



## An Autopsy Observations in Suicidal Cases of Hanging – A Retrospective Study

**\*Dr.S. Ranjan Bajpai**

Associate professor Department of Forensic Medicine and Toxicology, SMBT Institute of Medical Sciences and Research Centre, Nasik, Maharashtra \*Corresponding Author

ABSTRACT

**Introduction:** Suicide since time immemorial is one of the way of ending one's life and hanging is one of the commonest method. A short span of three to five minutes of total respiratory arrest usually produces irreversible brain damage and death. Autopsy findings depend upon number of factors like manner in which victim has hanged himself, the fatal period, period of hanging and material used for hanging, etc. Even in identical case of suicidal hanging autopsy findings vary and depends upon above mentioned factors. Looking at the challenges posed by these variations in hanging cases, an attempt is made to review and analyze autopsy findings in cases of suicidal hanging.

**Objectives:** Analysis of cases of suicidal hanging

- To compile and analyze various external and internal findings.
- Co-relation between external and internal findings with type of hanging.

**Duration of study** – 6 months

**Material and methods:** Data of past 10 yrs. is collected from autopsy record. Out of 249 cases of hanging, 200 were confirmed as cases of suicidal hanging, and were studied.

**OBSERVATION AND RESULT :** Suicidal hanging is very common in males with highest incidence in 16-20 yrs. age group. Hard material with sliding knot was more commonly used. Ligature mark was often seen above thyroid cartilage. Eyes remained semi-open in fresh bodies, while protruded in moderate to advance decomposed bodies. Cyanosis was seen in fresh bodies and masked with time in moderate to advance decomposed bodies.

**Conclusion:** Autopsy findings greatly differ in almost every case and depend upon various factors.

### KEYWORDS

Autopsy, Suicidal hanging, complete hanging, Partial hanging.

### INTRODUCTION

Suicide since time immemorial is one of the way of ending one's life and hanging is one of the commonest method. Suicide as it is commonly understood, is the act of intentional self-destruction or as Durkheim termed it "an intentional self homicide".<sup>1,2</sup>

Hanging has been used by both the sexes of almost every community as a manner of suicide. Hanging was used as a second most common method after poisoning in India.<sup>3</sup>

A short span of three to five minutes of total respiratory arrest usually produces irreversible brain damage and death. Death by asphyxia due to hanging is one such form. In hanging cause of death may be asphyxia, venous congestion, combination of asphyxia and venous congestion, cerebral ischemia, fracture or dislocation of cervical vertebra etc. But most of the cases don't show findings identical with any of the particular cause of death and majority of cases show signs indicating the combination of two or more causes.

The manner in which the hanging is committed depends on a number of factors. The two main causes are, firstly, due to lack of oxygen "anoxia" in the blood and tissues, secondly due to local constriction of neck by the ligature. Apart from these two causes, other findings in any particular case may be due to the manner in which the victim has hanged himself and the fatal period.

Different authors have described a number of identical findings to be present in a case of hanging but very rarely one come across all the findings mentioned. Usually typical picture of hanging as described in books are not present in any single case result in difficulties in concluding the cause and manner of death. Sometimes, it is also seen that the signs present at the time of when the body is seen in hanging position may

disappear by the time the dead body reaches the autopsy table.

Looking at the challenges posed by these variations in hanging cases, an attempt is made to review and analyze the autopsy findings of 200 cases of suicidal hanging.

### OBJECTIVES:

Analysis of cases of suicidal hanging

- To compile and analyze the various external and internal findings.
- Co-relation between external and internal findings with type of hanging.

### MATERIAL AND METHODS:

Cases of suicidal hanging brought to the Medico legal Institute and The Department of Forensic Medicine. Data of past 10 yrs. is collected from autopsy record. Out of 249 cases of hanging, 200 were confirmed as cases of suicidal hanging, and were studied.

The nature of hanging i.e. suicidal, homicidal or accidental is decided on the basis of autopsy findings in consideration with the spot findings, viscera report and circumstantial evidences.

### OBSERVATION AND RESULT

**Table 1 : Age and Sex wise Distribution of Suicidal Hanging Cases**

Age Groups (yrs)	Male	Female	Total
05 to 10	--	01	01
11 to 15	05	01	06
16 to 20	26	27	53
21 to 25	30	14	44
26 to 30	23	04	27
31 to 35	17	04	21
36 to 40	17	04	21

41 to 45	10	02	12
46 to 50	02	01	03
50 and above	08	02	10
Total	136	64	200

Table 1, shows that the maximum number of cases are in 16 to 20 years and 21 to 25 years of age groups (53 and 44 cases). Incidence of suicidal hanging is higher in males (136 cases) than females (64 cases).

On the basis of spot examination of 66 cases, partial hanging was seen in 41 cases (Male 32, Female 09) and complete hanging in 25 cases.

Out of 66 cases, atypical type of hanging was seen 58 cases while typical type was seen in 8 cases. The male-female ratio is 2:1 in atypical cases and 7:1 in typical types of hanging cases.

The character of ligature mark indicated that the hard nature of ligature in 115 cases (Male 80, Female 35), soft in 81 cases (Male 50, Female 81) and undetermined in 4 cases (Male 03, Female 01). Sex wise analysis shows, hard and soft ligature material used by 80 and 35 males, while in case of females it was 50 and 31 respectively. The nature of ligature remained undetermined in 3 males and 1 female. Maximum number of victims have used sliding (running) knot, (141 cases), followed by fixed knot in 26 cases and presence of loop in 25 cases. In 4 percent cases the type of knot was not found available in the records.

Out of 200 cases, the knot position was on the right side in 94 cases, on the left side in 96 cases, and in the middle in 9 cases. In 1 case data regarding knot position was not available.

**Table 2: Position of ligature mark in relation to thyroid cartilage**

Position	No. of Cases	Percent
Above Thyroid	138	69.0
On Thyroid	14	7.0
Below Thyroid	03	1.5
Not Clearly Described	45	22.5

Table 2 in 138 cases the ligature mark was seen above the thyroid cartilage followed by on the thyroid cartilage in 14 cases, while in 3 cases the mark was below the thyroid cartilage. The position of ligature was not clearly described in 45 cases.

**Table 3: Condition of eyes in relation to body condition**

Body Condition	No. of Cases	Eyes			
		Closed	Semi-Open	Open	Protruded
Fresh Bodies	156	57	97	02	--
Early Decomposition	019	11	04	04	--
Moderate Decomposition	017	01	04	06	06
Advanced Decomposition	008	--	--	02	06

Out of 156 fresh bodies, eyes remained close, semi-open and open in 57, 97 and 2 cases respectively. Eyes closed in 11 cases and were semi-open or open in 4 cases each in early decomposition phase. No case of protruding eyes was recorded in fresh bodies or early decomposition stage. In moderately decomposed bodies, the eyes were closed in 1 case, semi-open in 4 cases and open or protruding in 6 cases each. In advanced decomposition, the eyes were either seen open (2 cases) or protruding (6 cases).

**Table 4: Position of tongue in relation to body conditions**

Body condition	No. of cases	Protruding	In side	Bitten
Fresh Bodies	156	56	60	40
Early Decomposition	019	15	03	01
Moderate Decomposition	017	16	01	--

Advanced Decomposition	008	08	-	--
Total	200	95	64	41

Out of 200 cases, tongue was inside, bitten and protruding out in 64, 41 and 95 cases respectively.

**Table 5: Direction of feet in relation to type of hanging**

Type of hanging	No. of cases	Hyper planter flexion	Normal	No significant findings
Complete	25	25	--	--
Partial	41	18	23	--
Not Known	134	65	49	20
Total	200	108	72	20

Hyper planter flexion of feet was seen in 108 cases, while position of feet was normal in 72 cases. Findings were not significant in 20 cases.

**Table 6: Presence of cyanosis in relation to body condition**

Body Condition	No. of Cases	Cyanosis		
		Present	Absent	Masked
Fresh Bodies	156	145	11	00
Early Decomposition	019	01		18
Moderate Decomposition	017	00	00	17
Advanced Decomposition	008	00	00	08
Total	200	146	11	43

Out of 156 cases of fresh bodies, 78 cases recorded presence of cyanosis in nails and lips followed by 55 cases in nails, 12 cases in lips and was absent in 11 cases. 18 cases of early decomposed bodies recorded presence masked cyanosis and only in 1 case the cyanosis was seen in lips. In moderate and advanced decomposed bodies only masked cyanosis was seen.

**Table 7: Escape of Biological material in relation to body condition**

Body Condition	Cases	Biological Material					
		Semen		Urine		Feces	
		Passed	Ab-sent	Passed	Ab-sent	Passed	Ab-sent
Fresh Bodies	156	15	141	10	146	19	137
Early Decomposition	019	--	19	02	17	03	16
Moderate Decomposition	017	--	17	01	16	04	13
Advanced Decomposition	009	--	08	--	08	--	08
Total	200	15	185	13	187	26	174

**Table 8: Other Findings Observed in Cases of Suicidal Hanging (In 156 Fresh Bodies)**

Findings	Organ	No. of Cases	%
Hypostasis	- On dependent parts of limbs	91	58.3
	- On the back	26	16.6
	- Back and dependent parts	36	23.1
	- Undeveloped	03	1.9
Congestion	- Internal organs	156	100.0
Petechial Hemorrhage	- Eyes, Pleura, Pericardium	34	21.8

In 91 cases hypostasis on the dependent parts of the limbs was found when the body was in vertical (standing) position, on the back as well as on the dependent parts in 36 cases and on the back only in 26 cases. Congestion in all the internal organs (lung, liver, kidney, spleen etc.) was seen in all the cases. Petechial hemorrhage in eyes, pleura, pericardium was observed only in 34 cases.

**DISCUSSION**

Birth is an uncontrolled event, but the manner of one's departure from life may bear a definite relation to one's philosophy

of life. In the present study, retrospective analysis of autopsy findings of 200 cases of suicidal hanging was under taken.

The sex wise analysis revealed that the males (136 cases) out number females (64 cases) and are more than two times. On comparing the present study with other studies on suicidal hanging cases both form India and abroad, <sup>3,4,5</sup> a similar male preponderance was seen. Paripurananand Verma in his book "Suicide in India and Abroad" reported suicidal hanging to be the second most common method after poisoning both in India and Abroad. Mukharjee JB, et al.,<sup>6</sup> in his study reported that, hanging was the most frequently adopted mode after poisoning. Ting and Tan<sup>7</sup> reported hanging as the most popular method (41.6%) followed by poisoning (22.1%). Number of male was more than female in almost all the cases of suicide and males showed a preference for hanging and females as slight preference for poisoning, which is similar to present study.

The highest incidence of suicidal hanging was seen between 16-25 years of age. A higher incident of suicide in 16-20 years was notice by Mukherjee<sup>5</sup> and was more or less in conformity with the observations of Hopkins,<sup>8</sup> Stengel,<sup>9</sup> Schneider,<sup>10</sup> Ganpathi and Vankoba Rao,<sup>11</sup> Farmer,<sup>12</sup> Jordan <sup>13</sup> and Bowen.<sup>14</sup> In all the cases included in the present study the presence of ligature mark was a uniform feature, which was almost consistent with the genera description in various books.<sup>15,16,17,18</sup>

In present study majority of victims had used sliding (running) knot (70.5%) while fixed knot had been used by 13% of victims. Results are in accordance with the various available literatures.<sup>15,18</sup>

In majority of cases the ligature mark was seen above the thyroid cartilage i.e. in 69 percent, followed by on the thyroid cartilage in 7 percent and below thyroid cartilage only in 1.5 percent. Polson et al. <sup>18</sup> reported that the ligature lies above the thyroid cartilage in at least 80 percent of hanging, it may be at the level of cartilage in about 15 percent but it is below this cartilage in only 5 percent of hanging.

In the present study, we did not find fracture of hyoid bone or thyroid cartilage in any case. This negative finding in the present series could be just an incidental observation. A number of workers were reported fracture of hyoid bone and thyroid cartilage in hanging. According to Reuter <sup>19</sup> the fracture of hyoid is relatively common and reported in 60 percent of typical and 30 percent of atypical hanging. According to Fiddle's [1953] the hyoid bone is never injured and taking age of the victim into consideration, those under 40 years of age are unlikely to have a fractured bone.

Weintraub<sup>20</sup> found the hyoid bone fracture in 27% cases of hanging. Reddy <sup>21</sup> reported fracture of hyoid bone in 6% cases of hanging and all the cases except one were males. Modi <sup>16</sup> is of opinion that the hyoid bone is generally not fractured in hanging while Chandulal <sup>22</sup> found fracture of hyoid bone in 3 i.e. 10 percent of 32 cases. Davidson and Marshal <sup>23</sup> in a study on victims of hanging in Northern Island reported fracture of hyoid bone in 17% cases.

According to Polson & Gee <sup>18</sup> thyroid cartilage is most susceptible to fracture in hanging and in a series of 80 consecutive cases, the great horn/horns of the thyroid cartilage were found fractured in 50 percent of the cases. The fracture of hyoid bone was only half of frequent, it occurred alone or with fracture of thyroid cartilage, in 25 percent. Camps and Hunt <sup>24</sup> found fracture of hyoid bone comparatively frequent. Since no case of fracture of hyoid and thyroid alone or in association was observed thus needs more attention and more careful and thorough dissection of neck structures in future cases of hanging.

The study reveals that in fresh bodies the eyes were found semi-open (slit like) in 62.2 percent, closed in 36.5 percent and open in 1.3 percent. None of the fresh body in early de-

composition stage showed protrusion of eyes. The eyes were found closed in 58 percent, semi-open and open in 21 percent each in early decomposition. But the condition of eyes is considerably changed with the advancement of decomposition and the maximum number of cases both in moderate and advanced decomposition recorded open (35.3% and 25%) and protrusion of eyes (35.3% and 75%) respectively.

Our observation is in accordance with various Indian and Foreign authors.<sup>15, 16</sup> Study revealed that the state of decomposition greatly alter the condition of eye. In the present study, the fresh bodies showed protrusion of tongue in 56 cases (35.9%), inside mouth in 60 cases (38.5%) and bitten in between tongue in 40 cases (25.7). A gradual increase in the number of cases of protrusion of tongue is observed with the advancement of decomposition.

Protrusion of tongue was observed in moderate and advanced decomposition indicating that the position of tongue gets easily altered with the advancement of decomposition. Ogston<sup>25</sup> has reported the protrusion of tongue in 14 cases (35%) out of 40 cases which is 10 percent higher than the present study (25%). Similar findings regarding position of tongue have been reported by various authors <sup>5,16,18,21</sup> but the present figures cannot be compared as the exact figures are not given. Chandra et al <sup>26</sup> in the observations made during the present study, revealed that the position of tongue needs careful and thorough examination on the spot and later in the mortuary. The state of rigor mortis and the length of tongue protruding out are of great importance because it is the rigor which holds the tongue in its original position and if the body is cut down before fixation, the protrusion of tongue may go inside.

Observation regarding the direction of toes and feet revealed that hyper planter flexion (Planter extension) is present in 100 percent cases of complete hanging. The direction of feet in hyper planter flexion in complete hanging is attributed mainly to gravity and terminal convulsion which occur in hanging when asphyxia supervenes. The hyper planter flexion of feet in partial hanging is mainly due to the position of legs and feet. A higher incidence of normal position of feet in partial hanging is mainly attributable to the position i.e. feet resting on the ground or any other platform.

Cyanosis in fresh suicidal hanging cases was observed highest in nails and lip-s (50%), followed by nails (35.28%) and only 7.7 percent was observed in lips and was absent in 11 cases (7%) (Table-20). Polson <sup>27</sup> has mentioned that severe cyanosis is likely only when hanging is affected by low point of suspension or the ligature has been cut/broken down between the knot and point of suspension.

Suicidal hangings the escape of biological material has been reported in 44 cases of 156 fresh bodies and in rest of the cases found absent. Out of these 44 cases the 12 percent cases showed faecal escape, followed by 10 percent, semen and then urine in 6 percent cases (Table-21). Keith Mant <sup>28</sup> reported that with engorgement and semi-erection of penis, there may be some dribbling of seminal fluid.

Hypostasis on the dependent parts of the limbs when the body is in hanging position (Vertical) was found in 91 cases (58%), on the back as well as on the dependent parts in 36 (23.1%) cases and on back only in 26 (16.6%) cases. The incidence of petechial hemorrhages in eyes pleura, pericardium is reported only in 21.8 percent cases in fresh bodies.

## CONCLUSION

A gradual and alarming increase in the number of deaths due to suicidal hanging over a period of time has been observed. The age wise analysis revealed that maximum number of victims was between 16 to 25 years age groups (52 males, 42 females) and gradual decrease in the number of suicidal hangings cases was observed with the advancing age after 26 years onwards.

This can be explained in India on the basis of general concept that this age group covers the marriageable age. Among females suicidal hanging could be attributed to factors like dowry demands, maladjustment, allegation of infidelity etc, while in cases of males due to unemployment, mismatched marriages, failure in examination or love affairs, chronic ailments etc. Suicidal tendency is more common in males than females; male female ratio is 2:1.

Hard ligature material was used by 130 cases, while 66 cases used soft material. Females showed preference (37.5%) over males (27.2%) for the use of soft ligature. In both types of ligature the household material of common use i.e. ropes (hard) and sari, dhoti, gamaccha etc. (soft) are used.

As far as the types of knot concerned the suicides have a higher preference for sliding (running) nooses/knots (70.5%) over the fixed knots (13.5%) and the loop without knots (12%).

The study shows that the partial hanging was more common in males (48.5%) than females (13.6%), however only slight higher incidence of complete hanging was observed in males (19.7%) than in females (18.2%).

Atypical hanging occurred more commonly in both the sexes (male 57.6% and female 30.3%) than that of typical hanging (male 10.6% and female 1.5%). The distribution of hypostasis in hanging cases was observed and is altered by duration of suspension, change in posture/position by putting/cutting down the body.

The analysis of autopsy findings revealed that in fresh body eyes may be semi open, closed or open but protrusion of eyes was not reported. Protrusion of eyes in moderate and advanced decomposition is entirely due to decomposition changes. The feet were in hyper plantar flexed position in all cases of complete hanging and were due to gravitational force, etc. Normal feet direction was observed in 56% cases of partial hanging.

The study revealed that the cyanosis and hypostasis completely depends upon time, as time elapses cyanosis is masked by hypostasis. The escape of biological material i.e. semen, farces and urine was observed in 10 percent, 12 percent and 6 percent respectively.

## REFERENCES

- Durkheim, Emile (1897) [1951]. *Suicide : a study in sociology*. The Free Press. Assessed online on dated 11/03/2016 at [https://en.wikipedia.org/wiki/Suicide\\_%28book%29](https://en.wikipedia.org/wiki/Suicide_%28book%29).
- Pickering, W.S.F.; Walford, Geoffrey (2000). *Durkheim's Suicide: A Century of Research and Debate*. Routledge. Assessed online on dated 11/03/2016 at [https://en.wikipedia.org/wiki/Suicide\\_%28book%29](https://en.wikipedia.org/wiki/Suicide_%28book%29).
- Paripurnanand Verma, (1976): *Suicide in India and Abroad*. Sahitya Bhawan Agra.
- Modi, N.S. (1977): *Deaths from asphyxia medical jurisprudence and toxicology*, NM Tripathi Private Limited Bombay, 28th Ed. 142.
- Parikh, C.K. (1979) *Textbook of medical jurisprudence and toxicology for classrooms and courtrooms*. 3rd edition, Bombay Medical Publication, section II.
- Mukharjee, J.B. (1978): *Study of suicides in coroner's Calcutta for 5 years. A review of cases at Calcutta police morgue from 1967-71*. J. Ind. Acad. of For. Med., Vol. (1) 37-63.
- Ting, S.K. and Tan, K.K. (1969): *Post mortem survey of suicide in Singapore*. sing. Med. J. 10 (4) : 248-258.
- Hopkins, (1937): *In paper by In a paper by Mukherjee, J.B., Study of suicide in Coroners Calcutta for 5 years*. J. Ind. Acad. For. Med. 1 (1): 37-63.
- Stengel, E. (1964) : *Suicide and Attempted suicide penguin books*.
- Schenider (1954): *In a paper by Mukherjee, J.B., Study of suicide in Coroners Calcutta for 5 years*. J. Ind. Acad. For. Med. 1(1) : 87-63.
- Ganpati and Venkoba Rao (1966): *In paper by In a paper by Mukherjee, J.B., Study of suicide in Coroners Calcutta for 5 years*, J. Ind. Acad. For. Med. 1(1):37-63.
- Farmer, R.D.t. (1979): *The Suicide Syndrome*. Cambridge University Press, London.
- Jordan, F.B. and Schmeckpeper, K. and Strobe, M. (1987): *Jail Suicides by Hanging. An Epidemiological Review and Recommendations for Prevention*. Am. J. For. Med. and Path. 8(1):27-31.
- Bowen, D.A. (1982) : *Hanging-A Review*. For. Sci. Int. 20:247.
- Gordon, I. and Shapiro, H.A. (1982): *Death initiated by hypoxic hypoxia*. Churchill Livingstone, U.S.A. 114-118.
- Modi, N.S. (1977): *Deaths from asphyxia medical jurisprudence and toxicology*, NM Tripathi Private Limited Bombay, 28th Ed. 142.
- Reddy, B.N. and Kumar, B. (1979): *Importance of petechial haemorrhages in medicolegal autopsy-A review*. J. Ind. Acad. For. Ned., Vol. 2 (1), 28-37.
- Polson, C.J., Gee, J. and Knight, B. (1985): *The essential of Forensic medicine*. 4th ed. Oxford: Pergamon.
- Reuter, F. (1901): *Ztschr. Heilk.*, 22 145-72.
- Weintraub, C.M. (1961): *Med. Leg. J.*, 29, 209.
- Reddy, K.S.N. (1980): *Fracture of Hyoid Bone*. J. Ind. Acad. of For. med. Vol. 3(1), 7-15.
- Chandulal, R. (1972): *hanging-A study of 32 cases*. Curr. med. Pract. Bombay, 16:210.
- Davison, A. and Marshall, T.K. (1986): *Hanging in Northern Ireland: A survey*. Med. Sci. & Law, 26: 23-28.
- Camp, F.E. and Hunt, A.C. (1959): *J. Forens. Med.*, 6, 116.
- Orgston, F. (1868), "On Punctiform Ecchymosis in Interior of Body as a Proof of Deaths by Suffocation" B.M. 2, 332- cited in *Medical Jrisprudence by Gordop, I. et al.*: London E & S Livingston, 3rd ed. (1953) 467.
- Chandra, H., Satpathy, D.K. and Deshmukh, R. (1979): *Artefact Noticed In A Case of Hanging*. J. Ind. Acad. of For. Med., Vol. (1), 38-39.
- Polson, C.J. (1965): *The essentials of forensic medicine.*, 2nd edition. Oxford, Pergamon, 286-315.
- Keiller, A. (1984): *Taylor pp. 313. Acett (957)*.