Emergent bedside real-time three-dimensional transesophageal echocardiography in a patient with cardiac arrest following a caesarean section

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Post-caesarean pulmonary embolism (PE) is associated with significant peri-operative morbidity and mortality. This report describes a case of sudden cardiac arrest 2 days post-caesarean due to massive PE diagnosed via bedside transesophageal echocardiography (TEE). Recognition of the PE at the bifurcation of the right and left pulmonary arteries was achieved by real-time three-dimensional TEE, but not two-dimensional TEE. Extracorporeal membrane oxygenation was immediately established and emergent pulmonary thromboembolectomy was performed. The patient was discharged without residual deficits on Day 22 of hospitalization.

Keywords
Pulmonary embolism • Transesophageal echocardiography • 3D TEE • Caesarean section

Introduction
Amniotic fluid embolism (AFE)1,2 and pulmonary embolism (PE)3,4 are two major life-threatening emergencies that can occur in the peri-parturient period or following caesarean section. Both are relatively rare and can pose clinical challenges in terms of diagnosis. In the case report described herein, emergent bedside, real-time three-dimensional (3D) transesophageal echocardiography (TEE) was a valuable diagnostic tool.

Case report
A 36-year-old, 81 kg, and 167 cm tall female patient in her first parity presented in good health for a caesarean section at 37 weeks gestation due to cephalopelvic disproportion. On the second day post-operatively, the patient developed generalized discomfort with shortness of breath and vaginal bleeding. Her blood pressure decreased suddenly to 50/30 mmHg, which was immediately followed by convulsions and sudden cardiac arrest. AFE or post-partum haemorrhage was suspected. Resuscitation was initiated with endotracheal ventilation and external cardiac massage in conjunction with the intravenous administration of 1500 mL Lactated Ringer’s solution and epinephrine (total dose was 5 mg), but the patient did not respond.

An abdominal ultrasonography examination was performed, which revealed no evidence of internal bleeding. An emergent TEE was performed at the patient’s bedside during the resuscitation attempts. The two-dimensional (2D) TEE identified some emboli in the right pulmonary artery (PA; Figure 1) and poor right ventricular function was evident, but the real-time 3D TEE clearly demonstrated a massive PE lodged at the bifurcation of the main PA and bilateral PA (Figures 2 and 3). Extracorporeal membrane oxygenation (ECMO) was immediately established and emergent pulmonary thromboembolectomy was performed. Thrombi were removed from the main, right, and left PA. More than 10 fragments weighing 10 g were removed (Figure 4). ECMO was discontinued following surgery and inferior vena cava filters were inserted. The patient was discharged without residual deficits after 22 days of hospitalization.

Discussion
AFE1,2 and PE3,4 are two major life-threatening emergencies that can occur before, during, or shortly after parturition or caesarean section. The haemodynamic response in AFE is similar to that of PE with pulmonary hypertension, right ventricular failure, followed by left ventricular failure. AFE is usually associated with fulminant disseminated intravascular coagulation during caesarean section.
In our case, AFE was not considered the most likely diagnosis as the TEE identified a PE lodged in the bilateral PA, with total obstruction of pulmonary blood flow.

The major risk factors for PE during pregnancy are increasing age, operative vaginal delivery, caesarean section, high body mass index, previous venous thrombo-embolic events, and a family history of thrombosis, suggestive of an underlying thrombophilia. In this case, the patient's age (36 years) and obesity (body mass index was >30) could have contributed to the development of the venous thrombo-embolic event.

Diagnosing PE during pregnancy is challenging. Many common diagnostic tests, including compression ultrasonography, ventilation–perfusion scintigraphy, and helical computed tomography that have been extensively investigated in non-pregnant patients, have not been appropriately validated in pregnant patients due to various risks including the risk of radiation exposure. In patients with acute PE, TEE is a valuable tool during resuscitation for early detection and to assist decision-making.

In some cases, TEE permits direct visualization of the PE; however, PEs in the main PA bifurcation or proximal left PA are poorly visualized due to limitations of the 2D TEE technology. In our case, only emboli in the right PA were visualized on 2D TEE. With 3D TEE, however, the enhancement of the spatial resolution improved the dynamic spatial distribution of the PE and afforded a more precise localization of the thrombi and their extension into the PA.

In conclusion, the present case report demonstrates the feasibility and usefulness of real-time 3D TEE for early bedside evaluation of patients in an emergency setting. This technology is a clinically valuable tool and is likely to impact decision-making in a variety of cases.

Conflict of interest: none declared.

References

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