

FUSION BETWEEN BODY AND GREATER CORNU: A RADIOLOGICAL STUDY OF DRY HYOID BONES

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ABSTRACT

Introduction: The study of fusion of body and greater cornua of hyoid bone is of tremendous clinical and forensic significance as it can be used to estimate the age of living or dead or skeletonized remains. It becomes all the more important as this fusion is relatively immune to some individual factors like life style, health and nutrition etc.

Material method: The study comprised of 15 male and 15 female bones all collected from human cadavers with age >60 years. Digitalized radiographs of these bones were taken and fusion between body and greater cornua was studied.

Results: A bilateral fusion was seen in 43.3% bones with another 33% showing unilateral fusion. The bilateral fusion did not depict any sex difference but unilateral fusion was more common on left side in males and right side in females.

Conclusion: Fusion of body and greater cornua of hyoid bone after age of 60 years is not always seen so one should be cautious in interpreting fracture of this bone in persons with age >60 years and look for other local pathological features like haematoma formation at the site of fracture.

KEY WORDS: Hyoid bone, Greater cornua, Fusion.

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INTRODUCTION

During the process of developing a biological profile for identified skeletal material, possibly the least likely bone to be used is the hyoid, a small horseshoe shaped bone positioned in the anterior upper neck [1]. The name "Hyoid" is derived from the Greek word "Hyaidēs" which means U-shaped i.e. the shape of the Greek letter Upsilon [2].

The age dependency of hyoid fracture is correlated with the degree of ossification or fusion of the hyoid synchondroses. It is usually

united in older victims of strangulation whereas ununited hyoids are found in younger victims [3]. An increased degree of ossification of hyoid synchondrosis in aged people is responsible for losing elasticity and ability of shape adaptation to force impact on one hand, and on the other hand of specific morphological characteristics of fractured bones [4].

Estimation of age, either in the living person or in the dead bodies or in skeletonized remains, is of tremendous forensic significance. Among the skeletal changes used for age estimation in

adults, fusion of the body and greater horn of the hyoid bone is an easy and objective finding. Increasing age induces fusion in the hyoid bone [5]. Thus it can help in determining the age of an individual, especially of unknown dead bodies where only skeletal remains are available [6]. Furthermore, study of fusion in the hyoid bone has certain advantages. D'Souza et al [5] considered this fusion to be relatively immune to some individual factors like lifestyle, health and nutrition etc. Moreover, since it is a superficial and smaller bone it is easy to study. 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 [7]. There is a sharp rise in hyoid bone fusion in both males and females after the age of 60 years [8] so that all bones are fused after this age [6].

On the contrary none is fused below the age of 20 years [5] or below the age of 25 years [9].

MATERIALS AND METHODS

The material for the present study comprised of 30 dried Hyoid bones, (M:F::15:15), dissected out from cadavers with age > 60 years. These were made available from Department of Anatomy, Govt. Medical College, Amritsar. Bones were labelled from 1- 30 with suffix M (male) or F(female). Each hyoid bone was examined as a whole and digitized X-ray films were taken to analyse fusion of the joints between body and greater cornua. It was observed for both the sides.

RESULTS

Table 1: Showing fusion between body and greater cornu.

	Male (n=15)			Female (n=15)		
	Bilateral	Right only	Left only	Bilateral	Right only	Left only
Present	7(46.6%)	1(6.66%)	3(20%)	6(40%)	5(33%)	1(6.66%)
Absent	4(26.6%)			3(20%)		

Table 1 shows the incidence of fusion between body and greater cornua of hyoid bones. Out of the 15 male bones, 7(46.6%) depicted a complete bilateral fusion. While 4(26.6%), showed no fusion on either side. 3 bones (20%) showed only left sided fusion. 1(6.66%) bone showed only right sided fusion.

In the female bones, bilateral fusion was seen in 6(40%) bones with no fusion in 3(20%). The incidence of unilateral fusion in females was

more on right side [5(33.3%)] as compared with left side [1 (6.66%)].

DISCUSSION

As evident from Table 1 out of thirty hyoid bones of the present study (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). Thus we 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.

Earlier Kaur et al [9] 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% female bones as compared with our figures of 46.6% and 40% respectively. It may be explained by the fact that in our study all bones were of the cadavers >60 years of age. Similarly unilateral fusion was seen in 6% of their male bones and 7.5% of female bones as compared with our corresponding figures of 13.3% and 20%. The reason may be the same.

According to O' Halloran and Lundy [10] 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. On the contrary, Shimizu et al [11] opined that the population of males and females with bilateral lack of fusion is roughly equal. 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 nonfusion. Also they could not find evidence for a sex difference in the age at which bilateral fusion occurs.

Clinical Implications:

1. According to Gupta et al [6] victim of compression of neck will more likely have a

fracture of hyoid bone if his hyoid bone is fused. 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 [4] However, strangulation should not be declared unlikely on the basis of a hyoid free of fracture even in advanced age, since a significant percentage of elderly people have persistent and flexible greater cornual joints[10].

2. The frequency of unilateral nonfusion 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 had been fractured [13]. Since females are commonly victims of manual strangulation and since data in the present study shows that 40% (6 out of 15) of adult of adult females have unilateral nonfusion of greater cornua, it is important for the pathologist to examine the hyoid bone carefully. It should be removed and visually examined for evidence of haemorrhage in any area of mobility. The diagnosis of a premortem fracture should not be made in absence of haemorrhage at the fractured site. [10]

3. Hyoid is seldom fractured in children because it is not ossified i.e. joint between greater cornua and body are unfused [10] and the bones are more flexible than in adults[14].

4. Gordan et al [15] are of the view that since incomplete ossification may be easily mistaken for fractured hyoid, so radiography prior to dissection of hyoid should be mandatory. Thus an incomplete ankylosis of greater cornu to the body that frequently occurs even in older adults should not be mistaken for a fracture.

5. An incomplete fusion is frequently confused with a fracture of hyoid bone in both clinical [16] & forensic setting [17]. So 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[18].

CONCLUSION

After the age of 60 years, bilateral fusion of body

and greater cornu of hyoid bone is seen in only 43.3% with additional 33% showing unilateral fusion, bilateral fusion didn't depict a much sex difference and there is unilateral fusion was 3times more common on left side in males as compared with right side while in females it was 5times more common on right side as compared with left side.

Conflicts of Interests: None

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