

## Study of delayed death in hanging

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### Abstract

**Background:** Survival period in hanging is variable, which can be few seconds to few minutes. That is why it is said that 'no retreat from suicide once launched by hanging. Prompt rescue to the patient of hanging injury can save their life. Victims succumb to death in later stage due to complications after certain period of survival which called as delayed hanging death.

**Aim:** To find out the causes of death those who succumb to death surviving certain time period after hanging injury.

**Material and Methods:** Total 8 cases of death in hanging which were delayed has been studied at Assam Medical College & Hospital from 1st November 2014 to 31st October 2015. Data are collected from Inquest reports, dead body challan, hospital case sheets, interview from family members and proper autopsy examination.

**Result:** Out of 8 cases male: female ratio is 1:1, age ranges from 15 to 50 years, 5 partial and 3 complete suspensions. Survival period ranges from 1 day to 15 days. 4 cases died due to hypoxic encephalopathy with pulmonary edema, followed by pulmonary edema in 2 cases, hypoxic encephalopathy with pneumonia and pneumonia 1 each.

**Conclusion:** Survival period is variable in attempted hanging. In spite of medical advancement, still no standard framework for hanging injury patient which can be used to say patient is 'out of danger'.

**Keywords:** Hanging, Near Hanging, Delayed Hanging Death, Pulmonary Edema

### Introduction

Fatal period in hanging is variable, but can be few seconds to few minutes. 41.8% of suicidal death is due to hanging in India.<sup>(1)</sup> After hanging injury those who survived enough to reach hospital are termed as "near hanging".<sup>(2,3)</sup> Only few persons survive this initial hanging episode. Prompt rescue to the patient of hanging injury can save their life. Victims succumb to death in later stage due to complications after certain period which called as delayed hanging death.<sup>(4)</sup> However, survival after hanging act have been reported in the literature.

### Material and Methods

The materials for present study consist of 8 cases of delayed hanging death out of 180 cases of hanging death brought to the mortuary for autopsy in Assam Medical college & Hospital (Department of Forensic Medicine)

during one-year period from 1st November 2014 to 31st October 2015.

Data are collected from Inquest reports, dead body challan, hospital case sheets, interview from family members and proper autopsy examination. Tissue collected for histopathological examination were processed by routine paraffin techniques and section stained by hematoxylin and eosin.

### Result and Observations

Demographic observations and clinical course of each case, were assessed to throw light on the outcome of autopsy. Out of 8 near hanging cases, the male verses female ratio is 1:1. Age of the cases ranges from 15-50 years. Type of suspension was 5 partial and 3 complete hanging. Ligature materials used was nylon rope in 4 cases, followed by saree in 2 cases, gamosa and dupatta in each case. All the cases were unconscious during their treatment. Survival period ranges from 1 day to 15 days.

**Table 1: Shows demographic distribution and clinical course**

| Demographic distribution & clinical course |             |        |                    |                   |                 |                        |
|--------------------------------------------|-------------|--------|--------------------|-------------------|-----------------|------------------------|
| Case Number                                | Age (years) | Sex    | Type of Suspension | Ligature Material | Clinical Course | Survival Period (days) |
| 1.                                         | 30          | Male   | Partial            | Nylon rope        | Unconscious     | 4                      |
| 2.                                         | 15          | Female | Complete           | Dupatta           | Unconscious     | 1                      |
| 3.                                         | 24          | Female | Complete           | Nylon rope        | Unconscious     | 2                      |
| 4.                                         | 18          | Male   | Complete           | Nylon rope        | Unconscious     | 4                      |
| 5.                                         | 50          | Male   | Partial            | Nylon rope        | Unconscious     | 7                      |
| 6.                                         | 28          | Male   | Partial            | Gamosa            | Unconscious     | 7                      |
| 7.                                         | 32          | Female | Partial            | Saree             | Unconscious     | 2                      |
| 8.                                         | 37          | Female | Partial            | Saree             | Unconscious     | 15                     |

On gross examination, congestion with edema of lungs found in 6 cases, and consolidation in 2 cases. Congestion, edema & softness of brain found in 5 cases, and only congestion in 3 cases.

On histopathological examination, lung shows pulmonary edema in 6 cases and pneumonia in 2 cases; Brain shows hypoxic injury in 5 cases and congestion only in 3 cases.

4 cases died due to hypoxic encephalopathy with pulmonary edema, pulmonary edema only in 2 cases, hypoxic encephalopathy with pneumonia and pneumonia 1 each.

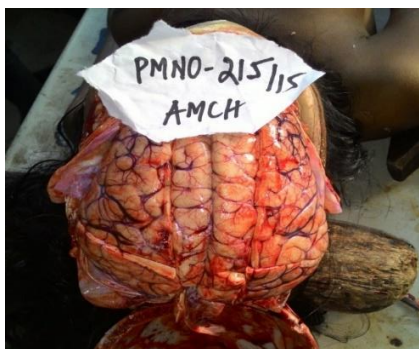
**Table 2: Shows distributions of postmortem and histopathology findings**

| Case no. | Lungs                 | Brain                       | Histopathology (lung & brain)    | Cause of Death                           |
|----------|-----------------------|-----------------------------|----------------------------------|------------------------------------------|
| 1        | Consolidation         | Congested, soft & edematous | Pneumonia & hypoxic injury       | Pneumonia & hypoxic encephalopathy       |
| 2        | Congested & edematous | Congested                   | Pulmonary edema & congestion     | Pulmonary edema                          |
| 3        | Congested & edematous | Congested, soft & edematous | Pulmonary edema & hypoxic injury | Pulmonary edema & hypoxic encephalopathy |
| 4        | Congested & edematous | Congested, soft & edematous | Pulmonary edema & hypoxic injury | Pulmonary edema & hypoxic encephalopathy |
| 5        | Consolidation & pus   | Congested                   | Pneumonia & congestion           | pneumonia                                |
| 6        | Congested & edematous | Congested, soft & edematous | Pulmonary edema & hypoxic injury | Pulmonary edema & hypoxic encephalopathy |
| 7        | Congested & edematous | Congested                   | Pulmonary edema & congestion     | Pulmonary edema                          |
| 8        | Congested & edematous | Congested, soft & edematous | Pulmonary edema & hypoxic injury | Pulmonary edema & hypoxic encephalopathy |

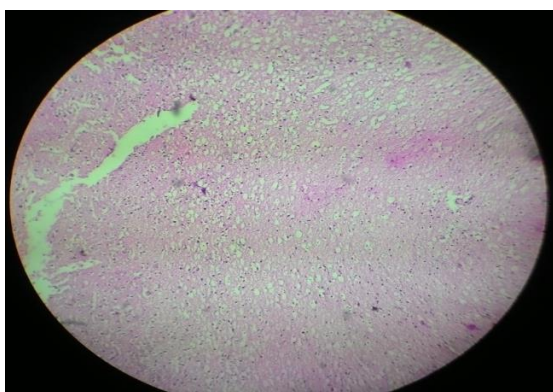
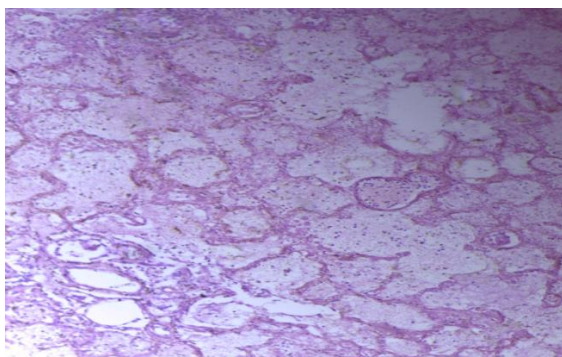


**Fig.: Photographs show ligature marks**





**Fig.:** Photograph shows pulmonary edema(1), pus in lung(2) and congestion with brain edema(3)



**Fig.:** Photograph shows pulmonary edema with congestion (1), ischemic changes with eosinophilic changes of neural cells (2)

## Discussion

Out of 8 cases, male: female ratio is 1:1 of age group 15-50 years. All 3 female cases were reported by Nithin MD et al.<sup>(5)</sup>

All the cases were unconscious throughout their treatment, consistent with study by Maxeiner H,<sup>(6)</sup> Kumar RR & Punitha R<sup>4</sup>, Agarwal et al.,<sup>(7)</sup> where they reported delayed hanging death cases.

Gandhi et al. & Fishman et al. reported cases of near hanging where patient survived with complete neurological recovery.<sup>(8,9)</sup>

Victims survived between 1 day to 15 days in present study. Other authors also reported cases with variable survival period.<sup>(4,5,6,7,10,11,12,13)</sup>

If victims saved initially from hanging, may succumb later to aspiration pneumonia, edematous or hemorrhaging swelling of pharyngeal tissues or aryepiglottic folds, edema of larynx and lungs, infections, emphysema, brain pathology [hypoxic encephalopathy, abscess, infarction and softening] etc.

Pulmonary edema occurs immediately in patients following their rescue from acute airway obstruction is one of the most common complication<sup>(14)</sup> and also commonest cause of death in this study. It is due to hydrostatic forces and increase capillary permeability following sudden airway obstruction.<sup>(15)</sup> Pulmonary capillary membrane damage leads to increased capillary permeability. Cerebral hypoxia which triggers release of vasoactive mediators like histamines, serotonin and kinins which causes pulmonary vasoconstriction, and sudden fall in intrapulmonary pressure due to abrupt release of obstruction leads to pulmonary hyperemia.<sup>(16)</sup>

Next common cause of delayed hanging death is development of hypoxic encephalopathy.

The consensus of permanent brain damage is continuous cut off blood supply to brain for 4-5 minutes but it is variable.<sup>(17)</sup> Such may be either:

1. Occlusion of neck arteries supplying to the brain, to which may be added failure to oxygenate the blood due to occlusion of the airway, or,
2. The cerebral blood flow ceases, because of stoppage of heart<sup>(18)</sup>

Hypoxia causes necrosis of brain cells which leads to edema and swelling, ultimately causes encephalopathy. Then combined with stasis lung (congestion) and infection leads to respiratory failure.<sup>(19)</sup>

Pneumonia as next cause of delayed death seen in 2 cases.

Taware AA et al. reported that pulmonary edema played a major role in 4 cases of delayed hanging death<sup>(20)</sup> but Khetre et al. reported pulmonary edema with hypoxic encephalopathy was the cause.<sup>(21)</sup>

Sane MR et al. observed that hypoxic encephalopathy was the commonest in their study of near hanging cases.<sup>(13)</sup> Other authors also reported the same.<sup>(10,11,22)</sup> Most often it is the inadequate oxygenation and cerebral perfusion that results the death. The cause of death of a case was cerebral infarction resulting from

traumatic thrombosis of sub-totally ruptured carotid artery.<sup>(23)</sup>

Duration of suspension, compressive force and early resuscitation are main factors besides others in survival of hanging.<sup>(22)</sup>

Conclusion cannot be drawn about the relation between type of suspension and occurrence of hypoxic encephalopathy in this study. Analysis of filmed hanging<sup>(24)</sup> & Sane MR et al.<sup>(13)</sup> also concluded the same.

### Conclusion

Fatal period in attempted hanging is not fixed. Limitation of information regarding duration of suspension, and time period between hanging act and initial resuscitation is the major obstacle of study. Early resuscitation and meticulous assessment of other prognostic factors may give them a second chance of life. In spite of medical advancement, still no standard framework for hanging injury patient which can be used to say patient is 'out of danger'.

### References

1. Crime in India. National Crime Records Bureau. Ministry of Home Affairs. [Internet] 2014 July 08. Retrieved from: <http://ncrb.nic.in>.
2. Adams N. Near hanging. *Emerg Med* 1999;11:17-21.
3. McHugh TP, Stout M. Near-hanging injury. *Ann Emerg Med* 1983;12:774-6.
4. Kumar RR, Punitha R. Delayed causes of death in hanging: an autopsy study. *J Punjab Acad Forensic Med Toxicol.* 2014;14(1):32-35.
5. Nithin MD, Manjunatha B, Pramod Kumar GN, Sasidharan S. Delayed death in hanging. *J Forensic Res* 2011;S1:001.
6. Maxeiner H. Delayed death following strangulation (hanging). *Arch Kriminol* 1987;180:161-71.
7. Aggarwal NK, Kishore U, Agarwal BB. Hanging-delayed death (a rare Phenomenon). *Med Sci Law* 2000;40(3):270-2.
8. Gandhi R, Taneja N, Mazumder P. Near hanging: Early intervention can save lives. *Indian J Anaesth* 2011(4);55:388-91
9. Fishman, Goldstein MS, Gardener LB. Suicidal Hanging: An Association with adult respiratory distress syndrome. *Chest* 1977;71:225-227.
10. Bhoi SB, Tumram NK, Shinde DK, Chandekar KS. Delayed death after attempted suicide by hanging. *J Punjab Acad Forensic Med Toxicol.* 2013;13(2):86-87.
11. Marak FK, Balaraman R. Delayed death in hanging. *J Indian Acad Forensic Med.* 2008;30(3):149-50.
12. Kumar V. Delayed Hanging Death: A case report. *J Pak Med Assoc.* 2007;57(1):39-41.
13. Sane MR, Mugadlimath AB, Zine KU, Farooqui JM, Phalke BJ. *Journal of Clinical and Diagnostic Research.* 2015;9(3):HC01-HC03.
14. Kumar M, Mandhyan R, Shukla U, Kumar A, Rautela RS. Delayed pulmonary edema following attempted suicidal hanging- a case report. *Indian J Anaesth.* 2009; 53(3): 355-7.
15. Fremont RD, Kallet RH, Matthey MA, Ware LB. Post obstructive pulmonary edema: a case for hydrostatic mechanisms. *Chest* 2007; 131:1742-6.
16. Oswalt CE, Gates GA, Holmstrom MG. Pulmonary edema as complication of acute airway obstruction. *JAMA.* 1997;238:1833-5.
17. Saukko P, Knight B. Fatal pressure on the neck. *Kn. Forensic Pathol.* 3rd ed. London: Arnold; 2004. pp. 369.
18. Anscombe AM, Knight BH. Case report. Delayed death after pressure on the neck: Possible causal mechanisms and implications for mode of death in manual strangulation discussed. *Forensic Sci Int.* 1996;78:193-97.
19. Venkatesaprasanna J, Parmar P, Balaraman R. Delayed death after survival period of 28 days in case of hanging - rare case report. *IJMPS.* 2012;3(4):23-6.
20. Taware AA, Jadhao VT, Tatiya HS. Delayed death in suicidal hanging: A case report. 2013;22(1).
21. Khetre RR, Bansude ME, Dode CR, Umbare RB, Chormale DS. *International Journal of Recent Trends in Science Technology* September 2014;12(2):253-255.
22. Verma SK, Agarwal BBL. Accidental hanging with delayed death in a lift. *Med Sci Law.* 1999;39(4):342-44.
23. Hausmann R, Betz P. Delayed death after attempted suicide by hanging. *Int J Leg Med.* 1997;110(3):164-66.
24. Sauvageau A, Laharpe R, King D, Dowling G, Andrews S, Kelly S, et al. Agonal Sequences in 14 Filmed Hangings with Comments on the Role of the Type of Suspension, Ischemic Habituation, and Ethanol Intoxication on the Timing of Agonal Responses. *Am J Forensic Med Pathol.* 2011;32(2):104-07.