Transesophageal echocardiography (TEE) has emerged as the most sensitive and specific technique for the detection of left atrial (LA) thrombi. Although initial studies suggested that TEE was better for small LA appendage (LAA) thrombi compared to multidetector computed tomography (MDCT), these studies used standard lung protocols and older generation MDCT or electron beam computed tomography (EBCT). We report on the use of multidetector computed tomography (MDCT) in the diagnosis of prosthetic heart valve thrombosis and a giant left atrial (LA) thrombus extending into the LA appendage (LAA), in comparison with findings of transesophageal echocardiography (TEE). A 52-year-old woman with an eight-year history of mechanical mitral valve (MMV) replacement presented with progressive dyspnea. The electrocardiogram (ECG) showed atrial fibrillation. Transesophageal echocardiography showed severely increased MMV gradients and decreased MMV area. Two thrombi were identified on the atrial aspect of the MMV, one restricting the motion of the lateral leaflet, and the other localized on the septal side of the valve ring. Two other thrombi were also visualized, one in the LA and the other in the LAA, measuring 4.3x1.3 cm and 2.1x1 cm, respectively. ECG-gated 64-slice contrast-enhanced MDCT depicted a thrombus, involving both atrial and ventricular aspects of the MMV, and also a giant thrombus, 8.3x2.4 cm in size, in the LA extending into the LAA. The patient underwent redo-mitral valve replacement, LA thrombectomy, and LAA ligation, and was discharged uneventfully. The size and localization of thrombi in the LA and on the explant MMV matched to the findings of MDCT. In this case, MDCT was superior to TEE in showing the precise nature of both MMV thrombosis and the integrated thrombus involving the LA and LAA.

Key words: Atrial appendage/radiography; echocardiography, transesophageal; heart atria/radiography; heart valve prosthesis; thrombosis/diagnosis; tomography, X-ray computed.

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Mechanical mitral valve thrombosis and giant left atrial thrombus: Comparison of transesophageal echocardiography and 64-slice multidetector computed tomography

Mekanik mitral kapak trombozu ve dev sol atriyum trombüsü: Transözofageal ekokardiyografi ve 64 kesitli bilgisayarlı tomografi bulgularının karşılaştırılması

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raphy scanners with inferior temporal and spatial resolution.

We report on a successful and accurate diagnosis of prosthetic heart valve thrombosis and associated giant LA thrombus extending into the LAA by MDCT.

CASE REPORT

A 52-year-old woman with an eight-year history of mechanical mitral valve (MMV) replacement with a bileaflet prosthesis (St. Jude, No: 27) presented with progressive dyspnea of 10-day duration (New York Heart Association class II). Cardiovascular examination showed normal vital signs and moderately muffled MMV sounds. There were bilateral basal rales on lung auscultation. Examination of other systems yielded normal findings. The electrocardiogram (ECG) revealed atrial fibrillation with a heart rate of 104 beats per minute. Laboratory findings were unremarkable except for a subtherapeutic international normalized ratio of 1.4. Transthoracic and transesophageal echocardiography (TEE, Vivid 3, GE Medical Systems) showed severely increased MMV gradients (mean gradient 22 mmHg) and decreased MMV area (1.24 cm²) (Fig 1a) with dense spontaneous echocardiographic contrast in the LA and LAA. Two thrombi, one restricting the motion of the lateral leaflet, 2x1.1 cm in size, and the other on the septal side of the valve ring measuring 1x0.8 cm were identified on the atrial aspect of the MMV (Fig. 1b). Two other thrombi were also visualized by TEE, one in the body of the LA, 4.3x1.3 cm in size (Fig. 1c), and the other in the LAA, 2.1x1 cm in size (Fig. 1d).

She was scheduled for reoperation. After heart rate control with intravenous metoprolol administration, ECG-gated 64-slice contrast-enhanced MDCT was performed for the evaluation of coronary arteries, MMV, and LA before surgery, which depicted a mass, suggestive of thrombus, involving both atrial and ventricular aspects of the MMV (Fig 2), and also a giant thrombus measuring 8.3x2.4 cm in the LA.
Mechanical mitral valve thrombosis and giant left atrial thrombus

There were no significant stenoses in the coronary arteries. She underwent redo-mitral valve replacement, LA thrombectomy, and LAA ligation. The size and localization of thrombi in the LA and on the explant MMV matched to those estimated preoperatively by MDCT (Fig 3). The patient was discharged uneventfully 10 days after the operation.

DISCUSSION

Prosthetic heart valve thrombosis (PHVT) is a rare but serious complication. Patients may sustain systemic embolism, acute pulmonary edema, circulatory collapse, or progressive dyspnea and typical findings include a diminished mechanical valve sound, decreased valve area, and increased transprosthetic gradients on Doppler echocardiography. Surgery is recommended in patients with PHVT and a large LA thrombus. Although TEE is the method of choice in evaluating patients with PHVT, evaluation of mechanical aortic valves and ventricular side of MMVs by TEE is challenging due to their strong echo-reflective properties. Although the thrombus usually involves the atrial aspect of MMVs, those extending into the LAA (Fig 3a).
involving the ventricular side may also cause obstruction or embolism. In this regard, in a previous report, we emphasized the use of MDCT for the evaluation of PHVT. In our case, MDCT showed the MMV thrombus on the atrial side with its extension to the ventricular side, which most importantly was not noted by TEE.

Transesophageal echocardiography has proved to be the most sensitive and specific technique for the detection of LA thrombi. Recent advances in MDCT allow accurate and consistent imaging of cardiac structures, including LA/LAA anatomy especially in patients undergoing electrophysiological procedures for ablation of atrial fibrillation. Although the initial studies suggested that TEE was better for small LAA thrombi compared to computed tomography, these studies used standard lung protocols and were restricted to older generation MDCT or electron beam computed tomography scanners with inferior temporal and spatial resolution. In a more recent study, detection of LA/LAA thrombus with 64-slice MDCT was also reported to be less reliable compared with TEE, possibly due to the lack of ECG-gating and specific volume parameters. In contrast, in our case, ECG-gated 64-slice MDCT provided more precise information about the size, attachment site, and the integrity of the LA thrombus compared with TEE. The dimensions of the LA thrombus measured by MDCT was the same as that measured in vitro, which was two-fold of the size estimated by TEE. Of note, MDCT also showed that the thrombus involving the LA and LAA was of the same composition as confirmed surgically, rather than being a freestanding LAA thrombus as underestimated by TEE.

The use of MDCT for the evaluation of MMVs may have some limitations besides standard contraindications of MDCT imaging. Firstly, patients with PHVT and poor functional capacity (New York Heart Association class III-IV) may not be eligible for MDCT scan because of inability to lie in the supine position and comply with breath commands. Secondly, atrial fibrillation, the most common arrhythmia in patients with PHVT, remains a limitation for cardiac MDCT due to extreme beat-to-beat variability which may lead to severe motion artifacts. However, the influence of heart rate variability on image quality in patients with atrial fibrillation undergoing cardiac MDCT has not been widely assessed. In a recent study, 64-slice MDCT was found to reliably yield diagnostic-quality images of the coronary arteries in patients with atrial fibrillation. In our patient with chronic atrial fibrillation, high-quality images could be obtained by achieving heart rate control with intravenous metoprolol administration before the scan, and multiple phase reconstructions and ECG editing after the scan.

This case illustrates the successful and accurate diagnosis of PHVT and associated giant LA thrombus extending into the LAA by MDCT with surgical confirmation. The ability of ECG-gated 64-slice MDCT to detect PHVT, and thrombus involving the LA and LAA in comparison with TEE has yet to be defined.

REFERENCES


