CASE REPORT

Complete reversal of hypertensive cardiomyopathy after initiating combined antihypertensive therapy

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SUMMARY

Hypertensive cardiomyopathy is a common complication of hypertension, with a prevalence ranging from 12% to 26%. It is associated with an increased cardiac mortality and morbidity. Lifestyle changes and antihypertensive therapy usually have a significant, but relatively small effect on left ventricular hypertrophy (LVH), which is associated with a reduction in cardiovascular risk. In this paper, we describe a 39-year-old woman with severe LVH. On transthoracic echocardiogram there was concentric LVH, systolic function was a mildly reduced and there was diastolic dysfunction grade III. After only 6 months of therapy with a combination of antihypertensive agents, the left ventricular mass index was reduced by 29%, systolic function was normal and the diastolic dysfunction improved to grade I. This paper shows that in hypertensive cardiomyopathy, even severe LVH can be completely reversible.

BACKGROUND

Hypertensive cardiomyopathy is a common complication of hypertension, with a prevalence ranging from 12% to 26%.^{1–3} It is associated with an increased cardiac mortality and morbidity.^{4–5} Lifestyle changes and antihypertensive therapy usually have a significant, but relatively small effect on left ventricular hypertrophy (LVH), which is associated with a reduction in cardiovascular risk.^{6–7}

LVH is defined as thickening of the left ventricle, in women an interventricular septum thickness of more than 9 mm.⁸ This increase results from a growth in the number and size of sarcomeres within myocardial cells and it mainly results from a chronic rise in afterload of the left ventricle. The increase in mass and interstitial fibrosis contribute to increased myocardial stiffness and results in diastolic and later systolic dysfunction plus a higher risk of cardiovascular mortality.^{4–5}

In this paper, we describe a patient in whom complete reversal of severe LVH was seen after 6 months of therapy with a combination of antihypertensive agents.

CASE PRESENTATION

A 39-year-old woman presented to the emergency department with severe shortness of breath and nausea, symptoms that had to a lesser extent be present for the past 4 months. At the age of 15 years a single measurement of elevated blood pressure was noticed, 150/90 mm Hg, but no follow-up was initiated. Furthermore, her prior medical history was unremarkable. Besides an oral

contraceptive agent, she did not use any medication. Family history was positive for hypertension in older age and negative for cardiomyopathy.

On presentation her blood pressure was 280/140 mm Hg in the right arm with a regular pulse of 120 bpm. The respiratory rate was 21 breaths/min with oxygen saturation varying between 85% and 99% on room air. The weight was 65.2 kg, the height 165.0 cm and the body mass index 23.9 kg/m². There was jugular venous distension. At auscultation there was a grade 2/6 systolic ejection murmur with a maximum at the second left intercostal space and faint bibasilar rales. No peripheral oedema was noted and the liver edge was not palpable.

INVESTIGATIONS

Laboratory testing showed a haemoglobin level of 103.1 g/dL (normal range, 120.9–169.2 g/dL). Troponin I level was slightly elevated 0.043 µg/L (normal level, <0.04 µg/L), as was the C reactive protein, 26 mg/L (normal level, <5 mg/L). The level of N-terminal pro-B-type natriuretic peptide was high 11 796 ng/L (normal level, <170 ng/L). Renal function, liver function and glucose were normal. Plasma renin activity, aldosterone levels and thyroid-stimulating hormone levels were normal on the day of admission. Urine did not show microalbuminuria.

Her ECG showed sinus tachycardia with voltage criteria for LVH with repolarisation abnormality; strain pattern (figure 1). A chest X-ray showed cardiomegaly, signs of vascular redistribution and pulmonary oedema. Funduscopy showed grade 4 hypertensive retinopathy in her left eye, in her right eye grade 3 hypertensive retinopathy was seen.

On transthoracic echocardiogram (TTE) there was concentric LVH with a mildly reduced systolic function; ejection fraction (EF) 50% and diastolic dysfunction grade III. The thickness of both the interventricular septum and the posterior wall was 19 mm (figure 2). There were no signs of outflow tract obstruction. The right ventricle was severely dilated; 42 mm, with normal systolic function. Right ventricular systolic pressure was estimated 63 mm Hg. Furthermore biatrial enlargement was seen; left and right atrial dimension, respectively, 50 and 46 mm. There was no significant valvular dysfunction.

Owing to an initial suspicion for a hypertrophic cardiomyopathy (HCM), due to her young age, a cardiac MRI (CMR) was performed 2 weeks after admission. This demonstrated concentric LVH; septum and lateral wall thickness both 16 mm

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Figure 1 ECG at baseline showing left ventricular hypertrophy with strain pattern.

(figure 3). Left ventricular systolic function was normal; EF 65%. Delayed-enhanced imaging did not show any enhancement.

DIFFERENTIAL DIAGNOSIS

She was diagnosed with a hypertensive crisis and decompensated heart failure. Initially, the absence of a clinical history in combination with the major findings on echocardiography and CMR prompted the diagnosis HCM. However, the family history was negative and resolution of LVH with improvement in systolic and diastolic function in HCM is extremely unlikely, leaving the cause of the LVH in this patient due to primary hypertension. Batrial enlargement is probably caused by grade III diastolic dysfunction due to the severity of the LVH. No other signs of restrictive cardiomyopathy were seen and diastolic

dysfunction improved after LVH reduced. Although hypertensive cardiomyopathy and retinopathy were diagnosed, no signs of hypertensive nephropathy were found. Kidney disease, primary aldosteronism and hypothyroidism were ruled out as secondary causes of hypertension.

TREATMENT

She was admitted to the intensive care unit for monitoring of her respiratory and circulatory condition and the administration of intravenous labetalol. Oral antihypertensive treatment was initiated and up-titrated; good blood pressure control was achieved with daily doses of enalapril 20 mg, amlodipine 10 mg, hydrochlorothiazide 25 mg, metoprolol 200 mg and doxazosin 8 mg.

Figure 2 Echocardiographic end-diastolic parasternal long axis view at baseline (A) and after 6 months of antihypertensive treatment (B) showing a remarkable reduction of left ventricular hypertrophy. IVS, interventricular septal; PW, posterior wall.

Figure 3 Cardiac MR study at baseline (A+C) and after 12 months of antihypertensive treatment (B+D) confirm the major reduction of left ventricular mass.

OUTCOME AND FOLLOW-UP

Six months after the initial presentation the TTE was repeated and showed complete normalisation of LVH, with the interventricular septum measuring 9 mm (figure 2). The left ventricular mass index (LVMI) was reduced by 29%. Systolic function was normal and the diastolic dysfunction improved to grade I. A CMR study 12 months after first admission confirmed this reduction in LVH (figure 3).

DISCUSSION

To date, only one case was presented demonstrating LVH regression in a patient with severe hypertension.⁹ The reduction was achieved in a short period with an ACE inhibitor and a calcium channel blocker. Meta-analyses on regression of LVH in all hypertensive patients with antihypertensive agents mainly focus on differences in effect between monotherapies. The largest reduction of 13% in LVMI was gained by treatment with angiotensin II receptor antagonists.^{10 11} The Assessment of LEscol in Renal Transplantation (ALERT) study however showed a greater left ventricular mass reduction with combination therapy of an ACE inhibitor and a calcium channel blocker compared to

higher dose monotherapy of one of both.¹² The patient in this case showed a reduction of 29% in LVMI in only 6 months. This demonstrates that severe LVH might be completely reversible if treated with combination therapy. Therefore, we are inquisitive about more studies with a design to compare combination therapies with monotherapies.

Learning points

- ▶ Hypertensive cardiomyopathy is a common complication of hypertension.
- ▶ Reduction of left ventricular hypertrophy (LVH) by lifestyle changes and antihypertensive therapy is associated with a reduction in cardiovascular risk.
- ▶ Hypertensive cardiomyopathy can mimic hypertrophic cardiomyopathy in accordance with severe LVH.
- ▶ In hypertensive cardiomyopathy, even severe LVH can be completely reversible.

Competing interests None declared.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

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