

**Ligature Mark in Deaths Due To Hanging –Retrospective Study****Rohit Raj Singh<sup>1</sup>, Prabhat Kumar<sup>2</sup>, Nishant Purbey<sup>3</sup>, Dharmendra Kumar<sup>4</sup>, Kaushal Kishore<sup>5</sup>, Bijay Kumar Prasad<sup>6</sup>**<sup>1</sup>Senior Resident, Dept of Forensic Medicine and Toxicology, RDJMMCH,, Turki, Muzaffarpur<sup>2</sup>Assistant Professor, Dept of Forensic Medicine and Toxicology, RDJMMCH Turki, Muzaffarpur<sup>3</sup>Senior Resident, Dept of Forensic Medicine and Toxicology, AIIMS, Patna<sup>4</sup>Associate Professor, Dept of Forensic Medicine and Toxicology, RDJMMCH, Turki, Muzaffarpur<sup>5</sup>Professor, Dept of Forensic Medicine and Toxicology, SKMCH, Muzaffarpur<sup>6</sup>Professor, Dept of Forensic Medicine and Toxicology, RDJMMCH, Turki, Muzaffarpur

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**Abstract:****Background and Objective:** Hanging is one of the ten leading causes of death in the world accounting for more than a million deaths annually. The hanging deaths are one of the most important asphyxial types of death which are encountered in day to day life by forensic pathologists. Ligature mark in the neck is the principal external sign in hanging depending on body suspension from ligature point.**Material and Methods:** This Retrospective study was conducted at the Department of Forensic Medicine, SKMCH Muzaffarpur and Other Medical College to assess the information provided by a ligature mark in deaths due to hanging.**Conclusion:** We found that typical hanging is seen in 50 cases and atypical hanging in 225 cases. Partial hanging is seen in 73.09% deaths and complete hanging in 26.9% deaths. Ligature mark was obliquely placed in 91.3% cases and was found to be running above thyroid cartilage in 80.7% cases. Single ligature mark with a breadth of 1-2cms is observed in the maximum number of cases. In 93% of the incidents, ligature mark showed discontinuity. The colour of ligature mark was reddish-brown in 46.9% cases.**Keywords:** Asphyxia, Ligature Mark, Hanging.

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**Introduction**

Hanging is one of the 10-leading causes of death in the world accounting for more than a million deaths annually. In India, hanging is one of the common methods of committing suicide along with poisoning, burning and drowning. Over the past 30 years the incidence of suicide by hanging is on increase, especially among young adults. [1] Hanging is a form of violent asphyxia as a result of suspension of the body by a ligature round the neck, the constricting force being the weight of the body. When the feet do not touch the ground and the weight of the whole-body acts as a constricting force, it is called complete hanging. When the weight of only the head, and not the whole body, acts as a constricting force, it is called partial hanging. [2] In typical hanging, the knot of the noose is always placed over the nape of neck. In atypical hanging, the knot is on either side of neck or under the chin. [3] In hanging, the ligature mark becomes a crucial aid in diagnosis and evaluation of the corpse. Hence, examination of ligature mark and material becomes an indispensable part of the autopsy. Ligature produces a mark as a furrow or groove in the tissue which is

pale initially, turns yellow or yellowish brown and becomes dry; it will be hard on touch, parchment like due to drying of slightly abraded skin. With progression of time, the furrow dries and becomes grey. The nature of ligature mark depends on the material and position of ligature used and the time of suspension of body after death. The ligature mark is more detectable in cases where the ligature is narrow and material is hard. If the ligature material is soft and is removed immediately after death the mark might be absent in such cases. [4] Usually single ligature mark is found. But, multiple marks may also be seen in cases of spiral turns, multiple turns around neck or upward displacement of material after application due to fall. In majority of cases the mark is found above thyroid cartilage between larynx and chin and will be oblique in direction. The mark is directed upwards, parallel to the line of mandible and is incomplete at the back with an ill-defined impression of the knot at the point of suspension, which is usually at mastoid process of one side. [5]

## Material and Methods

This prospective study is done on those dead bodies which are subjected to postmortem examination in the mortuary of the Department of Forensic Medicine, Sri Krishna medical College and Hospital Muzaffarpur, Bihar. During this period, 275 cases of hanging were selected and analysed for this study. A detailed history from police and relatives regarding deceased, scene of crime and position of body were taken. Autopsy was performed meticulously, especially noting the parameters of ligature mark like its site, level, size, number, colour and obliquity.

## Results and Discussion

When the type of hanging was analysed, typical hanging cases were 50(18.2%) and atypical hanging cases were 225(81.8%) as shown in Table-1. Similar were the observations of other studies. [1,6,7] The position of the knot or any intervening object like clothings, bony projections (angle of the jaw), long plaits in Indian women and also the beard accounted for the majority of the mark being atypical. In the present study it was found that partial hanging was the cause of death in 73% of cases, while the rest of the 27% cases were complete hanging. This finding is in conformity with the well accepted fact that partial hanging is mostly suicidal in nature. In partial hanging cases, feet touching the ground was seen in 130 deaths, kneeling in 39, sitting in 20 and lying down prone in 12 deaths. The partial type of hanging which was common in our study was also seen in other studies. [4,7,8] Our finding differs with the study done by Ambade VN et al [1] and Suresh Chand et al,<sup>6</sup> where complete hanging cases outnumbered partial hanging cases. In our study, it was observed that the ligature mark was above the level of thyroid cartilage in 222(80.7%) cases, at the level of thyroid cartilage in 38(13.8%) cases and below the thyroid cartilage in 15(5.5%) cases. In the study done by Momin SG et al, [4] Suresh Kumar Sharma GA et al, [9] Bhosle SH et al, [10] Dinesh Rao [11] and Rajeev Sharma et al, [12] it was seen that the position of ligature mark was above the thyroid cartilage in 72 cases(80%), 63 cases(96.92%), 70 cases(83.3%), 218 cases(82.58%) and 69.23% cases respectively, a pattern consistent with the pattern observed in our study. In hanging the ligature mark was normally situated higher in the neck above laryngeal prominence. The position of mark in hanging depends on the way - the device was fixed and the

suspension point. [14] In our study we observed obliquely placed ligature mark in 251(91.3%) cases and the direction of ligature mark was horizontal in 24(8.7%) cases as shown in Table-3. Our findings were in consonance with other studies. [4,5,9,10,11,12,13] Authors have reported that hanging mark is situated obliquely across the circumference of neck. Where suspension point is low, the pull on the rope is almost at right angle to the axis of the body, so the resulting mark may be horizontal. [4] The ligature mark was incompletely encircling around the neck in 256(93.09%) cases of hanging, in the current study. Similar were the observations made by Momin SG et al [4] (80%), Sharma BR et al<sup>5</sup> (83.52%), Sunil Kumar Sharma GA et al<sup>9</sup> (100%), Dinesh Rao [11] (80.58%) and Rajeev Sharma et al [12] (84.61%). The type of knot and the type of suspension determines the ligature mark and its continuity over the neck.<sup>11</sup> In the present study, the ligature mark was a single loop round the neck in 262(95.3%) cases of hanging and multiple in 13(4.7%) cases - Table 5. Single turn of ligature mark round the neck was seen in 93% cases, 98.46% cases and 96.42% cases in studies done by Sharma BR et al, [5] Sunil Kumar Sharma GA et al<sup>9</sup> and Th.Meera et al [15] respectively. The possible explanation is that it could be because of the fact that in most of the cases the ligature materials were long and strong enough to suspend the victim with a single turn.<sup>15</sup> The ligature mark was reddish brown colour in 129(46.9%) cases of hanging, parchmentized in 101(36.7%) cases and pale in 45(16.4%) cases. In the study done by Sunil Kumar Sharma GA et al, [9] the ligature mark was reddish brown in colour in 41.7% cases, Parchmentized in 36.7% cases and pale in 21.7% cases. Whereas in a study done by Bharath Kumar Guntheti et al, [13] the ligature mark was reddish brown in 56.25% cases, it was pale in 6.25% and parchmentized in 37.5% cases. The colour of ligature mark depends mostly on the duration of suspension of the body and nature of the ligature materials used and also the time elapsed between death and autopsy. [13] In the present study the breadth of the ligature mark was between 1-2cms in 191 cases(69.5%), <1cm in 5.8% cases, 2-3cm in 22.2% cases and >3cm in 2.5% cases. In a study done by Bharath Kumar Guntheti et al, [13] width of ligature mark of 0-2cms was noted in 23 cases(71.9%). The breadth of ligature mark depends on the width of the ligature material and also the multiplicity of the ligature material

**Table 1: Distribution of cases according to the type of hanging.**

Type of hanging	Cases	%
Typical	50	18.2
Atypical	225	81.8
Complete	74	26.9
Partial	201	73.09
Total	275	100

**Table 2: Distribution of cases according to the level of ligature mark.**

Level of ligature mark	Cases	%
Above thyroid cartilage	222	80.7
Overriding thyroid cartilage	38	13.8
Below thyroid cartilage	15	5.5
Total	275	100

**Table 3: Showing the direction of ligature mark.**

Direction	Cases	%
Oblique	251	91.3
Horizontal	24	8.7
Total	275	100

**Table 4: Showing extent of ligature mark.**

Extent	Cases	%
Complete encircling	19	6.9
Incomplete encircling	256	93.09
Total	275	100

**Table 5: Showing number of turns of ligature mark.**

Number of turns	Cases	%
Single	262	95.3
Multiple	13	4.7
Total	275	100

**Table 6: Showing colour/nature of ligature mark.**

Colour/Nature	Cases	%
Reddish brown	129	46.9
Parchmentisation	101	36.7
Pale	45	16.5
Total	275	100

**Table 7: Showing breadth of ligature mark.**

Breadth	Cases	%
<1cm	16	5.8
1-2cm	191	69.5
2-3cm	61	22.2
>3cm	07	2.5
Total	275	100

## Conclusion

Typical hanging is seen in 50 cases and atypical hanging in 225 cases. Partial hanging is seen in 73.09% deaths and complete hanging in 26.9% deaths. Ligature mark was obliquely placed in 91.3% cases and was found to be running above thyroid cartilage in 80.7% cases. Single ligature mark with a breadth of 1-2cms is observed in the maximum number of cases. In 93% of the incidents, ligature mark showed discontinuity. The colour of ligature mark was reddish-brown in 46.9% cases.

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