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Injuries over Neck due to Ligature Materials in case of Hanging of Varanasi Region of U.P.

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ABSTRACT

Background: Deaths by ligation of neck are in practice from the time immemorial and before advent of civilization. In uncivilized societies, the application of ligation for taking away the life of another person was one of the commonest practices which were successfully carried out into the civilized societies. Hanging is that form of violent asphyxial death in which ligature marks are found and it is mainly based on the constricting forces which is : (i) either by the exclusion of air from lungs or oxygenated blood from the brain, (ii) by means of ligature around the neck, (iii) the constricting force is the weight of the body. **Results:** The data of present cross-sectional study of 100 cases with the aim, injuries over neck due to ligature was collected from in the Department of Forensic Medicine & Toxicology, Institute of Medical Science (IMS), BHU, Varanasi, U.P. India. The total duration of sampling was six months and different aspects such as sex ratio, age group involved, residence, ligature material used type of hanging, place of hanging, the Position of the knot and other external findings involved were taking under consideration. **Conclusions:** It was found that the most common cause of death in Varanasi region was Socio-economic Status of the victims with a male: female ratio of 1.8:1 with age group of 20- 29 years being most commonly involved.

Introduction

The act of hanging involves dangling the body from a ligature around the neck, with the body's weight or a portion of its weight acting as the constricting force. Substances available at hand can be used as a ligature, and various knotting techniques are used to bind the ligature around the victim's neck. The most recognizable indication of death by hanging is a mark of ligature on the neck. Abrasions with

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pressure effects, grooves, or angled fiber patterns can be seen in ligature marks. [1] The application technique, level of suspension, movement of the ligature, and type of ligature substance will all have a significant impact on the mark's location. In most cases, the ligature line is elevated above the level of the thyroid cartilage and is angled upward towards the point of suspension. It may not be continuous at the rear or exhibit an atypical knot impression. The side of the neck opposite the knot where the most weight is carried will have a deeper ligature scar. If a cloth or other comparable soft substance is used, the ligature mark is broad and superficial. It is uncommon to see hanging-related internal neck injuries occur. Upon dissection, the subcutaneous tissue beneath the ligature line will appear compressed, dry, white, shiny, glistening, and leathery in texture. Particularly in long drops or complete suspension, platysma and sternocleidomastoid muscle fibers can bruise and rupture, particularly at their lower attachments. [2] Hyoid bone fracture in hanging is an exception rather than the normal rule in hanging. The hyoid bone can split both internally and externally when being hung. The ligature's strain on the thyrohyoid ligament can lead to traction fracture. People over the age of 40 are more likely to suffer from the injury. The goal of the current research is to identify the external and internal patterns of ligature present on neck injuries as well as their relationships. [3,27]

Homicidal hangings are uncommon. The ligature scar on skin is typically located above the larynx and appears as a furrow. The point of the knot determines its orientation. The furrow initially appears as a pale or yellow parchment-like region with a congested rim or with light punctiform hematomas, depending on the duration of suspension time. The furrows eventually dry out and turns brown. [4-5] The mark on the skin is more noticeable the tighter the ligature, the harder the substance, and the longer the suspension period. The furrows primarily occur after death i.e. it is a postmortem phenomenon. Any inner neck structure injury suggesting ligature mark intravitality must be found in order to confirm the intravital hanging.

The frequency and distribution of intracervical injury due to suspension may indicate the mechanism of affected organs in relation to the type of suspension or the apex of the ligament. Injuries to the internal structure of the neck can be caused in two ways: directly, at the point of highest compression of the ligament, which occurs on the opposite side of the nodal point, or indirectly, from excessive stretching of the neck structures, which occurs. is most visible around the apex of the connecting node. [6-7] The purpose of this study was to determine the frequency of damage to the internal structure of the neck in relation to hanging in relation to the apex of the ligament. A prospective study of deaths by hanging was investigated. A total 100 bodies of hanging related deaths brought for medicolegal autopsy in the Department of Forensic Medicine and toxicology, Institute of medical science, Banaras Hindu University, Varanasi between period of march 2020 to June 2020 were studied with a view to assess the information that a ligature mark can provide in such deaths. Out of the 100 cases studied 65 were males and 35 were females. Age group of the study sample ranged from 15 years to 65 years. During the postmortem investigation, details about the incident, the victim's age, gender, ligature material type, and injuries in the form of ligature marks and peri-ligature injuries were noted. The effects of various ligature materials on ligature marks and other injuries over the neck were investigated. The three types of peri-ligature injuries were sores, abrasions, and ecchymosis. The information regarding identification of the deceased and the type of asphyxial death was obtained from the police and detailed interviews of the relatives of the deceased. Various injuries to the neck structures in different cases of compression of the neck (hanging, ligature strangulation) and the different types of hanging were carefully noted at the time of conducting the autopsy using a standardized technique that included specific attention to the ligature mark on the neck, a layered dissection of the neck tissues and careful assessment of other injuries on the body surface.

Literature Review

According to **Naik and Patil (2005),** soft ligature materials were found in most of the hanging cases. **B.R. Sharma, et al (2008),** reported his work Injuries to neck structures in deaths due to constriction of neck, with a special reference to hanging, in his work he had focused Asphyxial deaths by constriction of the neck are widespread worldwide; therefore, prospective studies in various configurations to investigate the profile of injuries to the neck structure are required to more accurately distinguish the suicidal from the homicidal nature of these deaths. [28] **Jayaprakash, S., et al (2012),** Studies on Pattern of injuries to neck structures in hanging—an autopsy study. In his study he analyzed with special emphasis on correlation between the external and internal injuries on neck. Also focus on Atypical features such as infiltrations into the muscles and fracture of thyroid cartilage were found in a good number of cases. Materials that could be easily obtained were utilized to make ligatures. 47% of victims used soft items, including shawls, lungis, and sarees, while 29% utilized hard materials, like telephone cables, plastic rope, and coir rope, as ligatures. In 94.2% of the instances, an oblique ligature mark was found. In 78% of cases, there was a noncontinuous ligature mark. Partial

hanging cases were found to have horizontal ligature marks also noticed. **Patel A P, et al (2012),** Study of Hanging Cases in Ahmadabad Region, they found in their study as ligatures, soft materials (80%) were utilized more frequently than hard materials (20%). However, the victims used whatever was available at the time out of an inclination to commit suicide. The most reliable indicator of antemortem hanging was found in only 228 cases (71.25%) of the corpses that had ligature marks around the neck that were dribbling saliva. In these cases, correlations between the history and postmortem results are highly helpful. In these situations, examining the scene of the incident is quite valuable. **Tumram, N. K., (2014),** reported in his work entitled on Injuries over neck in hanging deaths and its relation with ligature material, he investigated the relationship between the ligature material and the incidence of ligature marks and various peri-ligature injuries in a systematic manner. They might be easily overlooked; thus, a very careful inspection is necessary. Consequently, this study has demonstrated the significance of recognizing these injuries and how they relate to ligature material. **Prasad et al. (2016)** worked on various patterns of ligature mark of 83 different cases of asphyxial deaths due to hanging. They found that 37(44.7%) of cases belongs to 21-30 years and the males 52(62.6%) are common victim , complete hanging was commonest type 76(91.56%), chunni was the commonest material 25 (31.12%), also found single ligature mark was common 80(96.3%).They concluded that the ligature mark need to be evaluated along with other external features and internal findings, this help to distinguish ante mortem ligature mark with post mortem ligature mark to find the mode of death. **Rao (2016)** worked on an autopsy study of death due to hanging, a total of 7968 autopsies were conducted of which 3.31% (n-264) cases were deaths due to hanging. In their studies most, preferred ligature materials were stealing (n-79) and Saree (n-68). In 88% of the cases, hanging was complete. Males (n-128) and females (n-136) were equally affected where as the major age group were 31-40 years. In 80.58% of the above cases, ligature mark showed discontinuity (incomplete). In 95.45% (n-252) of the cases, the ligature mark showed blackening and only 4.54% (n-12) showed intact of the skin. The domestic issue was the commonest reason (n-82) for self suspension of cases. **Pal and Pratihari (2017)** worked on the case study, the subject indicates that hanging is very common method of committing suicide in India. Ligature materials like cotton, jute rope, electric wire, belt, napkin, sari, dhoti, Dupatta are being used to meet the requirement. In almost all cases of suicidal hanging, knots are generally present in the noose. In one case of suicidal hanging, a 26-year-old male used a bunch of jute string as ligature material but without a knot. All the observations are suggestive of a case of suicidal hanging. In addition, post mortem (PM) findings corroborated the observation made at the scene of crime and confirmed the death was due to unusual suicidal hanging. **Singh et al. (2018)** studied on a comparative of ligature marks in cases of hanging and strangulation autopsied at Ranchi. During year 2016 to 2017, a total of 2981 cases of autopsy were conducted, out of which 180 cases were having ligature marks. There were 163 cases (90.56%) of hanging and 17 cases (9.44%) of strangulation. They concluded ligature Mark in hanging was oblique in 100% cases, discontinuous in 96.93% cases, and the subcutaneous tissue underneath the ligature mark was pale and dry in 100% cases. The ligature mark in strangulation was transverse in 100% cases, continuous in 100% cases and subcutaneous tissue underneath the mark was contused in 88.2% cases. **Mishra et al. (2018)** worked on Profile of deaths due to hanging- An autopsy based retrospective study in PGI, Indore. Total 1088 post-mortems were done during, from January 2013 to December 201. Out of which total 113 cases (10.39%) were of deaths due to hanging. Male victims (68.14%) outnumbered females (31.86%); with the male to female ratio was 2.1: 1. They found Majority of victims were resident of an urban region (84%), while 14.16% were from the rural area. Saree and Dupatta was the most common ligature material used for hanging. Salivary stain mark was present in 26.55% cases. In 78.76% cases' hanging was typical. Protrusion of tongue in 22.12%. Seminal ejaculation and passing off of fecal matter were found in 10.61% cases. **Buchade et al. (2019)** studied on Analysis pattern of hanging cases at Delhi. It was retrospective study, including 173 hanging cases was conducted. Mainly male victims constituted 72.8% with male: female ratio being 2.7:1. Commonly Young adults in the age group of 16 to 35 years were involved. Maximum cases of hanging, that is, 67 cases (38.7%), recorded in rainy season, whereas winter season recorded the least number with 24.3%. In this study in 149 cases (86.1%) sari/Dupatta/bed sheet was most commonly used as ligature material. Autopsy findings revealed dribbling of saliva in 129 cases (74.6%), cyanosis in 150 cases (86.7%). They concluded cause of death was mechanical asphyxia in 169 cases (97.6%). **Rajput et al. (2019)** worked on A Study of pattern of neck injuries in the victim's total of 208 autopsied at Bijapur (Karnataka) from June 2011 to May 2014. It was a one-year retrospective and two years prospective study. They observed that most vulnerable age group was 21-30 yrs (30.76%) followed by age group 31-40yrs (27.88%). Cervical vertebrae fracture and dislocation was the most common skeletal injury in neck region (18.26%). It was found that Suicide by hanging (40.38%) was the most common manner of death followed by road traffic accidents (31.73%). Major cause of death was mechanical asphyxia (53.84%). They

concluded Neck injuries constitute a potential factor in increasing the amount of mortality and morbidity. **Boyal and Kochar (2019)** studied on features of ligature mark and fracture in hanging and ligature strangulation cases in Ajmer region. A study was conducted at Ajmer, for a period of one year i.e. from January 2009 to December 2010. During this period a total number of 105 cases were observed; of which 100 were hanging and 05 cases of ligature strangulation. In the investigation of 100 cases of hanging reported for studied of injuries to bones and cartridge of neck. In the study, hyoid bone (13%) and thyroid cartridge fracture (5%) were most commonly observed among male and female respectively, no case of larynx and trachea fracture was recorded.

From the above review it is evident that no study has been done on findings involved in hanging cases of Varanasi, U.P. So, in the present study an attempt has been done to find out features involved in the concerned cases of the population.

Material and Methods:

2.1Aim

The aim of this study was to determine the proportions of deaths that were due to suicide by hanging with emphasis on ligature mark and the socio demographic factors affecting it in the population of Varanasi. Present prospective study was carried out to study the incidence, ligature materials, and post-mortem findings in hanging cases. This study sought to ascertain the rate of neck injuries in relation to the ligature material and their knot's place of hanging. Keeping the view of the place of hanging, manner of death and reason for death.

2.2 Objectives

The Present study has following objectives: -

1 The study provides epidemiological analysis of autopsy records on asphyxial deaths and different methods used to carry it out.

2 The determine the incidence of hanging deaths with other related factors like socio demographic and type of hanging among all unnatural deaths in Varanasi region in U.P. state.

3 To study the autopsy findings of hanging cases with main emphasis on ligature mark.

2.3 Data Collection:

This prospective study was conducted on 100 cases of known and unknown dead bodies of both sexes, brought for medico legal autopsy with history of death due to hanging, at the Department of Forensic Medicine, Institute of medical science, BHU, Varanasi during the period of six months. The inquest reports were scrutinized, and information regarding history of the incident and manner of death was gathered from the police records and relatives of the deceased. During the postmortem examination, the details about of incident, age, sex, the type of ligature material, and injuries in the form of peri-ligature injuries and ligature marks were recorded. The results of a thorough external examination and a neck flap dissection were examined, with a focus on the relationship between the external injuries to the neck.

2.4 Inclusion criteria:

All cases of hanging coming for autopsy in the department of forensic medicine and toxicology, IMS, BHU, Varanasi during the study period.

1 All well preserved bodies.

2 All cases of suicide by hanging.

3 All cases with well-defined ligature marks.

2.5 Exclusion Criteria:

1 Cases brought in a decomposed state were excluded.

2 Charred burnt bodies were also excluding from the study.

2.6 Measurements:

Total of 8 parameter measures including: -

1 Composition of ligature: The Pattern and appearance is produced upon the skin, e.g., if thick rope is used, its appearance may impress in the form of superficial abrasion

[Figure 1- Appearance and Multiplicity of Ligature Marks].

2 Width and Multiplicity of ligature: When ligature is a deep groove, narrow made because much more force per sq.cm, of ligature is directed inwards. If the ligature is passed twice round the neck, a double mark, one circular, and the order oblique may be seen the ligature may have one, two, or more layers [Figure 2 - Suspended for short time with light groove].

3 The length of time body has been suspended: Longer the suspension, deeper is the groove. Even a broad, soft ligature can cause a clear-cut groove if suspended long. There might not be an external trace if the ligature is quickly removed and a soft board ligature was used.

Figure 2 Suspended for short time with light groove

Figure 3 - Continuity of ligature mark by rough and tough ligature material

4 The knot's location: The ligature's primary force on the neck is directed away from the point of suspension. The front of the neck is also affected, and the point of suspension is in the occipital area. And if in front, the cervical vertebrae limit the groove's depth posteriorly.

Table -1: Sex wise distribution of cases (N=100)

Sex	Frequency	Percentage
Male	65	65%
Female	35	35%
Total	100	100%

5 Continuity of ligature mark: - Oblique and discontinuous ligature mark along with dry and pale subcutaneous tissue is suggestive of hanging while a transverse and continuous ligature mark with contused sub coetaneous tissue is indicative of strangulation [Figure 3 - Continuity of ligature mark by rough and tough ligature material].

6 Level in neck of ligature mark: - Ligature mark was situated above the level of thyroid cartilage in hanging cases and in ligature strangulation, ligature mark was found below the thyroid cartilage.

Table -2: Age wise distribution of cases (N=100)

Gender	10-19	20-29	30-39	40-49	50-59	60-69	Total
Male	13	18	17	7	8	2	65
female	8	15	7	5	0	0	35

Table -3: Particulars of ligature marks of hanging. (N=10

Particulars of Ligature Mark		frequency	Percentage
Encirclement	Complete Mark	44	44
	Incomplete Mark	56	56
Level	Above level of thyroid	98	98
	At level of thyroid	00	00
	Below level of thyroid	02	02
Direction	Oblique	98	98
	Transverse	02	02
Depth	Shallow	59	59
	Deep	41	41

7 The degree of suspension: Heavier the body and greater the proportion of the body suspended, the more marked is the ligature impression, either complete hanging or incomplete hanging.

8 Place of self-suspension: Basically the place where the deceased may carry out Suicide.

Results

Symptoms like clinched teeth or protrusion of tongue can be considered as indicator rather than specific either for hanging or ligature strangulation. In this study I found Majority of

deaths due to hanging were males 65 and females 35 out of the total number of 100 cases of hanging and all of them between the ages of 15-69 years. Out of the total 100 cases of degree of self-suspension, 85 (85%) of the hanging were

able -4: Types of Hanging, places of self-suspension, and marital status (N=100)

Features		Frequency	Percentage
Types of Hanging	Complete	66	84.6
	Incomplete	12	15.4
Marital status	Married	44	56.4
	Unmarried	34	43.6
Places of self-suspension	Out of house	15	19.2
	Inside house	63	80.8

Table -5: Ligature material used for suicidal Hanging, (N=100)

Ligature Material	Frequency	Percentage
Nylon rope	53	53
Chunni	11	11
Dhoti	10	10
Towel	04	04
Saree	22	22
Total	100	100.00

Table- 6: Relation of type of ligature mark wit type of knot. (N=100)

Ligature Knot	Ligature Mark		Total
	Complete	Incomplete	
Fixed	23 (52.2%)	21 (43.7%)	44 (100%)
Running	22 (39.20%)	34 (60.70%)	56 (100%)
Typical Hanging	20	16	36%
Atypical Hanging	50	14	64%

Complete and 15 (15%) were due to Partial or incomplete hanging. the most common ligature material used to commit suicide by hanging was nylon rope 53 (53%) was observed during the examination. During study period, 100 cases of death due to hanging were observed. Out of 100 cases most of the cases were suicidal in nature (98.81%). Only one or two case of homicidal hanging was observed during study period and victim was male. Accidental hanging was not observed during study period. Total 100 cases were included in this study; 65 males and 35 females, all of them between the ages of 15-69 years; the sample distribution according to sex and age is presented in [Table- 1]. Majority of deaths due to hanging were males 65 (65%) than females. In the present study the highest number of cases of death due to hanging were adults in the age group of 20 to 29 years –N=33 (33%), followed by individuals of 30 to 39 Years- N=24 (24%).

Position of ligature mark: - In 44 (44%) cases, the ligature mark was Complete and in 56 (56%) cases, ligature mark was incompletely encircling neck. The Ligature mark was observed above the level of thyroid cartilage in 98 (98%) cases, at the level of thyroid cartilage and below the thyroid cartilage in 02 (2%). In 98 (98%) cases, the ligature mark was Passing obliquely upward and ligature mark horizontal or transverse in only 02 (2%). Ligature mark was grooved in 41 (41%) and shallow in 59 (59%) cases .

Types of Hanging: - Out of the total 100 cases of degree of self-suspension, 85 (85%) of the hanging were Complete and 15 (15%) were due to Partial or incomplete hanging. Majority of the victims were married comprising 65 (65%) of the cases and other hand 35 (35%) of the cases unmarried. In 80 (80%) of cases, the incidents occurred inside the house, and the other preferred place was outside the house 20 (20%) [Table- 4].

Types of ligature material: - Considering the information gathered from the police record and from the relatives of the deceased and taking the examination findings of the ligature material wherever it has been sent along with the dead body it was observed that the most common ligature material used to commit suicide by hanging was nylon rope 53 (53%) followed by saree 22 (22%) and chunni 11 (11%).The least common ligature material of choice was Dhoti 10 (10%), followed by Towel 04 (4%) used by victims [Table- 5]. The fixed noose was observed in 44 (44%) cases; out of which 23 (52.2%) cases showed complete ligature mark and 21 (43.7%) cases showed incomplete ligature mark around neck. The running noose was seen in 56 (56%) cases; of which ligature mark completely encircling around neck was observed in 22 (39.2%) cases [Table- 6 indicate Relation of type of ligature mark with type of knot. (N=100)]. Out of total 100 cases; in which 36 (36%) was observed as Typical hanging which means the knot of the ligature should be at the nape of the neck and 64 (64%) cases showed Atypical means the knot of

the ligature at any site other than the nape of the neck on the basis of Position of Knot. Also noted that in maximum cases the position of knot was present at left mastoid region of the neck and least over right mastoid region of the neck. There was not a single case found where the position of knot at the front of the neck [Table:6].

Discussion

Most of the times, the ligature mark may be the only evidence available in cases of hanging. Thus, it is crucial diagnostic importance to examine the ligature mark in detail with regards to its course, depth, and pattern. The appearance of ligature mark at autopsy depends on the nature and texture of ligature material. Nylon rope, odhni, dupatta, and saree were the most frequently used ligature materials in the current research. It might be as a result of the simple abundance of such materials in the home and the simplicity of its construction. The results are in line with those of Pradhan et al., Sharma et al., and Dixit et al was found the primary ligature materials in western nations were rope/cord, belts, electric cables. However, dupatta was identified by Saisudhir et al. as the most frequent ligature material because it is a prevalent form of clothing for women in that area. The ligature line was typically usually incomplete and placed above the level of thyroid cartilage. It has typically been used alone and positioned diagonally over the neck. These results agree with those of other authors. [8,9,12,13,15] The grooving was evident in 54% of cases, and the imprint was in 32.5%. In every instance of suspending using the hard ligature material, there was grooving to be seen. The results were consistent with those of other research. [8, 11,13] Sometimes the groove keeps the design of the ligature material, such as a rope's helical weave.[14] Again the narrower and harder the ligature material, and longer the suspension time, more detectable is the grooving of ligature mark. Determining whether a fatality by hanging was antemortem or postmortem is one of the key factors in hanging cases. A saliva dribble trace is an indicator of antemortem hanging. However, it might not typically be present due to mouth-washing by family members or medical professionals during resuscitation attempts. [19] A medico legal expert can offer an opinion on the antemortem nature of hanging in this situation based on other ligature mark characteristics, such as peri-ligature injuries. According to our research, odhani, cotton rope, and dupatta were the most frequently reported ligature materials to cause peri-ligature injuries. Only nylon rope exhibits peri-ligature blisters, whereas peri-ligature ecchymosis and erosion are frequently seen in nylon rope, followed by odhani. Rope burns, also known as peri-ligature blisters, are caused by rough and strong ligature materials like coir or nylon rope rubbing against skin, which causes blistering by expressing tissue fluid into the top layers of skin. [7] The friction of a tight noose against skin can cause blisters that hold serum.[15] Vertical folds that rub against the rope and become abraded occur occasionally when the neck is constricted in a noose. As a result of the weight of the body below the neck pulling upward on the loop during hanging, there may occasionally be abrasions that are directed upward towards the ligature mark, which is known as "evidence of ligature material slippage" and is regarded as an indication of antemortem hanging. However, in cases of extended suspension where the ligature slips after death, there may be postmortem abrasions, hanging injuries are not always antemortem. [11,24,26] The skin may abrade in hanging instances where there is a lot of movement between the neck and the rope prior to death. Some ligature scars may have a thin hemorrhagic border around them. If the victim had long nails, he could scrape the flesh by pulling at the ligature. [18] while multiple ecchymotic areas that are present below the ligature mark are always antemortem in character, those that are present above the ligature mark may be postmortem. This is because an ecchymosis above the ligature mark may be more affected by the engorgement of blood vessels produced by the ligature material's stasis, which ultimately causes the rupture of the blood vessel. However, this mechanism won't have a significant impact on the ecchymosis that exists below the ligature line. Hence it is more likely to be of antemortem nature. [31]

Conclusion

The incidence rate of hanging is (100 out of 907 cases) in the present study with a male: female ratio of 1.8:1 with age group of 20-29 years being most commonly involved. Under the study (100 cases) maximum were suicidal and two of them was homicidal. Hard material was more commonly used as ligature than the soft one. However, on an impulse for suicide the victims used whatever material was available on that particular time. Obliquity of and discontinuity of mark, both are strongly suggestive of hanging. Pale and dry subcutaneous tissue is also a finding of hanging but may also be very less commonly found in ligature strangulation.

1 Ligation deaths from hanging are most common in the middle age group, the period of an emotional outlet and outburst, and almost all are suicidal in nature. In contrast, hanging deaths in the formative period i.e. in childhood, mostly accidental in nature and in the reconciliation period i.e. old age, are suicidal.

2 A ligation death by hanging, male preponderance is seen but it does not confirm the increased suicidal tendency in male sex because the preferred mode for female sex is 'conflagration'.
3 The leading predisposing factor for mortality is harassments in case of females, family and financial problems in case of males, leading to physical or mental stress in the both sexes.
4 Irrespective of sex, complete hanging is the choice and partial hanging is opted when environment is not conducive for complete hanging.
5 Atypical hangings are more particularly with knot on left side. There by typical hangings with knot over the occipital region or under the chin usually allow suspicion as it is a deviation from normalcy.
6 An interrupted ligature mark over and above thyroid cartilage is diagnostic of hanging, whereas maximum incomplete encircling marks over the neck.
7 It is not customary to get an imprint of ligature mark with a patterned ligature material. The presence of pattern over ligature mark has a positive value but its absence has more negative value.
8 The grooving of the skin produced by ligature material depends more on area of contact and duration of suspension rather than the consistency of the material.

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Ethical Approval

Not Applicable

Conflict of Interest

The Authors declare that there is no conflict of interest.

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