The Role of Transoesophageal Echocardiography in Intensive Care

Gary Lau, Ravi Hebballi, Justin Williams

ABSTRACT

We present a patient in whom transoesophageal echo was invaluable in diagnosing the cause of a patient’s haemodynamic instability and contributed to a significant change in the management.

Keywords: Transoesophageal echocardiography, Intensive care.

INTRODUCTION

Echocardiography and extra-cardiac ultrasound imaging is gaining increased recognition as an important tool in the management of the intensive care patient. This imaging modality gives us useful information about cardiac physiology, pathology and also provides valuable real-time haemodynamic information, thus helping the diagnosis and therapy in the haemodynamically unstable patient. We present a patient in whom the transoesophageal echo proved invaluable in diagnosing the cause of a patient’s haemodynamic instability and contributed to a significant change in patient management.

CASE REPORT

A 46-year-old male was admitted to a district general hospital with symptoms of pyrexia and shortness of breath. Approximately 6 weeks prior to this admission, he had a mechanical mitral valve replacement for severe mitral regurgitation secondary to infective endocarditis. On physical examination, he had signs consistent with a low cardiac output state. Shortly after admission, he was intubated because of type I respiratory failure and inotropes were started to improve his cardiac output.

Based on his presenting symptoms and history of recent valve surgery, infective endocarditis was suspected. A transthoracic echo was performed at the referring hospital, however, it could not rule out the presence of vegetations. The patient was then transferred to the adult intensive care unit at our hospital for further investigations and intervention. On arrival to intensive care, the patient had a blood pressure of 100/58 mmHg with a noradrenaline infusion of 0.4 μg/kg/min and an adrenaline infusion of 0.2 μg/kg/min. He had a heart rate of 106 beats per minute, a central venous pressure of 24 mmHg, and an arterial oxygen tension (PaO₂) of 8.2 kPa with fractional inspired oxygen concentration (FiO₂) of 0.8. A transoesophageal echocardiogram (TOE) was performed immediately to assess for the cause of the patient’s haemodynamic instability.

The mid-oesophageal four-chamber view of the heart demonstrated a normal functioning bileaflet mechanical mitral valve with its two leaflets opening and closing well (Fig. 1). The pericardium surrounding the right atrium was hyperechoic, but there was no evidence of effusion or constriction of the right side of the heart. Colour flow doppler was applied over the prosthetic mitral valve confirming that the prosthetic mitral valve was functioning well with no evidence of vegetations, regurgitation or valve dysfunction.

The right ventricular inflow-outflow view demonstrated a small effusion surrounding the right ventricle at the bottom of the image. The TOE probe was advanced further into the stomach to see the transgastric short-axis view of the left ventricle. On the inferolateral part of the heart, there was a large pericardial effusion, which measured between 3 and 4 cm, impairing left ventricular filling and causing tamponade (Fig. 2). Further assessment of the pericardial effusion demonstrated the development of an organised clot with fibrinous stranding, indicating that this was a long-standing pericardial effusion (Fig. 3). The fibrinous stranding and pericardial effusion extended around the entire inferior part of the left ventricle (Fig. 4).
The patient was immediately taken to cardiac theatre and an open drainage of the effusion with an insertion of a pericardial drain by a subxiphisternal approach was reformed. The patient had a blood pressure of 98/58 mmHg on inotropic support of 0.4 mcg/kg/min of noradrenaline and 0.2 mcg/kg/min of adrenaline, a central venous pressure of 24 mmHg and was hypoxic with a peripheral oxygen saturation of 86% on a FiO2 of 0.8. Within 60 seconds of drainage of the effusion, there was an immediate reduction in central venous pressure to 14 mmHg, and an improvement in oxygenation with the saturations increasing to 97% with a FiO2 of 0.8. Over the next several minutes there was an improvement in the patient’s haemodynamic status, with a widening of the pulse pressure of 110/45 mmHg and a reduction in heart rate to 90 beats/minute. This was followed by a cessation of inotropic support and reduction in oxygen requirements to a FiO2 of 0.40. The patient was discharged from hospital 7 days later.

DISCUSSION

The cause of this patient’s haemodynamic instability was a large pericardial effusion resulting in tamponade that could only be diagnosed with transoesophageal echo. The initial transthoracic echo did not show a significant effusion as it collected at the inferolateral part of the heart, which is inaccessible via transthoracic echo views. The echo also showed a normal mitral valve with no evidence of infective endocarditis, thus preventing a resternotomy and replacement of a normally functioning mechanical mitral valve.

One of the most commonly observed and difficult to manage conditions in intensive care unit is the haemodynamically unstable patient. Echocardiography accurately assesses global and regional heart function and provides more information than any other conventional cardiac monitor. Furthermore, general critical care ultrasonography has high diagnostic accuracy in the pathology of the lung and pleura, and aids in the diagnosis of intraperitoneal free fluid in the trauma patient. Vascular ultrasound in critical care is useful not only in vascular access for central venous catheters, but also during insertion of arterial catheters, intra-aortic balloon pumps and the diagnosis of venous thrombosis.

Several studies have demonstrated that echo has contributed to a positive therapeutic impact in 24 to 46% of critically ill patients. Recently, the use of echocardiography in a district general hospital intensive care unit in the UK contributed to a change in clinical management in 51.2% of their patients.

CONCLUSION

Doctors in trauma and emergency medicine are already using ultrasound and focused echo in the form of focused assessment with sonography in trauma (FAST) and focused echocardiography evaluation in life support (FEEL)
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ultrasound protocols. However, intensivists should be using this tool as well as they are ideally positioned to integrate the information obtained from an urgent echo exam with the pathophysiology of the patient’s condition. Echocardiography and extra-cardiac ultrasound have a definite role in the management of critically ill patients in intensive care.

REFERENCES


ABOUT THE AUTHORS

Gary Lau (Corresponding Author)
Department of Anaesthesia, Glenfield Hospital, Leicestershire United Kingdom, e-mail: drgklau@gmail.com

Ravi Hebballi
Department of Anaesthesia, Glenfield Hospital, Leicestershire United Kingdom

Justin Williams
Department of Anaesthesia, Glenfield Hospital, Leicestershire United Kingdom