Distal oesophageal stricture after transoesophageal echocardiography in a cardiac surgical patient

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Transoesophageal echocardiography (TEE) is an important tool for diagnosis and monitoring during anaesthesia in cardiac operation. TEE is generally considered a safe and minimally invasive technique. However, adverse events may occur during probe insertion or manipulation. We report a case of delayed distal oesophageal stricture with an associated scarring probably due to TEE during a cardiac operation. The patient, a 75-year-old female, underwent coronary artery bypass graft, mitral valve replacement, and tricuspid valve annuloplasty. Seven days after surgery, the patient complained of dysphagia without haemoptysis and drop of haematocrit. At 24 days after surgery, severe stricture of distal oesophagus with scarring was observed by oesophagography and stent insertion was done.

Keywords
Distal oesophageal stricture • Dysphagia • Transoesophageal echocardiography • Cardiac operation

Transoesophageal echocardiography (TEE) is an invaluable intraoperative technique for the diagnosis and monitoring of cardiac patients. TEE is generally considered a safe and semi-invasive technique that presents a minimal risk of oesophagogastric trauma and small mortality risk.1–4 The complications most commonly associated with TEE are severe odynophagia (0.1%), dental injury (0.03%), endotracheal tube malpositioning (0.03%), upper gastrointestinal (GI) haemorrhage (0.03%), and oesophageal perforation (0.01%).1 The manifestation of oesophagogastric trauma after TEE may be immediate or delayed, and has been reported to be associated with a late presentation (defined as >24 h after TEE).5

Here, we report a case of delayed distal oesophageal stricture requiring dilatation and stent insertion that was probably caused by TEE during a cardiac operation.

Case report

A 75-year-old female was presented at our emergency department with a squeezing chest pain of sudden onset. Her medical history included hypertension, mitral regurgitation, and angina. The patient had no history of an oesophageal-related disease, haematemesis, radiation therapy, or steroid medication. Electrocardiography (ECG) revealed septal infarction and atrial fibrillation. Transthoracic echocardiography revealed hypokinesia of the anterior and anteroseptum walls, severe mitral regurgitation with prolapse of the posterior mitral valve leaflet, and severe tricuspid regurgitation. Cardiac catheterization revealed 90% stenosis of the left anterior descending artery. She was scheduled for a one-vessel coronary artery bypass graft, mitral valve replacement, and tricuspid valve annuloplasty.

She was administered midazolam 2 mg and glycopyrrolate 0.2 mg IM as premedication 30 min before surgery. In the operating theatre, ECG (at leads II and V), pulse oximetry, invasive artery blood pressure, and bispectral index were monitored and recorded.

General anaesthesia was induced and maintained with propofol, remifentanil, and rocuronium. Invasive blood pressure was monitored by radial artery cannulation. A standard adult omniplane TEE probe (SONOS 4500, Philips, Andover, MA, USA) was placed without difficulty at first attempt by an experienced anaesthesiologist. Intraoperative TEE was performed as per standard guideline.6 A bite guard was mounted over the probe.

The patient underwent coronary artery bypass grafting, mitral valve replacement, and tricuspid valve annuloplasty. The surgical procedure lasted 9 h, and included cardiopulmonary bypass (CPB) for 3 h 50 min. TEE probe remained in the oesophagus during CPB, and the locking device was never used. We ensured that the tip was in a neutral position while advancing or...
withdrawing the probe and that the transducer was disconnected during bypass. Finally, the TEE probe was removed uneventfully before the patient was transferred to the intensive care unit.

On the first postoperative day, the tracheal tube was extubated. The patient did not complain of odynophagia, haemoptysis, or dyspnoea, and no fall in haematocrit or significant hypoxia was observed. However, on the 5th postoperative day, she complained of dysphagia and epigastric pain.

On the 14th postoperative day, she was discharged, but 10 days later, she complained of dysphagia on solid or liquid food. Oesophagogastroduodenoscopy was performed, which revealed severe stricture of the distal oesophagus with scarring (Figure 1); it was difficult to pass a 5 mm catheter through the narrowed region (Figure 2).

Bougienation was performed to enlarge the site up to 11 mm and a self-expanding metal oesophageal stent (Ultraflex, Boston Scientific, Natick, MA, USA) with a length of 6 cm was inserted. The dysphagia was immediately relieved and the patient was discharged.

**Discussion**

The overall incidence of TEE-related morbidity after cardiac surgery has been reported to be as low as 0.2%. However, the addition of late-presenting cases increases the overall incidence considerably to 1.2%. Complications attributed to TEE include odynophagia, upper GI haemorrhage, and oesophageal perforation. The overall mortality associated with oesophageal perforation can be as high as 20%, and delay in treatment (>24 h) can result in doubling mortality.

Mechanism of TEE probe-induced injury in cardiac surgical patients may be multifactorial. Direct trauma to the GI tract may be associated with blind probe insertion and advancement, and the size of the probe tip relative to the oesophagus. Blind insertion of a TEE probe in anaesthetized patients may be difficult because of loss of upper airway muscle tone and the presence of an endotracheal tube. Failure to successfully insert or advance the TEE probe has been reported to occur in 0.7–1.9% of sedated adult patients. Furthermore, the manipulation required to obtain certain images and with the probe in a locked position is a probable cause of injury. Moreover, the presence of an unknown oesophageal or gastric pathology, such as oesophageal varix, a tumour, a strictures, or a Mallory–Weiss tear increase the likelihood of tissue disruption, and are often considered to contraindicate a TEE examination. In addition, the use of medications, such as steroids and bisphosphonates, that may affect the integrity of oesophageal mucosa is also traditionally considered to be relative contraindications. Indirect trauma of the GI tract may be related to tissue ischaemia and necrosis caused by excessive or prolonged continuous pressure at the TEE probe–mucosal interface and an impaired blood supply during CPB.

In the majority of previous reports, TEE operators have described resistance or difficulty during probe insertion, and suggested that oesophageal injury/perforation in the upper oesophagus. A few reports of late oesophageal perforation, even at 12 days after TEE, have been issued. However, in our case, no resistance was encountered during probe insertion and no blood staining or haemoptysis was observed during probe removal. Dysphagia developed 5 days after surgery without haemoptysis and a low haematocrit and the manifestations of severe stricture were observed only at 24 days postoperatively. The mechanism of severe stricture after TEE remains unclear. We can only speculate that the fibrosis may be related to a prolonged period of compression of oesophageal mucosa by the TEE probe, to tissue hypoperfusion or ischaemia due to a lack of pulsatile flow, or to haemodynamic alterations during CPB. However, O’Shea et al. found no oesophageal mucosal or thermal injury by pathology in monkeys and dogs who had a transoesophageal probe in place.
for 1–7 h during CPB. One might also speculate about a functional deterioration of a pre-existent lesion although our patient had no preoperative oesophageal pathology. In this situation, ulcer could have developed when the probe was placed in a deep transgastric view position. Severe stricture of the distal oesophagus with scarring can be caused by an ulcer. Unfortunately, odynophagia was overlooked in our patient because of the rarity of severe stricture by fibrosis.

A serious TEE-related injury may not be apparent at the time of a procedure. Thus, we advise that every patient who has undergone a TEE examination be encouraged to report any sign of oesophageal discomfort immediately. Furthermore, the presentation of any of these clinical signs should prompt the physician to perform a systemic investigation without delay. This investigation should include a white blood cell count and haematocrit determination, and a radiographic study with a chest roentgenogram, neck/chest CT or oesophagoscopy, and barium radiography of the oesophagus. The early involvement of an appropriate surgical team is invaluable to the therapeutic resolution of this rare complication.

In unclear clinical situations, a preoperative examination should be considered to exclude any oesophageal abnormalities before proceeding with TEE.

References