Original Research Article

Autopsy based study of hanging and strangulation deaths in South Kerala

Nivin George[1], Rekha T P[2], Ajith V Asok[3]

[1]Assistant Professor, Department of Forensic Medicine, P K DAS Institute of Medical Sciences, Kerala, India
[2]Assistant Professor, Department of Pathology, P K DAS Institute of Medical Sciences, Kerala, India
[3]Senior Resident, Department of Forensic Medicine, P K DAS Institute of Medical Sciences, Kerala, India

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Abstract

Introduction

The ligature material used for hanging is one of the important factors that determine the type of ligature mark or the pressure abrasion. The various structures damaged in hanging and strangulation include the soft tissue like skin, subcutaneous tissue, fascia, muscle, blood vessels, lymph nodes, the bony and cartilaginous tissues like the hyoid bone and larynx. **Materials and Methods:** The medico-legal findings characteristics of victims of hanging and strangulation were the key variables of the study. There were total 75 asphyxial fatalities, out of which 70 were caused by hanging and 5 by strangulation, were examined. **Results:** According to the study's findings, The dribbling of saliva was found in 32.9% of cases of hanging deaths whereas, in 67.1 % of cases, there was no dribbling of saliva. The tongue was bitten and protruded in 58.6% of the cases. Commonest ligature material used in hanging was Mundu. Ligature marks from hanging were usually clearly defined, higher than the thyroid cartilage, discontinuous, and free of internal neck injuries, which was different from that of strangulation. Gross internal neck injuries were present in 11.4% of cases of hanging.

Keywords: Asphyxial fatalities, strangulation, hanging, ligature mark, ligature material.

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Introduction

The act of unnatural death may be accomplished in different ways like trauma, poisoning, and violent asphyxia. In violent asphyxia, the entry of air into the air passage is prevented. Hanging and strangulation are common types of violent asphyxiation that prevent the entry of air into the lungs. Hanging is one of the most common methods of suicide in India. Hanging can also occur accidentally while at work, during playing, exhibiting hanging exercises, or showing some performances in the circus etc. Lynching is a type of homicidal hanging. Hanging differs from strangulation in which the neck is constricted irrespective of any effect caused by the weight of the body. The various structures damaged in hanging and strangulation include the soft tissue like skin, subcutaneous tissue, fascia, muscle, blood vessels, lymph nodes, the bony and cartilaginous tissues like the hyoid bone and larynx. Strangulation is assumed to be homicidal until the contrary is proved otherwise. Various forms of strangulation are ligature strangulation, throttling, mugging, garroting, etc.

The objective of the study is to study autopsy findings of hanging and strangulation deaths in South Kerala. External findings like the status of the tongue, salivary dribble marks, ligature material findings like type and consistency, and ligature mark findings like continuity and location were studied. Gross internal neck findings were also studied.

Materials and Methods

This is an observational cross-sectional study approved by ethics committee conducted between November, 2015 and November, 2017. Informed consent had been taken from deceased family members prior to study. Seventy five cases were included in the study. Out of the seventy five cases, seventy cases were from victims of hanging and five cases were from victims of strangulation. Detailed autopsy was performed using modified Letulle's technique. Then flap dissection of the neck was carried out and gross findings were noted. Data was entered into excel sheet and were analysed using IBM SPSS 20. Study population included cases brought for post mortem examination in mortuary wing of the department of Forensic Medicine with history of death due to hanging and strangulation. Cases were selected from dead bodies brought to medical college with history of death due to hanging/ strangulation as per the investigating agency. Cases excluded from this study were decomposed bodies, cases with other injuries on neck and cases with unknown history[1-4].

Results

External findings

Status of tongue

The tongue was found protruding and bitten in 58.6% of the cases and not bitten in 41.4% of cases. The tongue was bitten and protruded in all 5 cases of strangulation.

Salivary dribble

Salivary dribble was obvious in 32.9 % of the cases of hanging. It was absent in any strangulation.

*Correspondence
Dr. Nivin George,
Assistant Professor, Department of Forensic Medicine, P K DAS Institute of Medical Sciences, Vaniamkulam, Palakkad-679522, Kerala, India.
E-mail: gnivin@gmail.com

Table 1: External findings

External findings	Hanging		Strangulation	
	Frequency	Percentage	Frequency	Percentage
Status of tongue				
Protruding and Bitten	41	58.6	5	100
Not bitten	29	41.4	0	0
Total	70	100	5	100
Salivary dribble				
Not present	47	67.1	5	100
Present	23	32.9	0	0
Total	70	100	5	100

Ligature material

Type of ligature material

Soft materials used as ligatures in hanging were lungies (28.6%), sarees (4.3%), shawls (11.4%), and bed sheets (1.4%). Hard materials that produced patterns included ropes of nylon and coir rope. Nylon rope was used in 27.1% of cases and coir rope was used in 1.4% of cases. No ligature material was brought with the body in 22.9% of the cases.

Consistency of ligature material

Soft ligature material was used in 45.7% of cases and hard ligature material was used in 28.6% of the cases.

Table 2: Ligature material features

Ligature material	Hanging		Strangulation	
	Frequency	Percentage	Frequency	Percentage
Type of ligature material				
Saree	3	4.3	0	0
Shawl	8	11.4	0	0
Lungie	20	28.6	0	0
Bed sheet	1	1.4	0	0
Nylon rope	19	27.1	0	0
Coir rope	1	1.4	0	0
Others	2	2.9	0	0
No ligature was brought with the body	16	22.9	5	100
Total	70	100	5	100
Consistency of ligature material				
Soft material	32	45.7	0	0
Hard material	20	28.6	0	0
Not known	18	25.7	5	100
Total	70	100	5	100

Figure 1: Commonest material used as ligature material: Mundu

Ligature mark

The appearance of pressure abrasion in hanging, 92.9% of the victims there were well-defined pressure abrasion and 7.1% showed faint pressure abrasion. Pressure abrasion was well-defined in all 5 cases of ligature strangulation.

Continuity of pressure abrasion

Pressure abrasion (ligature mark) was either continuous or noncontinuous. Noncontinuous pressure abrasion was present in 68.6% of the cases while continuous pressure abrasion was present in only 31.4% of the cases in hanging. In strangulation all the cases showed continuous pressure abrasion.

Location of pressure abrasion

In hanging, in 82.9% of cases, the ligature mark was over and above the level of the thyroid cartilage. In 8.6% of cases, it was below the level of the thyroid cartilage. In another 8.6% of cases, it was above the level of the thyroid cartilage. In strangulation, in 60% of the cases it was above the level of the thyroid cartilage and in 40% of cases it was over and above the level of the thyroid cartilage.

Figure 2: Measuring ligature mark

Figure 3: Neck dissection in strangulation victim showing hemorrhage

Gross internal neck injury

In cases of hanging 88.6% of the cases, a gross internal neck injury was absent. It was present in 11.4% of cases. In cases of strangulation internal neck injuries were present in 80% of the cases.

Table 3: **Ligature mark features and internal neck findings**

Ligature mark features and internal neck findings	Hanging		Strangulation	
	Frequency	Percentage	Frequency	Frequency
Appearance of pressure abrasion				
Well defined	65	92.9	5	100
Faint	5	7.1	0	0
Total	70	100	5	100
Continuity of pressure abrasion (nature)				
Discontinuous	48	68.6	0	0
Continuous	22	31.4	5	100
Total	70	100	5	100
Location of pressure abrasion				

Above thyroid cartilage	6	8.6	3	60
Over and above thyroid cartilage	58	82.9	2	40
Below thyroid cartilage	6	8.6	0	0
Total	70	100	5	100
Gross internal neck injury				
Absent	62	88.6	1	20
Present	8	11.4	4	80
Total	70	100	5	100

Discussion

In the present study, a total of 75 dead bodies were received for postmortem examination due to hanging (70 cases) and strangulation (5 cases), from Feb 2016 to July 2017. All the materials used as ligatures were easily available similar to that stated by Modi[1]. In the present study 'Lungi ' as ligature material was used in 28.6% of the cases (Table 2). The lungi is a type of traditional garment worn around the waist in Kerala and parts of South India. It is particularly popular in regions where the heat and humidity create an unpleasant climate for trousers. Hence, the easy availability at hand is used in suicide[5,6]. The rope was used as ligature material in 28.5 % of the cases. The reason for selecting the rope can also be explained based on its easy availability. In a study by Sharija S, soft material was used in 61.7% of the cases, and hard material in 36.9% of the cases[5]. In the study soft material was used in 45.7% of the cases while in 28.6% of the cases hard material (Table 2). It may be because of the general belief that the usage of soft material may decrease the pain that may be encountered at the time of hanging. These findings are not tallying with the strangulation deaths in all the cases the ligature material was not available at the scene of the crime which proves that it is essentially homicidal with the tendency of the criminal to abscond along with the ligature material to conceal the nature of the crime.

The appearance of ligature marks on the neck is the principal external sign in cases of hanging. A ligature mark in form of pressure abrasion was present in all 70 cases of hanging (Table 3). It was well-defined in 92.9% of the cases and faint in 7.1% of the cases of hanging. Ligature mark was also present in all 5 cases of strangulation. In a similar study by Harish S, it was faint in 56% of the cases but well-defined in 44% of the cases[6].

In the present study, the level of constricting force (ligature mark) was found to be over and above thyroid cartilage in 82.9% of cases of hanging (Table 3). In a study conducted by Sharija S and Harish S. the ligature material was above thyroid cartilage in 80% and 88% of cases respectively[5,6]. This finding is tallying with these two studies. The ligature mark was at the level of the thyroid cartilage in 44.4% of cases. In strangulation cases, in 60% of the cases, ligature material was above the level of the thyroid cartilage. This is not in accordance with a study conducted by Sharija S were only 22.2% of the cases were above the level of the thyroid cartilage.[5] According to Modi and Mukherjee, the ligature mark is placed above the thyroid cartilage in 80% of cases, at the level of the thyroid cartilage in 15%, and below thyroid cartilage in 5% of cases[1,2]. The ligature material was discontinuous in 68.6% of cases of hanging and was continuous in 31.4% of cases of hanging (Table 3). This is in accordance with the study by Sharija S in which 37.5% were continuous and 62.5% of cases showed noncontinuous ligature marks around the neck[5]. In strangulation, all the cases were found to have continuous ligature marks. In the present study, 32.9% of victims of hanging death showed dribbling of saliva, whereas 67.1% of hanging death had not shown dribbling of saliva. In any case of strangulation death, dribbling of saliva was not found (Table 1). Evidence of dried marks of dribbling of saliva is suggestive of ante mortem hanging as it occurred due to pressure upon the salivary glands but its absence alone will not suggest that the body was suspended after death. Dribbling of saliva from the angle of the mouth may not occur when the death is due to vagal inhibition or injury to the spinal cord. In a study by Sharija S salivary dribble mark was present in 25.9% of the cases[5]. The absence of salivary dribble marks could be because the clothes if any, worn at the time of committing the act were removed by the police before the body was brought to the mortuary for postmortem examination and it was not available for scrutiny.

The tongue was bitten and protruded in 58.6% of the cases (Table 1). This could be due to pressure exerted by the ligature on the neck as stated by Spitz and Fischer[3]. This is in accordance with work done by Sharija S in which the tongue was bitten and protruded in 50.8% of the cases[5].

Gross internal neck injuries were present in 11.4% of cases of hanging (Table 3). These included contusions seen in subcutaneous tissue, rupture of the lower attachment of sternocleidomastoid muscle, contusion of sternocleidomastoid, and fracture of neck skeleton including the hyoid bone and the thyroid cartilage. The carotid intimal tear was the rarest finding and was present in only 1 % of the cases. In work done by Sharija S injuries to internal neck structures were present in 15.4% of the cases[5]. In a study by Luke JL hyoid bone and/or thyroid cartilage fractures (found in 26% of cases) are most frequently identified in those persons found completely suspended and in victims in the older age ranges. No hyoid bone/thyroid cartilage fractures, internal soft tissue injury, or petechiae were present in 13 (21%) cases.[4] In a similar study by Anil Yadav hyoid bone was found fractured in only 3.19% of mechanical asphyxial deaths[7]. Internal neck injuries were present in 80% of the cases of strangulation in the present study, this may be due to more than the required force that is always present in cases of ligature strangulation.

Conclusion

'Lungi' was the most common ligature material (28.6%) used for hanging. Majority (45.7%) used soft ligature materials like lungi, shawl, saree, etc. Hard materials were used in 28.6% of the cases. The dribbling of saliva was found in 32.9% of cases of hanging deaths whereas, in 67.1 % of cases, there was no dribbling of saliva. Dribbling of saliva was absent in all 5 cases of strangulation. Ligature mark in the form of pressure abrasion was seen in all 70 cases of hanging. It was well-defined in 92.9% of the cases and faint in 7.1% of the cases. The ligature mark was placed over and above the level of the thyroid cartilage in 82.9% of cases of hanging while in 60% of cases of strangulation, the ligature mark was placed above the level of the thyroid cartilage. In cases of hanging discontinuity was present in 68.6% of the cases. It was continuous in all five cases of strangulation. The tongue was bitten and protruded in 58.6% of the cases. Internal neck injuries were present only in 11.4% of the cases of hanging and these include contusions seen in subcutaneous tissue, rupture of the lower attachment of sternocleidomastoid muscle, contusion of sternocleidomastoid and fracture of neck skeleton including hyoid bone and thyroid cartilage.

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