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The Effects of Positive Pressure Ventilation on Acute Cardiac Tamponade : A Case Series

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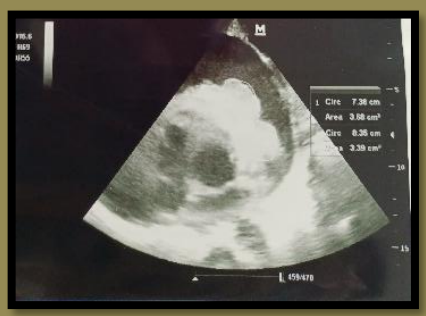
INTRODUCTION

In acute cardiac tamponade resuscitation, circulatory management takes precedence over airway and breathing. Both invasive and non-invasive positive pressure ventilation (PPV) may worsen the condition by raising intrathoracic pressure, negatively impacting a preload-dependent heart.

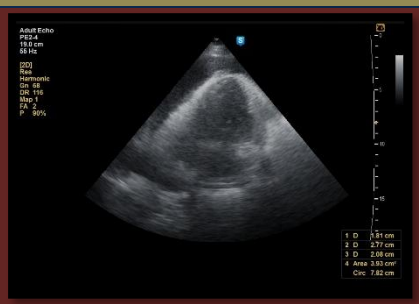
CASE DESCRIPTION

CASE 1



An 18-year-old male presented with acute onset of shortness of breath with eye swelling and a fever. He was tachypneic with a compensated shock. Cardiac POCUS revealed an exophytic mass with a large pericardial effusion with evidence of tamponade. BiPAP was initiated and his blood pressure rapidly dropping. He was mechanically ventilated and hemodynamic support with inotropes. Patient was hypoxic despite on 100% bag-valve-mask ventilation and high ventilator settings. Pericardiocentesis was performed using a parasternal approach and drained 100 ml of hemoserous fluid. Patient subsequently developed pulseless electrical activity and cardiopulmonary resuscitation was commenced. A second pericardiocentesis was attempted via subxiphoid and drained only 10 ml. Patient succumbed likely due to malignant cardiac tamponade.

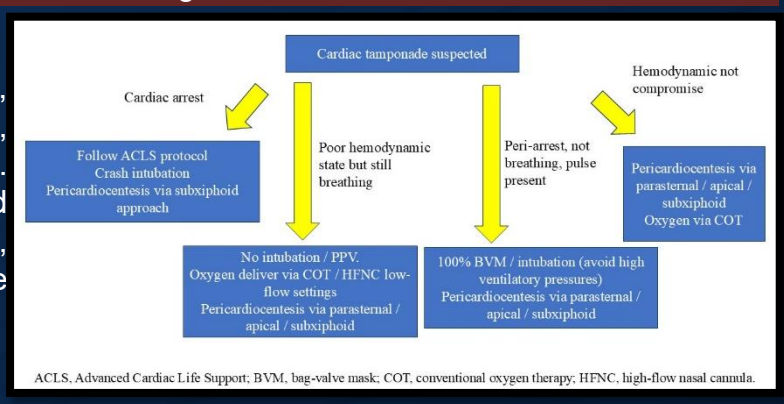
CASE 2



A 76-year-old male with no comorbidities presented with acute onset chest pain with shortness of breath and reduced effort tolerance. His vitals were as follows: blood pressure 120/80 mmHg, heart rate 106 beats/min and respiratory rate 24 breaths/min. Cardiac POCUS showed and irregular pericardial wall with a large pericardial effusion with evidences of tamponade. He was placed on BiPAP due to worsening respiratory distress. He became hypotensive along with compensatory tachycardia. BiPAP was discontinued and replaced with HFNC, which he tolerated well. Pericardiocentesis was performed via parasternal approach and a catheter was inserted, draining 250 ml hemoserous fluid. Analysis of pericardial fluid revealed atypical cells with immature lymphocytes and a computed tomography showed left lung mass with distant metastasis.

DISCUSSION

Cardiac tamponade is preload-dependent, and PPV further increases diastolic pressure, reducing stroke volume and cardiac output. Animal studies have shown PPV caused fluctuations in various pressures (pleural, pericardial, arterial and cardiac) and were transmitted to the pericardial fluid.



ACLS, Advanced Cardiac Life Support; BVM, bag-valve mask; COT, conventional oxygen therapy; HFNC, high-flow nasal cannula.

CONCLUSION

The principal management of acute crashing cardiac tamponade should be emphasized on circulation rather than standard 'airway and breathing', and timely pericardiocentesis should be performed to improve the outcome of the patients.

[1] Ho AM, et al. Timing of tracheal intubation in traumatic cardiac tamponade: a word of caution. Resuscitation. 2009;80(2):272-274.