

## Accidental left atrial appendage thrombus detected by intraoperative transesophageal echocardiography during coronary artery bypass graft –A case report–

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A 77-year-old woman was scheduled for a coronary artery bypass graft. Her preoperative transthoracic echocardiographic (TTE) examination revealed an enlarged left atrium with reduced systolic dysfunction (ejection fraction: 38%), moderate global hypokinesia of the left ventricle, and moderate mitral and tricuspid regurgitation. No thrombus was visualized on the preoperative TTE. However, the intraoperative transesophageal echocardiography performed before the cardiopulmonary bypass revealed a thrombus of approximately  $1.3 \times 1.8$  cm in the left atrial appendage (LAA). The LAA thrombus was removed, an internal suture was placed on the LAA before the coronary artery bypass grafting, and the main operation was performed successfully. The patient was transferred to the intensive care unit to receive postoperative care. She was extubated 4 h after the surgery and was transferred to the general ward on postoperative day 3 without any neurological sequelae. (*Anesth Pain Med* 2016; 11: 389-392)

**Key Words:** Atrial appendage, Thrombosis, Transesophageal echocardiography.

The utility of intraoperative transesophageal echocardiography (TEE) for patients undergoing coronary artery bypass grafting (CABG) has been well established [1]. TEE provides important information for the surgical and hemodynamic management of

patients before and after cardiopulmonary bypass (CPB) [2]. We report a case of incidental intraoperative TEE detection of a left atrial appendage (LAA) thrombus in a patient with atrial fibrillation (AF) scheduled for an on-pump CABG. The timely removal of the thrombus prevented fatal embolic complications.

### CASE REPORT

A 77-year-old woman presented with a history of dyspnea on exertion (NYHA class III) over the past 3 months. She had been diagnosed with hypertension and AF (treated with 50 mg losartan and 100 mg aspirin) 1 year prior. Her laboratory work showed elevated levels of serum troponin I (0.245 ng/ml), creatine kinase-MB (4.55 ng/ml), and brain natriuretic peptide (958.2 pg/ml). The preoperative transthoracic echocardiographic (TTE) examination revealed an enlarged left atrium (LA) with reduced systolic dysfunction (ejection fraction: 38%), moderate global hypokinesia of the left ventricle, and moderate mitral and tricuspid regurgitation. No thrombus was visualized on the preoperative TTE (<https://doi.org/10.17085/apm.2016.11.4.389>). As the coronary artery angiography showed triple vessel disease with severe stenosis of the proximal left anterior descending artery, the patient was scheduled for an on-pump CABG.

Upon arrival in the operating room, basic monitors – including a precordial five-lead electrocardiograph and a pulse oximeter – were attached. An arterial catheter was inserted in the right radial artery after local anesthesia was induced. The anesthesia was induced with titrated doses of midazolam, sufentanil, and sevoflurane. Cisatracurium was administered to facilitate the endotracheal intubation with a 6.5 mm cuffed oral endotracheal tube. No significant hemodynamic disturbances

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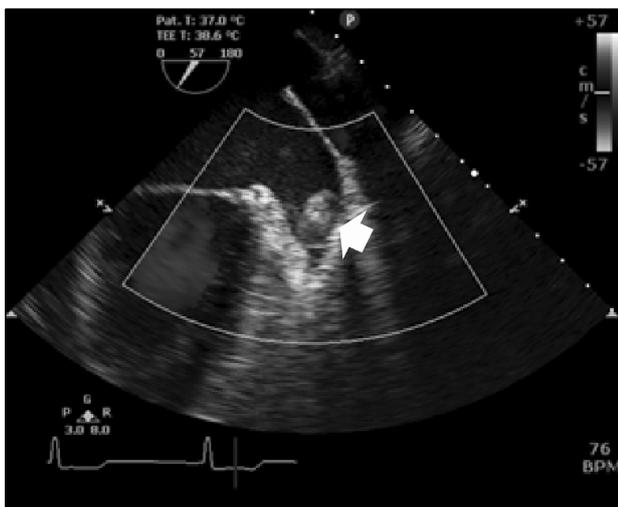
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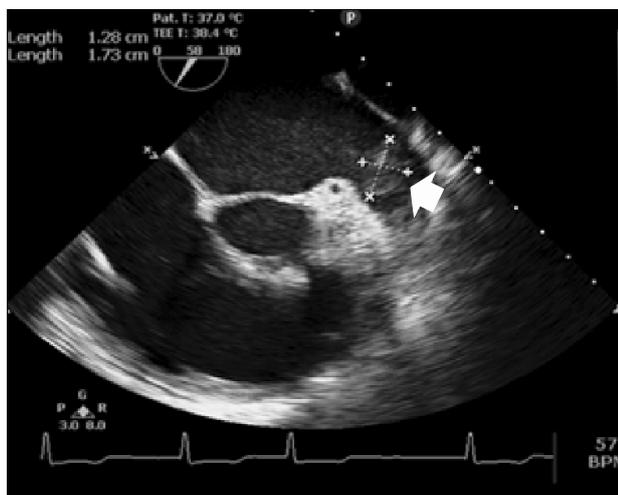
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occurred during the anesthetic induction. A TEE probe (X7-2t Transducer, Philips Medical Systems, USA) was inserted for cardiac examination. While other findings were consistent with the preoperative TTE assessment, the TEE image in the mid-esophageal LAA view showed a small immobile thrombus of approximately 1.3 × 1.8 cm in the LAA (Fig. 1) that had been dislodged by cardiac manipulation during the dissection of the left internal mammary artery (Fig. 2) (Video 2). This prompted a change in the surgical plan. We decided to open the LA and remove the thrombus prior to the CABG.



**Fig. 1.** Transesophageal echocardiography image obtained before CPB showing small immobile thrombus (white arrow) of 1.3 × 1.8 cm in the LAA. CPB: cardiopulmonary bypass, LAA: left atrial appendage.



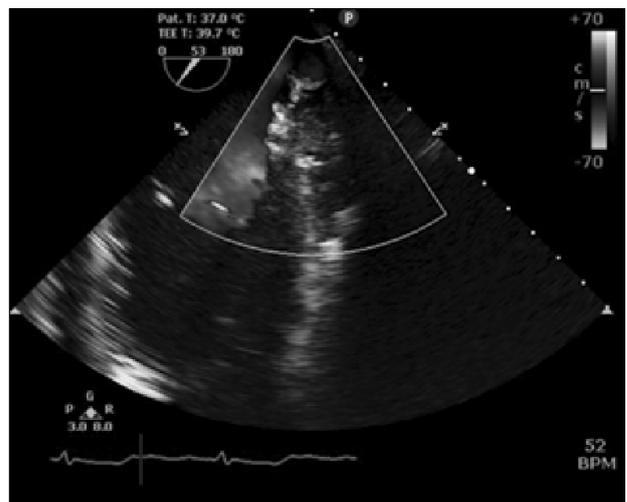
**Fig. 2.** Transesophageal echocardiography image obtained before CPB showing dislodged thrombus (white arrow) after cardiac manipulation. CPB: cardiopulmonary bypass.

After CPB was established, the 1.5 × 1 cm LAA thrombus (as measured) was removed, and the LAA was ligated. CABG was performed afterwards. After completing the proximal graft anastomoses, the patient was weaned from the CPB with an inotropic infusion of 5 µg/kg/min dobutamine and 0.5 µg/kg/min nitroglycerin. The LAA thrombus was no longer observed (Fig. 3). The patient was transferred to the intensive care unit to receive postoperative care. She was extubated 4 h after the surgery and was transferred to the general ward on postoperative day 3 without any neurological sequelae.

### DISCUSSION

The importance of TEE as a monitoring and diagnostic tool for perioperative management has gained prominence [3]. In the present case, intraoperative TEE provided important information that led to the alteration of the surgical strategy [4,5]. A previous study demonstrated that intraoperative TEE evidenced new pathological findings in 13% of patients undergoing CABG surgery, leading to a change in the surgical approach in 5-6% of these cases [1]. In our case, we incidentally detected a LAA thrombus from the intraoperative TEE prior to CPB in a patient scheduled for CABG. This allowed for timely removal of the thrombus and prevented fatal embolic complications after the operation.

TTE and TEE are common imaging modalities used in cardiac perioperative settings. TTE and TEE are complementary in their ability to provide better images of precise structures.



**Fig. 3.** Transesophageal echocardiography image obtained after CPB showing no thrombus in the LA and ligated LAA. CPB: cardiopulmonary bypass, LA: left atrium, LAA: left atrial appendage.

Whereas TTE provides superior imaging of anterior structures such as the pulmonic valve, right ventricular outflow tract, right ventricle, and anterior pericardium, TEE provides superior spatial resolution of the posterior cardiac structures, such as the interatrial septum, mitral valve, and left atrium [6]. In patients with AF, thrombi are most often located in the LAA [7]. Due to the posterior location of the LA and the frequent difficulty in imaging the LAA, the detection of LAA thrombi with TTE is not often successful. TTE only presents a 69% sensitivity for the identification of left atrial thrombi, with more limited success for LAA thrombi [8]. Meanwhile, as its close proximity to the esophagus allows the use of a higher frequency transducer, TEE enables clear visualization of the LAA [8]. In a study comparing the two intraoperative observation methods, all 9 LAA thrombi were undetected on the TTE but were clearly identified by the TEE, with a sensitivity of 100% and a specificity of 99% [9]. The exclusion of LAA thrombi with TEE is of particular importance before open heart surgery. Indeed, the safety of the procedure is directly influenced by the presence of LAA thrombi as it involves LAA manipulation that might cause embolization of the LAA content [10].

The incidence of LAA thrombi in patients with atrial fibrillation is about 10% [11]. If a thrombus in the LAA embolizes, stroke can occur. Moreover, embolism to the lower extremities, the kidney, and the spleen or mesenteric vessels can also occur [12-14]. The risk of stroke in patients with AF depends on the risk profile of the population examined and on the concomitant antithrombotic therapies. The CHADS<sub>2</sub> (congestive heart failure, hypertension, age > 75 years, diabetes mellitus, stroke or transient ischemic attack) score is a good predictor of the stroke risk in patients with AF [15]. An increased left atrial volume ( $\geq 50$  ml), decreased ejection fraction (< 56%), and increased brain natriuretic peptide level (> 75 pg/ml) are significantly correlated with an increased risk of LAA thrombus, even in patients with a low CHADS<sub>2</sub> score [15]. As our patient had a CHADS<sub>2</sub> score of 3, an increased left atrial volume, a decreased ejection fraction, and an increased brain natriuretic peptide level, the risk of thromboembolic events was high.

In summary, the intraoperative TEE identified an LAA thrombus previously undiagnosed by the TTE. Comprehensive intraoperative TEE is particularly useful for evaluation of the posterior cardiac structures, as it provides superior spatial resolution.

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