

## ORIGINAL ARTICLE

### **A STUDY OF LIGATURE MARKS IN ASPHYXIAL DEATH OF HANGING: A THREE YEARS RETROSPECTIVE STUDY DONE AT MIMS MANDYA**

Puttaswamy<sup>1</sup>

#### **HOW TO CITE THIS ARTICLE:**

Puttaswamy. "A Study of Ligature Marks in Asphyxial Death of Hanging: A Three Years Retrospective Study Done At MIMS Mandya". Journal of Evidence based Medicine and Healthcare; Volume 2, Issue 39, September 28, 2015; Page: 6487-6492, DOI: 10.18410/jebmh/2015/887

**ABSTRACT:** The present study was conducted between 2010 to 2012 to determine the pattern of ligature marks, and those factors that contributed for the formation of ligature mark over the neck and also to correlate the ligature mark with the manner of death. The sample for this study consisted of 140 cases of hanging which were reported during 2010-2012 along with the detailed information regarding the deceased and the circumstances of death was collected from the police and relatives. Maximum number of suicide hangings occurred in the age group of 20-29 years (32.14%) Number of hanging deaths in the men was more than the Women.

**KEYWORDS:** Ligature mark, Hanging, Asphyxial death, and Ligature material.

**INTRODUCTION:** Violent asphyxial death is one of the most important causes for unnatural deaths, amongst which hanging and strangulation are commonly encountered in day to day autopsy. Hanging is that form of asphyxia which is caused by the suspension of the body by a ligature around the neck constricting force being weight of the body.<sup>1</sup> The conspicuous feature of hanging deaths is the ligature mark over the neck.

Ligature mark is a pressure abrasion on the neck at the site of ligature appears as a groove. Character of the Ligature mark depends on various factors like nature of ligature, body weight, number of turns round the neck, type of knot etc. variations in the ligature marks like faint/absent ligature mark, ant bite artifacts, and other variables are encountered in day to day autopsies. Slipping of ligature may lead to double ligature marks over the neck. It is easy to diagnose hanging when one finds the classical features. But rarely all the features are seldom present. Application of pressure over the neck often results in findings which are quite variable. Thus the ligature mark around the victim's neck constitutes an extremely precious piece of evidence to arrive at a conclusion as to cause of death and manner of death.

#### **AIMS AND OBJECTIVES OF THE STUDY:**

1. To Study the pattern of ligature marks.
2. To Study the factors that Contributes for the formation of ligature marks.
3. To correlate the ligature mark with the manner of death.

**MATERIAL AND METHODS:** The present study was carried out in the Department of Forensic medicine MIMS Mandya during the period of 2010-2012. A sum total of deceased and the circumstances of death were collected from the police and relatives. In some cases visit to Scene of occurrence or from Photographs of scene of occurrence was collected.

## ORIGINAL ARTICLE

**Inclusion Criteria:** All the cases brought with a history of hanging.

**Exclusion Criteria:** Decomposed bodies where ligature mark is masked.

**RESULTS:** The victims of hanging were classified on various characters;

**A. Type of Ligature Mark Produced:**

- a. Typical.
- b. Atypical.

**B. Type of Suspension:**

- a. Complete.
- b. Partial.

Observations made during the autopsy included external and internal examination of deceased along with Ligature material whenever it was found in situ or brought by police. Ligature materials were classified into two groups. Hard and soft ligature materials. Ropes, metal chains are considered as hard. saree, dupatta, towel, lungi as soft.

**Topographical location of Ligature marks over neck were classified as below:-**

- Level 1:** Right front of neck.
- Level 1,2:** Below right ear.
- Level 2:** Right back of neck.
- Level 2,3:** Center of back (Occipital).
- Level 3:** Left back of neck.
- Level 3,4:** Below left ear.
- Level 4:** Left front of neck.

**Age and Sex Distribution in the Study Population:**

Sl. No.	Age	No. of Cases	%
1	10–19	30	21.42
2	20–29	45	32.14
3	30–39	20	14.28
4	40–49	15	10.71
5	50–59	20	14.28
6	>60	10	07.14

Table 1: Age Distribution

Sl. No.	Sex	No. of Cases	%
1	Male	85	60.71 %
2	Female	55	39.28 %

Table 2: Sex Distribution

## ORIGINAL ARTICLE

From the above tables it is seen that maximum number of hanging in the study population is seen in the age group 20–29 (32.14%) followed by 10–19 years (21.42%). In the sex distribution pattern males accounted for 85 cases (60.71%) as compared to 55 cases of females (39.28%).

The influencing factors for the above distribution being unemployment, financial problems, and marital disharmony which tallies with studies done by B.K. Sen Guptha.<sup>3</sup> Gary P Paparo and Siegel H.<sup>4</sup> Andrew Davison and Marshall T.K,<sup>5</sup> Ryk James and paul Sillocts.<sup>6</sup> Th. Meera Devi son and L. Fimate.<sup>7</sup> S.K. Sharma, O. P. Murthy and T.D.Dogra.<sup>8</sup> It is in Contrast to findings observed by James Luke,<sup>9</sup> and David A.L.L. Bowen.<sup>10</sup>

### Suspension and ligature Mark:

Sl. No.	Degree of Suspension	No. of Cases	%
1	Partial	45	32.14
2	Complete	95	67.85

Table 3: Degree of suspension

Sl. No.	ligature Mark	No. of Cases	%
1	Typical	30	21.42
2	Atypical	110	78.57

Table 4: Ligature Mark

In the present study it is observed that complete suspension was noted in 95 cases (67.85%) as compared to partial suspension 45 cases (32.14%).

Atypical ligature Mark was noticed in 110 cases (78.57%) compared to typical ligature Mark 30cases (21.42%).

The above observations were similar to findings observed by Andrew Davi son and T.K.Marshall,<sup>5</sup> Jom Simonson,<sup>11</sup> O.A. Awad,<sup>12</sup> and Luke JL,<sup>14</sup> Busutil A,<sup>15</sup> Balabantaray J.K.<sup>16</sup>

Sl. No.	material used	No. of Victims	%
1	Soft	90	64.28
2	Hard	50	35.71

Table 5: Ligature Material used

Sl. No.	Position of the knot	No. of Victims	%
1	Right occipital	35	25
2	Below the right ear	32	22.85
3	Left occipital	18	12.85
4	Occipital	24	17.14
5	Below the Left ear	26	18.57
6	Below chin	05	3.57
7	Others	0	0

Table 6: Position of the Knot

## ORIGINAL ARTICLE

Sl. No.	Type of Knot	No. of Victims	%
1	Slipping	110	78.57
2	Fixed	30	21.42

**Table 7: Type of Knot**

The present study showed 90 cases (64.28%) had used soft ligature and hard ligature were used in 50 cases (35.71%). In the present study it is observed that Right Occipital Knot in 35 cases (25%), In 32 cases (22.85%) Below right ear, Followed by knot in below left ear 26 cases (18.57%) and in 24 cases (17.14%) in the occipital area.

Similar findings were observed in studies conducted by G.A.Sunil Kumar, T.D. Dorga<sup>8</sup> and Balabantray.<sup>16</sup> It is in contrast to the findings observed by Jonathan P. Wyatt and Busuttill A.<sup>15</sup>

In 110 cases (78.57%) slipping knot was used and fixed knot in 30 cases (21.42%).

Similar findings were observed in studies conducted by micic Jelena, Djolic vesna, Dionic Danijela,<sup>17</sup> and Eisenmenger W.<sup>18</sup>

### Fracture of Thyroid Cartilage:

Sl. No.	Present / Absent	No. of Victims	%
1	Present	4	2.85%
2	Absent	136	97.14%

**Table 8: Fracture of thyroid cartilage and hyoid bone**

Sl. No.	Present/ Absent	No. of victims	%
1	Present	03	2.14
2	Absent	137	97.85

**Table 9: Fracture of hyoid bone**

In the present study, it is observed that in 136 cases (97.14%) no fracture of thyroid cartilage was detected & in 137 cases (97.85%) no fracture of hyoid bone was noted. Only in 4 cases (2.85%) there was a fracture of the superior horn on the left side of thyroid cartilage & only in 3 cases (2.14%) there was fracture of greater cornua on right side of hyoid bone. The reason being victims in their 4<sup>th</sup> & 5<sup>th</sup> decades of life, complete suspension of victim, ankylosis and calcification increasing with the age after 30 years.

Similar findings were observed in studies done by Feigin Gerald,<sup>13</sup> Ryk James,<sup>6</sup> Gary Paparo.<sup>4</sup>

**CONCLUSION:** From the present study following are the conclusions arrived at;

- Atypical ligature marks with complete hanging outnumbered typical ligature mark with partial hanging.
- Soft ligature were more commonly employed with posterior knot positioning & slipping knot being the commonest.

## ORIGINAL ARTICLE

---

- Distinct ligature mark furrow/ groove of width & pattern of materials used is observed in cases where a narrow & hard ligature is used. Soft & broader ligature materials lead to less distinct marks.
- All the deaths due to hanging studied were concluded as suicidal in manner based on history, circumstantial evidence, examination of material, mark, & other internal findings on dissection of neck tissues along with correlation of circumstantial evidence, FIR , Forms no 146 (i) & (ii).

### REFERENCES:

1. C.K. Narayana Reddy "The essentials of forensic medicine & toxicology". 26<sup>th</sup> Edn Medical Book Company. Hyderabad, 2006:296.
2. Parikh C.K "Parikh's textbook of medical jurisprudence, forensic medicine & toxicology for classrooms and court rooms" 6<sup>th</sup> edition, CBS Publisher & Distributers, New Delhi, 1999:3.33-4.10.
3. Sen gupta B.K "Studies on 101 cases of death due to hanging" Journal of Indian Medical Academy, 1965, 45 (3), 135-139.
4. Paparo G.P & Siegel.H "Neck markings & fractures in suicidal hangings ", Forensic science international 1984, 24: 27-35.
5. Davison .A & Marshall T.K "Hanging in Northern Ireland- A survey" Medicine science & law, 1986, 26 (1): 23-28.
6. Ryk James & Paul silocks, "Suicidal hanging in Cardiff" A 15 year retrospective study" forensic science international 1992; 56, 167-175.
7. Momanchand A., Meera Devith, Fimate L, "Violent asphyxial death in Imphal, Journal of Forensic Medicine & Toxicology, 1998, 15 (1): 60-64.
8. G.A.Sunil Kumar Sharma, O.P Murthy, T.D Dogra "Study of ligature marks in qsphyxial details of hanging & strangulation" Inernational Journal o Medical toxicology and Legal medicine 2002;4 (2): 21-24.
9. Luke.J.L "Asphyxial details by hanging in New York city 1964-65". Journal of Forensic Science 1967, 12 (3): 359-369.
10. Bowen D.A.L.L "Hanging –a review ", Forensic Science International 1982; 20:247-249.
11. Simansen .J "Patho – anatomic finding in neck structure in asphyxiation due to hanging: A survey of 80 cases", Forensic Science International 1988, 38: 83-91.
12. El fawal M.A & Awad O.A " Deaths from hanging in the eastern province of Soudi Arabia" Medicine Science & Law, 1994, 34(4): 307-312.
13. Feign.G "Frequency of neck organ fractures in hanging" American journal of Forensic Medicine & Pathology 1999, 20 (2) 128-130.
14. Lake J.L Reddy D.J Eisel J.W "Correction of circumstance with pathological findings in asphyxial deaths by hanging: A prospective study of 61 cases from seattle, WA, Journal of Forensic Science 1985, 30(4). 1140-1147.
15. Wyatt J.P Wyatt W, Squires TJ & Busutill A. " Hanging Death in children ", The American journal of Forensic medicine & Pathology 1998:19 (4): 343-346.

## ORIGINAL ARTICLE

16. Balabantaray J.K "findings in neck structures in asphyxiation due to hanging" Journal of the Indian academy of Forensic Medicine, 1998, 20(4): 82-84.
17. Nikdic Slobodan, Micic Jelena, Djonic Danijela, "Analysis of neck injuries in hanging (case report)" the American journal of Forensic Medicine & Pathology 2003, 24 (2), 179-182.
18. Betz.P & Eisenmanager W. "Frequency of throat –skeleton fractures in hanging". The American journal of Forensic Medicine & Pathology 1996, 17 (3): 191-193.

### **AUTHORS:**

1. Puttaswamy

### **PARTICULARS OF CONTRIBUTORS:**

1. Associate Professor, Department of Forensic Medicine, Mandya Institute of Medical Sciences, Mandya.

### **NAME ADDRESS EMAIL ID OF THE CORRESPONDING AUTHOR:**

Dr. Puttaswamy,  
Associate Professor,  
Department of Forensic Medicine,  
Mandya Institute of Medical Sciences,  
Mandya.  
E-mail: pswamyfrnt63@gmail.com

Date of Submission: 15/09/2015.  
Date of Peer Review: 18/09/2015.  
Date of Acceptance: 22/09/2015.  
Date of Publishing: 25/09/2015.