Case Reports

Reversibility of catecholamine-induced cardiomyopathy in a woman with pheochromocytoma

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Focal myocardial necrosis secondary to catecholamine excess has been well documented at autopsy in patients with pheochromocytoma.[1] More recently, noninvasive studies involving such patients have demonstrated concentric left ventricular hypertrophy,[2] asymmetric septal hypertrophy,[3] systolic anterior motion of the mitral apparatus[2,3] and dilated cardiomyopathy.[4-6] Reversibility of left ventricular dysfunction has been documented in only a few cases,[4-6] and it is unclear what the major determinants of the improvement in left ventricular function are. We describe the effects of medical and surgical therapy on left ventricular function in a patient with pheochromocytoma and catecholamine-induced dilated cardiomyopathy.

Case report

A 35-year-old woman presented with a 6-month history of diaphoresis and hot flushes. Her blood pressure had been as high as 200/140 mm Hg about 1 month before presentation. Precordial palpation revealed a prominent left ventricular heave. Electrocardiography showed sinus tachycardia with left ventricular hypertrophy and strain. A chest x-ray film showed cardiomegaly, pulmonary venous hypertension and interstitial pulmonary edema. Two-dimensional echocardiography revealed moderate left ventricular dilatation and hypertrophy, as well as severe global hypokinesis. The ejection fraction was severely depressed (30% [normally 60% plus or minus 6.2%]), and the left ventricular mass index[7] was increased (253 g/m^2; normally less than 110 g/m^2 in women). The total creatine kinase concentration and the myocardial isoenzyme level were within normal limits.

The vanillylmandelic acid level in a 24-hour urine collection was 504 (normally 9 to 45) μmol; also elevated were the total metanephrine level (243 [normally less than 50] μmol) and the catecholamine level (greater than 5800 [normally 500 or less] nmol). Iodine-131 metaiodobenzylguanidine scanning revealed a left adrenal pheochromocytoma; the diagnosis was confirmed by computed tomography.

The patient was treated with propranolol, 80 mg/d, and phenoxybenzamine, 60 mg/d, for 2 months. She was readmitted to hospital for resection of the pheochromocytoma. Preoperative two-dimensional echocardiography done during the drug therapy revealed mild residual left ventricular dilatation and mild global hypokinesis; the ejection fraction was 41%. The left ventricular mass index had decreased to 167 g/m^2. Gated radionuclide angiography confirmed a left ventricular ejection fraction of 42% and a right ventricular ejection fraction of 36%.

Eight days before surgery α-methylparatyrosine, in incremental doses up to 4 g/d, was added to deplete the catecholamine level. This was done so that lower doses of α-blocking agents could be used perioperatively in the hope that postoperative hypotension would be prevented. The removal of the pheochromocytoma was uneventful, and pathological analysis was consistent with an epinephrine-producing pheochromocytoma.

Seven months postoperatively the patient re-

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mained asymptomatic and normotensive without medication. Two-dimensional echocardiography revealed normal left ventricular dimensions and contractility, and the ejection fraction was 65%.

Comments

This report demonstrates the marked improvement in left ventricular function in a patient with catecholamine-induced dilated cardiomyopathy secondary to pheochromocytoma treated with α-adrenergic and β-adrenergic blockers (Fig. 1). There have been only a few reports documenting the reversibility of dilated cardiomyopathy in this setting,[4-6,8] most of which described improved cardiac function after surgical resection.[4,8] Two reports documented improved left ventricular function after therapy with phenoxybenzamine and α-methylparatyrosine in one case[6] and propranolol, hydralazine and captopril in the other case.[5] In neither of these cases did β-adrenergic blockade appear to play a major role in restoring left ventricular performance. In the case presented here two-dimensional echocardiography and radionuclide angiography over a 10-month period allowed a unique opportunity to assess left ventricular function.

Catecholamine-induced cardiomyopathy secondary to pheochromocytoma is a well-recognized pathological entity with distinct histologic features such as foci of inflammatory cells, myofibrillar degeneration and interstitial fibrosis.[1,9] Van Vliet, Burchell and Titus[1] found evidence of active myocarditis at autopsy in 15 of 26 patients with pheochromocytoma.

The case presented here demonstrates that decreased levels of circulating catecholamines (such as those produced by α-methylparatyrosine) are not essential for recovery of left ventricular function. More likely β-adrenergic blockers are beneficial in preventing cardiac damage in this setting. Hoffman[10] found that timolol, a β-adrenergic antagonist, prevented both cardiomyopathy and left ventricular hypertrophy in rats with pheochromocytoma, whereas phentolamine, an α-adrenergic antagonist, failed to do this.

As demonstrated in the case described here the use of appropriate medical therapy is important for reversing severe pheochromocytoma-induced dilated cardiomyopathy and for timing the surgical intervention so that the tumour is not removed from a patient with severely compromised left ventricular function.

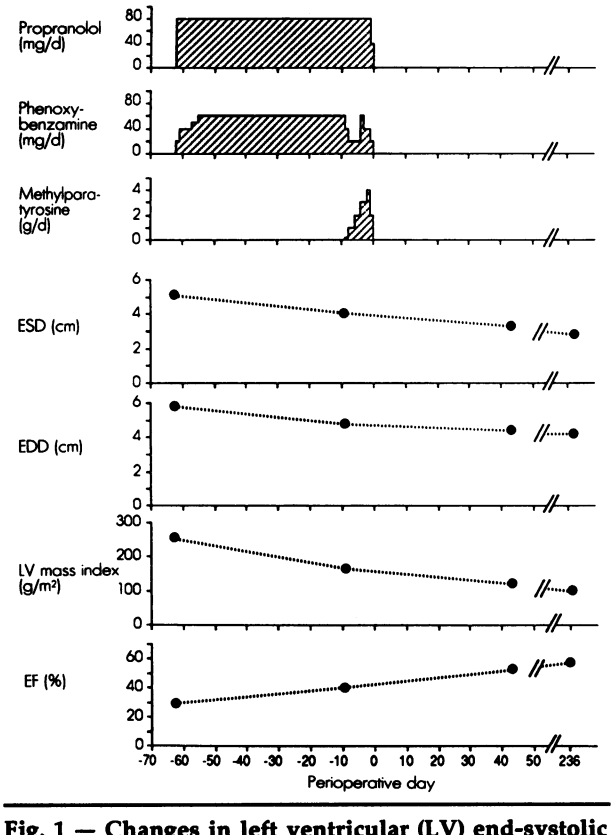

Fig. 1 — Changes in left ventricular (LV) end-systolic (ES) and end-diastolic (ED) internal diameter, mass index and ejection fraction (EF) after medical therapy and surgical removal of pheochromocytoma.

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