

The Fracture of Hyoid Bone in Strangulation - A review

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Fifty-seven medico legal autopsies on strangulation deaths, conducted during five-year period between January 1995 and December 1999 in the Department of Forensic Medicine and Toxicology, Khyber Medical College Peshawar, were reviewed. The result revealed that incidence of fracture of hyoid bone was exceptionally high in manual strangulation (73%) compared to the overall incidence of (22.8%). Majority of the victims (80.7%) were strangled by means of hanging or ligature strangulation. Fracture of the hyoid bone was more common in the age group above forty (40%). 27.3% hyoid bones were fractured where the Level of constriction of neck was above thyroid cartilage and 16.7% where it was at or below thyroid cartilage.

Key words: Hyoid bone, strangulation, asphyxia

Number of post-mortem observations may facilitate the diagnosis of strangulation but the fracture of the hyoid bone has a significant practical relevance¹. It is highly suggestive of death due to compression of the neck. Constricting force to the neck may either be applied directly through hands (manual strangulation) or indirectly through a ligature, which in turn, may be applied actively (ligature strangulation) or passively (hanging)².

Though no age group is immune, yet the incidence is more in the age group of above forty years, which can be explained by the fact that the ossification in the bone at this age makes it hard and inelastic and thus more liable to fracture^{3,4}. The level of the neck where the constricting force is applied may also play a contributory role. Two mechanisms of fracture, direct through lateral compression and indirect through traction on the thyro-hyoid ligament have been reported^{5,6}.

The following study was conducted to find out the incidence of fracture of hyoid bone in deaths due to strangulation and its relationship with age of the victim. An effort was also made to determine the level of application of constricting force in the neck and its relationship to the fracture of the hyoid bone.

Subjects and Method

For the present study, which was conducted in the Department of Forensic Medicine and Toxicology, Khyber Medical College Peshawar, fifty-seven cases of strangulation were reviewed which were conducted between January 1995 and December 1999, with regard to age, presence or absence of fracture of hyoid bone and the level of constriction of neck where the force was applied. Those cases where injuries were though present on the neck, but the cause of death was other than strangulation, were excluded from the study.

Results

Fifty-seven cases of strangulation, which were reviewed, constituted 1.6% of the total 3494 medico legal autopsies conducted during these five years. This incidence of strangulation deaths is rather high compared with the rate

reported by Luke¹ in his series of cases, which was 0.9%. Majority of the victims (80.7%) were strangled by means of either hanging or ligature strangulation. Manual strangulation accounts for only 11 (19.3%) cases. Table-1 shows incidence / distribution of these cases and their relationship to hyoid bone fracture.

Table I Distribution of strangulation cases and its relationship to the incidence of fracture of hyoid bone.

Cause of death	n	Fracture of Hyoid bone	%age
Hanging	33	02	6
Ligature strangulation	13	03	23
Manual strangulation	11	08	73
Total	57	13	100

Taking collectively together the two age groups, fracture of the hyoid bone was found to be more common in the age group above 40 years (4/10 or 40%) as compared to the age group below 40 years (9/47 or 19%). Table-2 shows distribution of age and its relationship to hyoid bone fracture.

Table No : 2 Relationship of the age of the deceased with fracture of hyoid bone.

Age range	n	Hyoid bone fracture	%age
<40 yrs	47	9	19
>40 yrs	10	04	40

Multiple abrasions and contusions in the form of ligature mark, finger, thumb and nail marks are characteristic of all cases of strangulation, may they be caused by means of ligature or manual means. This represents the level of application of constricting force in the neck. In majority of the cases of hanging (72.7%), the level of constriction was found to be above the level of thyroid cartilage, whereas in majority of the cases of ligature strangulation (53.8%), it was at the level of thyroid cartilage. Out of eleven cases of

manual strangulation, level of constriction was above thyroid cartilage in seven and at the level of thyroid cartilage in four. In four cases of ligature strangulation it was found even below thyroid cartilage. This distribution follows the set pattern as has been reported by others^{3,4,7}. Hyoid bone was fractured in 9 out of 33 (27.3%) cases, where the level of constriction was above thyroid cartilage (due to direct lateral compression) and 4 out of 24 (16.7%) cases, where it was at and below the level of thyroid cartilage (due to indirect traction on thyrohyoid ligament). Table-3 shows relationship of the level of application of constricting force to the fracture of hyoid bone.

Table No.3. Level of application of force and its relationship to fracture of hyoid bone.

Cause of death / Level of constricting force.	Hangin g	Ligature strangulation	Manual strangu- lation	Fracture of Hyoid bone
Above the level of thyroid cartilage	24	2	7	9
At the level of thyroid cartilage	9	7	4	4
Below the level of thyroid cartilage	-	4	-	-
Total	33	13	11	13

Discussion

Fracture of hyoid bone is a well-recognized indicator of strangulation, particularly manual strangulation, and has been less frequently reported in ligature strangulation and hanging⁸. Although fracture of the hyoid bone is strongly associated with strangulation, the absence of this observation does not preclude the possibility of manual strangulation. In a recent review of the literature, Ubelaker⁹ reported that only 34% of all cases of manual strangulation have a fractured hyoid bone. Contrary to this, our figures are on the higher side where 73% cases of manual strangulation have fractured hyoid bone. This could likely be attributed to number of fracture determining variables like the age of the victim, rigidity of the hyoid bone, magnitude and the precise level of the neck where the force is applied and the nature of the material used to strangle like hands or ligature. Low frequency of hyoid fracture in hanging in our series of cases (6%) may be related to the position of the ligature and / or other mechanical factors. Bowen¹⁰, in the review study of 201 cases of hanging has found no fracture of the hyoid bone even in the age group above 50years.

The over all incidence of fractured hyoid bone in our study turns out to be 22.8%. Paparo and Siegel⁴ in their retrospective and prospective study of suicidal hanging

conducted in Westchester county, New York have reported a slightly lower incidence (20%) whereas Srivastava et al⁷, in the case profiles of 26 cases of strangulation conducted in the district of Varanasi, India has reported a higher incidence (25%).

The concurrence of the proportions of the victims with a fractured hyoid bone and age greater than 40 years, as reported by others^{3,4,7} is also consistent with our data, where fracture of the hyoid bone was found to be more commonly present in the age group above 40 years (40%) rather below 40 years (19%), probably due to the ossification of the bone which makes it hard and brittle, thus more vulnerable to fracture.

The findings, in our study regarding the level of application of constricting force to the neck are comparable to the findings reported by others^{3,7} and their relationship to the fracture of the hyoid bone is consistent with the studies conducted by Camps⁵ and Mant⁶.

The main conclusion of our study is that the fracture of the hyoid bone is more common in the age group above forty years (40%), predominantly in cases of manual strangulation (73%) especially when the level of constriction of neck is above thyroid cartilage.

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