

## Study of Pattern of Ligature Mark in Hanging Cases in Ahmedabad Region

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### ABSTRACT

As a painless form of death hanging is the commonest method of committing suicide. A proper observation and study of ligature mark is characteristic hallmark of hanging. The ligature mark is a pressure abrasion on the neck at the site of the ligature which appears as a groove. This prospective study was conducted among victims of hanging brought to GMERS Medical College Sola, Ahmedabad during the period July 2018 to June 2022. 214 cases brought with a history of hanging out of total 2054 autopsy cases were selected for this prospective study. A typical ligature marks with partial hanging outnumbered typical ligature mark with complete hanging. Ligature mark was obliquely placed above the level of thyroid cartilage with a breadth of 1 to 2 cm is observed in the maximum number of cases. The colour of ligature mark was dark brown in one third of cases. Young adults of the age group 21 to 30 years accounted for the maximum cases 41.12% and the male: female ratio was 2:1. Churni (3%) was the most common ligature material used.

**Keywords:** Hanging, Ligature mark, Suicide, Thyroid cartilage

### Introduction

Human suicidal behaviour has always been a source of dread and wonder to mankind. Hanging is the commonest method of committing suicide considered as a painless form of death. Hanging is a form of death produced by suspension of the body by a ligature around the neck, constricting force being the weight of the body (complete hanging), or part of the weight of the body (partial hanging).<sup>[1]</sup> In India hanging is among the top 5 methods of choice for committing suicide.

In hanging the appreciation of external signs particularly ligature mark plays a vital role.

The ligature mark is a pressure abrasion on the neck at the site of the ligature which appears as a groove. The base of ligature mark is pale, hard leathery and parchment like and margins are red and congested. In typical hanging, the ligature mark is situated above the level of thyroid cartilage between the larynx and the chin. It is directed obliquely upwards along the line of the mandible and reaches the mastoid processes behind the ears. Character of the ligature mark depends on various factors like the nature of the ligature, body weight, length of time the body has remained suspended and the number of turns of the ligature round the neck. The course of the ligature mark depends

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on whether a fixed or running noose has been used.

In hanging, ligature material may be any substance that is available at the time of the impulse has been used by the suicides as a ligature. Knot is frequently in the form of a single knot to produce a running noose or fixed by a granny or reef knot, occasionally a simple loop is used.<sup>[2]</sup> There may be more than one turn around the neck and/or more than one knot imparting corresponding complexity to the mark. A running noose can tighten at the time of suspension and may then produce a mark which takes a horizontal turn but it is likely to be above the thyroid cartilage. The mark will be circular and oblique if a ligature is passed round the neck more than once. Near the position of the knot, it is like an inverted 'V'. Ligature mark into consideration, there are a few points like (i) level (ii) continuous/non-continuous (iii) oblique/ transverse of the ligature mark which differentiate hanging from ligature strangulation.

## Materials and Methods

This prospective study was conducted among victims of hanging for the purpose of studying the pattern of ligature mark brought to GMERS

**Table 2: Type of Hanging- Depending on degree of Suspension**

Type of Hanging	Cases	Percentage
Complete	138	64.48
Partial	76	35.52
Total	214	100

**Table 4: Age and Sex Wise Distribution of death due to Hanging**

Age group (Years)	Male	Female	Total	(Percentage)
0-10	3	1	4	01.87
11-20	28	16	44	20.56
21-30	58	30	88	41.12
31-40	26	16	42	19.63
41-50	14	9	23	10.75
51-60	5	3	8	03.74
>60	2	3	5	02.33
Total	136	78	214	100

Medical College Sola, Ahmedabad during the period July 2018 to June 2022. Out Of 2054 cases brought to the department for medico-legal autopsy, 214 cases were identified and selected for this study in which death had resulted from hanging. A detailed history from police and relatives regarding age, sex, socio economical status, marital status, habits, illness (mental/ other disease/deformity), previous attempted suicides, suicide note if any etc. were taken. Detailed history from police regarding scene of crime, position of body etc. were taken.

Irrespective of information collected, both external and internal post mortem findings were observed meticulously especially the ligature mark. During observation of ligature mark, all the parameters like its site, size, level, number, discontinuity and obliquity were noted.

## Results

**Table 1: Type of Hanging - Depending on position of Knot**

Type of Hanging	Cases	Percentage
Typical	41	19.16
Atypical	173	80.84
Total	214	100

**Table 3: According to the Level of Ligature Mark**

Level of Ligature Mark	Cases	Percentage
Above the thyroid cartilage	180	84.12
Overriding the thyroid cartilage	22	10.28
Below the thyroid cartilage	12	05.60
Total	214	100

**Table 5: According to the Breadth of Ligature Mark**

According to the Color of the Ligature Mark	Cases	Percentage
< 1cm	15	07.01
1-2 cm	142	66.36
2-3 cm	45	21.02
>3 cm	12	05.61
Total	214	100

**Table 6: According to the Color of the Ligature Mark**

Colour of ligature mark	Cases	Percentage
Dark brown	102	47.66
Red	35	16.36
Pale	26	12.15
Yellowish brown	51	23.83
Total	214	100

**Table 7: According to the Characteristics of Ligature Mark**

		Cases	Percentage
Depending on prominence	Prominent	177	82.71
	Faint	37	17.29
	Total	214	100
Depending on continuity	Continuous	12	05.60
	Interrupted	202	94.40
	Total	214	100
Depending on placement	Oblique	214	100
	Horizontal	00	00
	Total	214	100

**Table 8: Distribution of type of Ligature material**

Type of Ligature Material	No. of Cases	Percentage
Chunni	72	33.64
Nylon rope	56	26.16
Saree	40	18.69
Cotton rope	36	16.82
Shirt	04	01.87
Handkerchief	02	00.08
Metal wire	01	00.04
Not Known	03	01.40
Total (%)	214	100

## Discussion

The hanging deaths are taking different types in their execution as typical/atypical and complete/partial. In this study, atypical hanging was seen in 173 (80.84%) cases and typical hanging in 41 (19.16%) cases. [Table 1] In this study, depending on degree of suspension, complete hangings were seen in 138 (64.48%) cases and partial hangings in 76(35.52%) cases. [Table 2] Similar findings were observed in the studies conducted by other authors.<sup>[1,2]</sup>

In our study, it was observed that in 180 (84.12%) cases, the level of ligature mark was above the thyroid cartilage, overriding the thyroid cartilage in 22 (10.28%) cases and below the thyroid cartilage in 12 (05.60%) cases. [Table 3] This was also observed in various other authors studies.<sup>[1,5-11]</sup>

As per Table 4, maximum 88 cases (41.12%) of hanging deaths were reported in age group of 21-30 years, which is consistent with observations of Sheikh et al <sup>[12]</sup> (42.4%) and Joshi et al <sup>[13]</sup> (44.18%). Hanging deaths were reported in male were 136. 63.55%) cases and in female were 78(36.44), which is consistent with observations of Sheikh et al<sup>[10]</sup> and Jani et al.<sup>[12]</sup> The male: female ratio was approximately 1.75:1.

In present study the breadth of the ligature mark was between 1-2cms in 142(66.36%) cases. [Table No.5] Similar findings are reported by others.<sup>[7,8,14-16]</sup> The breadth of ligature mark depends on the width of the ligature material and also the multiplicity of the ligature material.

In this study, ligature mark was dark brown in 102(47.66%) cases; yellowish brown in 51(23.83%) cases; red colour in 35(16.36%)

cases and pale in 26 (12.15%) cases. [Table 6] These are consistent with other author findings. [16] The reason being the colour of ligature mark depends on the duration of suspension and the complexion of the person.

The ligature mark was prominent in 177 (82.71%) cases and faint in 37 (17.29%) cases. [Table 7] Our findings were consistent with the findings observed in other studies [15-16]. The prominent mark is due to the type of the material being strong and also increased period of suspension. The ligature mark was interrupted in 202 (94.40%) cases and continuous in 12 (05.60%) cases.

As per Table 8, Chunni was used as a ligature material in maximum 72 cases (34.64%) of hanging followed by nylon rope in 56 cases (26.16%) cases. In study by Sharma B R et al [15] commonest ligature material was Chunni in 17 cases (30.90%)

## Conclusion

Atypical ligature marks with complete hanging outnumbered typical ligature mark with partial hanging. From the medico-legal point of view, following measures and recommendations in cases of deaths due to hanging are very essential:

- Always bring the Ligature material along with the body for correlation with the Ligature mark.
- Photograph of the scene of occurrence should include point of suspension.
- In fatal cases not to disturb the ligature material and release only the suspension point or cut the ligature material away from the site of knot.
- Photograph of the scene of occurrence should include point of suspension.
- Radiograph of the neck plays a vital role to appreciate the fractures of hyoid bone and thyroid cartilage.
- Visit the scene of occurrence.

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**Conflict of Interest:** None

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