

## A Case of Pulmonary Edema Induced by Hanging

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**Abstract:** A 47-year-old female committed suicides by hanging in the barn. When emergency medical technicians (EMTs) arrived at the scene, she was in cardiopulmonary arrest and initial rhythm was asystole. On arrival, she had a plenty of foamy fluid on her mouth and underwent cricothyroidotomy. A chest X-ray and computed tomography showed severe pulmonary edema. She unfortunately did not return her circulation by resuscitation. We presented a rare case of pulmonary edema induced by hanging and discussed complexity of mechanisms pulmonary edema induced by hanging.

**Keywords:** hanging; lung edema; negative pressure.

### INTRODUCTION

Pulmonary edema induced by hanging has been reported rarely [1-4]. However, it is important for understanding the mechanisms. We report hanging induced pulmonary edema and discuss about the etiology.

### CASE REPORT

A 47-year-old female committed suicides by hanging in the barn. She was diagnosed as schizophrenia by a local hospital and treated with major tranquilizer. She was discovered by her mother. He mother released her and called an ambulance without basic cardiopulmonary resuscitation.

When emergency medical technicians (EMTs) arrived at the scene, she was in cardiopulmonary arrest and her pupils had dilated. Initial rhythm was asystole. On arrival at hospital in 30 minutes receiving basic life support without infusion of adrenaline by EMTs, she remained cardiac arrest. As she had a plenty of foamy fluid on her mouth suggesting lung edema, she underwent cricothyroidotomy for securing airway, and injection of 5 times of 1mg of epinephrine every four minute in order to attempt resuscitation. Results of blood gas analysis on admission (FiO<sub>2</sub> 100%) were pH 6.49, pCO<sub>2</sub> 51 mmHg, pO<sub>2</sub> 140 mmHg, HCO<sub>3</sub><sup>-</sup> 3.7 mmol/L, and base excess (BE) -36.5 mmol/L. A complete blood count revealed the following findings: white blood cells, 7,500/mm<sup>3</sup>; hemoglobin, 11.4 g/dL

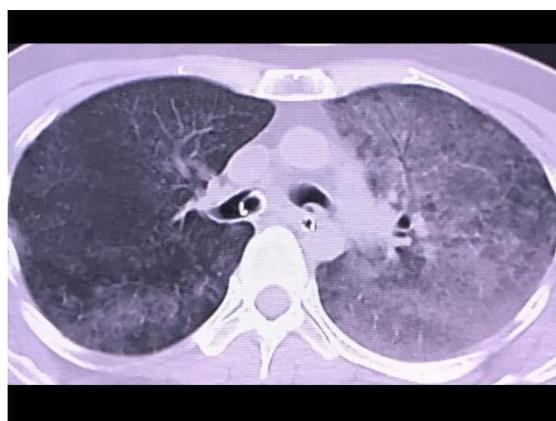
and platelets, 28.5 x 10<sup>4</sup>/mm<sup>3</sup>. Serum biochemical analyses revealed the following findings: total bilirubin, 0.3 mg/dL; aspartate aminotransferase (AST), 3180 IU/L; alanine aminotransferase (ALT), 4990 IU/L; albumin, 3.7 g/dL; glucose, 678 mg/dL; glycated hemoglobin, 5.2%; blood urea nitrogen, 13.0 mg/dL; creatinine, 0.64 mg/dL; creatine phosphokinase, 191 IU/L; sodium, 144 mEq/L; potassium, 16.7 mEq/L; chloride, 96 mEq/L; c-reactive protein, 0.3 mg/dL. A chest X-ray and computed tomography (CT) showed severe pulmonary edema (Fig. 1 & 2). She unfortunately did not return her circulation.

The roentgen reveals decreased permeability in both lung fields.



**Fig-1: Chest roentgen on arrival**

The CT demonstrates bilateral diffuse ground glass appearance, suggesting lung edema.



**Fig-2: Chest computed tomography (CT) on arrival**

## DISCUSSION

Differential diagnosis of pulmonary edema was inflammation, hypo-osmolality, over hydration, heart failure and neurogenic. As she had normal value of leukocyte, C - reactive protein and albumin, possibility of inflammation and hypo-osmolality is minimized. As her past history did not include heart, kidney and liver diseases, possibility of overhydration is also denied. Furthermore, as the CT detected no significant lesions in her head and spine except for change of anoxic brain due to cardiac arrest, possibility of neurological lung edema is also minimized [5]. Hanging may cause takotsubo cardiomyopathy, following lung edema [6-8]. However this mechanism requires time at least from several hours to a few days. This case shows lung edema immediately after hanging so that possibility of takotsubo induced lung edema is also minimized. Injection of adrenaline cause lung edema, however, this case showed sign of lung edema before injection of adrenaline [9]. In addition, hypoxia may cause lung edema [10]. Exposure to hypoxia increase reactive oxygen species from mitochondria, as from nicotinamide adenine dinucleotide phosphate oxidase, xanthine oxidase/reductase, and nitric oxide synthase enzymes, as well as establishing an inflammatory process [10]. However, this mechanism also requires time. Marked high level of AST, ALT and

potassium of the present case were just caused by prolong time course from cardiac arrest [11]. The remaining other causes were negative pressure in pulmonary cavity. swalt et al reported the three mechanisms of pulmonary edema for acute obstruction of upper airway [12]. First is that forced respiration for acute obstruction of upper airway makes pulmonary cavity negative pressure and increases venous return. Second is strong negative pressure destroys alveolus and capillary. As this mechanism can cause immediate lung edema, theory of negative pressure induced lung edema is most likely cause of this case.

## CONCLUSION

We presented a case of pulmonary edema induced by hanging and discussed complexity of mechanisms pulmonary edema induced by hanging.

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