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Research Article

Negative pressure pulmonary edema (NPPE) After Hanging: a case report

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Abstract

Negative pressure pulmonary edema (NPPE) is a type of non-cardiac pulmonary edema (PE) that results from the production of high negative pressure in the chest (NIP) to overcome upper airway obstruction (UAO). The most commonly reported cause of NPPE in adults is laryngospasm during intubation or the postoperative period after anesthesia, and outpatient cases are rare. This was a case of a 43-year-old man with NPPE after judicial Hanging. Bilateral rull s were present in the lung and SpO2 was 60%. The patient's chest showed bilateral diffuse infiltration. The patient underwent ACMV (mode ventilation). On the third day of admission, the patient was weaned from the ventilator and extubated.

This confirms the importance of early detection of NPPE, which can lead to optimal outcome and complete recovery in these cases.

Keywords: Pulmonary Edema , Hanging, Judicial

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Introduction

Negative pressure pulmonary edema (NPPE) is a type of non-cardiac pulmonary edema (PE) caused by the generation of negative upper thoracic pressure (NIP) to overcome upper airway obstruction (UAO). The prevalence of negative pressure pulmonary edema (NPPE) in patients with acute upper airway obstruction is more than 12% (1).

Negative pressure pulmonary edema (NPPE) is a life-threatening complication in general anesthesia. Its incidence occurs in 0.1% of general anesthesia cases with endotracheal intubation, which is mostly caused by laryngospasm (2).

Negative pressure pulmonary edema (NPPE), which can also occur after Hanging, often leads to death, and the cases that are saved are less reported.

In this report, we describe the clinical symptoms and diagnostic findings of an adult man who developed NPPE after Hanging.

Patient Presentation

A 43-year-old man was referred to the hospital with a history of Hanging. The patient was cyanotic and had a pulse below 40 and a blood pressure of 60/p. Cardio-pulmonary resuscitation was started immediately and the patient was intubated with tube 8. He received 5 mg of midazolam and 100 mcg of fentanyl. The patient was revived with epinephrine and atropine. The patient's pulse reached 100 and norepinephrine drip was prescribed to increase the patient's blood pressure. And the blood pressure reached 108.72 and the patient's SpO2 reached 90%.

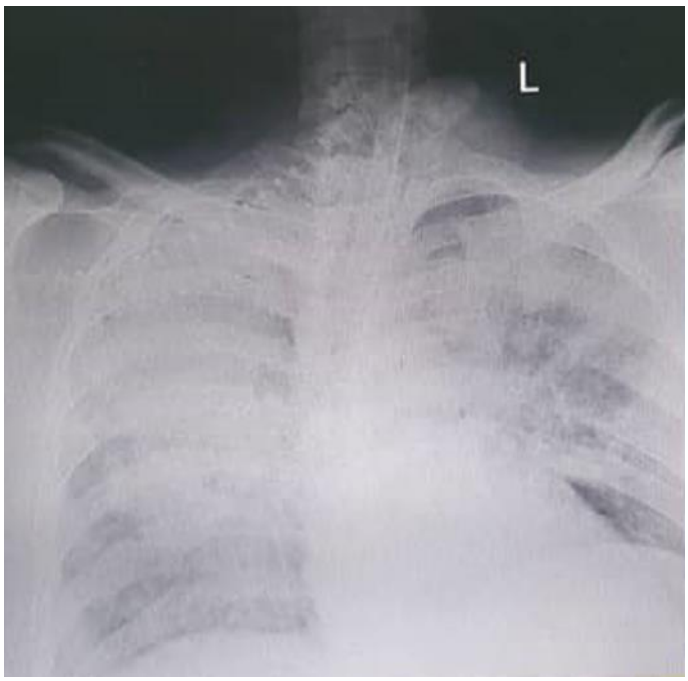

Figure 1- CHEST X RAY (CXR) with bilateral and diffuse infiltration

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The result of arterial gas analysis of the patient's ABG after resuscitation was as follows:

pCO2= 34 mm Hg, Ph =7.16, HCO3= 12 mEq/L , BE=-16, lactate=5.3

The patient was connected to a portable ventilator. After 2 hours, the patient was transferred to the ICU with a blood pressure of 56/37 and heart rate of 104. The norepinephrine drip was immediately started for the patient and the patient's blood pressure reached 116.92.

After increasing the patient's blood pressure, according to bilateral fine ral auscultation in the patient after connecting to the ventilator and chest X RAY (Figure 1) and pink foamy secretions inside the tracheal tube, with suspicion of pulmonary edema, Lasix was prescribed to the patient.

The ventilator settings were as follows:

Mode=ACMV, tidal volume=550cc, FiO2 100%, I/E:1.2, rate=14 /min, PEEP 5 cm H2O, ps=15

During the next 4 hours, FiO2 reached 60% with SpO2 =93-95%. During the three days of hospitalization in the intensive care unit, with the continuation of the pulmonary edema treatment, the patient became conscious and asymptomatic and was removed from the ventilator. He was discharged from the hospital 4 days after endotracheal extubation with normal neurological examinations.

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Discussion

In 1972, POPE was first described in an animal model (3) and in 1973 it was also described in humans (4). Two types of POPE have been described: Type I, which occurs in the context of acute airway obstruction And type II occurs after removal of partial airway obstruction, for example, adenoidectomy, removal of the larynx mass (5).

The most common cause of POPE type I is after intubation. Other causes of upper airway obstruction leading to POPE include: Hanging, mononucleosis, sleep apnea, biting of the endotracheal tube in intubated people, croup and epiglottitis (especially in children), suffocation, postoperative vocal cord paralysis, early administration of muscle relaxants in induction of anesthesia (glossal muscle paralysis before diaphragm), and aspiration follows pneumothorax or extensive pleural effusion (6,7).

POPE is usually associated with acute respiratory failure, and chest radiography with findings of pulmonary edema confirms this diagnosis (8).

In hanging for judicial reasons, death is due to fatal injuries such as injuries to the spinal cord, brainstem and larynx, which often do not reach the hospital, but in suicide attempts or accidents, they usually cause compression of the internal jugular veins and carotid arteries. and lead to cerebral hypoxia and airways. (9)

Most hospital deaths following hanging are due to severe pulmonary edema or pneumonia (10) and this

Edema can be neurogenic or secondary to increased intrathoracic pressure.

In the case of our patient, negative pressure pulmonary edema occurred due to negative pressure secondary to sudden compression of the airways, which the improvement of neurological outcomes after treatment and normal images of the brain without damage confirm this diagnosis. Initial lack of consciousness in the patient is also possible. It is caused by jugular vein compression or hypoxia. In this patient, other causes of pulmonary edema such as aspiration pneumonia, iatrogenic volume overload, and heart diseases were not considered.

In this patient, other causes of pulmonary edema such as aspiration pneumonia, iatrogenic volume overload, and heart diseases were not considered.

Considering the different treatment strategies in this patient with clinical suspicion and supportive measures including maintaining the airway and adequate oxygenation by adding positive end pressure (PEEP) controlled by pulse oximetry and determination of arterial blood gas and appropriate setting of mechanical ventilation and drug treatment Pulmonary edema improved.

With effective treatment, almost most patients recover within 24 to 48 hours and the chest radiograph becomes normal (8). In this patient, after treatment, the patient recovered within three days.

Conclusions

Negative pressure pulmonary edema is one of the most important causes of death in patients with upper airway obstruction, and correct and timely management of the patient in most cases leads to the patient's recovery.

Declarations

This research has been approved by the ethics committee of Babol University of Medical Sciences with the reference number IR.MUBABOL.HRI.REC.1401.146

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Author's contribution

Conceptualization: K.L., SH.S., P.A.M; Methodology: KH.E.; Sampling: K.L; Statistical analysis and investigation: KH.E.; Writing -

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original draft preparation: K.L., KH.E.; Writing - review and editing: SH.S., P.A.M.

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Consent for publication

Not applicable.

Conflict of interest

The authors declare no conflicts of interest.

References

1. Zhang Q, Vayalumkal J, Ricely J, Elrod S, Raza A. The awareness of negative pressure pulmonary edema in the medical intensive care unit. Cureus. 2020;12(9).

2. Aay T, Bouti K, Tebay N. Negative pressure pulmonary edema following a cholecystectomy-a case report. Rev Pneumol Clin. 2017;73:267–71 https://doi.org/10.1016/j.pneumo.2017.08.006.

3. Berdai AM, Labib S, Harandou M. Postobstructive pulmonary edema following accidental near-hanging. The American Journal of Case Reports. 2013;14:350.

4. Tonazzo V, Po' C, Bertolo S, Ferraro VA, Zanconato S, Martelossi S, et al. Negative pressure pulmonary edema and hemorrhage after near fatal suffocation in an infant: a case report. Italian Journal of Pediatrics. 2025;51(1):178.

5. Bhattacharya M, Kallet RH, Ware LB, Matthay MA. Negative-pressure pulmonary edema. Chest. 2016;150(4):927-33.

6. Singh Bajwa SJ, Kulshrestha A: Diagnosis, Prevention and Management of Postoperative Pulmonary Edema. Ann Med Health Sci Res, 2012; 2: 180–85

7. Tahir S, Dar TA. Acute Pulmonary Oedema. Perioperative Anaesthetic Emergencies. 2021:366.

8. Sinha A, Sivanandan S, Ramesh P et al: Post Obstructive Pulmonary Edema in a Child who attempted Suicidal Hanging. Indian J Pediatr, 2008; 75: 1075–77

9. Nair S, Jacob J, Aaron S et al: Pulmonary distress following attempted sui¬cidal hanging. Indian J Med Sci, 2009; 63: 53–57

10. Bouzid A, Motiaa Y, Sbai H, Labib S. Acute pulmonary edema after hanging attempt. World J Clin Med Img, 2022, 1 (2), 100.102.

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