Ten Year Autopsy Study of Differentiating Features Between Hanging and Strangulation

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Abstract

Introduction: Hanging is that form of asphyxia which is caused by the suspension of the body by a ligature which encircles the neck, the constricting force being the weight of the body, or part of body weight. Strangulation is a form of death caused by constricting the neck by some means other than body weight. The means used may be ligature (ligature strangulation), human hand (throttling or manual strangulation), elbow (mugging), or some hard subject such as stick (bansdola).

Aims and Objectives: To study the differentiating aspect between Hanging and Strangulation, with respect to type of ligature material and its position, external and internal finding of neck and changes in the subcutaneous tissue of neck.

Results: Hanging amounted for 50.37% cases while strangulation was 17.20% cases among the violent asphyxial deaths. Clothes (65.45%) were most common ligature material both in hanging and strangulation as well. Position of ligature was above the level of thyroid in 95.12% cases while in strangulation the position of ligature was at level of thyroid in most of the cases (45.71%). Associated injuries are present in 51.43% cases of strangulation. Subcutaneous tissue is white glistening in most of hanging cases (76.58%) while contused in most of strangulation (82.86%) cases.

Conclusion and Suggestions: It is suggested that in the interest of justice to avoid confusion, in all cases of violent asphyxial deaths, the post-mortem examination should be conducted by the Forensic experts only. Police personals should also be given training that they should not cut the ligature material and remove ligature material before post-mortem examination so that easy differentiation of hanging and strangulation can be made.

Keywords: *Hanging, Strangulation, ligature material,violent asphyxial deaths, internal neck findings.*

Introduction

Hanging is that form of asphyxia which is caused by the suspension of the body by a ligature which encircles the neck, the constricting force being the weight of the body, or part of body weight.

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Hanging is classified on the basis of:

(A) Degree of suspension, 1. Complete hanging: The body is completely suspended without any part of the body touching the ground. 2. Partial hanging: The body is partially suspended, the toes or feet touching the ground, or in sitting, kneeling, lying down, prone, or any posture with only head and chest off the ground.

(B) Position of the knot 1. Typical hanging: Knot is present over the central part over the back of the neck. 2. Atypical hanging: The knot is anywhere other than on the occiput, i.e., on the right or left side or front of the neck.[1]

The "mark of hanging" on the victim depends upon various factors like height of suspension point, nature and composition of the ligature material used, the weight of the body, duration of the suspension, things which intervene between the ligature material and skin of the neck. It requires an expert's skill and care for the determination of cause and manner of death. Multiple rounds of ligature around the neck with two or more fixed knots calls special care in interpretation to decide the cause and manner of death, other injuries over the neck and bodily injuries could complicate the matter.[2]

The level at which the ligature mark lies is also of importance in making the distinction between hanging and strangulation by a ligature. Strangulation is a form of death caused by constricting the neck by some means other than body weight. The cause of death in hanging and strangulation is mainly due to asphyxia. Still, it may be due to venous congestion, cerebral ischemia, shock, or a combination of more than two causes. Fracture-dislocation of cervical vertebrae occurs in judicial hanging. Postmortem appearances vary according to mode of death. There are external and internal appearances. External appearances are due to ligature on the neck and those peculiar to the mode of death. The ligature mark on the neck varies according to the nature of the material used as a ligature, which requires a detail inspection. In complete hanging, the ligature mark is usually situated above thyroid cartilage between larynx and chin. It is directed obliquely upward along the line of the mandible (lower jaw) and reaches the mastoid process behind the ear. It is sometimes absent at the back where two limbs of noose stretch upward toward the knot. The mark may be found on or below the thyroid cartilage, especially in case of partial suspension. It may also be circular. In the case of strangulation by ligature, the mark is well defined and usually situated low down in the neck below the thyroid cartilages and encircling the neck horizontally and completely. The marks are multiple if ligature is twisted several times around the neck. It may be oblique as in hanging if the victim has been dragged by ligature or strangled in recumbent position.[3]

Aims and Objectives: The present study was carried out with a view to study the incidence and to study the differentiating aspect between Hanging and Strangulation, with respect to type of ligature material and its position, external and internal finding of neck and changes in the subcutaneous tissue of neck.

Material and Method

Data has been collected from autopsies conducted on dead bodies of cases of violent asphyxial deaths at the mortuary of department of Forensic Medicine and Toxicology, Govt. Medical College, Amritsar, during period of last 10 years from 1st. January 2006 to 31st. December 2015.

407 cases of violent asphyxial deaths has been studied using pre-tested structured schedule, all cases of violent asphyxial deaths brought to department of Forensic Medicine and Toxicology, Government Medical College, Amritsar, mortuary for autopsy and those who fulfill the inclusion and exclusion criteria had been selected on a purposive sampling basis.

Inclusion Criteria: Autopsy on all cases of violent asphyxial deaths conducted at mortuary of department of Forensic Medicine and Toxicology, Govt. Medical College, Amritsar during a period of ten years.

Exclusion Criteria:

1. All deaths due to violence other than asphyxial death.
2. Deaths due to chemical asphyxiants.
3. Deaths due to poisoning.
4. Sudden natural deaths.
5 Deaths due to cold, starvation, heat and anaphylaxis.

Observations:

Table 1: Incidence of violent asphyxial deaths based on method of asphyxiation

Type of Asphyxial death	No. of cases	%
Hanging	205	50.37
Strangulation	70	17.20
Throttling	5	1.23
Traumatic asphyxia	3	0.74
Suffocation	4	0.98
Drowning	120	29.48
Total	**407**	**100.0**

Table 2: Type of ligature material used in hanging and strangulation

Ligature Material	Hanging				Strangulation				Total	
	Male		Female		Male		Female		No.	%
	No.	%	No.	%	No.	%	No.	%		
Wire	3	1.46	0	0.00	0	0.00	0	0.00	3	1.09
Rope	49	23.90	20	9.76	10	14.29	10	14.29	89	32.36
String	1	0.49	0	0.00	1	1.42	1	1.42	3	1.09
Clothes	86	41.95	46	22.44	18	25.71	30	42.86	180	65.45
Total	**139**	**67.80**	**66**	**32.20**	**29**	**41.43**	**41**	**58.57**	**275**	**100.00**

Table 3: Position of ligature mark in hanging and strangulation

Position of ligature mark	Hanging		Strangulation		Total	
	No.	%	No.	%	No.	%
Above the thyroid cartilage	195	95.12	11	15.71	206	74.91
Below the thyroid cartilage	1	0.49	27	38.57	28	10.18
At the level of thyroid cartilage	9	4.39	32	45.71	41	14.91
Total	**205**	**100.00**	**70**	**100.00**	**275**	**100.00**

Table 4: External findings of neck in case of hanging and strangulation

Details of ligature mark		Hanging		Strangulation		Total (n=275)	
		No.	%	No.	%	No.	%
Number	Single	204	99.51	65	92.86	269	97.82
	Multiple	1	0.49	5	7.14	6	2.18
Direction	Oblique	202	98.54	9	12.86	211	76.73
	Horizontal	3	1.46	61	87.14	64	23.27
Ligature mark	Complete	1	0.49	19	27.14	20	7.27
	Partial	204	99.51	51	72.86	255	92.73
Associated injuries	Present	19	9.27	34	48.57	53	19.27
	Absent	186	90.73	36	51.43	222	80.73
Ecchymosis at edges	Present	78	38.05	38	54.29	116	42.18
	Absent	127	61.95	32	45.71	159	57.82
Foreign body/material	Present	11	5.37	5	7.14	16	5.82
	Absent	194	94.63	65	92.86	259	94.18

Table 5: Internal findings of neck in case of hanging and strangulation

Findings in neck	Hanging				Strangulation				Total	
	Absent		Present		Absent		Present		No.	%
	No.	%	No.	%	No.	%	No.	%		
Fracture of thyroid cartilage	203	99.02	2	0.98	62	88.57	8	11.43	275	100.00
Fracture of cricoid cartilage	205	100.00	0	0.00	70	100.00	0	0.00	275	100.00
Fracture of hyoid bone	200	97.56	5	2.44	63	90.00	7	10.00	275	100.00
Fracture of cervical vertebra	205	100.00	0	0.00	70	100.00	0	0.00	275	100.00

Findings in neck	Hanging				Strangulation				Total	
	Absent		Present		Absent		Present		No.	%
	No.	%	No.	%	No.	%	No.	%		
Tear of intima of carotid artery	98	47.80	107	52.20	28	40.00	42	60.00	275	100.00
Tear of neck muscles	18	8.78	187	91.22	4	5.71	66	94.29	275	100.00
Infiltration in the soft tissue	1	0.49	204	99.51	0	0.00	70	100.00	275	100.00

Table 6: Changes in subcutaneous tissue of neck in hanging and strangulation

Type of asphyxial death	White glistening		Contused		Normal		Total
	No.	%	No.	%	No.	%	No.
Hanging	157	76.58	46	22.44	2	0.98	205
Strangulation	12	17.14	58	82.86	0	0.00	70

Discussion

In the total number of cases of hanging and strangulation, the offending weapons were found to be various types of ligature materials 37.82% of the males and 27.63% of females preferred soft materials (saree, veil, towel, etc.) whereas 23.27% of men and 11.27% women used hard ligature material (wire, rope, string, etc.). These findings correlate with the study of Patel et al[4] where they found in hanging 80% of the victims used soft materials and 20% victims used hard materials. In strangulation cases, they found that 66.67% victims were strangulated by using soft material and 33.33% victims were strangulated by using hard materials. In a study conducted only on type of ligature material used for hanging by Sharma et al[5] they found that soft material was used in 56.36% and hard material in 43.64% cases. In another study conducted only on type of ligature material used for hanging by Naik et al[6] they found that soft material was used in 53.97% and hard material in 46.03%. Lastly, in a study by Vijaynath et al[7] on type of ligature material used for hanging, they found that soft material was used in 70% cases and hard material was used in 30%.

In 97.82% cases of hanging and strangulation, the ligature mark was single in number while only in 2.18% cases it was multiple. In only 7.14% cases of strangulation, the ligature mark was multiple in number.

In 95.12% cases of hanging the ligature mark was situated above the level of thyroid cartilage followed by 4.39 % of the cases showing the ligature mark below the level of thyroid cartilage, the least was a single case (0.49%) showing the ligature mark at the level of thyroid cartilage. In hanging, the ligature mark is usually situated above the level of thyroid cartilage due to the fact that during the suspension of the body there is slippage of ligature material over the upper part of the neck and the constriction force being the weight of the body. While in strangulation in 15.71% cases the ligature mark was situated above the level of thyroid cartilage in 45.71% of the cases showing the mark below the level of thyroid cartilage and in 38.57% cases showing the ligature mark at the level of thyroid cartilage which is reverse trend as compared to hanging.

In 98.54 % of the cases of hanging the ligature mark was obliquely placed over the front of neck and in only 0.49 % of the cases it was horizontal. While this trend was reverse in strangulation in which in 87.14 % of the cases the ligature mark was horizontally placed over the front of neck and in 12.86 % of the cases it was oblique.

In 99.51% cases of hanging the ligature mark was partial and in only 0.49 % of the cases showing the complete ligature mark. While in strangulation in 72.86% cases it was partial and in 27.14% cases the ligature mark was complete. These results correlate with the study by Patel et al[4] who observed the following, among the hanging cases 100% victims had oblique ligature mark on the neck and 100 % transverse ligature mark on the neck in strangulations. In 93.75% cases the ligature mark was above the level of thyroid cartilage while in 6.25% cases the ligature mark was at the level of thyroid cartilage in hanging deaths.

The classical external asphyxial findings such as cyanosis in hanging was found in 97.07% cases, dribbling of saliva in 28.29% cases, protrusion of tongue in 31.71% of cases and it was clenched between teeth in 19.02% cases, seminal fluid discharge in 12.20 % cases, external injury marks in 10.24% cases, froth from nostrils in 16.09% cases and rigor mortis in 96.10% cases. These results closely correlate with study made by Patel et al[4] who observed the following: congestion of face 77.5%, dribbling of saliva 71.25%, discharge of semen 17.5%, discharge of feces 13.75%, struggle marks nil cases.

Internal findings in cases of hanging were found as, torn intima of common carotid artery in 52.20% cases, fracture of thyroid cartilage in 0.98%, fracture of hyoid bone in 2.44% cases, tear of neck muscles in 91.22% cases and infiltration of blood in the soft tissues of neck in 99.51% cases and subcutaneous tissue was found contused in 22.44% cases and white glistening in 76.58% which differs from the study by Patel et al[4] who found contusions in strap muscles of neck in 6.25% cases of hanging but no carotid artery tears or fractures of hyoid bone and thyroid cartilage. This study is partly consistent with the study by Patil et al[6] where he found no victims of hyoid bone fracture. The results however varied from the studies of Sharma et al[5] and Clement et al.[8]

In strangulation cases encountered cyanosis was found in 92.86% cases, discharge of semen was found in 2.86% cases, external injuries were found in 52.86% cases and froth from nostrils in 37.14% cases, tongue was protruded in 38.57% cases and it was clenched in between teeth in 21.43% cases. Rigor mortis present in 77.14% cases. These results closely correlate with the study made by Patel et al[4] who observed the following; congestion in 100% cases, discharge of semen, urine and stools in zero percent cases, struggle marks in 100 % cases.

Internal findings in strangulation cases observed were as follows- Contusions of strap muscles in 82.86% cases, fracture of thyroid cartilage in 11.43% cases, fracture of hyoid bone in 10% cases were observed. Intima of carotid artery was found torn in 60% cases while neck muscles were torn in 94.29% cases and infiltration of blood in the soft tissues was present in 100% cases. These results partially correlate with the study of Patel et al[4] who observed strap muscle contusions in 100% cases and 66% cases having hyoid bone fracture with nil per fracture of thyroid cartilage. The results once again vary from the studies of Sharma et al,[5] in which they found hyoid bone fracture in 21% cases, thyroid cartilage fracture in 17% cases and neck muscles were found torn in 54% cases and Clement et al,[8] Patil et al[6] in which they found hyoid bone fracture in 42% cases.

Conclusion and Suggestions

Ligature mark was situated above the level of the thyroid cartilage in most of the cases in hanging while it was either below or at the level of thyroid cartilage in strangulation. The preferred ligature material used in both hanging and strangulation cases was soft in most of the cases. As most of the postmortem cases of violent asphyxial deaths are being conducted by the doctors who are not Forensic experts and they found difficulty in concluding whether it is a case of hanging or strangulation. It is suggested that in the interest of justice to avoid confusion, in all cases of violent asphyxial deaths, the postmortem examination should be conducted by the Forensic experts only. Police personals should also be given training that they should not cut the ligature material and remove ligature material before postmortem examination so that easy differentiation of hanging and strangulation can be made. They should also routinely take the help of technology by video recording and photography of the scene of crime.

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