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## Asphyxia death analysis and cello tape sample implications

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### Abstract

**Background:** Asphyxiation caused by violence is one of the most significant contributors to unnatural deaths. When conducting day-to-day autopsies, forensic experts frequently come across deaths caused by hanging and other forms of strangulation in the course of their professional lives. Around the world, suicide is a significant problem that affects both the economy and public health. The presence of a ligature mark at the victim's neck is one of the characteristics that is considered to be indicative of a death caused by hanging or strangulation.

**Method:** This current study was conducted on cases of death due to compression of the neck by any form, such as ligature material due to hanging, strangulation, etc., that were brought for postmortem examination at the Department of Forensic Medicine, Malla Reddy Medical College for Women, Hyderabad, Telangana, India.

**Results:** There were a total of 500 autopsies performed, and 90 of them involved the compression of the victim's neck in some way, shape, or form. 01 was a case of hanging with antemortem injury over the body, 01 was a case of ligature strangulation, 01 was a case of manual strangulation, one was a case of hanging with a sign of asphyxia present over the body, and 06 were under investigation because a ligature mark was not clearly visible over the body.

**Discussion:** This study was conducted on cases of deaths caused by compression of the neck in any way, such as ligature material from hanging, strangulation, or other causes, brought for postmortem. A total of 500 postmortems were performed, of which 90 involved neck compression in some way. Out of them, 81 cases involved hanging, 01 involved ligature strangulation, 01 involved manual strangulation, 01 involved hanging with an antemortem damage to the body, and 06 involved signs of suffocation present on the body but no clearly visible ligature mark.

**Conclusion:** The majority of hanging cases included saliva dripping, although manual strangulation and ligature instances did not. In certain instances, we had sampled cello tape from around the neck and placed it on paper to check for fibres and foreign objects, as well as a cross-match with ligature material. After getting the FSL findings, the definitive cause of death was determined.

**Keywords:** Cello tape, asphyxiation, hanging, strangulation, postmortem, and saliva dribbling

### Introduction

Asphyxiation caused by violence is one of the most significant contributors to unnatural fatalities. When conducting day-to-day autopsies, forensic experts frequently come across deaths caused by hanging and other forms of strangling in the course of their professional lives [1-3]. Around the world, suicide is a significant problem that affects both the economy and public health. The presence of a ligature mark at the victim's neck is one of the characteristics that is regarded to be indicative of a death caused by hanging or strangulation [4]. As is known knowledge, hanging is one of the main causes of death around the world, accounting for more than a million deaths per year. In India, hanging is the second most common means of suicide after poisoning [5]. The number of people who commit suicide by hanging themselves has been steadily rising over the past three decades, particularly among young individuals [6-8]. The fact that 71% of suicides in India are committed by people under the age of 44 years places a significant strain on our society on multiple fronts, including the social, the emotional, and the economic fronts. In cases of strangulation and hanging, a mark called a ligature mark is detected around the victim's neck [9]. If there is no ligature mark or only a faint one, this raises questions about how the victim died. A person can die from a violent kind of asphyxia known as hanging. In hanging, the body is suspended from the ceiling by a rope that tightens around the neck and prevents air from entering the lungs.

The weight of the body is the source of the constraining force. The term "total hanging" refers to situations in which the body is completely suspended from above. Incomplete or partial hanging is the term used to describe the process when some part of the body makes contact with the ground [10-12].

The victims of a hanging experience a quick and painless death, and there are no additional costs involved other than the cost of the ligature material. Strangulation is the medical term for when someone is rendered unconscious by placing something around their neck, such as a thin rope. Suffocation that is brought on by the tightness of the neck brought about by a ligature even when the body is not suspended. It is possible to cause death by applying pressure with a U-shaped ligature on the front and sides of the neck while the victim is standing behind them. The following categories of suffocation deaths are distinguished from one another according to the method that was utilised to suffocate the victim's neck: A mugging, bansdola, garroting, palmar strangulation, garroting, ligature strangulation, and palmar strangulation are all forms of strangling. As is well known, circumstantial evidence plays a significant part in the investigation of questionable cases [13-15]. Evidence based on circumstantial factors is an indirect form of evidence that is derived from suspicious events and their surrounding context. In the event that a person dies as a result of pressure being applied to the neck and the ligature mark is unclear, circumstantial evidence can be collected. Cello tape can be removed from around the neck and placed on paper so that it can be compared to ligature material. In the past, forensic science laboratories would search for fibres on cello tape and attempt to cross-match them with ligature material [16]. When a ligature material was recovered from the crime scene, the FSL team would collect a sample of it from the suspension point, which may be a fan, for instance. In the past, the FSL would additionally provide a report regarding the existence of fibres on the hanging point and the same on the neck of the deceased person with a cross match. With this in mind, we decided to perform a study that would concentrate on the elements that have already been identified that are connected with passing away from compression around the neck.

## Material and Methods

This prospective study was carried out at the Department of Forensic Medicine, Malla Reddy Medical College for Women, Hyderabad, Telangana, India. A total of 500 postmortem examinations were performed, 90 of which involved the compression of the victim's neck in some way, shape, or form. We included cases in which the history and the scene of crime examination report that was given by the investigating police officer as well as the history that was given by the close relatives and friends who attended the inquest were suggestive of a suicide by hanging.

The attendants of the victim were interviewed to obtain information regarding the ligature material and other relevant information. During the postmortem examination, it was also noted whether or not samples were collected. We obtained the specifics of the postmortem reports in order to determine the cause of death, and we also retrieved a sample of the tape that was wrapped around the victim's neck in order to cross-match it with other ligature materials.

## Results

Among the 90 instances, 143 (90.00%) were obvious cases of hanging, 01 case (1.11%) was a case of strangulation by ligature, 01 case (1.11%) was a case of strangulation by hand, 01 case (1.11%) was a case of hanging with antemortem injuries over body, and 06 cases (6.66%) were

in question (Table-1).

**Table 1:** Reason wise distribution of cases

Reason	No. of case	Percentage (%)
Hanging	81	90.00
Ligature strangulation	1	1.11
Manual strangulation	1	1.11
Hanging with other Injuries	1	1.11
Query cases	6	6.66
Total	90	100

On external examination, none of the cases in the enquiry showed any signs of ligature or any other type of injury mark. An internal examination revealed a hematoma in the muscle. Asphyxiation symptoms were seen in every case. The saree was the most frequent type of ligature material, followed by the material made of nylon and then the electric wire. In 90 cases, sarees were employed by 28.29% of the deceased as a ligature material, while nylon material, commonly known as nylon rope, was used by 23.02% of the cases. The findings of the FSL investigation into the ligature material were presented in this table (Table-2).

**Table 2:** Ligature material used

Ligature material	No of cases	Percentage
Orna (Dupatta)	16	17.77
Joute rope	8	8.88
Saree	31	34.44
Nylon rope	22	24.44
Towel	4	4.44
Electric wire	7	7.77
Hand	1	1.11
Other	1	1.11
Total	90	100

According to what we already know, the dribbling of saliva is very essential evidence of antemortem hanging. A total of 90 cases showed mark of dribbling of saliva, which is 83.33% of total cases; however, in the remaining 16.66% of cases, dribbling of saliva mark was not visible (Table 3).

**Table 3:** Data on dribbling of saliva

Sr. No.	Dribbling of saliva	No of cases	Percentage
1.	Yes	75	83.33
2.	No	15	16.66
3.	Total	90	100

Cello tape was used for FSL in each of these instances. In all of these cases, police or the investigating authority was urged to attend the murder scene. Cello tape that was removed from around the neck was tested on paper for the presence of fibre and foreign substances and their cross-match. They also suggested gathering and preserving the ligature material. The ligature material with cello tape was always examined by the forensic science laboratory to see whether any fibres or foreign objects were present. In each of these cases, a forensic science laboratory also went to the scene of the crime and took the right samples. This visit aids in the ligature material's confirmation. Out of the six cases, a saree and a dupatta were worn in two of the cases. The remaining 2 cases both had a nail foreign body and towel fibre.

## Discussions

During the post mortem examination, ligature material is typically not accessible in the majority of cases. In most cases, family members were the ones who transported the deceased person to the hospital from the scene of the crime.

In those particular instances, the medical administration notified the police. It indicates that the police or investigating authority has arrived at the scene with only the body because, in most cases, they do not wish to waste time travelling to the crime scene. Because the police have such a heavy workload on their shoulders, they used to just close the case without doing a thorough investigation first. However, despite the fact that the ligature is missing, the police are still preparing the inquiry and including the statements of eyewitnesses regarding the cause of death and the way in which it occurred. The punchnama at the time, which was dubbed "farth surat hal" and was provided by the autopsy police as a demonstration of their intelligence, did not contain any information about the ligature material; as a result, the material was subject to investigation<sup>[17, 18]</sup>.

In the current study, which included 81 cases of hanging, the biggest number of hanging deaths occurred due to suicide, making hanging the method of death with the highest occurrence. A high suicide rate places an enormous strain on our society, not only emotionally but also financially and socially. It appears that the number of young people committing suicide is rising in both developed and developing countries. The materials made of nylon were the ones that were used as ligatures the most frequently.

According to Pal *et al.* (2016)<sup>[19]</sup>, saree was the most common ligature material used by males, while dupatta was the most common ligature material used by females. The easy availability of these materials makes it very difficult to prevent their use. As a result, if we want to stop someone from killing themselves by hanging themselves, we need to determine what leads up to it and then work to stop it<sup>[19]</sup>.

Despite the fact that the research conducted by Reddy *et al.* 2019 came to differing conclusions, it was found that dribbling saliva was present in the majority of instances, accounting for 86.84% of all cases. Only 47% of the cases that Ashok and his colleagues examined showed evidence of dribbling saliva<sup>[20]</sup>.

In forty percent of the instances, the researchers Bhuchade *et al.*, noted dribbling of saliva<sup>[21]</sup>. It was determined that there was no possibility of being misled by taking a sample for FSL in these cases. In these cases, the mark was nearly nonexistent, but the other findings were consistent with suffocation. When this occurs, obtaining a sample of the cello tape and having the FSL report on it are both helpful to the investigating authority in finalising the results. There hasn't been any other research that suggests or did this kind of evidence up until now.

### Conclusions

The high incidences of suicidal hangings were amongst asphyxia death when pressure is present around the neck. Private nature of hanging and easy availability of ligature materials and ligature points makes prevention of suicide by hanging a difficult task. Also a change regarding social practices and perceptions in India will prevent most of the suicides. Dribbling of saliva present in case of hanging is a sure sign of antemortem hanging. In query cases where mark of ligature material is questionable, sample of cello tapes helps the forensic expert a positive boost. So it is request to forensic experts please ensure to take cello tape samples if ligature mark is very faint or under questionable.

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**Conflict of Interest:** None

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