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ORIGINAL PAPER

# A Study of Hyoid Bone Fracture in Cases of Ante mortem Hanging

***Baishya Manoj Kumar***

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**ABSTRACT**

*Hyoid bone fractures are rare injuries that can be difficult to diagnose. Typically resulting from a direct compression to the anterior neck, hyoid fractures can lead to subcutaneous edema and subsequent airway compromise and death. Typically, these fractures have tremendous medico legal importance in forensic investigation. To raise awareness of this potentially dangerous fracture, the authors studied 316 cases of hanging cases to find out hyoid bone fractures in medico legal autopsy at Gauhati Medical College, Assam. This study has tried to evaluate the different aspect of three-isolated hyoid bone fracture amongst those cases of hanging.*

***Key Words:*** *Hyoid Bone, Fracture, Suicide*

**Address for correspondence and Reprint**
Demonstrator
Department of Forensic Medicine and Toxicology
Gauhati Medical College, Guwahati, Assam
Email: manoj.baishya9@gmail.com

## INTRODUCTION

The hyoid bone, which is also known as lingual bone, is situated in the anterior midline of the neck between the chin and the thyroid cartilage. The bone consists of a central part called the body and two pairs of cornua, two greater cornua and two lesser cornua.

The primary role of the hyoid bone is to support the weight of the tongue, allowing people to articulate words while speaking, and enabling the production of a wide range of vocalizations. In addition to being of interest to living humans, the hyoid also bears important in forensic analysis. When the hyoid bone is broken, it is a strong indicator that someone was strangled, as the bone is otherwise extremely difficult to break. So when any case of hanging, strangulation or throttling comes for postmortem examination, the hyoid becomes the most integral part of internal examination at the autopsy table. Victims of compression of neck will more likely have fracture of hyoid bone if his hyoid bone is fused.[1]Fracture of the hyoid bone is rare, accounting for only 0.002% to 1% of all fractures.[2, 3]

Many authors and workers in this field have seriously highlighted fracture of hyoid bone. Though percentage of hyoid bone fracture in cases of hanging vary according to different research study by different author, but almost all study groups agreed that hyoid bone fracture increases with age above 40 years due to calcification, loss of elasticity and immobilization.

This article has aimed to evaluate the importance of age as contributing variable of hyoid bone fracture in cases of ante mortem hanging.

## OBJECTIVE

To analyze the frequency of hyoid bone fractures caused by suicidal hanging and compare the different methods of visualizing the those fractures. Results could be used for forensic purposes.

## MATERIAL AND METHODS

1. The present study was of 1 (one) year duration from 1st July, 2012 to 30th June, 2013, conducted upon all cases of death due to hanging which were autopsied in the mortuary of the Department of Forensic Medicine, Gauhati Medical College and Hospital, Guwahati, Assam.

2. The material for this study included all types of death due to hanging brought by police personal of different police station/outpost to our department for medico legal autopsy.

3. A Standard autopsy protocol was adopted with proper external examination and followed by internal examination. After palpation, the hyoid was very carefully removed from underlying structure to examine it thoroughly regarding the fracture number, site, type, etc.

4. Diagnosis of fracture of hyoid bone was solely made by placatory method and gross examination with naked eye. No pre autopsy X-ray of hyoid bone or help of microscopy was taken to diagnose fracture.

## OBSERVATION AND RESULTS

In this present study, it was observed that out of total 2772 cases, death due to hanging accounted only in 316(11.40%) and all were suicidal in nature.

Out of 316 hanging cases, only three (0.94%) cases showed evidence of neck structure of hyoid bone fracture.Hyoid bone fracture was found in all these three cases (0.94%). Only in two cases (0.63%) of this study fracture of the thyroid cartilage was found.Out of these three cases, two had combined fracture of hyoid bone and thyroid cartilage.One case of isolated hyoid bone fracture was observed in this study.In two cases, right greater horn was involved and in one case left greater horn.Abduction type of fracture was seen in all these three fracture cases of hyoid bone.

In the present study, it has been observed that incidence of hyoid bone fracture increases with age as shown in **Table 1**. Out of these three cases of hyoid bone fracture two cases were in the age group of 41-50 years and one case was in the age group of 71-80 years. Thus incidence of hyoid fracture was 12.5% for 71-80 years age group followed by 4.34% for the age group 41-50 years. The age wise distribution of hyoid bone fracture is also shown in **Figure 1**.

**Table 1** Age Wise Distribution of Hyoid Bone Fracture

| **Age in Years** | **No Of Cases** (Total=316) | **With Fracture** | | **Without Fracture** | |
|---|---|---|---|---|---|
| | | **Frequency** | **Percentage** | **Frequency** | **Percentage** |
| 00-10 | 0 | 00 | 00 | 0 | 100 |
| 11- 20 | 49 | 00 | 00 | 49 | 100 |
| 21-30 | 123 | 00 | 00 | 123 | 100 |
| 31-40 | 57 | 00 | 00 | 57 | 100 |
| 41-50 | 46 | 02 | 4.34 | 44 | 95.65 |
| 51-60 | 18 | 00 | 00 | 018 | 100 |
| 61-70 | 12 | 00 | 00 | 12 | 100 |
| 71-80 | 8 | 01 | 12.5 | 7 | 87.5 |
| 81-90 | 3 | 00 | 00 | 3 | 100 |

Considering the age demarcation of 40 years, it was found that fracture incidence increases above the age of 40 years as shown in **Table 2.** No case with hyoid fracture was seen below the age of 40 years.

**Table 2** Hyoid Bone Fracture in Relation to 40 Years Age Margin

| Age | Total Case (316) | Absence of Fracture | | Presence of Fracture | |
|---|---|---|---|---|---|
| | | Frequency | Percentage (%) | Frequency | Percentage (%) |
| Upto 40 yrs | 229 | 229 | 100 | 0 | 0 |
| More than 40 yrs | 87 | 84 | 96.55 | 03 | 3.44 |

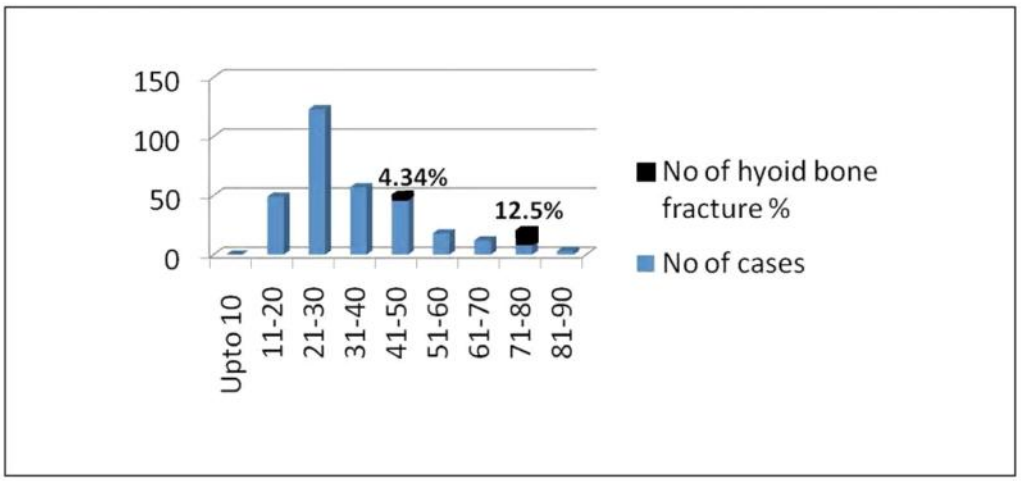


**Figure** 1 Bar Graph Showing Age Wise Distribution of Hyoid Bone Fracture

## DISCUSSION

Hyoid bone consists of the body and the greater and lesser horns. The fibrous connection between the greater horns and the body undergoes full osseous fusion in midadulthood. Multiple anterior neck muscles insert on its superior an inferior surface.

Incidence of fractures increases with age because neck structures become calciûed and more brittle in middle and later life.

The present finding is also supported by previous studies conducted by Polson CJ et al[4], Sharma BR et al[5], Cle'ment Renaud et al[6], Charoonnate Nantana et al[7], etc.Elfawal MA and Awad OA[8] stated that Individuals under 40 are generally regarded as less likely to sustain fractures because of the elasticity of the cartilage and mobility of the joints of the hyoid bones and the fact that young hyoid bone tends to be supple and bends rather snaps under pressure.

According to Wyatt JP et al[9], Drake RL, Vogl AW, Mitchell AWM[10]bony fusion of the greater horn and body of the hyoid bone is rare in an individual under 20 years old and increases with advancing age and hence incidence of fracture increases.

## CONCLUSION

Fractures of the hyoid bone in 0.94% who died of suicidal hanging were related with older ages and incomplete hanging but not related with location of the knot.
Hyoid bone is one of the most integral parts of internal examination during autopsy of hanging, ligature strangulation or throttling case. The incidence of hyoid fracture in hanging varies from one study to the next, from 0 to 60%.

Factors like age, sex, weight of the victim, type of suspension, position of ligature around the neck, ligature material etc may influence causation of fracture. However the most important one is the age of the victim.

To establish the fact with confirmation that age is the most strong and important contributing variable for hyoid fracture in hanging cases, one need further continuous study in this regard taking large sample.

**Ethical clearance**: Taken

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**Conflict of Interest**: Nil

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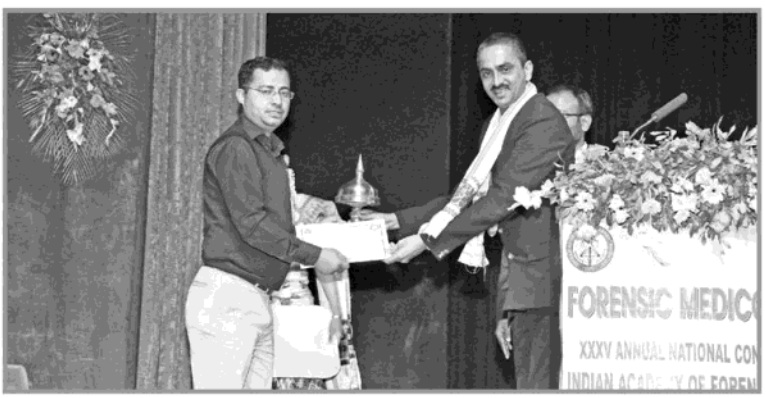


Dr. Raktim Pratim Tamuli, Demonstrator of Tezpur Medical College, Tezpur, Assam, India was awarded the best Poster at IAFM conference "Forensic Medicon 2014" held at Guwahati Medical College, Guwahati, Assam in 2014