

Clinical Utility of Miniaturized Transesophageal Imaging in a Trauma Patient with Right Ventricular Rupture

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Abstract

This case report describes how hTEE™, hemodynamic management guided by a miniaturized, disposable transesophageal ultrasound probe (ClariTEE®, ImaCor Inc., Garden City, NY) was used in the management of a patient with blunt anterior chest wall trauma from a motor vehicle accident (MVA), resulting in right ventricular (RV) rupture. Surgical repair could not be performed immediately due to treatment of concomitant cerebral contusions with anticoagulation therapy. Insertion of a pulmonary artery (PA) catheter poses a risk of systemic bleeding during anticoagulation therapy, therefore was not performed. Given the importance of structural and hemodynamic information needed to determine the course of treatment in a high risk, preoperative patient, hTEE imaging was superior for imaging of the patient's right heart function. Importantly, hTEE does not interfere with anticoagulation therapy and can be indwelling for up to 72 hours. Subsequent monitoring of the patient's RV function provided critical information and confidence to continue anticoagulation therapy. Once coagulation levels were within normal range, the patient underwent successful repair of the RV rupture and made a full recovery. In summary, hTEE imaging provided critical information on right heart function and guided medical management, in a high-risk preoperative patient.

Case Presentation

A 41-year-old female presented to the ER following an MVA. She had a remarkable history of orthotopic heart transplant 10 years prior. One week prior to admission, she developed an acute coronary syndrome, which required percutaneous coronary intervention. Upon examination, she was found to have multiple orthopedic injuries as well as bilateral cerebral contusions. Given the nature of the blunt trauma, computed tomography (CT) of the chest was ordered. Results showed RV freewall discontinuity consistent with RV rupture that appeared contained within the thorax. These findings were consistent with blunt chest wall trauma.

Although immediate surgery is required for cardiac wall rupture, due to the cerebral contusions, anticoagulation therapy was performed. However, timing of surgery is predicated on the status of RV function; if function deteriorated, the patient would then undergo surgery. Given that a PA catheter could not be placed during

anticoagulation therapy, limited information was available on the patient's RV structural and hemodynamic state. An hTEE probe was placed to monitor the patient's RV function over the next three days. The hTEE imaging demonstrated normal biventricular function.

Because the hTEE probe can be indwelling for up to 72 hours, serial assessment of heart function provided critical insights to cardiac status, verifying that RV function remained stable. The patient underwent successful repair of the RV rupture and made a full recovery.

Discussion

Cardiac injuries resulting from blunt chest trauma are common, often go undetected, and are potentially catastrophic.¹ These injuries encompass a large range of presentations, including cardiac contusion, free wall rupture, ventricular septal rupture, and valvular disrapture.² Most injuries often go undetected while more obvious problems are treated. The location of the RV is immediately posterior to the sternum, predisposing it to blunt trauma. It is thought that acute elevation of the right intraventricular pressure leads to injury of the tricuspid valvular apparatus, with RV wall rupture being less common.³

Imaging modalities used to evaluate the RV include conventional angiography, radionuclide angiography, CT, magnetic resonance imaging (MRI), and echocardiography. Although MRI allows best resolution of the heart, depicting both functional and structural abnormalities, this modality is not readily available and is not practical in the acute setting.

Echocardiography, on the other hand, provides instantaneous information on heart function and physiology. It has been reported that standard transthoracic echocardiography has low diagnostic yield in severe blunt chest trauma, while transesophageal echocardiography (TEE) provides accurate diagnosis in a short time at the bedside and does not interfere with other diagnostic or therapeutic procedures.⁴ However, it is impractical to use conventional TEE for ongoing management of intensive care patients over a duration of several days.

Continued on reverse

Conclusion

The use of hTEE overcame the limitations of conventional TEE by providing serial imaging of right heart function in an acutely ill, preoperative patient.

This is particularly important in the scenario where other modalities used for the assessment of structure and physiology are otherwise unavailable or contraindicated.

References

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