



## Case Report

### Attempted Suicidal hanging leading to Hypoxic Ischemic Encephalopathy

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#### ABSTRACT

Suicidal hanging is an act of intentionally killing oneself through suspension from an anchor point by a ligature. It is a widely practiced suicidal method in all cultures and has a very effective killing potential with a mortality of 80 percent. It has been practiced since prehistoric times. Hanging can also be homicidal and has to be differentiated from suicidal hanging and this differentiation has wide medico legal implications in all countries. Hangings can be classified as either complete or incomplete. When the whole body hangs off the ground and the entire weight of the victim is suspended at the neck, the hanging is said to be complete. Incomplete hangings imply that some part of the body is touching the ground and that the weight of the victim is not fully supported by the neck. Hangings may also be classified by intent (eg, homicidal, suicidal, autoerotic, accidental). Pathophysiology of hanging involves venous obstruction, arterial obstruction, vagal stimulation, spinal cord injury. Airway obstruction is not thought to play a very important role.

**KEYWORDS:** suicidal hanging, hypoxic encephalopathy.

#### INTRODUCTION

Hanging is a common mode of committing suicide with a high incidence among the suicidal cases[1]. The death usually occurs within few minutes of hanging[2]. Most of the patients develop respiratory and neurological complications immediately after incidence. MRI is the imaging modality of choice for the diagnosis and follow-up of infants with moderate-to-severe hypoxic-ischemic encephalopathy (HIE)[3].

The neck is the target organ for hanging. Easy accessibility, rounded contours, minimum bony shields, the small diameter and unsafe location of the airway, vital blood vessels, and spinal cord

make it susceptible to life-threatening injuries by hanging, which has been practiced as a popular method of committing suicide since ancient times. We report a case of suicidal hanging who survived but developed hypoxic ischemic encephalopathy. Patient recovered with supportive treatment. The case demonstrates a rare case of survival after suicidal hanging complicated with local and neurological complications in the form of hypoxic encephalopathy.

#### CASE REPORT

Our patient was a 20 year old boy with no underlying psychiatric disorder, student by occupation, who presented to the emergency

room with encephalopathy in form of inattentiveness , motor in coordination and impaired judgement . History revealed complete suicidal hanging with a jute rope from a fan for 3 to 5 minutes precipitated by a quarrel with his mother. History also revealed chronic social strain at home.

On examination patient was found to be cyanosed with facial congestion, tachycardia, tachypneic but regular breathing, inattentive, hypoactive, not responding to commands. Pupils were normal sized, reactive to light, intact corneal reflexes, intact occulocephalic reflexes, and no other

abnormalities to suggest brain stem damage. Patient was responding to pain stimuli by withdrawing and no abnormal posturing .Score on Glasgow coma scale was 12.

A prominent ligature mark , about 1.5 cm in diameter at the level of laryngeal prominence , discontinuous , obliquely directed to the nape of neck , with no significant trauma to the underlying structures ( figure 1 ) was seen . There were no marks of struggle (bruises or lacerations) on the body . These supported the suicidal nature than strangulation or homicidal hanging.

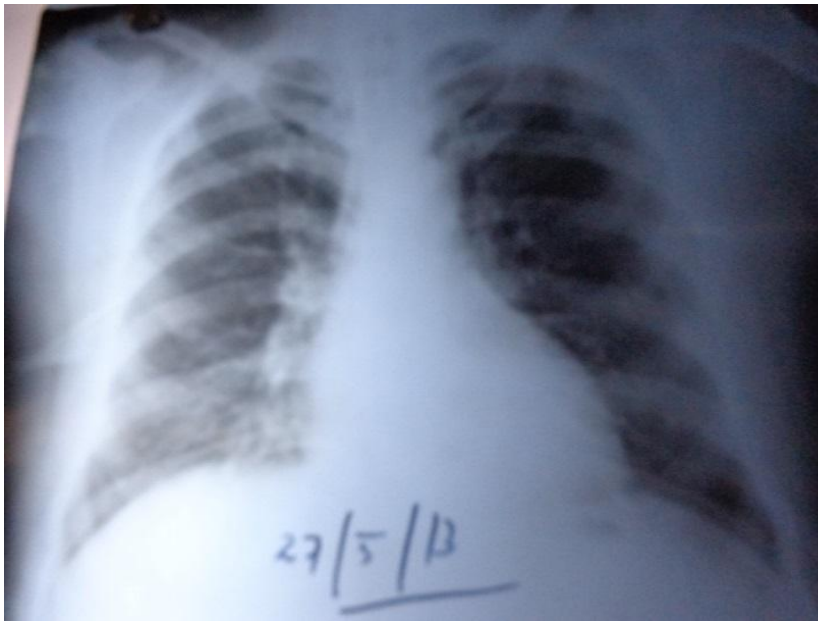
**Figure1 : ligature mark, about 1.5 cm in diameter at the level of laryngeal prominence, discontinuous, obliquely directed to the nape of neck .**



Lab parameters were normal except for decreased oxygen saturation ( 80 percent ) , chest X ray (Figure 2) showed bilateral infiltrates with ECG showing sinus tachycardia. X-ray cervical spine (Figure3) were normal. MRI brain (figure 4) T2 weighted pictures showed hyperintense areas in the basal ganglia and occipital region (arrows) which is suggestive of with the hypoxic insult to the brain.

With these findings, patient was diagnosed as a case of suicidal near hanging complicated with hypoxic ischemic encephalopathy and aspiration pneumonia . Patient was managed with high flow oxygen without intubation , IV fluids , IV antibiotics and was kept under observation. Within 24 hours patient was out of encephalopathy but with some memory deficits particularly around the hanging incident .

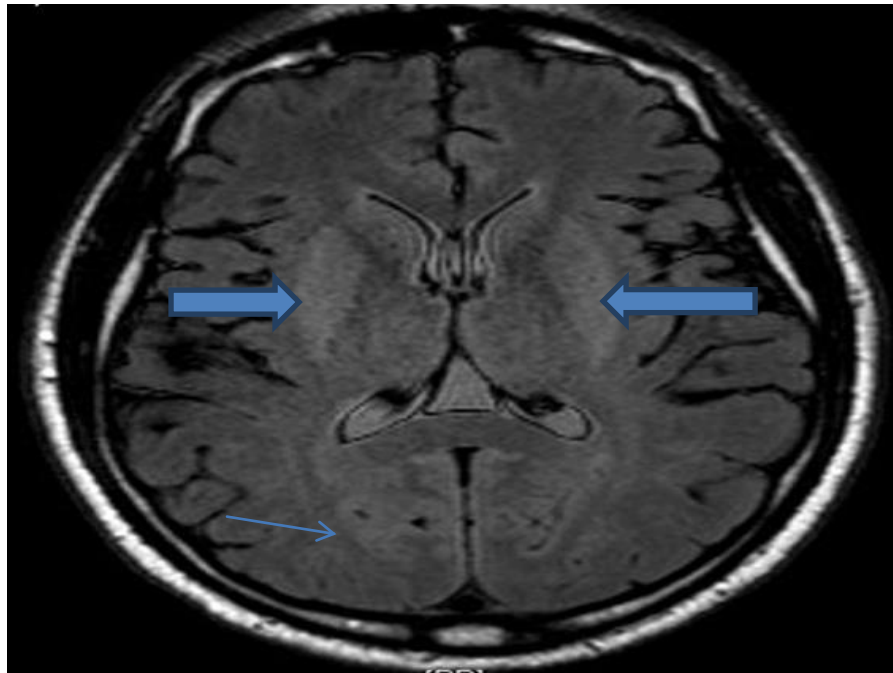
**Figure2 :chest X ray showing bilateral infiltrates ,right side > left side.**



**Figure 3:Normal cervical spine**



**Figure 4: MRI (T2 weighted image) showing the hyperintense areas in the basal ganglia and in the occipital regions.(arrows)**



## DISCUSSION

In classical judicial hanging, which involves drop from a distance  $\geq$  body height, death is due to cervical spine fracture or transection of the spinal cord. In near hanging, which involves drop from a minimal height ( $<$  body height), injury occurs due to compression of the neck structures. The pathophysiology of morbidity and mortality is described in the literature as [4,5]: Venous obstruction and cerebral hypoxia. Laryngeal oedema and delayed airway obstruction (due to loss of neck muscle tone). Carotid sinus stimulation causing increased vagal tone.

Local injuries (thyroid cartilage/hyoid bone fracture/laryngeal rupture). Pulmonary complications (aspiration pneumonia, development of adult respiratory distress syndrome, pulmonary oedema secondary to negative intrathoracic pressure due to attempted inspiration in upper airway obstruction or centrally mediated sympathetic discharge leading to generalized vasoconstriction).

Secondary cerebral injury (diffuse because of cerebral oedema and generalized cerebral hypoxia and/or focal because of arterial dissection or arterial spasm or subarachnoid

haemorrhage). Other complications (hyperthermia, status epilepticus, bleeding into vessel wall or intima of carotid arteries or lower oesophageal rupture)

The two principal means by which hanging induces brain damage are cerebral ischemia resulting from ligature induced obstruction of cervical blood flow and, to a lesser extent, cerebral anoxia resulting from asphyxia due to mechanical airway obstruction. Reports of successful hanging in individuals with tracheotomies at a level lower than the ligature, suggest that asphyxia alone does not play a lethal role, although upward displacement of the tongue and glottis are in some cases sufficient to occlude the airway [6]

A study in 2010 found out that GCS value below 10 at admission was associated with adverse neurological outcome. Abnormal plantar reflex, defined as unilateral or bilateral equivocal or extensor response, strongly correlated with neurosequelae development. Pulse rate, respiratory rate, systolic blood pressure, diastolic blood pressure, pupil size and pupillary reaction to light had insignificant association with future neurosequelae [7].



Hanging is known as a painless mode of death with a very narrow failure rate. Average fatal period is about 3 to 5 minutes and death occurs immediately if there is fracture and dislocation of the cervical vertebrae or heart block. Death is delayed in cases where there is only venous obstruction without much compression on the wind pipe/trachea as in partial hanging. Those who reach hospital alive have a relatively high probability of survival [8]. Death follows in 5-10 minutes (10-20 minutes, according to Polson[9]however his number seems to be based on the fact that the heart may continue beating for up to 20minutes after judicial hanging[10] and ignores that the heart may continue to beat after brain death).

A study conducted by Dept. of Forensic Medicine and Toxicology, Govt. Medical College & Hospital, Chandigarh found that majority of the hanging victims preferred multiple knots (61%) and fixed knots (58%) and a single loop (93%). The mark was obliquely placed (98% cases) above the larynx(85% cases).While in all the cases of ligature strangulation; the mark was transverse, below the level of thyroid cartilage. Imprint over the groove when present, corresponded with the ligature material used in all the cases [11].

In our case the hanging mark was obliquely placed above the level of larynx with a single knot . Patient remained suspended for five minutes , did not have any cervical spinal injury , was immediately brought to the hospital , had a Glasgow coma score above 10 which are all good prognostic factors and thus the patient survived. The patient developed ischemic hypoxic encephalopathy due to cerebral ischemia resulting from ligature induced obstruction of cervical blood flow and, to a lesser extent, cerebral anoxia resulting from asphyxia due to mechanical airway obstruction.

Hypoxic ischemic encephalopathy is an important complication in a patient who survives an attempt of hanging as evidenced by our case .MRI is the imaging modality of choice for the diagnosis and follow-up in patients with moderate-to-severe hypoxic-ischemic encephalopathy (HIE)[3].When performed after the first day (and particularly after day 4), conventional images may accurately demonstrate the injury pattern as area of hyper intense lesions. In the early sub acute period (24

hours–2 weeks), conventional T2 weighted images typically become positive and demonstrate increased signal intensity and swelling of the injured gray matter structures. T1 hyper intensities signalling cortical laminar necrosis become evident after two weeks. This hyperintense signal does not represent haemorrhage; it's believed to be caused by the accumulation of denatured proteins in dying cells.

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