

Postobstructive pulmonary edema: A fatal complication in suicidal near-hanging

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Abstract

Postobstructive pulmonary edema is a life-threatening complication that occurs after the removal of severe upper airway obstruction. Development of postobstructive pulmonary edema has been described after several cases of upper airway obstruction. However, postobstructive pulmonary edema developing after non-lethal hanging has not been reported widely in the literature. Herein, we describe a fatal case of postobstructive pulmonary edema in a 10-year-old girl, which was brought to the hospital with history of attempted suicide by hanging. At presentation, the girl was breathing laboriously. The oxygen saturation was of 82% and pulmonary auscultation revealed bilateral and diffuse crepitations. The chest computed tomographic scan showed bilateral diffuse infiltrates consistent with pulmonary edema. After 3 days of hospitalization, the respiratory state of the girl worsened leading to death despite intensive care. An autopsy was conducted and confirmed the diffuse pulmonary edema. Hence, this case confirms that delayed death in near hanging may occur. Pulmonary edema which develops subsequently in such patients is an uncommon mechanism of death that physicians should consider in emergency room.

Keywords

Postobstructive pulmonary edema, hanging, attempted suicide, death

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Introduction

Fatalities from upper airway obstruction are usually due to asphyxia.¹ However, rapid re-establishment of the airway does not guarantee repair in gas exchange. In fact, it has been established that mortality could result from the delayed effects of the obstruction like secondary cerebral injury or pulmonary complications. Postobstructive pulmonary edema (POPE) is a form of “non-cardiogenic, non-neurogenic” pulmonary edema which is uncommon and occurring after acute and severe airway obstruction.² It is a potentially life-threatening condition if not diagnosed immediately and managed promptly. It develops rapidly, without warning, within seconds to minutes after the relief of severe upper airway obstruction due to tumor, strangulation or near hanging.³ The term “near hanging” refers to patients who survive a hanging injury long enough to reach the hospital. Development of POPE after non-lethal suicidal hanging has not been described widely in the literature.⁴ Its incidence is difficult to ascertain. Most reports are of single cases. A literature review

and research of the topic “postobstructive pulmonary edema following near-hanging” identifies a dozen case presentations on the topic to date. Herein, we report a case of POPE in a 10-year-old girl following attempted suicidal hanging and we discuss its pathophysiology.

Case presentation

A 10-year-old girl was admitted to the emergency department with alleged history of hanging. She was rescued by her father who brought her down from suspension immediately. The event was unwitnessed; thus, the duration of hanging was unknown. The girl was last seen 15 min before being

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or accidental hangings.⁷ “The pathophysiology of POPE is multifactorial.”¹³ The starting event is the generation of considerably negative transpulmonary pressure during a forceful inspiration against a closed upper airway and hence the synonym, “negative pressure pulmonary edema”:⁴

It has been reported that a forceful inspiration against such glottic obstruction could result in a maximum intrathoracic pressure of (–140) cm H₂O from a baseline of (–4) cm H₂O. This event then leads to an increase in venous return and blood flow to the right side of the heart as well as a decrease in the flow from the left side as a result of increased afterload.¹

The high pressure is also transmitted to the interstitium and alveoli and causes an increase in the hydrostatic gradient favoring transudation of fluid from the pulmonary capillary to the pulmonary interstitial space. This combination results in generation of pulmonary edema.¹⁴

Hypoxia and hyperadrenergic state are other contributors in the development of POPE. “Hypoxemia due to upper airway obstruction leads to increased pulmonary vascular resistance and pulmonary capillary pressure. The hyperadrenergic response is thought to redistribute blood from the systemic veins to the pulmonary circuit and increase pulmonary vascular resistance.” All of these events may precipitate edema formation.¹

“The etiologic factors leading to POPE type II are less clear than what has been described for type I. Type II POPE pathophysiology focuses more on expiration against an obstructed airway.”¹ Expiration against a closed airway is assimilated to Valsalva which causes positive alveolar and pleural pressures, leading to a decrease in the pulmonary blood volume, a decrease in venous return to the right side of the heart and a decrease in ventricular preload.¹⁴ Thus, once the obstruction is relieved, as in the case of laryngeal mass resection or post-adenotonsillectomy, the sudden discharge induces an abrupt fall in airway pressure, an increase in the venous return, and a subsequent increase in preload. This results in an elevated hydrostatic pressure in the pulmonary circuit leading to pulmonary edema.^{14,15}

Nevertheless, physicians should consider other several mechanisms by which acute respiratory distress (ARDS) may develop after attempted hanging. In fact, patients presenting with a low GCS score and therefore a depressed mental status, like in the current case report, may be predisposed to aspiration, leading to pneumonia or pneumonitis with subsequent ARDS development.¹⁶ Also, serious brain injury that results in cerebral hypoxia has been associated with neurogenic pulmonary edema and acute lung injury mediated by massive sympathetic discharge. In such situation, neurogenic pulmonary edema often has poor prognostic implications, as it is associated with devastating and usually lethal brain injuries.⁷

Conclusion

Fatal period in attempted hanging is not well identified. It may vary markedly with the amount of constricting forces as

well as the time of removing the compressing force around neck. Patient surviving after attempted hanging is never out of danger. Hypoxic-ischemic encephalopathy is the principal mechanism of subsequent mortality in the survivors of suicidal or accidental hanging. However, delayed ARDS due to POPE is well described but often missed complication that clinicians should keep in mind.

Declaration of conflicting interests

The author(s) declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Ethical approval

All procedures performed in this report involving human participants were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki Declaration and its later amendments or comparable ethical standards. Our institution does not require ethical approval for reporting individual cases or case series.

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Informed consent

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