

Tension Pneumopericardium in the Intensive Care Unit

Nadia Isabel Abelhad, MD
Katia Bravo-Jaimes, MD
Francisco Fuentes, MD

A 64-year-old man was admitted to the intensive care unit (ICU) with increased work of breathing and altered mental status. He was also in acute respiratory distress due to respiratory syncytial virus pneumonia and herpes simplex virus encephalitis. His medical history included a kidney transplant and aorto-coronary bypass grafting. He was treated with prolonged intubation and tracheostomy.

One week after his tracheostomy, the patient underwent brain magnetic resonance imaging (MRI) while he was on a portable ventilator (ParaPAC 200DMRI; Smiths Medical). A chest radiograph obtained immediately after MRI showed pneumopericardium, pneumomediastinum, and subcutaneous emphysema (Fig. 1A). Physical examination revealed a heart rate of 108 beats/min, a blood pressure of 120/72 mmHg, and distant heart sounds but no bruit de moulin or Hamman sign. An electrocardiogram showed sinus tachycardia. The patient was treated conservatively with 100% oxygen. After 4 days, the pneumopericardium had improved (Fig. 1B); after one week, it had resolved.

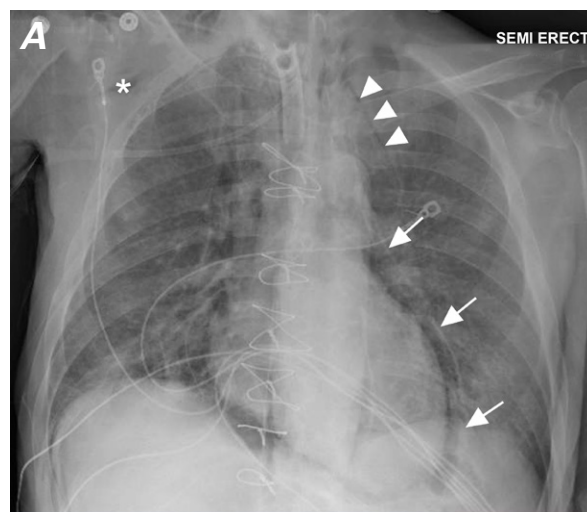


Fig. 1 Chest radiographs show **A**) pneumopericardium (arrows), pneumomediastinum (arrowheads), and subcutaneous emphysema (asterisk) immediately after the patient underwent magnetic resonance imaging while he was on a portable ventilator and **B**) improvement after 4 days of conservative therapy with 100% oxygen.

Section Editor:
Raymond F. Stainback, MD

From: Department of
Cardiovascular Medicine,
The University of Texas
John P. and Katherine G.
McGovern Medical School,
Houston, Texas 77030

Address for reprints:
Nadia Isabel Abelhad, MD,
1514 Jefferson Hwy.,
3rd fl. Atrium Tower, Rm.
#3D718, New Orleans,
LA 70121

E-mail: Nadia.Abelhad@
ochsner.org

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Comment

Pneumopericardium most often occurs after blunt or sharp chest trauma.¹ It can also occur after pericardiocentesis, catheter ablation, thoracic surgery, endotracheal intubation, and positive-pressure mechanical ventilation.¹ Absent tracheobronchial or gastroesophageal-pericardial fistulae, pneumopericardium results when pressure gradients between alveoli and interstitial spaces increase, leading to alveolar rupture and air traveling from the pulmonary perivascular sheaths to the hilum and pericardium (the Macklin effect).² Use of a portable ventilator during our patient's MRI may have caused barotrauma and pneumopericardium. Portable ventilators pose unique challenges to safe mechanical ventilation during MRI because they vary in terms of delivered tidal volume, inspired oxygen fraction, positive end-expiratory pressure (PEEP), capabilities, and alarms. One recent study compared the performance of older MRI-compatible portable ventilators (including the one used in our patient) and an ICU ventilator.³ None of

the MRI-compatible ventilators delivered tidal volumes within the American Society for Testing and Materials standard limits of $\pm 10\%$ under all conditions, nor did any maintain set PEEP values.³ In cases such as this one, conservative therapy with 100% oxygen should be the initial approach. If hemodynamic instability arises, surgical treatment should be considered.⁴

References

1. Capizzi PJ, Martin M, Bannon MP. Tension pneumopericardium following blunt injury. *J Trauma* 1995;39(4):775-80.
2. Macklin CC. Transport of air along sheaths of pulmonary blood vessels from alveoli to mediastinum: clinical implications. *Arch Intern Med (Chic)* 1939;64(5):913-26.
3. Chikata Y, Okuda N, Izawa M, Onodera M, Nishimura M. Performance of ventilators compatible with magnetic resonance imaging: a bench study. *Respir Care* 2015;60(3):341-6.
4. Haan JM, Scalea TM. Tension pneumopericardium: a case report and a review of the literature. *Am Surg* 2006;72(4):330-1.