



**ORIGINAL RESEARCH PAPER**

**Forensic Medicine**

**A STUDY ON ASPHYXIAL DEATHS SECONDARY TO NECK COMPRESSION IN HYDERABAD KARNATAKA REGION**

**KEY WORDS:** neck compression, neck structures, hyoid bone, thyroid cartilage, cricoid cartilage

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**ABSTRACT**

Asphyxia may result from a number of varied circumstances. It may arise from breathing air that is low in oxygen, from compression of the external airways (nose and mouth), from obstruction of the internal airways, from external compression of the neck or chest, or from awkward positioning of the body.<sup>1</sup> Asphyxia means apparent or actual cessation of life due to interruption of effective gaseous exchange in the lungs. Major proportion of unnatural deaths resulting from asphyxia is due to fatal neck compression. Pressure on the neck may arise from hanging, manual strangulation, ligature strangulation and other means of strangulation such as direct blows, arm locks and a variety of accidental lesions including entanglement of the umbilical cord around neck. Injuries to neck structures (Fracture of hyoid bone and laryngeal cartilages) is of great practical significance to forensic pathologist as it forms one of the most valuable autopsy finding in deaths due to neck compression. It forms a significant criterion when the gross autopsy findings and radiological findings can be correlated to mechanical injury to neck. Only skillful dissection, radiography of neck structures and appropriate interpretation of findings will serve the purpose. Absence of proper skills and techniques shall lead to post mortem artifacts. This study conducted in the department of Forensic Medicine MPMC, Gulbarga on neck structure specimens sent from various hospitals and primary health centers across the district focused primarily on determining incidence of fracture neck structures and its interpretation in deaths due to fatal neck compression. We studied 95 neck structure specimens over the period of four years which included 62 cases of hanging, 20 cases of ligature strangulation, 10 cases of throttling and 03 cases due to other causes of neck compression. Specimens subjected to radiography prior to dissection and findings were appropriately tabulated. Nature of fracture is determined by histopathological examination at the fracture site.

**INTRODUCTION**

Asphyxia may result from a number of varied circumstances. It may arise from breathing air that is low in oxygen, from compression of the external airways (nose and mouth), from obstruction of the internal airways, from external compression of the neck or chest, or from awkward positioning of the body.<sup>1</sup> Asphyxia means apparent or actual cessation of life due to interruption of effective gaseous exchange in the lungs.<sup>2</sup>

Major proportion of unnatural deaths resulting from asphyxia is due to fatal neck compression. Most often neck compression results from hanging, strangulation [ligature and manual], assault and less commonly from industrial trauma, traffic accident and fall from height.

Among the asphyxial deaths, hanging is the commonly used method of committing suicide and strangulation is the commonly used method for homicidal purpose.<sup>3</sup>

Hanging is a form of asphyxia death due constriction of the air passage at the neck as a result suspension of the body by a ligature in the form of noose, applied in such a manner, when weight of the body (complete hanging), or other part of the body eg. head acts as constricting force (partial hanging).<sup>4</sup>

Ante mortem fracture of hyoid bone is diagnosed by gross examination and radiological examination.<sup>9</sup> On gross examination, evidence of haemorrhage around the fracture site suggesting ante-mortem phenomena associated with other injuries to neck like bruises and soft tissue haemorrhage.<sup>10,11</sup>

Neck structures of forensic importance in cases of fatal neck compression mainly includes Hyoid bone and laryngeal cartilages [Thyroid and Cricoid cartilage].

Fracture hyoid bone / laryngeal cartilages forms one of the most valuable autopsy finding in deaths due to neck compression and serves as a great diagnostic criterion when the gross autopsy findings and radiological findings are correlated to mechanical injury of neck. This study aims to

find out incidence of fracture neck structures and its interpretation in deaths due to fatal neck compression. Our study also makes an attempt to differentiate ante mortem and post mortem injuries to neck structures in victims of neck compression by histopathological examination of fracture site.

**MATERIALS AND METHODS**

This study is conducted on Excised neck structure specimens sent by medical officers of Gulbarga and Bidar districts to the Department of Forensic Medicine and Toxicology MPMC, Gulbarga, Karnataka, for expert opinion regarding suspected hyoid bone and laryngeal cartilages fracture in cases of death due to neck compression, through the concerned police officials from January 2007- December 2010.

Excised neck structure specimens were received in the department of Forensic Medicine & Toxicology along with a copy of inquest report and autopsy reports through proper channel. These neck structure specimens were subjected to radiography prior to dissection for determining ossification status of hyoid bone and any evidence of fracture. Upon detection of fracture on radiography, Ante mortem/postmortem nature of fracture was determined by histopathological examination of the fracture site.

This study excludes neck structure specimens in which both hyoid bone and laryngeal cartilages were missing and those neck structure specimens not accompanied by postmortem report and inquest report.

**Findings:**

**Table No 1**

Year	Hyoid Bone Fractures			Thyroid cartilage Fractures		
	Present	Absent	Total	Present	Absent	Total
2007	05	20	25	02	23	25
2008	07	22	29	01	28	29
2009	04	17	21	00	21	21
2010	06	14	20	01	19	20
Total	22	73	95	04	91	95

**Table No 2: Sex Incidence:**

Sex	Hyoid Bone Fractures			Thyroid cartilage Fractures		
	Present	Absent	Total	Present	Absent	Total
Male	16	33	49	03	46	49
Female	06	40	46	01	45	46
Total	22	73	95	04	91	95

**Table No 3: Age Incidence:**

Age in Years	Hyoid Bone Fractures			Thyroid cartilage Fractures		
	Present	Absent	Total	Present	Absent	Total
<20	03	08	11	00	11	11
20-40	05	56	61	01	60	61
>40	14	09	23	03	20	23
Total	22	73	95	04	91	95

**Table No 4: Distribution of cases:**

Type of Neck Compression	Hyoid Bone Fractures			Thyroid cartilage Fractures		
	Present	Absent	Total	Present	Absent	Total
Hanging	11	51	62	00	62	62
Lig.Strangulation	04	16	20	03	17	20
Throttling	06	04	10	01	09	10
Others	01	02	03	00	03	03
Total	22	73	75	04	91	95

**Table No 5: Hyoid Bone fractures**

Age in Years	Ante mortem		Post mortem		Total
	Number	%	Number	%	
<20	00	0.0%	04	100%	04
20-40	02	25%	06	75%	08
>40	06	60%	04	40%	10
Total	08	36.3%	14	63.6%	22

**Table No 6: Hyoid Bone fractures**

Sex	Ante mortem		Post mortem		Total
	Number	%	Number	%	
Males	06	40%	09	60%	15
Females	02	28.5%	05	71.4%	07
Total	08	36.3%	14	63.6%	22

**Table No 7: Thyroid cartilage fractures**

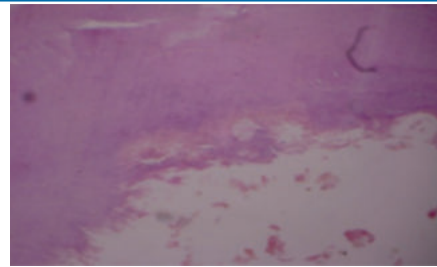
Age in Years	Ante mortem		Post mortem		Total
	Number	%	Number	%	
<20	00	0.0%	00	0.0%	00
20-40	01	33.3%	02	66.6%	03
>40	00	0.0%	01	100%	01
Total	01	25%	03	100%	04

**Table No 8: Thyroid cartilage fractures**

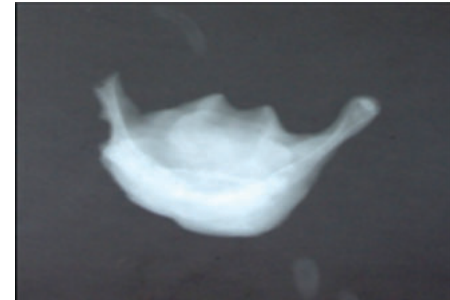
Sex	Ante mortem		Post mortem		Total
	Number	%	Number	%	
Males	01	33.3%	02	66.6%	03
Females	00	0.00	01	100%	01
Total	01	25%	03	75%	04



**Figure No 1 Hyoid bone showing inward compression of outer one – third of right greater horn**



**Figure No 2 Section showing RBC extravasations at the fracture site**



**Figure No 3 Hyoid bone showing clear cut incision of outer one – third of right greater horn.**



**Figure No 4 Section showing fracture site is devoid of RBC extravasations.**

**DISCUSSION**

This study documents almost equal distribution of cases of neck compression from both sexes and there was no sex predominance in the victims. This study data is consistent with study of Balabantaray et al<sup>7</sup> but contradicts with studies of Sarangi M.P et al<sup>8</sup> and Sengupta BK<sup>9</sup> et al, who noted predominance in male victims (75%) when compared to females (25%).

In the present study majority 61 (64.2%) of victims were aged between 20-40 yrs with youngest 16 years and eldest 78 years and this is supported by studies of Dixit P.G. et al<sup>10</sup>, Sengupta BK<sup>9</sup> et al and Luke et al<sup>11</sup> who also uphold the same finding. Ibrahim Uzun MD<sup>12</sup> in their retrospective analysis of 761 autopsy cases noted that most cases were in the age group of 20–29 years (226 cases, 25.69%) with youngest case of 10 years and the oldest on 83 years which is consistent with our study results.

In our study of 95 cases of fatal neck compression 22 fractures of hyoid bone were noted in which hanging alone accounted for 11(50%) of cases followed by Throttling 06(27.2%), Ligature strangulation 04(18.1%) and other causes 01(4.5%). Present study records' hanging as the most common cause of Hyoid bone fractures in victims of neck compression and is in accordance with studies conducted by Dixit et al<sup>10</sup>, B.R.Sharma et al<sup>13</sup>.

This study records out of 95 cases of fatal neck compression 22(23.15%) fractures of hyoid bone. In contrast to our study results, Betz & Eisenmenger<sup>14</sup>, Davison<sup>15</sup> observed (73%) and 46.8% Hyoid bone fractures in their study respectively. This is

explained by the fact that majority of victims in our study 72(75.87%) were aged less than 40 years and hyoid bone is generally not ossified before the age of 40 years and less likely to get fractured in this age group. Also many medical officers conducting neck dissection during autopsy often misinterpret the natural mobility of greater cornua of Hyoid bone as fracture before forwarding specimen for medicolegal examination.

As per this study, manual strangulation records 06(27.27%) of Hyoid bone fractures. In conjunction with our study, Luke<sup>16</sup> (1967) reported 38% of Hyoid bone fractures were due to manual strangulation.

In the present study, 22 fractures of hyoid bone were recorded of which 16 (75.27%) were males and 06 (27.27%) were females. Among males 06 (37.5%) were antemortem in nature and 10 (62.5%) postmortem in nature but in females 02 (28.57%) fractures were antemortem and 05 (71.42%) were post mortem in nature.

In the present study 22 fractures of hyoid bone were recorded, 14 (63.63%) in victims aged above 40 years followed by victims of 20-40 age group 05 (22.72%) and below 20 years 03(13.63%). Among victims over 40 years 06 (60%) are antemortem in nature and 04 (40%) postmortem in nature. only 02 (33.33%) antemortem fracture is noted in victims between 20-40 years and rest 06 (66.66%) were post mortem fractures. In contrast to the present study results Ibrahim Uzun MD<sup>12</sup> in their retrospective analysis of 761 autopsy cases noted that most cases hyoid bone fracture were in the age group of 20-29 years (25.69%).

In the present study 04 fractures of thyroid cartilage were recorded, 03 (75%) in males and 01 (25%) in females. 01 (33.3%) antemortem fracture was noted in males and rest 03 (66.6%) fractures are post mortem in nature.

Majority of fractures 03(75%) were noted in victims aged between 20-40 years and 01 (25%) case was reported in age group of more than 40 years . among fractures of thyroid cartilage, 03 (75%) fractures were noted in victims of manual strangulation and 01 (25%) case was reported in victim of manual strangulation.

**CONCLUSIONS:**

- Ossification of hyoid bone generally occurs after the age of 40 years in which bone becomes less pliable and mobile which can cause fracture of the bone usually at the cornua upon compression of the neck as documented in victims of hanging, manual and ligature strangulation.
- As hyoid bone is more cartilaginous below the age of 40 years, it has greater mobility and pliability and should not be confused with fracture particularly while dealing with neck dissection in victims of neck compression.
- There is a need of adopting very skillful techniques while dissecting the neck structures in all autopsy cases with special reference to victims of neck compression as in hanging and various forms of strangulation. It is very much essential in avoiding postmortem artifacts like cuts on hyoid bone and laryngeal cartilages during neck dissection.
- Best results come from best a sample, which includes proper dissection, preservation and timely forwarding through proper channel.

**Interest of conflict:**

- There is a need of training of medical officers in skillful dissection, removal, preservation and transportation of neck structures which plays a vital role in preventing incidence of post mortem fractures resulting from unskillful dissection.
- Fracture Hyoid bone and laryngeal cartilage is corroborative evidence in victims of neck compression,

the purpose of the examination can serve its purpose only when radiological, histopathological findings can be correlated to gross autopsy findings.

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