Staphylococcus aureus infective endocarditis: role of transoesophageal echocardiography

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DESCRIPTION

A 66-year-old woman with a history of end-stage chronic obstructive pulmonary disease, obesity and no known prior cardiac condition, presented to the hospital with working diagnosis of septic shock. She was admitted to the intensive care unit for mechanical ventilation and vasopressor support. Two sets of blood cultures resulted positive for methicillin sensitive *Staphylococcus aureus* (MSSA) for which intravenous nafcillin was initiated. CT of the head revealed multiple hypodense lesions, with subsequent CT of the abdomen revealing wedge-shaped infarct areas in the spleen and kidneys (figure 1). Transthoracic echocardiogram (TTE) was obtained which showed preserved left ventricular ejection fraction and no significant valvular dysfunction. However, this was a technically difficult study with suboptimal image quality. Due to high probability of infective endocarditis (IE), a transoesophageal echocardiogram (TEE) was obtained. TEE revealed aortic valve vegetation associated with moderate aortic regurgitation. Also, there was mitral valve vegetation complicated with valve abscess formation, valve perforation and moderate mitral valve regurgitation (figure 1, video 1). The decision for treatment of this patient was decided by a multidisciplinary team of physicians along with the patient's family. Given the extremely high mortality risk of surgery, the patient's poor baseline functional status and her neurological deterioration, it was decided that the patient was not a surgical candidate and would be managed medically.

Video 1 1st frame: TEE long axis of aortic valve revealing an echogenic density with independent mobility attached to the aortic valve leaflets on the aortic side. 2nd frame: TEE color Doppler interrogation revealing the presence of moderate eccentric aortic regurgitation. 3rd frame: TEE mitral valve commissural view; revealing a 1.7 x 1.5 cm echogenic mass attached to the posterior leaflet on atrial side with independent mobility, with echolucency present. 4th frame: TEE long axis view showing a large vegetation on the mitral valve with associated perforation and associated regurgitation. 5th frame: 3D TEE; surgical view; revealing an echogenic mass attached to the P2, P3 scallops of the mitral valve.

IE is a life-threatening disease affecting 3–7/100 000 patients per year.¹ While many pathogens can cause IE, *Staphylococcus aureus* has become the most common cause in the industrialised world due to the increase in healthcare-associated infections.¹ TTE is recommended in all patients with suspected IE to identify vegetation, assess ventricular and

Figure 1 Top left: transoesophageal echocardiogram (TEE)—a large vegetation noted attached an aortic valve leaflet. Top right: TEE long axis view; posterior mitral leaflet has a vegetation with a focal tissue dropout and regurgitant jet. Bottom left: CT of the head revealing a hypodense lesion in the right parietal region. Bottom middle: CT of the abdomen revealing multiple hypodense lesions of the left kidney. Bottom right: CT of the abdomen showing a wedge-shaped hypodensity of the spleen.

Learning points

- ▶ A high level of suspicion for infective endocarditis (IE) in septic patients with *Staphylococcus aureus* bacteraemia is essential as these patients typically suffer high morbidity and mortality. The use of an interdisciplinary medicine team including infectious disease specialists is recommended.
- ▶ Multimodal imaging is essential in the diagnosis of IE as the disease and its complications can often be missed with initial imaging studies. Transthoracic echocardiogram is a far more superior imaging modality in the diagnosis of IE
- ▶ Multimodal imaging for detection of extra cardiac complications is essential as this can significantly alter management. It is important to use appropriate studies in these patients and be familiar with the indications for early surgical intervention.

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valvular function, as well as to detect complications.² Due to high risk of IE in patients with *Staphylococcus bacteriaemia*, TEE is reasonable even if initial TTE does not show evidence of endocardial infection. TEE has much higher sensitivity than TTE in detecting vegetation (90%–100% vs 40%–63%, respectively).³ In addition, TEE is more effective at detecting complications of MSSA IE. Common complications include regurgitation, leaflet perforation, perivalvular abscess and fistula formation.³ The sensitivity and specificity of TTE is 45% and 98%, respectively in detecting perforations⁴ and 28.3% and 98.6% in detecting abscess.⁵ Conversely, TEE has a sensitivity and specificity of 95% and 98% for perforations,⁴ and 87% and 94.6% for abscess detection.⁵ These discrepancies highlight the importance of multimodal imaging in the diagnosis and further evaluation of this disease.

Once the diagnosis is confirmed with Modified Duke Criteria, it should be evaluated and managed with consultation of a multi-specialty team including an infectious disease specialist, cardiologist and cardiac surgeon in selected cases.² Initial treatment requires prolonged antibiotic therapy tailored to specific pathogens. Nafcillin is commonly used against MSSA for a duration of 6 weeks once blood cultures clear.¹ Surgical intervention is indicated in the following instances, including valve dysfunction resulting in symptoms of heart failure, left-sided IE caused by *S. aureus* or other highly resistant organisms, heart block, abscess, destructive penetrating lesions and persistent infection after the onset of appropriate antimicrobial therapy.² Due to the high mortality of MSSA IE, proper use of multimodal imaging and

multidisciplinary medicine teams are of the most importance to ensure prompt diagnosis and effective treatment.

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