Catecholamine-induced Cardiomyopathy Secondary to Pheochromocytoma Mimicking Fulminant Acute Myocarditis

Yung-Nien Yang, Yi-Cheng Chuang, Wei-Hsian Yin and Mason Shing Young

Pheochromocytoma is a relatively rare catecholamine-secreting tumor (0.1 to 0.8% of hypertensives). It has a large spectrum of clinical and biochemical manifestations. The clinical manifestation of acute myocarditis has only rarely been reported. We describe a case of a 46-year-old woman who presented with cardiogenic shock associated with acute pulmonary edema following an upper respiratory infection, which was initially presumed to be acute viral myocarditis. Cardiac function progressively improved after serial management including intra-aortic balloon pump and extracorporeal membrane oxygenation but soon deteriorated two days after weaning off the mechanical support. The episodic high blood pressure, tachycardia and marked fluctuation of cardiac function during hospitalization subsequently led to the correct diagnosis of pheochromocytoma.

Key Words: Pheochromocytoma • Catecholamine-induced cardiomyopathy • Acute myocarditis • Acute pulmonary edema

INTRODUCTION

Pheochromocytoma is a rare catecholamine-secreting tumor, and the majority of patients have the classical sudden triad characterized by headache, sweating and tachycardia. Although suspicion is aroused by severe hypertension, some cases lacking hypertension have been reported. Acute myocarditis as its primary manifestation is not common and was first reported by Imperato-McGinley et al.1 We report such a case with the initial presentation of cardiogenic shock with severe left ventricular dysfunction, mimicking viral myocarditis, requiring the use of multiple cardiopulmonary devices. Finally, an episode of hypertensive crisis raised the clinical suspicion of pheochromocytoma.

CASE REPORT

A 46-year-old woman without history of major systemic disease arrived at our ER because of dyspnea occurring several hours previously. Upper respiratory tract infection two weeks before this admission was noted. Vital signs were blood pressure 149/88 mmHg, heart rate 89/min, respiratory rate 20/min and body temperature 36.6 °C. Electrocardiography displayed sinus tachycardia and myocardial ischemic changes (Figure 1A). Chest X-ray disclosed normal cardiac silhouette with pulmonary edema. The cardiac enzyme of Troponin-I was 11.68 ng/ml and of creatine kinase/creatinine kinase MB (CK-MB) isoenzyme was 699/52 IU/L. Bedside echocardiography showed global hypokinesis of the left ventricle and severe left ventricular dysfunction, with an ejection fraction estimated at around 20% (Figure 2A). Emergent
cardiac catheterization was performed because of possible acute non-ST-elevation myocardial infarction, but coronary angiography disclosed normal epicardial coronary artery. Cardiogenic shock occurred during this procedure; endotracheal intubation and intra-aortic balloon pumping were performed. Under the impression of acute myocarditis with cardiogenic shock, intravenous immunoglobulin was also prescribed for the patient. Profound hypotension was still noted despite the above intensive therapeutic measures. Because of the persistence of profound shock, an extracorporeal membrane oxygenation (ECMO) was initiated to counter hemodynamic instability. The following echocardiography revealed much improvement of LV systolic function except for akinesis of the basal segmental wall. The patient was weaned off ECMO 5 days after admission, and we removed endotracheal intubation 2 days later. Unfortunately, around midnight of the same day, a sudden onset of high blood pressure (200/100 mmHg) and rapid heart rate (180 bpm) occurred, and the patient manifested acute delirium. Echocardiography disclosed global hypokinesis of the LV with severe systolic dysfunction again, and ro-

Figure 1. Initial electrocardiography displayed sinus tachycardia and myocardial ischemic changes (A). After administration of phenoxybenzamine, the depression of the ST segments was normalized (B).
entgenography again revealed acute pulmonary edema, that aroused clinical suspicion of catecholamine cardiomyopathy of pheochromocytoma. We gave the patient a single dose of oral phenoxybenzamine 10 mg immediately, and her LV function improved gradually several hours later (Figure 2B). CT of the abdomen disclosed a well-defined mass around 5.5 × 4.4 × 4 cm with internal necrosis, hemorrhage and strong contrast enhancement at the right adrenal gland (Figure 3A). Twenty-four hour urinary catecholamine levels revealed 635.5 μg/day (normal range, 11.1-85.5 μg/day) of norepinephrine and 275 μg/day (normal range, < 22.4 μg/day) of epinephrine. Twenty-four hour VMA disclosed 16.33 mg/day (normal range, 1.00-7.50 mg/day). After one-week medication with alpha-adrenergic antagonist (phenoxybenzamine 10 mg twice a day) and intensive care, the patient’s cardiac function recovered before the tumor was finally removed by adrenalectomy (Figure 3B). Histological analysis confirmed a pheochromocytoma with focal hemorrhage (Figure 3C and 3D). Left ventricular function returned almost to normal after the operation.

DISCUSSION

Pheochromocytoma is a rare neuroendocrine tumor that secretes high levels of catecholamine. The most common manifestations are paroxysmal sustained hypertension with episodes of headache, sweating and tachycardia. Acute noncardiogenic pulmonary edema and catecholamine-induced cardiomyopathy as the first presentation of pheochromocytoma are uncommon events, but usually rapidly fatal. The present case was not diagnosed correctly at the time of first presentation because the patient had a history of upper respiratory tract infection before this episode, leading to a tentative diagnosis of viral myocarditis with cardiogenic shock that required mechanical ventilation, intravenous inotropic infusion, intravenous immunoglobulin infusion, intra-aortic balloon pump and ECMO to stabilize her condition. It wasn’t until the onset of subsequent catecholamine storm-like events (acute delirium, tachycardia, severe hypertension, recurrent heart failure and recurrent pulmonary edema) that we considered the possibility of pheochromocytoma.
The pathogenesis of pheochromocytoma-induced catecholamine cardiomyopathy with myocardial stunning has not yet been clarified. It may result from epicardial coronary artery spasm that can cause vasoconstriction in patients without coronary disease. Our patient didn’t have angiographic evidence of coronary spasm or ST-segment elevation on ECG. Another possible mechanism is catecholamine-mediated myocardial stunning due to direct toxicity. Catecholamine may decrease viability of myocytes through cyclic AMP-mediated calcium overload, and catecholamine is also a potential source of oxygen-derived free radicals that can cause myocyte injury. The activation of alpha-adrenergic receptors, especially the alpha-1 receptor, in the pathogenesis of catecholamine cardiomyopathy has been described by Lee and Sponenberg. Hirata et al. also found that alpha-adrenergic receptor was involved in the development of the ST-T changes of the ECG. In our case, after administration of phenoxybenzamine, the depression of the ST segment was normalized (Figure 1B).

Various echocardiographic abnormalities have been described in pheochromocytoma-related cardiomyopathy, including systolic anterior movement of the mitral valve, global hypokinesis and hypokinesis of the base and apex. Yoshinaga et al. found that the hypokinesis of the LV initially appeared in the cardiac base and subsequently in the mid-portion. The hypokinesis improved initially in the mid-portion and then in the base, probably because the distribution of sympathetic nerves in the myocardium is denser in the base than in the apical region. Severe generalized hypokinesis and left ventricular dysfunction have been described in pheochromocytoma-related cardiomyopathy. Unlike stress-related cardiomyopathy (Takotsubo cardiomyopathy), there is no unique ventricular dysfunction pattern in catecholamine-related cardiomyopathy.

We report a rare case of catecholamine-secreting tumor with initial presentation mimicking acute viral myocarditis. The episodic high blood pressure, tachycardia and marked fluctuation of cardiac function during hospitalization suggested and subsequently led to the correct diagnosis of pheochromocytoma. Although uncommon,
this case highlights the need to consider pheochromocytoma earlier in the management of unexplained cardiogenic shock.

REFERENCES

嗜鉻性細胞瘤導致之兒茶酚心肌病變
表現類似猛爆性急性心肌炎

楊永年1 莊義成3 殷偉賢1 楊茂勳2
台北市 財團法人振興復健醫學中心 心臟內科1 內科部2 心臟外科3

嗜鉻性細胞瘤是一種少見之分泌兒茶酚的腫瘤（約佔所有高血壓患者的百分之 0.1 至百分之 0.8），它可以表現出許多不同臨床及生化之表徵，但以急性心肌炎為表現非常罕見。一位 46 歲女性，經上呼吸道感染後表現出心因性休克及急性肺水腫，起初讓我們誤認為單純之急性病毒心肌炎。經動脈內氣球幫浦及葉克膜機器輔助逐漸改善心臟功能，但在機械性輔助器移除兩天後，患者之心臟功能又急速惡化。其陣發性之高血壓、心跳過速、及短時間內急劇之心臟功能變化讓我們考慮到並進一步診斷其為嗜鉻性細胞瘤所致。

關鍵詞：嗜鉻性細胞瘤、兒茶酚心肌病變、急性心肌炎、急性肺水腫。