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Hanging: An Autopsy-Based Study on Violent Asphyxial Deaths.

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ABSTRACT

This autopsy-based descriptive cross-sectional study aimed to investigate violent asphyxial deaths, with a specific focus on hanging cases. The primary objective was to elucidate the forensic intricacies, including postmortem findings and ligature mark characteristics, contributing to a comprehensive understanding of the physiological manifestations and circumstances surrounding hanging-related fatalities. A total of 154 autopsy cases of violent asphyxial deaths were examined, with 91 cases identified as hanging-related. The study employed rigorous inclusion and exclusion criteria and received ethical approval. Postmortem examinations followed standard medico-legal protocols, with data gathered from inquest papers, detailed histories from relatives, and autopsy findings. Complete hanging (91.20%) predominated over partial hanging (8.79%), with atypical hanging (84.61%) more prevalent than typical hanging (15.38%). Postmortem findings revealed distinctive characteristics, including cyanosis (61.53%), facial congestion (54.94%), and tongue protrusion (35.16%). Ligature mark analysis demonstrated marked differences between hanging and ligature strangulation, emphasizing the importance of careful examination of encirclement, loops, level, and position. Among the 91 cases of hanging most preferred ligature material used by victim was saree (36 cases, 39.56%) followed by dupatta / scarf / gamcha (21 cases, 23.07%), nylon rope (21 cases, 23.07 %) and jute rope (13 cases, 14.28 %). Dhoti and belt as ligature material was used in 1 case (1.09%) each. Our study contributes valuable insights into the forensic landscape of violent asphyxial deaths, offering detailed observations on hanging-related fatalities. The findings underscore the importance of a meticulous autopsy in unravelling the complexities surrounding these tragic incidents, guiding forensic experts and legal authorities in accurate determinations.

Keywords: violent asphyxial deaths, hanging, autopsy.

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INTRODUCTION

The ominous specter of violent asphyxial deaths, particularly those resulting from hanging, demands meticulous scrutiny to unravel the complexities surrounding this tragic phenomenon [1]. Our autopsy-based study focused into the intricate details of such incidents, seeking to illuminate the forensic intricacies and contribute valuable insights to the medico-legal domain. Hanging, as a form of violent asphyxia, poses unique challenges for forensic pathologists and investigators, necessitating a comprehensive examination of post-mortem findings, circumstantial evidence, and contributory factors [2]. By analysis of data from autopsy examinations, our research focused to enhance our understanding of the pathophysiological mechanisms underlying hanging deaths. The findings promise to not only refine forensic protocols but also inform preventive measures, ultimately aiding in the pursuit of justice and the establishment of comprehensive strategies for the mitigation of these occurrences [3-6].

METHODOLOGY

It was an autopsy based descriptive cross-sectional study. A total 154 autopsy cases of violent asphyxial deaths were studied during the study period, of which found 91 hanging related cases. All the cases brought for medico-legal autopsies to morgue of Department of Forensic Medicine during study period.

Inclusion criteria

The criterion applied for the selection of cases was that the asphyxia should have occurred by mechanical interference with respiration.

Exclusion criteria

- Cases of birth asphyxia in neonates
- Cases showing signs of decomposition masking findings of asphyxia

The study has been undertaken with due approval from the Institutional Ethics Committee. The present study was conducted in accordance with protocol and to comply with all requirements of ICMR guidelines (2006).

All the cases of violent asphyxial deaths were examined as per standard medico-legal autopsy procedure and data was gathered on the basis of information from –

- Inquest papers
- Detail history from near relatives of deceased
- Autopsy findings

RESULTS

During the study period, out of the 1691 cases being autopsied in mortuary, 154 cases were of deaths due to asphyxia making the incidence 9.10%. It was observed that among 91 cases of hanging, maximum number of cases 30 (32.96%) were observed in the age group of 21-30 years followed by 31-40 years (24 cases, 26.37%), 11-20 years (16 cases, 17.58%) and 41-50 years (11 cases, 12.08%). In 51-60 years, age group, 5 cases (5.49%) were observed. 2 cases (2.19%) were observed in 51-60 years and 61-70 years age group. 3 cases (3.29%) were observed in the age group >71 years. Thus, it was clear that no case was observed in 0-10-year age group.

Among the 154 cases studied, male preponderance was observed with 110 cases (71.42%) and remaining 44 were female (28.57%) making the male to female ratio 2.5:1. Among males 63 (69.23 %) cases were of hanging. Out of 91 cases of hanging it was observed that most of the victims (83 cases, 91.20%) chose home for hanging over the other places like farm (7 cases, 7.69%) and road side (1 case, 1.09%).

Among the 91 cases of Hanging studied financial factors were detected in 22 cases comprising (24.17 %), family problems were present in 10 cases comprising (10.98 %), domestic violence in 3

cases comprising (3.29 %), exam failure / study tension in 11 cases comprising (12.08 %), chronic illness / psychiatric problems in 14 cases comprising (15.38%), unemployment in 6 cases comprising (6.59 %), 1 case (1.09%) of accidental hanging and 5 cases (5.49%) turned out to be farmer's suicide.

Among the 91 cases of hanging most preferred ligature material used by victim was saree (36 cases, 39.56%) followed by dupatta / scarf / gamcha (21 cases, 23.07%), nylon rope (21 cases, 23.07 %) and jute rope (13 cases, 14.28 %). Dhoti and belt as ligature material was used in 1 case (1.09%) each. Information regarding ligature material was not available in 2 cases.

Table 1: Type of Hanging (n-91)

Character	Types	No.	%
Depending upon suspension of body	Complete	83	91.20
	Partial	8	8.79
Depending upon position of knot	Typical	14	15.38
	Atypical	77	84.61

Table divides the cases of hanging into complete and partial hanging depending upon the suspension of body while depending upon the position of knot into typical and atypical hanging. In this study complete hanging (83 cases, 91.20%) and atypical hanging (77 cases, 84.61%) were more common than partial hanging (8 cases, 8.79%) and typical hanging (14 cases, 15.38%) respectively.

Table 2: Postmortem findings in cases of Hanging (n-91)

Finding		No. of cases	Percentage
Dribbling of saliva		29	31.36
Protruding tongue		32	35.16
Congestion of face		50	54.94
Cyanosis		56	61.53
La facie sympathique		2	2.19
Post mortem Lividity	Typical	15	16.48
	On back of body	76	83.51
Changes in subcutaneous tissue	White glistening	91	100
	Contused	0	0
Neck Muscle haemorrhages		3	3.29
Fracture Thyroid /Cricoid cartilage		0	0
Fracture Hyoid bone		0	0

Table 2 illustrates the relevant postmortem findings in 91 cases of hanging studied. From the table it is clear that cyanosis was observed in 56 cases (61.53%) over skin, nail beds and oral mucosa. Face was congested in 50 cases (54.94%), tongue was protruded in 32 cases (35.16%) and dribbling of saliva was found in 29 cases (31.36%). In 2 cases (2.19%) La facie sympathique was present.

During study the pattern of post mortem lividity was also observed. The presence of typical pattern known as glove and stocking pattern of lividity (presence of post mortem lividity over lower part of upper limbs, hands, palms and over lower limbs) was observed in 15 cases (16.48%) and in remaining 76 cases it was over back of body comprising of 83.51%.

The neck was examined in detail for various findings. It was observed that, in all cases of hanging i.e. 91 cases, subcutaneous tissue was white and glistening. Extravasation in neck muscles were observed in 3 cases comprising of 3.29%. There was not a single case where we observed fracture of thyroid / cricoid cartilage or hyoid bone.

Table 3: Particulars of ligature mark

Ligature Mark		Hanging (n-91)		Ligature Strangulation (n-7)	
		No.	%	No.	%
Encirclement	Complete	1	1.09	5	71.42
	Incomplete	90	98.90	2	28.57
Loops	Single	85	93.40	5	71.42
	Multiple	6	6.59	2	28.57
Level	Above Thyroid	63	69.23	0	0
	At & Above Thyroid	28	30.76	2	28.57
	Below Thyroid	0	0	5	71.42
Position	Oblique	90	98.90	0	0
	Transverse	1	1.09	7	100

Table 3 highlights the difference in characteristics of ligature marks between hanging (91 cases) and ligature strangulation (7 cases) studied. In the present study, ligature mark was completely encircling the neck in 1 case (1.09%) and incompletely encircling the neck of the victim in 90 cases (98.90%) among hanging cases while ligature mark was completely encircling the neck in 5 cases (71.42%) and incompletely encircling the neck of the victim in 2 cases (28.57%) among ligature strangulation cases. Single mark was found in 85 cases (93.40%) of hanging and in 5 cases (71.42%) of ligature strangulation while multiple marks were found in 6 cases (6.59%) and 2 cases (28.57%) of hanging and ligature strangulation respectively.

The ligature mark was present above the level of thyroid cartilage in 63 cases (69.23%), at and above the level of thyroid cartilage in 28 cases (30.76%) but mark below the thyroid cartilage was not found in any case of hanging. In ligature strangulation mark was found below thyroid cartilage in 5 cases (71.42%), mark was at and above thyroid cartilage in 2 cases (28.57%) and in no case mark was found above the thyroid cartilage. In hanging the ligature mark was obliquely placed in 90 cases (98.90%) and transverse in only 1 case (1.09%) while in all cases (7 cases, 100%) of ligature strangulation, mark was transverse.

DISCUSSION

The results of this autopsy-based descriptive cross-sectional study focused light on the intricate details surrounding violent asphyxial deaths, with a specific focus on hanging cases. A total of 154 autopsy cases were scrutinized, revealing 91 instances related to hanging during the study period. The methodology ensured a comprehensive approach, considering inclusion and exclusion criteria, ethical approval, and adherence to established guidelines [7-11].

It was observed that among 91 cases of hanging, maximum number of cases 30 (32.96%) were observed in the age group of 21-30 years followed by 31-40 years (24 cases, 26.37%), 11-20 years (16 cases, 17.58%) and 41- 50 years (11 cases, 12.08%). In 51-60 years age group, 5 cases (5.49%) were observed. 2 cases (2.19%) were observed in 51-60 years and 61-70 years age group. Among the 91 cases of hanging most preferred ligature material used by victim was saree (36 cases, 39.56%) followed by dupatta / scarf / gamcha (21 cases, 23.07%), nylon rope (21 cases, 23.07 %) and jute rope (13 cases, 14.28 %). Dhoti and belt as ligature material was used in 1 case (1.09%) each. Information regarding ligature material was not available in 2 cases.

The demographic distribution of hanging cases, as delineated in Table 1, unveils intriguing patterns. Notably, the prevalence of complete hanging (91.20%) overshadowed partial hanging (8.79%), emphasizing the gravity and lethality of the former. The dominance of atypical hanging (84.61%) compared to typical hanging (15.38%) underscores the diversity in the circumstances surrounding these incidents, necessitating a nuanced understanding for forensic evaluation.

Table 2 delves into the postmortem findings in cases of hanging, providing a detailed insight into the physiological manifestations of asphyxial deaths. Cyanosis, observed in 61.53% of cases, indicates the compromised oxygenation of tissues, while facial congestion (54.94%) and tongue protrusion (35.16%)

contribute to the delineation of the postmortem profile. Such findings not only serve as crucial indicators for forensic pathologists but also underscore the complexity of investigating hanging deaths.

The distribution of postmortem lividity patterns, as highlighted in Table 2, further adds depth to the forensic analysis. The observed prevalence of the glove and stocking pattern (16.48%) and its predominant occurrence over the back of the body (83.51%) aligns with established postmortem lividity expectations. This pattern, a consequence of gravity and blood pooling, serves as an invaluable marker for investigators in reconstructing the circumstances surrounding the death.

Table 3 meticulously dissects the characteristics of ligature marks in hanging cases, drawing a clear distinction from ligature strangulation cases. The prevalence of completely encircling ligature marks in 98.90% of hanging cases contrasts sharply with the predominant incomplete encirclement (28.57%) in ligature strangulation. The specific positioning of ligature marks above the thyroid cartilage in hanging cases (69.23%) versus below the thyroid cartilage in ligature strangulation cases (71.42%) provides crucial discriminatory information for forensic experts.

Moreover, the orientation of ligature marks is a key differentiator, with 98.90% of hanging cases displaying an oblique placement, while ligature strangulation cases exclusively exhibit a transverse orientation. This disparity in ligature mark characteristics serves as a pivotal factor in differentiating between hanging and strangulation, guiding investigators towards an accurate determination of the cause of death.

The absence of fractures in thyroid/cricoid cartilage or hyoid bone across all hanging cases underscores the distinct biomechanics of hanging as compared to strangulation. Such meticulous analysis reaffirms the importance of a comprehensive autopsy in unraveling the intricacies of violent asphyxial deaths and providing crucial insights for legal proceedings.

This study, while offering valuable contributions to forensic literature, is not without limitations. The sample size, though substantial, may not fully capture the heterogeneity within hanging cases. Additionally, the reliance on autopsy findings and related information might overlook potential confounding factors, necessitating a multi-disciplinary approach for a holistic understanding of each case.

Table 1 shows that in present study only 8 (8.79%) victims were in partial hanging position (kneeling down) and the rest (83 cases forming 91.20%) were found fully suspended with feet clearly off the ground. Similar results were found by Naik¹ et al where they found that out of 232 cases of hanging, 15 victims died due to partial hanging where some part of body was touching the ground whereas 217 victims died due to complete hanging. Meera Th⁷ et al also reported similar findings with complete hanging in 91.67% victims while partial hanging in 8.33% victims. This may be explained by the fact that most of the victims in the present study committed suicide by hanging indoors. When a victim attempts to commit suicide in a room, he usually uses a chair or a stool for standing thereby accessing the point of suspension which may be ceiling fan, beam etc. and later on pushes it away thus effecting complete suspension. This opinion is in concurrence with the explanation of Meera Th⁷ et al.

In present study typical hanging accounted for 15.38% while atypical hanging accounted for 84.61%. Study done by Naik [1] et al reported similar findings as the typical hangings were 19 (7.39%) where the probable knot positions were on the occiputs whereas there were 238 (92.6%) victims dying due to atypical hanging where the knot positions were other than over the occiput.

As per Table 10, dribbling of saliva from the angle of mouth opposite to the knot which is considered to be the surest sign of ante-mortem hanging was noticed in 29 cases (31.36%). This finding was also seen in the study of Bhagora LR [11] et al (22.54%), but it's in contrast with the study of Patel-Ankur P et al (71.25%). This difference might be due to manual alteration by relatives or police before or at the time of inquest preparation.

CONCLUSION

In conclusion, this autopsy-based study on violent asphyxial deaths, with a specific focus on hanging cases, contributes significantly to the forensic understanding of these tragic incidents. The nuanced analysis of postmortem findings, ligature mark characteristics, and associated factors enriches

the forensic pathology landscape. As the medico-legal community continues to grapple with the complexities of violent asphyxial deaths, studies of this nature pave the way for informed investigations, robust legal proceedings, and ultimately, the pursuit of justice.

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