

Lack of correlation between intracavitary thrombosis detected by cross sectional echocardiography and systemic emboli in patients with dilated cardiomyopathy

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SUMMARY The correlation between intracavitary thrombosis detected by cross sectional echocardiography and systemic embolism was studied in 126 consecutive patients with idiopathic dilated cardiomyopathy who were examined from January 1980 to September 1987. A total of 1041 serial echocardiograms were obtained with 3.5 and 5 MHz transducers. The mean follow up period was 41.2 months. The survival rate was 88% at two years and 56% at five years. Echocardiography showed intracavitary thrombi in 14 (11.1%) patients; 13 were mural and 11 were localised at the apex of the left ventricle. Twelve patients (8.4%) had systemic emboli; this corresponded to an incidence of new embolic events of 1.4 for 100 patient-years. Patients with intracavitary thrombi or systemic emboli were treated with oral anticoagulants, as were nine in functional class IV of the New York Heart Association, for 61 patient-years. The cumulative observation period for the whole population study was 418 patient-years. None of the patients with intracavitary thrombosis had embolic complications and none of those with embolism had intracavitary thrombi. Rates of intracavitary thrombosis and systemic embolism in this series were low and there was no overlap between the two events. This may have been because the patients did not have severe dilated cardiomyopathy, because echocardiography did not detect all the thrombi, or because patients were treated with oral anticoagulants.

The presence of intracardiac thrombosis detected by cross sectional echocardiography is not predictive of systemic embolism in patients with idiopathic dilated cardiomyopathy. Criteria for the use of the anticoagulant treatment remain largely empirical in these cases.

Although intracardiac thromboses have been identified by cross sectional echocardiography in a high percentage of patients with dilated cardiomyopathy,¹ the correlation of these findings with clinical evidence of systemic embolism is still controversial.² Because this may be relevant to indications for anticoagulant treatment in these patients, we studied a series of patients with dilated cardiomyopathy by serial cross sectional echocardiography to see

whether intracardiac thrombosis was correlated with embolic complications.

Patients and methods

One hundred and twenty six patients with dilated cardiomyopathy aged 19-72 years (mean 54), 31 women and 95 men were studied at our hospital from January 1980 to September 1987. All patients had a history of cardiac failure. Patients with systemic hypertension (> 160/90 mm Hg), diabetes, congenital, valvar, and ischaemic heart disease were excluded by clinical history and a physical and laboratory examination. Left ventriculography and coronary angiography were performed in 62 patients. Echocardiographic criteria for the diagnosis of

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dilated cardiomyopathy were an enlarged cardiac left ventricular diastolic dimension (normalised for body surface area), decreased mitral valve opening, and fractional shortening of the left ventricle $<25\%$. Normal values were derived from published data by Feigenbaum.³ Angiographic criteria were the absence of critical obstructions ($\geq 50\%$) of the right coronary artery, anterior descending and circumflex branches of the left coronary artery and an ejection fraction of ≤ 0.45 .

M mode and cross sectional echocardiography were performed at the initial evaluation in the study and every six months thereafter. When intracoronary thrombosis was identified or an embolic event occurred echocardiograms were performed within the next month and then every three months. A total of 1041 echocardiograms were performed. The follow up period lasted 1–92 months (mean 41.2). The survival rate was 88% at two years and 56% at five years. Echocardiograms were performed with a Smith Kline instrument (model 5000) and a 3.5 MHz transducer. When a left ventricular thrombus was detected the examination was repeated with a 5 MHz probe. Echoes were recorded on a Panasonic video recorder (model 8500). Echocardiographic studies were performed in the parasternal and apical views with the patient in the supine position or the 30°–45° left lateral position. Two chamber and four chamber views gave a better image of the left ventricle, particularly the apex. Left ventricle thrombosis was diagnosed when we saw abnormal intracavitary echoes that resembled a mass adjacent to the ventricular wall and clearly were distinguishable from papillary muscle, trabeculae, and endocardium. These were generally found near the cardiac apex, protruding into the cavity. They were fixed or occasionally mobile. The echoes were unlike those coming from the adjacent myocardium.⁴ The echocardiographic studies were reviewed independently by two experienced echocardiographers and reproducibility was 100%.

Systemic embolisation was diagnosed when a patient had a stroke, transient ischaemic cerebral attacks, acute vascular occlusion in the legs, or sudden renal pain with haematuria. In all patients the diagnosis was confirmed either by scintiscan, computed axial tomography, or selective arteriography.

One hundred and twelve patients had ambulatory electrocardiographic monitoring (Holter technique) for a cumulative period ranging from 24 to 240 hours (mean 71).

Patients in whom an intracardiac thrombus was identified and those in whom an embolic event occurred were treated with oral anticoagulants (warfarin). Prothrombin activity or the International Normalised Ratio were maintained at 25%–35% and 3.0–3.9 respectively.

Results

Intracardiac thrombosis was detected at the onset of the study in seven patients and during follow up in other seven. In 13 of these patients the intracardiac thrombosis was mural, while in the remaining patient it was pedunculated and mobile inside the left ventricular cavity. The most frequent site was the apex of the left ventricle (11/14 patients) (fig 1); in one patient the thrombus was localised in the left atrial cavity; in one a small thrombus was attached to the inferior portion of the left side of the intraventricular septum; while in another it was at the level of mitral valve apparatus. In four patients the diagnosis of intracardiac thrombosis by the 3.5 MHz probe was not confirmed by the use of the 5 MHz probe, which showed only the presence of muscular trabeculae or endocardial thickening of the apex.

Embolism occurred in 12 patients (8.4%); seven before they entered the study and five during follow up. The occurrence of new embolic events in patients not taking anticoagulants was 1.4 events for every 100 patient-years. Eleven of 12 patients had systemic embolic events (cerebral in eight, peripheral in two, renal in one) while one patient had a systemic (cerebral) and pulmonary embolism. None of the 14 patients with intracardiac thrombosis had embolism either before entry to the study or during follow up. Conversely no intracardiac thrombosis was found in the 12 patients with embolic complications. There were no statistically significant differences (analysis of variance) in the clinical, echocardiographic, and angiographic findings between the patients with embolic events and those without (table).

Paroxysmal atrial fibrillation was not detected by ambulatory electrocardiographic monitoring in any patient. Non-sustained ventricular tachycardias

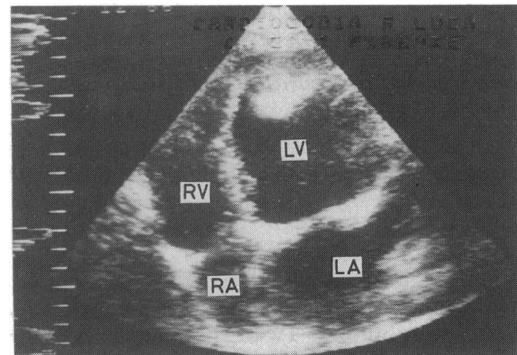


Fig 1 Cross sectional echocardiogram showing apical four chamber view with an echo-reflecting mass at the apex. LV, left ventricle; LA, left atrium; RV, right ventricle; RA, right atrium.

Table Clinical, echocardiographic, and angiographic features in 126 patients with idiopathic dilated cardiomyopathy

No.	Sex M/F	Age (yr)	Status D/A	Class NYHA I/II/III/IV	ECG SR/AF	D%	Echo DD (mm)	Angio* EF%
(a) 14	13/1	46-67 (56.3)	3/11	0/6/5/3	12/2	6-21 (15.0)	67-87 (76.5)	16-45 (30.0)
(b) 12	8/4	36-71 (55.0)	7/5	0/7/5/0	8/4	8-21 (13.2)	62-87 (72.0)	15-34 (24.0)
(c) 126	94/32	19-72 (54.0)	33/93	6/67/41/12	111/15	6-25 (15.9)	47-89 (69.5)	7-45 (30.1)

(a) Patients with intracavitary thrombosis. (b) Patients who had embolic complications. (c) Total. D, dead; A, alive; SR, sinus rhythm; AF, atrial fibrillation; D%, fractional shortening of the left ventricle; DD, end diastolic diameter; EF, ejection fraction. *Angiocardiology was performed in 9/14 cases (group a), 4/12 (group b), 62/126 (group c). Mean values are given in parentheses.

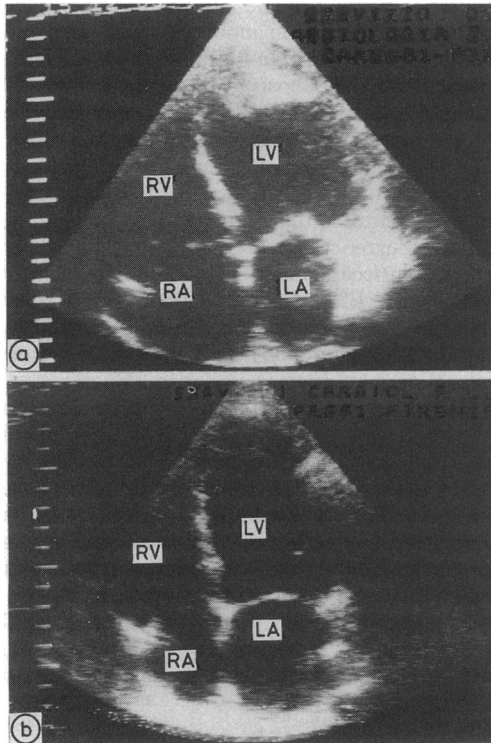


Fig 2 Cross sectional echocardiogram of apical four chamber views showing (a) a large apical thrombus and (b) no evidence of the thrombus after treatment with oral anticoagulant. LV, left ventricle; LA, left atrium; RV, right ventricle; RA, right atrium.

occurred in 54% of 11 with embolism and 49% of 101 without.

ANTICOAGULANT TREATMENT

Oral anticoagulants were given to 35 patients—14 with intracavitary thrombosis, 12 with embolism, and nine who were in class IV of the New York Heart Association—either at entry to the study or during it. The cumulative period of treatment was 61 patient-years and the cumulative observation period, from January 1980 to September 1987, was 418 patient-

years for the 126 patients with dilated cardiomyopathy. No embolic or haemorrhagic complications were seen during anticoagulant treatment. Intracavitary thrombosis disappeared in two patients one and three months after the start of anticoagulant treatment (fig 2).

Discussion

Systemic embolism is a life-threatening complication in patients with dilated cardiomyopathy and treatment with oral anticoagulants has been recommended⁵ particularly during prolonged bed rest, and in patients with heart failure or atrial fibrillation.^{6,7} The presence of intracavitary thrombosis, detected by cross sectional echocardiograms, does not seem to be useful in defining a high risk population. Gottdiener *et al* found no statistical difference in the frequency of embolism in a group with intracavitary thrombosis and a group without.¹ Our results confirm their results, although we also found no overlap between the two groups.

We found intracavitary thrombosis in 11.1% of our patients whereas others reported values ranging from 35% to 58% in patients with ischaemic⁸ or primary¹ cardiomyopathy examined by cross sectional echocardiography. Our result resembles that found in two necropsy series.^{9,10} Exceptionally Tobin *et al* found only one patient with left ventricular thrombus among 90 patients with congestive myocardial disease, half of whom had idiopathic cardiomyopathy.¹¹ They did not find intracavitary thrombosis on gross inspection in any of the chambers in 27 hearts after death. The cross sectional echocardiographic technique may also influence the results. The 5 MHz transducer that we used in patients in whom an examination with the 3.5 MHz probe suggested an intracavitary thrombus allowed better identification of the left ventricular apex,¹² and excluded false diagnosis of intracavitary thrombosis in four patients. Also the rate of embolic complications was lower in our study (8.4%) than in those reported by Gottdiener *et al* (11%),¹ Fuster *et al* (18%),¹³ and Gavazzi *et al* (18%).¹⁴ In Fuster *et al*'s study 3.5 new embolic events occurred every 100 patient-years in patients

not treated with anticoagulants,¹³ in comparison with 1.4 events for the same period in the present series. The difference in the population studies according to the severity of the disease may be responsible for these results. For instance survival rate was 88% in our study at two years and 56% at five years, while in the Mayo Clinic series it was respectively about 50 and 30%.¹³

Only one of our patients had a protruding left ventricular thrombi; increased motility was reported to promote embolism in patients with ischaemic heart disease.^{2,15,16} A mobile thrombus was reported in 27–58% of the patients in these studies. Gottdiener *et al* did not find similar results in patients with idiopathic dilated cardiomyopathy. They reported that the shape of the thrombus (flat or pedunculated) did not influence the occurrence of embolism.¹

The pathophysiology of thrombus formation and embolisation are notably different in patients with "ischaemic cardiomyopathy"¹⁷ and in those with idiopathic dilated cardiomyopathy.² The endocardial abnormalities that stimulate clot formation in acute infarction and chronic aneurysm (for example stasis of blood in the cardiac apex (fig 1)) are different or absent in patients with idiopathic dilated cardiomyopathy.

An intracardiac thrombus disappeared during anticoagulant treatment in two of our patients (fig 2). Treatment with oral anticoagulants, which were also given to five patients during follow up as soon as the embolic event occurred, might have led to the rapid resolution of the intracardiac thrombosis before the echocardiogram was performed,¹⁸ thus further reducing any possible correlation of the two events in this subgroup.

Although atrial fibrillation has been claimed by some to be an important influence on the incidence of embolisation in patients with dilated cardiomyopathy, others did not confirm this view.^{17,19,20} In our series embolic complications occurred in 4/15 patients with atrial fibrillation and in 7/11 patients in sinus rhythm. The small number of cases precludes any statistical analysis. Data obtained from the ambulatory electrocardiographic monitoring suggest that non-sustained ventricular tachycardias do not influence the embolic events.

Finally, haemodynamic factors do not seem to correlate with the likelihood of embolism in patients with dilated cardiomyopathy.¹ We found no difference in the echocardiographic left ventricular dimensions or in the ejection fraction among the groups with embolic complications, intracardiac thrombosis, and the whole group (table).

We conclude that anticoagulant treatment may not be needed by every patient with dilated car-

diomyopathy but should be given to patients with severe heart failure, previous embolism, and intracavitary thrombosis.

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