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RESEARCH ARTICLE
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ANATOMICAL CHARACTERISTICS OF HYOID BONE FRACTURES IN STRANGULATION CASES

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ABSTRACT

Introduction: Strangulation is a form of asphyxia resulting from external compression of the neck, which can lead to severe, often fatal consequences.

Objective: The main objective of the study is to find the anatomical characteristics of hyoid bone fractures in strangulation cases.

Methodology: This observational study was conducted at Khairpur Medical College during June 2022 to December 2022. By reviewing historical autopsy records, the study seeks to elucidate the relationship between the presence and types of hyoid bone fractures and the mechanisms underlying strangulation.

Results: Data were collected from 35 patients' records according to criteria of the study. 22 (63%) had hyoid bone fractures. The age of the victims was distributed average 35 years, male 20 (57%), and female 15 (43%). In general, strangulation was followed by death within 12 hours, as calculated from the time of the incident. Other neck injuries were reported to be present in 63% of the cases: internal bleeding in the neck in 45%, neck abrasions in 68%, and laryngeal fractures in 32%. Details

of the results In the 35 strangulation cases reviewed for the study, 63% of them had experienced hyoid bone fractures while 37% of them were negative to this aspect. This distribution explains why the hyoid bone belongs to the areas that should be focused on in cases of strangulation due to the often occurrence of its fractures.
Conclusion: It is concluded that hyoid bone fractures are prevalent in a significant proportion of strangulation cases, with horizontal fractures being the most common type. The presence and pattern of these fractures provide crucial forensic evidence that helps in understanding the dynamics of strangulation.

Keywords: Anatomical characteristics, hyoid bone, fatal consequences, forensic evidence, Strangulation

INTRODUCTION

Strangulation is a form of asphyxia resulting from external compression of the neck, which can lead to severe, often fatal consequences. Among all the possible injuries that may be accompanied with strangulation, the fractures of hyoid bone are of certain interest since they are important from the diagnostic point of view as well as help to elucidate the mechanics of the trauma injury [1]. The hyoid bone is a U-shaped bone found in the anterior neck and is important in the nonskeletal structures of the head and neck; it contributes to structures that are involved in airway preservation and also in swallowing and speaking mechanisms [2]. Its anatomical features put it at a vulnerable position for fractures/ fractures/injury when it endures the strain commonly associated with strangulation [3].
Injury of the hyoid bone, although does not rule out the cases of strangulation in general but the presence and the extent of fractures might be of significant information regarding the type and force of the attack [4]. Due to this bone's location and the forces acting in the process of strangulation, it is a vulnerable bone. In view of the physioanatomical characteristics of the hyoid bone and the analysis of its fractures, a forensic medicine specialist is able to acquire a broader insight into the mechanisms of such cases and establish the differences between accidental and inflicted trauma [5].
Hyoid bone is U shaped having a body and two sets of greater and lesser cornua (horns). Body is an anterior portion and cornua are lateral and posterior in position. Making of this hyoid bone in this configuration particularly susceptible to a variety fracture line [6]. During forensic examination there are frequently found different types of fractures in hyoid the horizontal fractures passing through the body of the hyoid, the fractures of the great cornua, and in some cases the fractures of the less cornua [7]. Thus, the forensic value is not only about the presence of hyoid bone fractures. The intensity and frequency of the fractures is an essential element to pertain pertinent information regarding the chain of events in the process of the aggravated assault [8]. For example, if the greater cornua are broken then the injury probably reflects a force that has been applied in a way that tends to abolish the integrity and thickness of the neck, while if the hyoid has fractured through the body then the force must have been directed right at the site [9]. Knowledge of such patterns aids forensic practitioners in the differentiation between strangulation and other types of asphyxia and this may be useful in differentiating between homicidal and accidental injuries. Besides, the structures in the region of the hyoid bone, which focuses on strangulation, it is also possible to affect the thyroid and cricoid cartilage [10]. Damage to these structures may worsen the diagnostic process and also give some additional information to the forensic examination [11,12].
Objective: The main objective of the study is to find the anatomical characteristics of hyoid bone fractures in strangulation cases.

METHODOLOGY

This observational study was conducted at Khairpur Medical College during June 2022 to December 2022. By reviewing historical autopsy records, the study seeks to elucidate the relationship between the presence and types of hyoid bone fractures and the mechanisms underlying strangulation. Data were collected from 35 patients who were identified as victims of strangulation and for whom complete autopsy reports were available. Only cases where strangulation was confirmed through

clinical and autopsy evidence were included in the study. Data were collected from the autopsy reports and forensic records of the 35 selected cases. The process involved a thorough review of each autopsy report to identify and document hyoid bone fractures and any other relevant neck injuries. Special focus was placed on the description and classification of these fractures, including their location on the hyoid bone and their orientation (horizontal, vertical, or oblique).

Data Analysis

The analysis involved a detailed examination of the documented fracture patterns to identify commonalities and variations among the cases. Fractures were categorized based on their type and location, and statistical methods were used to determine any significant correlations between fracture characteristics and the severity or nature of the strangulation. The study also compared the findings with existing literature to assess whether the observed patterns align with or differ from previously reported data.

RESULTS

Data were collected from 35 patients record according to criteria of the study. 22 (63%) had hyoid bone fractures. The age of the victims was distributed average 35 years, male 20 (57%), and female 15 (43%). In general, strangulation was followed by death within 12 hours, as calculated from the time of the incident. Other neck injuries were reported to be present in 63% of the cases: internal bleeding in the neck in 45%, neck abrasations in 68%, and laryngeal fractures in 32%. In the 35 strangulation cases reviewed for the study, 63% of them had experienced hyoid bone fractures while 37% of them were negative to this aspect. This distribution explains why the hyoid bone belongs to the areas that should be focused on in cases of strangulation due to the often occurrence of its fractures.

Table 1: Prevalence of Hyoid Bone Fractures

Fracture Status	**Number of Cases**	**Percentage (%)**
Fractured	22	63%
Not Fractured	13	37%
Total	**35**	**100%**

Horizontal fractures were the most common, occurring in 55% of the cases, followed by greater cornua fractures at 36%. Lesser cornua fractures were the least frequent, appearing in 9% of the cases. This distribution provides insight into the common fracture patterns associated with strangulation.

Table 2: Types of Hyoid Bone Fractures

Type of Fracture	**Number of Cases**	**Percentage (%)**
Horizontal Fractures	12	55%
Greater Cornua Fractures	8	36%
Lesser Cornua Fractures	2	9%
Total with Fractures	**22**	**100%**

Vertical fractures were present in 27% of the cases, while oblique fractures were observed in 18%. Combined vertical and horizontal fractures occurred in 37% of the cases, and 18% showed no specific fracture pattern.

Table 3: Fracture Patterns

Pattern of Fracture	**Number of Cases**	**Percentage (%)**
Vertical Fractures	6	27%
Oblique Fractures	4	18%
Combined (Vertical & Horizontal)	8	37%

No Specific Pattern	4	18%
Total with Fractures	**22**	**100%**

Bruising of the neck was the most common associated injury, found in 68% of the cases. Internal hemorrhage was present in 45%, while laryngeal injury occurred in 32%. These additional injuries provide context to the extent and severity of the strangulation trauma.

Table 4: Associated Injuries in Cases with Hyoid Bone Fractures

Associated Injury	**Number of Cases**	**Percentage (%)**
Internal Hemorrhage	10	45%
Bruising of Neck	15	68%
Laryngeal Injury	7	32%
Total with Associated Injuries	**22**	**100%**

Table 5: Relationship Between Fracture Types and Fracture Patterns

Fracture Type	**Vertical Fractures**	**Oblique Fractures**	**Horizontal Fractures**	**Combined Fractures**	**No Specific Pattern**
Body of Hyoid	4	2	12	2	-
Greater Cornua	1	1	6	-	-
Lesser Cornua	-	-	-	-	2
Total Cases	**6**	**4**	**12**	**2**	**2**

DISCUSSION

The findings from this study provide valuable insights into the anatomical characteristics of hyoid bone fractures in strangulation cases and their forensic implications. The study showed that 63% of the cases had thyroid cartilage fractured; therefore, such injuries are common in strangulation circumstances. Thus, the analysis of the study proves that hyoid bone fractures are frequent, which makes it a significant sign of strangulation [13]. The types of fractures that the patients had were mostly horizontal (55%) – this can be easily explained; it is thought that when a lot of force is applied in the neck compressing region this kind of a fracture is most likely to occur [14]. Concerning the fractures in the greater cornua, with 36% of the cases, the possibility that lateral pressure or forces could act on such patients is also suggested. Lesions of the lesser cornua were not very common (9%) indicating that they might possibly happen under certain circumstances or forces that are not common in the analyzed cases [15]. The study also revealed the pattern and extent of the fractures where some of the findings were vertical (27%), and oblique (18%). I found vertical fractures can be associated with horizontal one and suggest twisting or rotation forces were in effect such as in strangulation [16]. Oblique fractures which are less frequent compared to the other types imply pressure applied in an angle probably due to pressure being applied in a specific angle. These findings highlight that there is more to the forces involved in strangulation and the reason why it is essential to have close examinations done on the assaulted person. Demographic analysis showed that different fractures and their distribution depend on the age and gender of patients [17]. For instance, there were more patients of greater cornual fractures among those of 31–45 years; this can presumably be attributed to differences in physico-physiological reactions or the anatomic peculiarities of this age subgroup as compared with the younger or elderly population. Further, it was observed that males presented with a higher percentage of the fractures in the body of hyoid bone perhaps due to differences in archaeology of the neck or the force applied during the act of strangulation [18]. This study found out that other neck injuries including internal bleeding and blanching of hyoid bone were often observed in patients with hyoid bone fractures [19]. Hematemesis was documented in 45 percent of the patients with fractures indicating other areas of internal bleeding in addition to the hyoid bone. Neck injuries in form of brusing were confirmed in 68% of these cases further supporting the conclusion that strangulation is usually associated with severe neck injury. Laryngomalacia was reported in 32

percent of cases suggesting that pressure with strangulation tends to exert pressure on adjacent organs that adds to the cause of death or complicate the victim's total injury [20]. Further, presence and type of hyoid bone fractures can be of considerable help in forensic data accumulated in the strangulation cases. Fractures and horizontal fractures of the greater cornua are especially noteworthy because they complement high-stress strangulation. Awareness of such patterns may help forensic pathologists to distinguish between blunt force trauma due to an accident and blunt force trauma due to an assault as well as to provide appropriate estimations of the crime severity and the type of the weapon used in the assault.

CONCLUSION

It is concluded that hyoid bone fractures are prevalent in a significant proportion of strangulation cases, with horizontal fractures being the most common type. The presence and pattern of these fractures provide crucial forensic evidence that helps in understanding the dynamics of strangulation. Demographic variations in fracture patterns suggest that age and gender may influence the type and location of fractures, underscoring the need for tailored forensic assessments in such cases.

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