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Original Article

Clinical and echocardiographic diagnosis, follow up and management of right-sided cardiac thrombi

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ABSTRACT

Background: Right-sided cardiac masses are infrequent and have varied clinical presentation. The present study describes the clinical features, echocardiographic findings and management of 19 patients presenting with right-sided cardiac thrombi in a tertiary care center in north India. **Methods:** This is a retrospective, single center observational study of consecutive patients over the period January 2003–2008 admitted in our emergency intensive care unit (EICU). We identified 38 patients with right-sided cardiac masses admitted to EICU diagnosed by transthoracic echocardiography of which 19 patients had right-sided thrombus. The echocardiographic findings were reviewed by two cardiologists in all patients. Treatment was not standardized and choice of therapy was based on judgment of attending physician.

Results: The mean age of patients with cardiac thrombus was 36.6 ± 11.8 years. Right atrial ($n = 17$) and right ventricle ($n = 2$) thrombi were associated with deep vein thrombosis (DVT) in 7 (36.8%) and pulmonary embolism in 3 (15%) patients. 13 (68.4%) patients appeared to have in situ mural thrombus. 12 patients were managed with oral anticoagulants, 3 patients underwent surgery and 4 patients were thrombolysed. All the survivors had a mean follow-up of 40 ± 6 months (range – 18–50 months).

Conclusions: Prompt echocardiographic examination in an appropriate clinical setting facilitates faster diagnosis and management of patients with right-sided cardiac thrombi. High incidence of in situ mural thrombus and varied comorbidities predisposing to right-sided cardiac thrombi besides DVT and pulmonary embolism need to be recognized. Oral anticoagulation and thrombolysis appear to be the mainstay of treatment with surgery limited for selected patients.

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Abbreviations: EICU, emergency intensive care unit; DVT, deep vein thrombosis; TEE, trans-esophageal echocardiography; ELISA, enzyme linked immunosorbent assay; VQ, ventilation perfusion; PA, pulmonary artery; RV, right ventricle; PAH, pulmonary arterial hypertension; CCP, chronic constrictive pericarditis; RA, right atrial; LA, left atrial; LV, left ventricle; CA, carcinoma; CTEPH, chronic thromboembolic pulmonary hypertension; HIV, human immunodeficiency virus; IVC, inferior vena cava; PFO, patent foramen ovale; PASP, pulmonary artery systolic pressure; STK, streptokinase; IV, intravenous; rtPA, recombinant tissue plasminogen activator; MI, myocardial infarction; BMV, balloon mitral valvotomy; MVR, mitral valve replacement; ATT, antitubercular treatment; RVOT, right ventricle outflow tract; CABG, coronary artery bypass grafting; ASD, atrial septal defect.

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Right-sided cardiac masses are infrequent and do not have a uniform clinical presentation. High index of suspicion and prompt echocardiographic examination in an appropriate clinical setting shall facilitate faster diagnosis and management of patients with right-sided cardiac thrombi. The present study describes the clinical features, echocardiographic findings and management of 19 patients presenting with right-sided cardiac thrombi in a tertiary care center in north India.

1. Methods

This is a retrospective, single center study of all consecutive patients admitted in our EICU from Jan 2003–2008. We identified 38 patients with right-sided cardiac masses admitted to EICU diagnosed by transthoracic echocardiography of which 19 patients had right-sided thrombus. Masses such as vegetation, primary or metastatic tumors and embryological remnants were excluded.

Trans-thoracic echocardiography was done in all patients using a Philips Envisor with a 2.5- or 3.5-MHz probe. Six patients also underwent trans-esophageal echocardiography (TEE) using a 5-MHz monoplane echo probe. Cardiac MRI was needed in one patient to differentiate it from myxoma. All patients underwent vascular Doppler studies, D-dimer assay (by enzyme linked immunosorbant assay [ELISA]) and three blood cultures with the first and last one at least half an hour apart. Ventilation perfusion (VQ) scan was done in 10 patients where high pulmonary artery (PA) pressures or dilation of right ventricle (RV) or excessive mobility of the mass pointed to the possibility of associated pulmonary thromboembolism. The 9 patients who did not undergo VQ scan included 4 patients with rheumatic heart disease, 1 with RV cardiomyopathy, 2 patients with constrictive pericarditis and 2 patients with sepsis where possibility of pulmonary embolism was unlikely in presence of alternative diagnosis.

2. Results

Out of 38 patients identified with right-sided cardiac masses 19 had right-sided thrombus. The mean age of patients with cardiac thrombus was 36.6 ± 11.8 years (age range – 7 days to 64 years; median age – 33 years). There were 7 female and 12 male patients. Clinical and echocardiographic findings of patients are presented in flowcharts (Figs. 1 and 2).

All patients presented with dyspnea; 10, 6 and 3 patients were in NYHA class II, III and IV, respectively at presentation. One patient each presented with palpitations and easy fatigability. Pulmonary arterial hypertension (PAH) was present in 17 patients at presentation. Ten patients (52.6%) presented with mild PAH and 7 patients presented with moderate to severe PAH. The severity of PAH was classified on the basis of mean pulmonary artery pressure as mild (25–40 mmHg), moderate (41–55 mmHg) or severe (>55 mmHg).¹

In all, 36.8% ($n = 7$) patients presented with deep venous thrombosis (DVT); with ileo-femoral DVT ($n = 2$), ileo-femoral and popliteal ($n = 1$) and popliteal vein ($n = 4$) involvement. One patient had a history of DVT 3 years ago which was not present during the time of enrollment. This patient had developed right atrial (RA) thrombi while he was on oral

anticoagulants. 15% ($n = 3$) patients with right-sided thrombi had evidence of pulmonary embolism.

Only 21% ($n = 4$) patients had a history of prolonged immobilization and three of these had associated DVT. Similar number of patients ($n = 4$) had associated tuberculosis [pleural effusion 1, pott's spine 1, tubercular chronic constrictive pericarditis (CCP) 2], and half of these had associated large vein occult DVT.

Two patients presented with sepsis and infected RA thrombus. One of these patients was a 7 days female, presenting with cerebrovascular accident following umbilical vein cannulation and other patient presented with pyopericardium, pyomyositis and history of acute febrile illness. Four patients had associated rheumatic heart disease all of whom had severe mitral stenosis with associated RV dysfunction ($n = 1$), left ventricle (LV) dysfunction ($n = 1$) left atrial (LA) thrombus ($n = 1$) and organic tricuspid valve disease ($n = 1$). Associated malignancy (carcinoma (CA) breast post-irradiation and surgery), connective tissue disease (Scleroderma with chronic thromboembolic pulmonary hypertension (CTEPH) with RV thrombus), RV cardiomyopathy and human immunodeficiency virus (HIV) positive status on follow-up was detected in one patient each. Three patients had associated RV dysfunction and 2 patients had LV systolic dysfunction.

2.1. Imaging characteristics

The echocardiographic findings were recorded and reviewed by two cardiologists in all patients. The right-sided thrombi varied in size from 1.1×0.9 to 6×8.5 cm. Most of these were regular (84%) with varying shapes {spherical (26%), oval/ovoid (36%), vermicular (21%), rhomboid and spindle shaped}. Broad-based pedicle could be identified in one of the cases, rest were non-pedunculated. Barring 3 cases, the attachment of thrombi could be localized from inferior vena cava (IVC) opening (3/19), RA roof (3/19), Eustachian valve (2/19), inter atrial septum (4/19), RV apex (2/19) and from body of RA and RA appendage (2/19). Mobility was preserved in 6 of these with 2 thrombi extending across tricuspid valve and 1 across tricuspid valve upto RV outflow tract. In 3 patients with patent foramen ovale (PFO) the thrombi extended across tricuspid valve and mitral valve; tricuspid, mitral and aortic valve; and across mitral and aortic valve, respectively. Two patients (one with scleroderma, CTEPH and other with RV myocardial infarction and RV dysfunction) had right ventricle thrombi. Mild and moderate to severe PAH was found in 52.6% ($n = 10$) and 36.8% ($n = 7$) patients, respectively.

3. Management and follow-up

Treatment was not standardized and choice of therapy was based on judgement of attending physician. Twelve patients were managed with oral anticoagulants, 3 patients underwent surgery and 4 patients were thrombolysed. The dose of thrombolytic agents used was – Streptokinase (STK) – intravenous (IV) bolus 250,000 units over 30 min followed by infusion of 100,000 units/h for 12–24 h and Recombinant tissue plasminogen activator (rtPA) – IV bolus of 15 mg in 10 min followed

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