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Original research article: Analysis of postmortem findings of asphyxial deaths due to hanging in a Madhya Pradesh state, India

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Abstract
Background: Violent asphyxial deaths is one of the most important cause for unnatural deaths among which hanging and ligature strangulation are commonly encountered in the professional life of forensic expert during day to day autopsy.
Aims: The aim of the study is to analyse the postmortem findings of asphyxial deaths due to Hanging.
Methodology: A retrospective study was conducted in the Department of Forensic Medicine and Toxicology, Sri Aurobindo Institute of Medical Science, Indore, M.P from April 2012 to March 2013, with an objective to study the post mortem findings in autopsy cases of hanging.
Results: Out of 700 autopsies, 30.28% cases were that of hanging. Most cases were atypical (95.3%) and complete hanging (91.98%) with the ligature mark situated above the thyroid cartilage. 33% of cases had dried salivary stain at the angle of mouth and 1.3% cases showed involuntary discharge. The incidence of fracture of hyoid bone was 15% of cases. This study depicts the possible findings in a suspected case of hanging which ought to be anticipated to avoid any flawed opinion.
Conclusion: Age is doubtlessly one of the most important variable contribute to the fracture of the neck structure in hanging. The fracture of hyoid bone should preferably be confirmed by radiography and histology before cataloging it as an ante-mortem fracture. Dribbling of saliva present in case of hanging is a sure sign of antemortem hanging.

Keywords: asphyxia, thyroid cartilage, hanging, autopsy, salivary stains

1. Introduction

Asphyxia is a condition of the body that occurs from severely inadequate oxygen supply or excessive carbon dioxide to the body. It is usually a result of disruption in breathing or insufficient oxygen supply. Nerve cells in the brain can survive only up to four minutes without oxygen. Without oxygen, these cells will die and usually leads to unconsciousness, and the most severe consequence, death. There are many causes of asphyxia, which all generally lead to hypoxia. Response will vary on the cause of asphyxia [1, 2].

Hanging is a form of strangulation where a noose is pulled tight around the neck by the person's own body weight. The noose compresses the airways, cutting off the supply of oxygen to the lungs. It also compresses the carotid arteries, which carry blood to the brain. Both mechanisms cause asphyxia, in which body and brain are deprived of oxygen. However, asphyxia is not always the cause of death in hanging. In some cases, the pressure on the neck causes vagal inhibition, a reflex that leads to cardiac arrest. The forensic pathologist has to try to distinguish between hanging and other forms of strangulation and between suicidal, homicidal, and accidental hangings [3, 4].

In this study an attempt has been undertaken in the view to gain, further knowledge and insight into the gross post mortem features of asphyxial deaths due to hanging in Bangalore South region.

2. Material & Method

The study consisted of 700 medico-legal autopsy performed in the Department of Forensic Medicine, Sri Aurobindo Institute of Medical Science, Indore, M.P from April 2012 to March 2013.Out of total 700 medico-legal autopsies, 212 were hanging victims (30.28%).

Necessary information for the study was gathered from Police, inquest report and hospital treatment records. The relatives, friends, and neighbors of the victims were also taken separately for data collection. In few cases additional information was gathered by a visit to the scene of crime or by reviewing the photographs.

A detailed proforma for recording the details of hanging was prepared for filling the observation of the present study. The information thus collected, was statistical analyzed.

3. Results & Discussion

During this study period, 100 cases were brought for post-mortem examination out of which 212 (30.28%) deaths were due to hanging. (Fig. 1)

Table 1: Typical and Atypical hanging

Typical/Atypical	Position of knot			
	Back	Left	Right	Total
Typical	10 (100.0%)	-	-	10(4.7%)
Atypical	-	85(42%)	117(57.92%)	202(95.3%)
	10(4.7%)	85(40%)	117(55.18%)	212

Out of 212 cases, typical hanging was found only in 10 cases (4.7%) whereas most of the cases 202 (95.3%) were atypical hanging, with the position of knot on left or right side. Knot was on the right side of neck in 117 cases (55.18%) (Table 1). Similar findings were observed in the studies conducted by other authors [5].

Table 2: Type of Hanging (Complete/ Partial)

Type of Hanging	Number	Percentage
Complete	195	91.98
Partial	17	8.0
Total	212	100.0

In the present study complete hanging was seen in 91.98% deaths. Partial hanging was taking lives mostly, accounted for 17(8.0%) deaths (Table 2). This is in accordance with studies by few authors [6] but not in agreement with others [1, 2].

Table 3: According to the Level of the Ligature Mark

Level of ligature mark	Cases	Percentage
Above the thyroid cartilage	185	87.26
Overriding the thyroid cartilage	15	7.0
Below the thyroid cartilage	12	5.60
Total	212	100

In our study, it was observed that in 185 cases, the level of ligature mark was above the thyroid cartilage, below the thyroid cartilage in 12 cases and overriding the thyroid cartilage in 15 cases (Table 3). This was also observed in various other authors' studies [7, 8].

Table 4: salivary stains

Salivary Stain	Number	%
Present	70	33%
a)Left (n=70)	42	60%
b)Right (n=70)	28	40%
Absent	142	62.83%
Total	212	100.0%

Dribbling of saliva, surest sign of antemortem hanging, was found in 70 cases (33%) of hanging. The findings are consistent with those of Ashok Kumar Samanta *et al* [5] who observed 32.31% cases with dribbling of saliva (Table 4).
In 175 (77.43%) cases, postmortem staining was present over the back, indicating the body was noticed by the relatives within 2 hours of suspension, removed and placed in a prone position. Involuntary discharge of feces was present in 1 cases and semen on glans penis present in 2 cases of hanging. In 212 cases of hanging, hyoid bone was fractured in 33 cases (15.0 %). This is in agreement with a study by various authors from Gujrat [9, 10].

Table 5: Hyoid Bone Fracture

Age in Years	Hyoid Bone Fracture					
	Present (n=33)		Absent (n=179)		Total (n=212)	
11-20	1	3	31	17.31	32	15
21-30	2	6	100	55.86	102	48.11
31-40	5	15.15	40	22.34	45	21.22
41-50	12	36.36	7	3.9	19	8.96
51-60	7	21.25	1	0.5	8	3.77
>60	6	18.18	-	-	6	2.83
Inference	The incidence of fracture of hyoid bone in hanging is significantly more (61 times) in age group above 40 years in comparison to the age group below 40 years ($X^2 = 111.17$, $p < 0.001$).					

25 cases out of the 35 were above the age group of 40 years. The incidence of fracture of hyoid bone is significantly more in the age group above 40years when compared to that below 40 years (Table 5). It has been demonstrated in numerous studies that the incidence of fractures increases with age [7] because neck structures become calcified and more brittle in middle and later life [11].

4. Conclusion

Age is doubtlessly one of the most important variable contribute to the fracture of the neck structure in hanging. The fracture of hyoid bone should preferably be confirmed by radiography and histology before cataloging it as an ante-mortem fracture. Dribbling of saliva present in case of hanging is a sure sign of antemortem hanging. Other post mortem findings like involuntary discharge of urine, fecal matter, semen on glans penis, postmortem staining etc. will help in the diagnosis when ligature marks are not clear.

5. References

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