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Medicine

THE ASSESSMENT OF AGE OF A PERSON BY THE STUDY OF ANATOMICAL FUSION OF GREATER HORN WITH THE BODY OF HYOID BONE

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ABSTRACT The hyoid bone is one of the peculiar bone where there is no articulation with other bones and is supported by the neck muscles. It is having special role to balance the physiology of the deglutition. The complete ossification of the hyoid bone is having much significance in assessing the age in the middle age people, particularly helpful to assess the age of the unknown dead bodies. So many studies have revealed the approximate time of ossification giving wide range. Hence, we attempt to reduce the range of approximate time of ossification by studying the bony growth and ossification in multiple subjects and to arrive the possible least range.

KEYWORDS : Hyoid Bone, Age, Ossification.

Introduction

The bones and teeth are the important tools in the human body to assess the age of the person as they are having specific growth pattern. The bones develop by calcification and ossification according to the calcium availability. The age of a person is determined by the appearance and fusion of the primary and secondary ossification centres of the bones in the body. There is a specific time of appearance of the ossification centres and fusion of the ossification centres with the bone. The growth of the bone is also influenced by various factors like, endocrinal, environmental, nutritional and genetical conditions. The hyoid bone is one of the important bone where the ossification is used to assess the age of the person in the middle age group. Anatomically, the hyoid bone is having a body, two greater horns and two lesser horns, with 'U' shape in horizontal position between chin and neck. Field EJ, [7] the name "Hyoid" which means U-shaped i.e. the shape of the Greek letter Upsilon. The junction of the greater horn and body starts fusing after 40 years of age and completes the fusion after 60 years of age. Hence, we attempt to study the ossification pattern of the hyoid bone to determine the accuracy of the ossification time and to reduce the range of time of ossification.

Objectives of The Study

a. To study the pattern of fusion of the joint at greater horn with the body of the hyoid bone to determine the age of the person.

Review Of Literature

Achintya Biswas, Sukanta Mazmdar, Tanmoy Saradar,9. in their study, they taken thirty human hyoid bones belonging to the Indian Bengali population. According to their study, the mean age of fusion in the pooled sample was 57.28 years, again in males it was 59.00 years. It was seen from the present study that the mean age of fusion did not significantly differ in the two sexes. Also, there was no difference in the mean age of fusion of left and right side. Thus, it is concluded that age of fusion of hyoid in Indian Bengali males and females was 59.00(SD 9.45) and 55.57(SD 13.62) respectively. The age dependency of hyoid fracture is correlated with the degree of ossification or fusion of the hyoid synchondroses. Poltanen MS and UbelakerDH [1], It is usually united in older victims of strangulation whereas ununited hyoids are found in younger victims. Kanetaka. H [13], this clearly indicated that age is one of the important determinants of hyoid fusion.

Bhavna, Derabassi, Rajan Kumar Singla, Ravi Kant Sharma 10, According to these study, out of thirty hyoid bones, all aged >60 years, bilateral fusion was seen in only 13 (43.3%) bones with additional 10 bones (33%) showing unilateral fusion. There was not much sex variation in bilateral fusion (male 7/15 bones, females 8/15 bones) but unilateral fusion depicted contrasting results. In males it was more on left side (R:L::1.3) while in females it was more on right side (R:L::5:1), they can interpret that after the age of 60 years in males, the fusion is seen 3 times more on left side as compared with right side while in females it is seen 5 times more on right side as compared with left side. D'Souza DH 8, the work from North India, no significant sexual and side differences were found between the incidences of fusion of greater cornu with the body of hyoid in almost all the age groups except in those above 60 years of age. Balseven-Odabasi [14], the fusion of greater horn & body are not only age dependent but also sex dependent so that with the advancing age, the hyoids of women are less likely to fuse than men.

Earlier Harjeeet K, Kaur et al [4], conducted a study in 200 hyoid bones M:F::133:67) with age between 18-85 years. They found a complete bilateral fusion in 16.5% males and 26.9% females bones. Similarly, unilateral fusion was seen in 6% of their male bones and 7.5% of female bones.

According to O' Halloran and Lundy [11], bilateral fusion of greater cornu joints was more frequent in males than in females in all age groups after third decade while unilateral fusion was more common in females as compared with males. Hyoid bone is seldom fractured in children because it is not ossified i.e., joint between greater cornua and body are unfused.

Shimizu et al [5]. opined that the population of males and females with bilateral lack of fusion is roughly equal. Gad EI [15], careful examination of hyoid bone grossly and radiologically is very important for forensic pathologist to distinguish fracture, incomplete fusion, regular articulation between the body and greater horns and greater horn diastases.

Miller et al [12]. confirmed that the proportion of people with bilateral fusion steadily increases with increasing age but at the same time they showed that many elderly individuals (30% after 4th decade) have either unilateral or bilateral non-fusion. Also, they could not find evidence for a sex difference in the age at which bilateral fusion occurs. According to Gupta et al [3], victim of compression of neck will more likely have a fracture of hyoid bone, if the hyoid one is fused. Leksan I, Marcikic M [2], it may be attributed to the loss of elasticity and ability of

shape adaptation to force impact on one hand & specific morphological characters on the other hand. Adelson L [6], the frequency of unilateral non fusion especially in females is of greater importance for forensic pathologist. Instances have been reported where innocent persons were charged and found guilty of homicide by strangulation in which major piece of evidence was the mistaken conclusion by pathologist that hyoid bone hand been fracture.

Methodology

The study will be conducted by the dissection of the neck structures during the post-mortem examination of the deceased who appears to be healthy as per the physical findings and gross appearance brought to the Mortuary, GGH, Guntur. The junction of the body with the greater horn of hyoid bone are noted. The X - rays are taken for all hyoid bones, with proper labelling. The state of fusion is identified and the probable age of the person is correlated. Any variations in the both sexes are studied and compared with the classical findings. A proforma is prepared containing all the vital data. The data is subjected to analysis by suitable statistics.

Material & Methods

107 cases of Hyoid bones are taken from the selected subjects, with due consent from the relatives of the deceased and escort police. The Hyoid bones are treated, then processed and subjected to 'X' Rays.

According the anatomical differentiation of the body and greater horns of the Hyoid bone the process of fusion can be classified into the following '5' stages for the analysis of fusion of Hyoid bone.

1. Stage – 0: Process of fusion of greater horns with the body of hyoid bones not initiated.
2. Stage – 1: Formation of callus (which is determined by the shortening of the gap between body and greater horns of the Hyoid bone)
3. Stage – 2 : Completion of formation of the callus (Determined by filling the gap between greater horn and body of the hyoid bone).
4. Stage – 3 : Fusion of greater horns with the body on one side (Partial Fusion)
5. Stage – 4 : Fusion of greater horn with the body of hyoid bones on both sides (Determined by Complete Fusion).

Observations

Total number of cases taken for study are: 107 Cases. In these 107 cases the process of fusion of greater horns of hyoid bones with body are divided according to the age groups. It is observed that the process of fusion of greater horn and body of hyoid bone not initiated and a gap is observed in 21 (19.626%) cases (Stage – 0). Approximation of greater horn and body of hyoid bone present in 18 (16.822%) cases (Stage -1). Partially fusion of greater horn with the body (one side) is observed in 25 (23.364%) cases (Stage -2). Union of greater horns and body of hyoid bones seen in 24 (22.429%) cases with demarcation (Stage -3). Complete fusion of greater horns of hyoid bones with bones without any demarcation is seen in 19 (17.757%) cases (Stage -4).

Fusion of greater horns with the body starts after attaining the age of 25 years. First stage of fusion is approximation of the greater horns with the body. The approximation starts after 25 years in all cases. The two cases are in exception where on observation no approximation even after 30 years. The process of fusion which is determined by approximation of greater horns with the body starts from 25 years to 45 years (18 Cases, 16.8%). Partial fusion (fusion of one side greater horn) occurs gradually between 46 – 50 Years (25 cases, 23.3%).

The union of greater horns with the body with demarcation occurs gradually between 50 – 60 Years (43 cases, 40.1%). Two of the cases show exception with early union of greater horns with the body at the age of 45 years. Complete fusion occurs without demarcation in the age group 60 Years and above. But in two cases there is fusion of greater horns with the body without demarcation below 60 years. There is no significant difference between males (11 cases 57.89%) and females (8 cases 42.105%) in the complete fusion age (60 – 65 Years), in total number of completely fused cases 19.

The following table shows the statistics of different stages of fusion of hyoid bone with greater horns in respect to the age and their percentages.

Table 1: Cases Fusing According to Stages

S.No.	Stage of Hyoid Bone	Age Group	Number of Cases	Exceptional Cases
1	Stage No: 0	< 25 Years	21 (19.626%)	2
2	Stage No: 1	25 – 45 Years	18 (16.822%)	
3	Stage No: 2	46 – 50 Years	25 (23.364%)	
4	Stage No: 3	50 – 60 Years	24 (22.429%)	2
5	Stage No: 4	>60 Years	19 (17.757%)	2

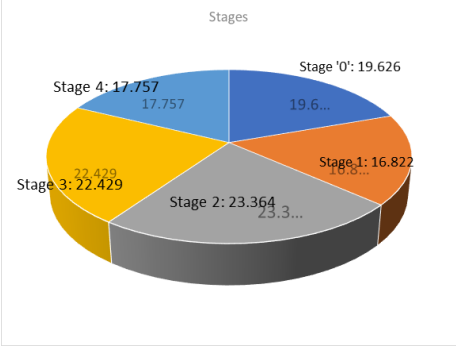
Table 2: Cases According to Sex

S.No.	Total Cases	Male	Female
1.	107	76 (71.02%)	31 (28.97%)

Table 3 Cases Fused by 60 to 65 years

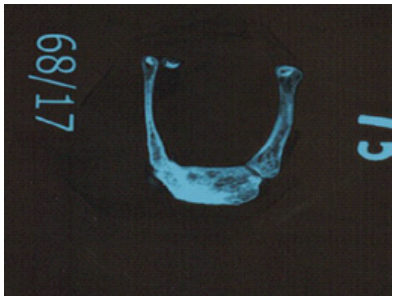
S.No.	Total Fused cases	Male	Female
1	19	11 (57.89%)	8 (42.105%)

Pie Representation 1 Cases Fusing According to Stages



1. Digital X-Ray showing Bilateral Non Fusion of Hyoid Bone

2. Digital X-Ray showing Unilateral Fusion of Hyoid Bone



3. Digital X-Ray showing Complete Fusion of Hyoid Bone

Discussion

The present study was designed to examine the age at which the body of hyoid bone fuses (calcifies) with the greater cornu in Indian Telugu population. The process of fusion of body of hyoid bone with greater horns starts after 25 years. In Stage -0, In the age below 25 years, there is no approximation between body and greater horns. In Stage -1, The approximation starts after 25 years in all cases, though exceptions have been reported in the age of fusion of body of hyoid bone with greater horns, the exceptions being endocrinal, social or nutritional factors, but the exact reason could not be made out. In Stage -2: Partial fusion (fusion of one side greater horn) occurs gradually between 46 – 50 Years.

In Stage -3: The union of greater horns with the body with demarcation occurs gradually between 50 – 60 Years. Some of the cases shows the final stage of fusion at the junction. In Stage -4: Complete fusion occurs without demarcation in the age group 60 Years and above. It was seen from the present study that the age of fusion did not significantly differ in the two sexes.

As per our analysis there is no much influence in the ossification of hyoid bone pertaining to the occupation. Many of our cases under study are laborers with regular hard work. Likewise, the marital status of the subject has also no role in the ossification of the hyoid bone.

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Conflict of interest: None declared.

Ethical approval: The study was approved on 27.07.2017 by the institutions Ethics Committee.

Conclusion

After observing the fusion of hyoid bones in the selected subjects, the stage of the ossification and correlating the findings with the other studies done earlier, we are able to conclude that:

1. The process of fusion of body of hyoid bone with greater horns starts after 25 years.
2. The process of calcification and ossification will be dynamic between the 25 – 45 years age.
3. Partial fusion occurs gradually between 46 – 50 Years.
4. The process of fusion is about to complete between 50 – 60 Years age.
5. The hyoid bone will be completely fused with the body and greater horns after 60 years of age and it can be assumed as a definite parameter in assessing the age of a person. Hence, the dispute regarding senior citizen ship can be solved with this single parameter.
6. All these findings are based on the gross observations in 'X' Ray of the hyoid bones. The anatomical measurements are not taken pertaining to the length, width, thickness and angle of the greater horns and body of the hyoid bone which is the limiting factor for this study.

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