# Resolution of a large left ventricular thrombus with anticoagulation alone

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## ABSTRACT

Dilated cardiomyopathy and the resultant left ventricular dysfunction are risk factors for thrombus formation in the heart, reflecting the intimate relationship between structure and function in this vital organ. Once formed, depending on size, location, and mobility, left ventricular thrombi have the tendency to embolize, sometimes with dire consequences. Proper management of these thrombi is still controversial. We present a case of an unusual large thrombus, which resolved with anticoagulation therapy alone, giving hope that more invasive intervention can safely be circumvented.

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Left ventricular (LV) thrombi can occur in several cardiac conditions, including acute anterior myocardial infarction, congestive heart failure due to dilated cardiomyopathy (CM), myocarditis, or both.[1,2] The incidence of LV thrombi in patients with end-stage CM varies from 11-44%.[1] However, as the incidence of thrombo-embolic events is low and cannot be predicted, the use of anticoagulation is individualized. We report a case of a 32-year-old Saudi male with CM and a large LV thrombus showing complete resolution within 2 weeks of anticoagulation therapy. Such a rapid resolution and disappearance of a large thrombus has rarely been reported.

Case Report. A 32-year-old Saudi male, hypertensive and diabetic on diet, nonsmoker, presented to our Accident and Emergency Department, Riyadh Medical Complex (RMC), Riyadh, Kingdom of Saudi Arabia, complaining of non-productive cough, progressive shortness of breath, intermittent fever, and hemoptysis for the previous 2 weeks. No history of exposure to tuberculosis, brucellosis, main lining or recent dental surgery was elicited. Physical examination revealed a thinly built man, dyspneic and tachypneic. He had a regular rapid pulse rate of 116 beats/min, blood pressure of 126/72 mm Hg, temperature of 37$^{o}$C and with a respiratory rate of 28 breaths/min. Pitting edema was present in the lower limbs, as well as the sacral region. No signs of infective endocarditis were evident. Cardio-vascular system examination showed a jugular venous pulse of 5 cm above the sternal angle. The apex beat was displaced outside the mid-clavicular line with a normal character. On auscultation, an S3 gallop was present, with mitral regurgitation of grade 3/6. Chest examination revealed bilateral basal rales, with diminished breath sounds in the right base of the lung. Examination of the abdomen and central nervous system was unremarkable. A urinalysis revealed no microscopic hematuria. Laboratory investigations included a complete blood count with a white blood cell count of 17.6, hemoglobin of 12 g/l, and platelet count of 375. Renal profile showed glucose of 9.9 mmol/l,

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creatinine 167 µmol/l, urea 17.6 mmol/l, sodium 127 mmol/l, potassium 5.7 mmol/l. Cardiac enzymes revealed creatinine phosphokinase 601 µ/l, and lactate dehydrogenase 1130 µ/l. Liver function tests showed aspartate aminotransferase 153 u/l, aspartate transferase 147 u/l, alkaline phosphatase 265 u/l, albumin 29 g/l, and total protein 56 g/l. Repeated blood and urine cultures were negative, as were viral studies. The electrocardiogram showed normal sinus rhythm, with LV hypertrophy by voltage criteria and LV strain pattern. The chest radiograph revealed moderate cardiomegaly, with evidence of pulmonary congestion and right and middle zone opacity highly suspicious of pulmonary infarction. Transthoracic echocardiography showed eccentric LV hypertrophy and mild dilatation of the left ventricle and left atrium. Global hypokinesia was present with an ejection fraction of 15-20%, and moderate tricuspid and mitral regurgitation and an estimated pulmonary artery pressure of 55. There was a large LV clot of 3 x 2 cm in the apical region, mobile and protruding into the LV cavity **(Figure 1)**. A ventilation perfusion scan revealed a high probability of thromboembolism in the distribution of the right pulmonary artery. Doppler ultrasound examination of the lower limbs was negative. Cardiac catheterization revealed normal coronary arteries. He was started on dose adjusted intravenous heparin infusion and antibiotics for pneumonitis. His medication included furosemide, oral nitrates, captopril and carvedilol. His coagulation was adjusted to a therapeutic level, prothrombin time 70-80 sec and later warfarin was added to achieve an international normalized ratio of 2.5-3. He gradually improved and was moved out of the coronary care unit to the general ward in an optimal condition. Echocardiogram was repeated at one and at 2 weeks. The LV clot was almost completely resolved and ejection fraction had improved to 35-40%. He was discharged within 3 weeks on maintenance dose of warfarin plus anti-failure medications. Anticoagulation was continued for a total of 6 months.

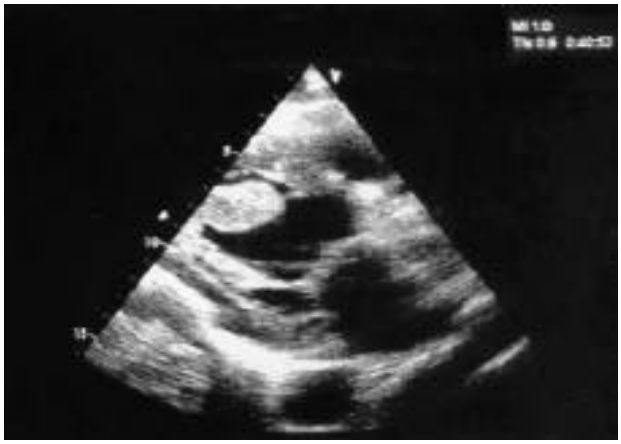

**Figure 1 -** Transthoracic echocardiogram showing large mobile apical thrombus protruding into the left ventricle.

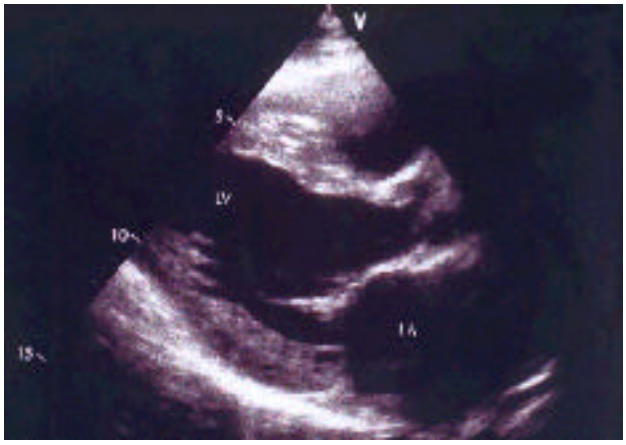


**Figure 2 -** Transthoracic echocardiogram showing complete resolution of left ventricular thrombus.

**Discussion.** Left ventricular thrombus is a frequent complication in patients with idiopathic dilated CM and acute anterior wall myocardial infarction and its sequel: LV aneurysm.[3] Left ventricular systolic dysfunction is the main clinical characteristic in patients with fresh LV thrombi.[4] Ischemic CM and dilated LV chamber size (left ventricular internal diastolic diameter >60 mm), lower ejection fraction and apical aneurysm appear to be major risk factors in thrombus formation and subsequent embolization.[5] The incidence of LV thrombus in patients with end-stage CM is 11-44%.[1] In one retrospective study of 104 patients with non-ischemic dilated CM, a frequency of 18% of thrombo-embolic events in patients not taking warfarin was found and an incidence of 4 clinically apparent events per 100 patient-years.[5] More recent studies reported a lower incidence of thrombo-embolic events ranging from 1.7/100-3.2/100 patient per years in patients with severe LV dysfunction.[5] The higher tendency of fresh thrombi to embolize is related to their increased friability and protrusion into the LV lumen, as opposed to well-organized, laminated thrombi formed within aneurysms.[6] Mobile and protruding thrombi are thought to carry the highest risk.[6] While mural laminar thrombi may have some effect to prevent infarct expansion by offering mechanical support to the infracted myocardium thereby optimizing its contractibility.[7] The morphologic characteristics of the clot itself combined with the contractibility of the ventricle are primary determinants of embolic risk.[8] The negative Doppler study for deep vein thrombosis in our patient confirmed the known association of

pulmonary emboli with LV thrombosis, which has been reported to occur in 28% of isolated LV thrombosis.[9] The absence of positive viral studies, negative blood cultures and no history of oral procedures made the improvement in LV function within 2 weeks attributable to a Tako-tsubo like transient LV dysfunction effect, and to some extent to his anti-failure treatment.[10] On readmission 6 months later, the initial LV dysfunction as on his first presentation was observed, which made us confident to exclude the differential diagnoses of acute myocarditis and infective endocarditis, and to conclude him to be a case of dilated CM.

Anticoagulation treatment decreases the prevalence of embolization in idiopathic dilated CM, and should be instituted regardless if atrial or ventricular emboli is detected by 2-dimensional echocardiography.[11] Limited information, however, is available concerning the effect of anticoagulants on the morphologic features of LV thrombus.[6] Several reports in the literature confirm the fact that anticoagulation suffices to resolve even large thrombi within days. Gould et al[12] found an LV thrombus by echocardiography in a 54-year-old man with congestive CM. They reported that with the use of anticoagulants, the thrombus was completely resolved.

Butman[13] reported rapid resolution of a massive LV thrombus by systemic anticoagulation. Quintana et al[14] demonstrated 2 patients with severe LV dysfunction and mobile mural thrombi, which disappeared with anticoagulant therapy as in our case. Bozkurt et al[15] reported a case of a 64-year-old male patient with a history of congestive heart failure and diabetes mellitus type 2 for the past 5 years. They observed cyst-like masses 1 x 1.5 cm and 3 x 3.5 cm in size clearly seen on the apico-lateral and mid septal regions of the left ventricle, and the masses were considered as thrombi. The patient was treated with heparin followed by warfarin 5 mg daily and the thrombi disappeared on the seventh day of treatment. Sivasankaran et al[16] reported 2 cases of LV thrombi identified by routine echocardiography in the presence of normal ventricular function. The thrombi disappeared after a few days of anti-coagulation therapy without symptoms of embolization. It seems advisable; however, to closely follow thrombus morphology by repeated echocardiographic studies when anticoagulants are being administered in order to be able to timely refer patients to thrombectomy should the thrombus undergo a "malignant" change in morphology.[6]Could the lower sensitivity of trans-thoracic echocardio-graphy as compared to trans-esophageal and MRI of the ventricle have implied an early resolution of the thrombus? We do not believe so as the resolution of trans thoracic echocardiography machines have markedly increased (a General Electric Vivid 7™ was employed in our patient) and the patient had a thin bodily habitus.

Thrombolysis is indicated when patients have evidence of systemic embolization and are poor candidates for thrombectomy.[17] Streptokinase, urokinase and recombinant tissue plasminogen activator (rt-PA) were used in several case reports with the latter favored due to its better safety profile, since rt-PA is a highly fibrin-specific serine protease that catalyzes the Arg560-Val561 peptide bond of plasminogen.[8,17] Thrombectomy is usually carried out by left ventriculotomy and is associated with subsequent LV dysfunction, arrhythmias and aneurysm formation.[18]

Video assisted cardioscopy, which allows an approach via aortotomy and intra-aortic filter devices, has decreased complications from this modality of therapy.[18,19] Left ventricular thrombectomy should be considered in selected patients in whom a very high-risk thrombus morphology is detected.[6] These thrombi are usually of a pedunculated globular nature connected to the endocardium by a very narrow stalk, moving freely in a "wavy" motion within the LV lumen, and constitute a risk for embolization of a magnitude approaching to 60-80%.[6] The present case report, and other recent reports, confirm the efficacy of anticoagulant therapy, and the opportunity of deferring surgical removal of intra-ventricular thrombi, in favor of anticoagulant therapy, where considered appropriate, on an individual basis. This case of massive LV thrombus is extremely unusual in CM. The most common and important consideration for clinicians is to take an immediate decision regarding the line of treatment in such cases. We suggest that anticoagulant therapy is still a valid option to treat the large size intra-cardiac thrombi and heparin has been demonstrated to aid in the resolution of a clot. We may conclude that LV clot is a common finding in patients with and without acute myocardial infarction and congestive heart failure, especially in patients with low ejection fraction. Two-dimensional echocardiography should be routinely performed to follow the thrombus morphology during heparin-assisted resolution.

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