using digital photographs. Hyoid bones from 52 males and 33 females were examined.

For each subject, they took 34 measurements from photographs using a computer program, and the data were analyzed statistically using SPSS 11.0. Twenty-one of 34 measurements had significant sex differences. The discriminant functions based on three measurements (X(1)-X(3)) were as follows: The accuracy of discriminant functions is 88.2% in both groups, so these can be used to distinguish males from females in a statistically significant manner [9,10].

CONCLUSION

From the results of present study, we conclude that non-fusion of greater cornua with body of hyoid bone is obsereved in cases of young age. Also, unialteral fusion and bilateral fusion is more commonly seen in the age group 40-45 years age group.

Conflicts of Interests: None

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