Journal of Cardiology Cases 20 (2019) 225–227

Contents lists available at ScienceDirect

Journal of Cardiology Cases

journal homepage: www.elsevier.com/locate/jccase

Case Report

A case of pheochromocytoma presenting with cardiopulmonary arrest

Takashi Touma (MD)*, Takafumi Miyara (MD), Yoji Taba (MD)

Department of Cardiology, Okinawa Prefectural Nanbu Medical Center & Children's Medical Center, Okinawa, Japan

ARTICLE INFO

Article history:
Received 23 May 2019
Received in revised form 21 July 2019
Accepted 16 August 2019

Keywords:
Pheochromocytoma
Ventricular fibrillation
Left ventricular dysfunction

ABSTRACT

A 33-year-old woman complained of sudden chest pain and intense headache. She was unconscious and underwent defibrillation for ventricular fibrillation in the ambulance. In the emergency room, she was placed on an artificial respirator. Diffuse wall hypokinesis and decreased left ventricular ejection fraction (31%) were identified on transthoracic echocardiography, and an intra-aortic balloon pump was inserted to address the cardiogenic shock. A mass was identified in the right adrenal gland on abdominal ultrasonography. Since a pheochromocytoma was suspected, doxazosin and carvedilol were administered. Blood and urinary norepinephrine and dopamine levels were elevated, confirming the pheochromocytoma diagnosis, and right adrenalectomy was performed 23 days after the initial hospitalization. After surgery, the left ventricular wall motion and left ventricular ejection fraction had improved to 62% on echocardiography. Blood and urinary norepinephrine and dopamine levels also decreased to within the normal range. This case highlights that the patient returned to normalcy and recovered to a transient myocardial disorder or malignant arrhythmia after cardiopulmonary arrest due to early diagnosis of and accurate treatment for pheochromocytoma.

<**Learning objective:** Pheochromocytomas secrete excessive levels of catecholamines that may cause cardiac dysfunction, including fatal arrhythmias. It is necessary for the transient hypertension and fatal arrhythmia appearance to consider the possibility of pheochromocytoma. The decreased cardiac function may be reversible with resection of the tumor. Therefore, early diagnosis and treatment can be lifesaving in such cases. Pheochromocytomas provide an interesting model to evaluate the vulnerability of the myocardium to adrenergic stimulation, such as in cases of takotsubo cardiomyopathy or catecholamine-induced cardiomyopathy.>

Introduction

Pheochromocytomas are rare but clinically important tumors of the chromaffin cells, which produce, store, release, and metabolize catecholamines, and can cause life-threatening systemic effects. Pheochromocytomas are generally unilateral (80%), although they may be bilateral (10%) or outside the adrenal glands (10%), and less than 10% of pheochromocytomas are malignant [1,2]. Typical clinical findings include recurrent episodes of headache, heart palpitations, and perspiration. Pheochromocytomas can also manifest clinically as sustained or paroxysmal hypertension ;[2] however, some patients present with unexplained orthostatic hypotension. Cardiac symptoms are observed, and the common sign is sinus tachycardia; however, ventricular tachycardia is observed in a few cases. Pheochromocytomas can lead to myocardial dysfunction and heart failure. Cardiogenic shock due to catecholamine-induced myocardial dysfunction can also occur [1,3].

We report a case of life-threatening arrhythmia in a 33-year-old woman, who was saved by rapid diagnosis and administration of effective treatment.

Case report

A 33-year-old woman with no relevant medical history was transported to the hospital emergency room. The patient had collapsed after complaining of chest discomfort and severe headache. The paramedic attached an external defibrillator to the patient, and ventricular fibrillation was detected (Fig.1). Since a 200-J defibrillation did not induce a normal sinus rhythm, a 300-J defibrillation was administered and resulted in a sinus rhythm. The patient remained unconscious, with a heart rate of 150 bpm and a

* Corresponding author at: Department of Cardiology, Okinawa Prefectural Nanbu Medical Center & Children's Medical Center, 118-1 Arakawa, Haebaru-cho, Okinawa, Japan.
E-mail address: kyohei@woody.ocn.ne.jp (T. Touma).

https://doi.org/10.1016/j.jccase.2019.08.009
1878-5409/

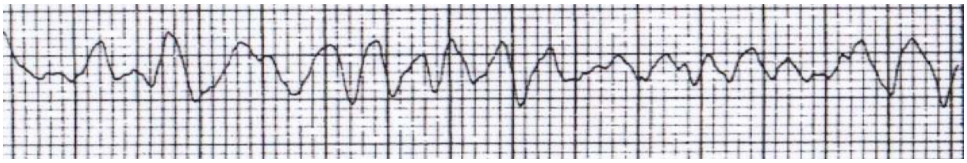

Fig. 1. Ventricular fibrillation detected by an external defibrillator.

systolic blood pressure of 70 mmHg. After admission to the emergency room, an endotracheal tube was inserted, and the patient was connected to a respirator because of spontaneous breathing disappearance. The patient's body temperature was 36.7 °C. On auscultation, the third and fourth sounds were not heard. However, late inspiratory crackles were heard in the lungs. No abnormal findings of serum electrolyte, potassium serum level were 4.0 mEq/l, magnesium 2.2 mg/dl. A 12-lead electrocardiogram (ECG) showed a sinus tachycardia of 150 bpm, with a horizontal ST depression in the inferior and lateral leads, no prolongation of QTc interval 418 ms. Transthoracic echocardiography revealed severe left ventricular (LV) dysfunction and a contractile abnormality, consisting of severe diffuse hypokinesis and a decreased LV ejection fraction of 31%. An emergency coronary angiography showed normal coronary arteries. The patient was stabilized after placement of an intra-aortic balloon pump and administration of dobutamine and noradrenaline infusions, with the latter being maintained for 2 days. Furthermore, transient hypertension occurred, apparently due to the non-sustained ventricular tachycardia (VT). The patient recovered in the intensive care unit and was extubated on day 3. Despite prolonged cardiopulmonary resuscitation (CPR), the patient did not display any neurological cognitive deficits. Although abdominal ultrasonography was performed because of elevated trasaminases in serum(GOT30IU/l,GPT110IU/l), and no abnormal findings in liver, biliary duct, the main pathological finding was a 24 × 22-mm mass in the right adrenal gland (Fig. 2). A computed tomography scan of the abdomen confirmed the right adrenal mass, and an iodine-123 meta-iodobenzylguanidine scan showed uptake areas in the central posterior abdomen. With a presumptive diagnosis of a pheochromocytomas, doxazosin0.5 mg and carvedilol 2.5 mg were administered, and the dosage was gradually increased to doxazosin4mg, carvedilol 15 mg. The diagnosis was confirmed by urine testing, where in norepinephrine level of 2406 μg/24 h (reference range 48–168 μg/24 h) and dopamine level of 33995 μg/24 h (reference 365–961 μg/24 h) was detected. On day 23, the patient underwent an uncomplicated adrenalectomy. Histological and immunohistochemical analyses confirmed the initial diagnosis of a pheochromocytomas (Fig. 3). The levels of catecholamine excretion in the urine returned to the normal range. No remarkable changes for QTc interval before 415 ms and after surgery 426 ms. Echocardiography repeated on day 28 after surgery showed a LV ejection fraction of 62%. The patient is alive and remains asymptomatic one year after the surgery.

Discussion

The diagnosis of pheochromocytomas is based on identifying excessive amounts of catecholamines and their metabolites (metanephrines) in the blood and urine samples, and biochemical testing for catecholamine-secreting tumors typically includes 24-h urinary excretion measurements of total metanephrines and catecholamines by liquid chromatography. More than 90% of patients with pheochromocytomas have elevated levels of catecholamines, metanephrines, and vanillyl-mandelic acid [4].

Less than 10% of pheochromocytomas predominately secrete epinephrine, which is 10 times more metabolically active than norepinephrine. Epinephrine-secreting pheochromocytomas are

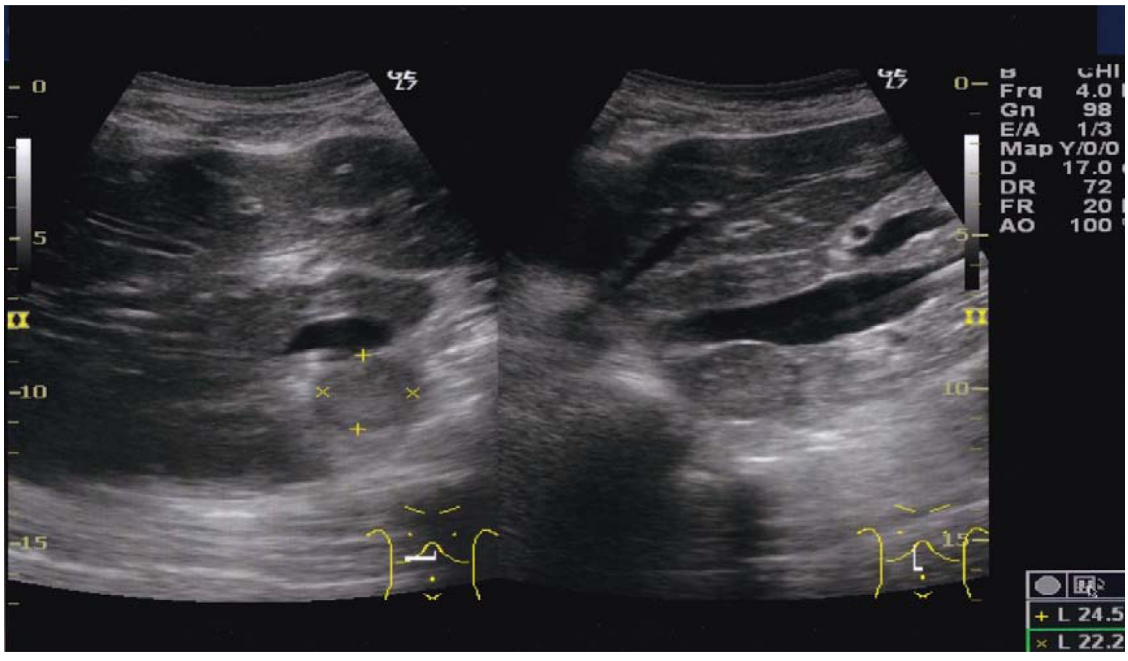

Fig. 2. Abdominal ultrasound image showing a 24 × 22-mm mass in the right adrenal gland.

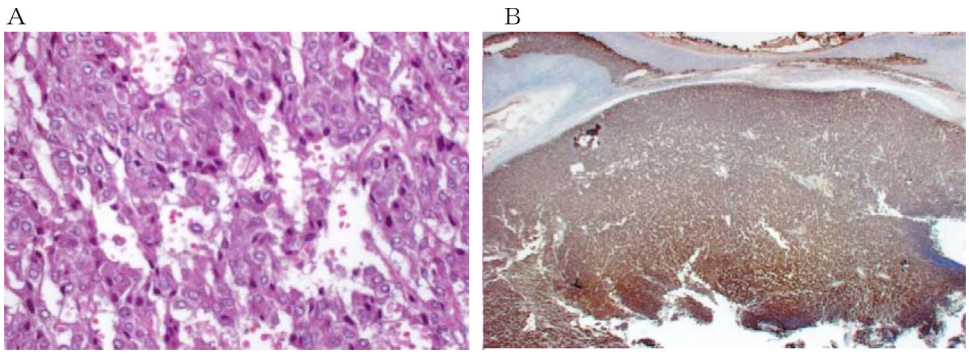

Fig. 3. (A) Hematoxylin and eosin staining showing polygonal cells and cluster of tumor cells(×12.5). (B) Immunohistochemical staining showing chromogranin and cytoplasmic immunoreactivity(×12.5).

more often asymptomatic or oligosymptomatic, and previous studies have reported death due to chronic elevation of epinephrine levels causing a compensatory down-regulation of beta-receptors in the heart, thus, decreasing contractility.

Sanchez-Recalde et al. reported improvement of decreased cardiac function in a 41-year-old woman after resection of a pheochromocytoma [5].

Although excess norepinephrine from pheochromocytomas may impair cardiac function, the resection of the tumor restores cardiac function and alleviates symptoms. Pheochromocytomas provide an interesting model for evaluating the vulnerability of the myocardium to adrenergic stimulation, and the disease course supports the pathogenetic role of catecholamines in takotsubo cardiomyopathy and pheochromocytoma-induced cardiomyopathy [6,7]. Mobine et al. suggested that pheochromocytoma-induced cardiomyopathy is not solely mediated by norepinephrine, but rather by pheochromocytoma secretory factors [7]. McEntee et al. showed that pheochromocytoma-induced cardiomyopathy can be reversed with an aggressive α-adrenergic blockade before surgical removal of the tumor [8]. The LV dysfunction was reversible with early intensive treatment in our case as well, where the LV ejection fraction improved from 34% to 62% after tumor resection.

In our case, the patient presented with non-sustained VT and transient hypertension that disappeared after tumor resection. The presence of sustained VT has been rarely reported and was associated with pheochromocytoma, QT prolongation, and neuropeptide Y. In our case, no prolongation of QT interval.

Chun et al. reported that pheochromocytomas cause life-threatening cardiovascular instability, but the use of extracorporeal membrane oxygenation (ECMO) to provide cardiopulmonary support enabled a good recovery [9].

Won Park et al. reported implantable cardioverter-defibrillator (ICD) implantation in a 34-year-old man for persistent VT due to a pheochromocytoma [10]. In our case, the prophylactic use of an ICD was thoroughly discussed among the members of the cardiac team and with the patient. However, the decision was made not to implant an ICD, since there was no recurrence of the VT after surgical resection of the tumor.

Patients with pheochromocytomas can be completely asymptomatic for long periods of time, despite having high circulating catecholamine levels. This can, in part, be due to desensitization of the cardiovascular system to catecholamines or to structural and functional changes that mask the effects of the catecholamines. In contrast, a large catecholamine release in a short time period may cause fatal arrhythmia, with symptoms of headache and chest discomfort. After tumor resection, fatal arrhythmia or headache and chest discomfort disappeared.

The amount of catecholamines released related to tumor tissue property, the release speed, and the adjustment factor are not currently known, and further studies are needed to evaluate these aspects of pheochromocytomas.

In conclusion, we present a case of pheochromocytomas, wherein the patient returned to normalcy after cardiopulmonary arrest due to early diagnosis and accurate treatment.

The first symptom appearance causes a fatal crisis like in this case. It may be exposure to massive catecholamine release for a short time. It is necessary to consider to pheochromocytoma in a cause of the sudden death.

Conflict of interest

The authors declare that there is no conflict of interest.

References

[1] Cardesi E, Cera G, Cassia A. Pheochromocytoma and sudden death: a case of hyperacute myocardial ischemia. Pathologica 1994;86:670–2.
[2] Lenders JWM, Eisenhofer G, Mannelli M, Pacak K. Phaeochromocytoma. Lancet 2005;366:665–75.
[3] Lassnig E, Weber T, Auer J, Nonmeyer R, Eber B. Pheochromocytoma crisis presenting with shock and tako-tsubo like cardiomyopathy. Int J Cardiol 2009;134:e138–140.
[4] Boyle JG, Davidson DF, Perry CG, Connell JMC. Comparison of diagnostic accuracy of urine free metanephrines, vanillyl mandelic acid, and catecholamines and plasma catecholamines for diagnosis of pheochromocytoma. J Clin Endocrinol Metab 2007;92:4602–8.
[5] Sanchez-Recalde A, Costero O, Oliver JM, Iborra C, Ruiz E, Sobrino JA. Pheochromocytoma-related cardiomyopathy: inverted takotsubo contractile pattern. Circulation 2006;113:e738–739.
[6] Takizawa M, Kobayakawa N, Uozumi H, Yonemura S, Kodama T, Fukusima K, et al. A case of transient left ventricular ballooning with pheochromocytoma, supporting pathogenetic role of catecholamines in stress-induced cardiomyopathy or takotsubo cardiomyopathy. Int J Cardiol 2007;114:e15–17.
[7] Mobine HR, Baker AB, Wang L, Wakimoto H, Jacobsen KC, Seidman CE, et al. Pheochromocytoma-induced cardiomyopathy is modulated by the synergistic effects of cell-secreted factors. Circ Heart Fail 2009;2:121–8.
[8] McEntee RK, Coyle D, Meyer M. Severe dilated cardiomyopathy after propranolol treatment in an undiagnosed adrenal pheochromocytoma. Circ Heart Fail 2011;4:e10–12.
[9] Chiu CC, Chen YC, Teng TH, Yang LH, Chen YP, Siao FY. Sudden cardiac arrest after minor abdominal trauma: a successful resuscitation in a patient with haemorrhagic phaeochromocytoma. Resuscitation 2009;80:1323–4.
[10] Won Park Ji, Park Seung Jung, Hur Kyu Yeon, Kim Jung Han, Choi Yoon La, Park Sun Mi, et al. Recurrent ventricular tachycardia in malignant metastatic pheochromocytoma. Circulation 2012;125:e435–8.