

Case reports

Verapamil: a cause of sudden death in a patient with hypertrophic cardiomyopathy

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SUMMARY Sudden death was recorded by continuous ambulatory electrocardiographic (Holter) monitoring in a 62 year old man with hypertrophic cardiomyopathy and atrial fibrillation, who had been treated for four days with verapamil 360 mg orally. Analysis of the tape showed a third degree atrioventricular block followed by complete asystole. The sudden death could be related to treatment with verapamil.

Sudden death occurred during continuous ambulatory electrocardiographic (Holter) monitoring in a patient with hypertrophic cardiomyopathy. The arrhythmia responsible was recorded and could have been related to treatment with verapamil.

Case report

A 62 year old man was admitted to hospital in January 1983 with heart failure and severe, NYHA class IV dyspnoea. He had already been admitted the previous year because of exertional dyspnoea and episodes of paroxysmal atrial fibrillation. Investigations had yielded the following results: the electrocardiogram was normal between the episodes of tachyarrhythmia; the cardiothoracic ratio was 0.50; M mode and cross sectional echocardiograms (Fig. 1) showed hypertrophic cardiomyopathy with a small left ventricular chamber (end diastolic and end systolic diameters 44 mm and 27 mm respectively) and increased left ventricular posterior wall and septum thickness (20.5 mm and 16 mm respectively) with a septal to free wall ratio of 1.28. Cardiac catheterisation showed a normal pulmonary artery pressure and no left ventricular outflow tract obstruction at rest. Angiography showed an ejection fraction of 0.74 and diffuse and distal coronary artery lesions.

Several months before the present admission he had

been treated with amiodarone (200 mg/day) and digoxin (125 mg/day), which had to be stopped after four weeks because of an increased PR interval (0.28

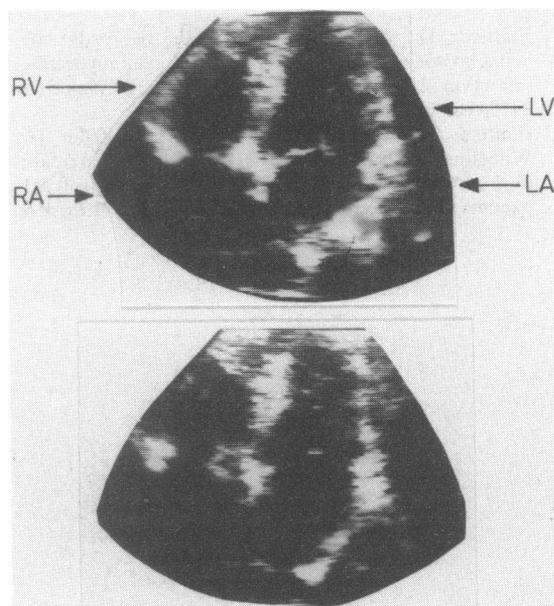


Fig. 1 Cross sectional echocardiogram showing apical four chamber view during (top) diastole and (bottom) systole. Note the increased thickness of the lateral and septal walls. RV, right ventricle; LV, left ventricle; RA, right atrium; LA, left atrium.

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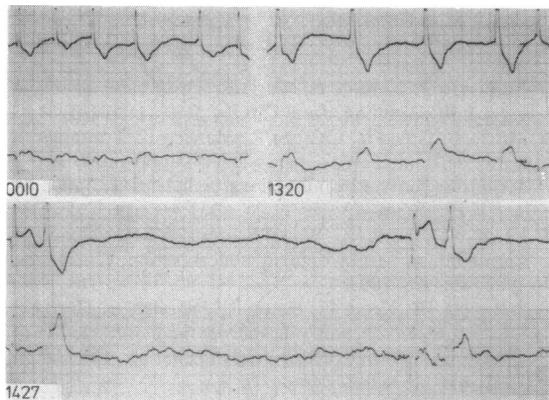


Fig. 2 Continuous ambulatory electrocardiogram showing initial atrial fibrillation and narrow QRS complexes. One hour before death episodes of regular bradycardia with large QRS complexes were evident. Sudden death was due to complete asystole.

s). Treatment before admission included oral digoxin (125 mg/day) and oral frusemide (250 mg/day).

On admission there was no history of syncope or dizziness, and examination showed a third heart sound and bilateral pulmonary rales. An electrocardiogram showed atrial fibrillation. Digoxin treatment was stopped, and two days later verapamil (240 mg for the first day then 360 mg/day) was given. The heart rate ranged from 50 to 90 beats/min, and the signs of heart failure disappeared. On the fourth day of verapamil treatment the patient died suddenly without any warning symptoms while undergoing Holter monitoring. Analysis of the tape showed atrial fibrillation with narrow QRS complexes (50 to 75 beats/min) during the first 20 hours followed by episodes of paroxysmal regular bradycardia with wide QRS complexes. An hour later ventricular pauses were noted; their length increased progressively until complete asystole occurred (Fig. 2). Death was caused by complete atrioventricular block, which was attributed to verapamil.

Discussion

The risk of sudden death is well known in patients with hypertrophic cardiomyopathy. There is, however, consistent evidence that sudden death is caused by rapid ventricular arrhythmias, which are more likely to develop in such patients¹ and have been recorded during Holter monitoring at the time of death.^{2,3}

Verapamil treatment in hypertrophic cardiomyopathy has been recommended for its haemodynamic effects and antiarrhythmic activity. The effectiveness of the drug is attributed primarily to

its influence on left ventricular relaxation and filling, but changes in coronary circulation may have additional beneficial effects.⁴ Verapamil appears to be particularly useful in cases of atrial fibrillation,⁵ which may precipitate acute haemodynamic deterioration in patients with hypertrophic cardiomyopathy. It reduces isovolumic relaxation time and increases the duration of the diastolic phase of rapid left ventricular filling, thus reducing the relative importance of the contribution of atrial systole.⁶

The adverse effects of verapamil are well known. Verapamil poisoning induces third degree atrioventricular dissociation,⁷ and various types of conduction disturbances—sinus pauses and first or second degree atrioventricular block—have been reported after standard oral doses of verapamil (240–360 mg daily).⁸ These conduction disturbances are particularly likely to occur in patients with underlying abnormalities of atrioventricular nodal conduction and sinus node pacemaker activity. These adverse effects are, however, rare and disappear when the drug is stopped. Furthermore, verapamil has been used in association with other atrioventricular nodal depressive drugs such as digoxin or propranolol without adverse effects^{9,10}: when given with digoxin verapamil induces a progressive reduction of heart rate within seven days.

In patients with hypertrophic cardiomyopathy, conduction abnormalities during treatment with verapamil are much more common¹¹: in 120 patients the incidence of sinus arrest was 2%, of sinus bradycardia 11%, of type I second degree atrioventricular block 3%, and of type II second degree atrioventricular block 1%. These conduction disturbances may have serious haemodynamic consequences in patients with sinus rhythm, in whom they lead to the loss of the contribution of synchronised atrial contraction to ventricular filling.

In our patient, the electrocardiogram showed complete third degree atrioventricular block with the progressive disappearance of ventricular escape beats. Death occurred six days after treatment with digoxin had been stopped; no other atrioventricular nodal depressive drug had been given.

There was no history of syncope, and the only conduction abnormality noted had been first degree atrioventricular block during treatment with digoxin and amiodarone several months before. It is, therefore, most likely that verapamil was directly responsible for the occurrence of this fatal complete atrioventricular block.

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