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Primary hyperaldosteronism presenting as recurrent polymorphic ventricular tachycardia (RCDD code: VI-2)

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Abstract

Primary hyperaldosteronism (PH) is a frequently overlooked cause of secondary hypertension mostly due to an aldosterone-producing adrenal adenoma. We report the case of a 48-year-old female who presented with recurrent episodes of polymorphic ventricular tachycardia before an aldosterone-producing adrenal adenoma was diagnosed. Although her past medical history was remarkable for poorly-controlled hypertension since age 30, she had never been examined for secondary causes. The patient underwent adrenalectomy resulting in stabilisation of her clinical condition, although residual hypertension remained. Causes of atypical presentation and diagnostic pitfalls are discussed. JRCD 2018; 4 (1): 26–30

Key words: primary hyperaldosteronism; polymorphic ventricular tachycardia; secondary hypertension; hypokalemia; rare atypical presentation

Background

Primary hyperaldosteronism (PH) is a frequently overlooked cause of secondary hypertension due to an aldosterone-producing adrenal adenoma (Conn's syndrome, ≈70%) or bilateral adrenal hyperplasia (≈30%). Other rare causes include aldosterone-producing adrenal carcinoma, primary (unilateral) adrenal hyperplasia, and glucocorticoid-remediable aldosteronism [1]. Although PH was previously considered to be a rare cause of hypertension (<1%) [2], its true prevalence among hypertensive patients may be as high as 6 to 11%. This number could be due to improved screening using the aldosterone-to-renin ratio [3,4]. Despite current guidelines [5,6], in practice, only 7–8% of patients with hypertension are screened for PH [7,8]. Previously, hypokalaemia was considered a mandatory feature of PH, however, recent data show that low serum potassium is present in only 50–80% of patients with confirmed PH and may be a late manifestation of the disorder [9]. This may lead to late diagnosis and atypical presentations of PH.

Case presentation

A 48-year-old Caucasian female presented to the Emergency Department of the Community Hospital in November 2016 complaining of headache, nausea, dizziness. Suddenly, the patient collapsed, and the obtained electrocardiogram (ECG) *(Figure 1)* revealed polymorphic ventricular tachycardia (PMVT). The patient was treated with 150 J asynchronous direct current (DC) shock resulting in successful conversion to sinus rhythm and subsequently, empirically with magnesium sulfate. ECG showed sinus rhythm, left ventricular hypertrophy with strain pattern, and prolonged QT interval *(Figure 2)*.

The patient had no family history for sudden cardiac death, however, she reported being diagnosed with arterial hypertension at the age of 30. Her hypertension had never been adequately controlled and she had never been evaluated for secondary causes of elevated blood pressure (BP).

On examination, after conversion to sinus rhythm, the patient's BP was 280/135 mmHg and intravenous infusion of urapidil was administered. Within 3 hours her BP stabilised at 135–150/80 mmHg.

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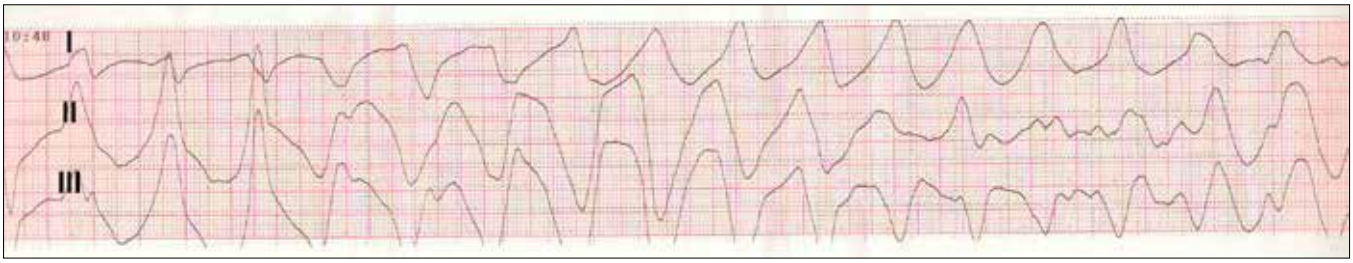

Figure 1. Rhythm strip demonstrating polymorphic ventricular tachycardia

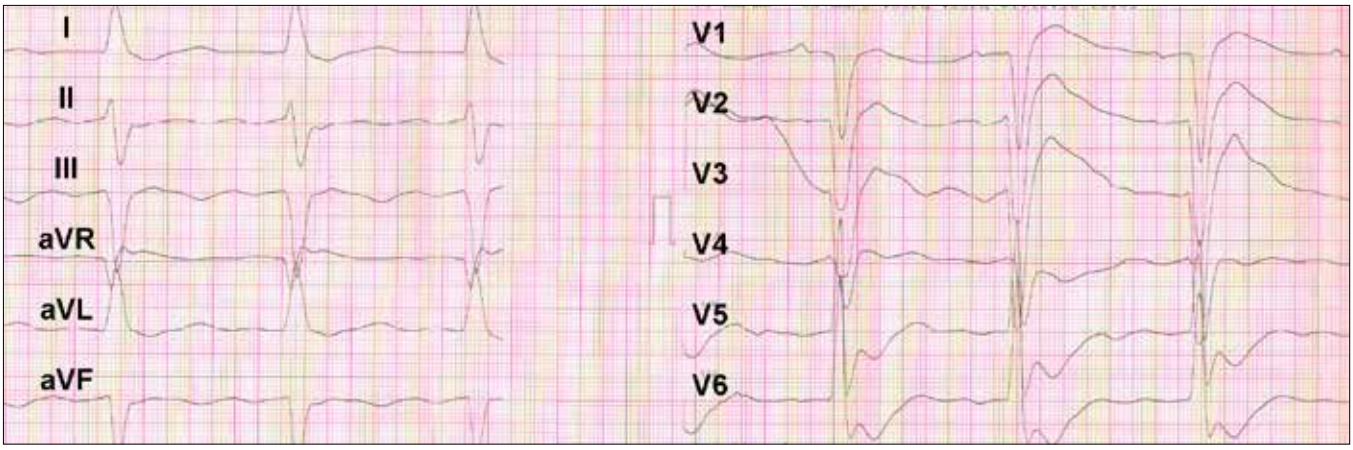

Figure 2. Twelve-lead ECG after conversion to sinus rhythm showing LV hypertrophy with strain pattern, QTc 593 msec

Echocardiography demonstrated severe concentric LV hypertrophy (interventricular septum 18 mm, LV posterior wall thickness 18 mm) with good systolic function (LV ejection fraction 60%). Laboratory findings revealed severe hypokalaemia (1.28 mmol/L, reference range: 3.3–5.2 mmol/L). During her stay in the Intensive Care Unit (ICU), recurrent episodes of PMVT were observed (overall, 19 registered episodes of PMVT over the next 72 hours, some of them were associated with haemodynamic instability requiring cardioversion). Magnesium sulfate, lidocaine, and intravenous potassium were continued with monitoring of ECG and serum potassium levels. PH was suspected, and the differential diagnosis included long Q-T syndrome and hypertrophic cardiomyopathy. Amlodipine, bisoprolol, spironolactone, and potassium supplements were prescribed, and work-up for hyperaldosteronism was initiated. Plasma aldosterone level was 1822 pg/mL (reference range: 30-160 pg/mL) and renin activity was <0.01 pg/mL (reference value: <17.22 pg/mL). Abdominal computed tomography (CT) scan revealed a left adrenal mass *(Figure 3)* measuring 34x20 mm with a density of –28 Hounsfield units, consistent with a lipid-rich adenoma [10].

Patient management and follow-up

PH due to adrenal adenoma was diagnosed and spironolactone dosage was increased to 400 mg/day, while potassium supplementation was gradually discontinued. On hospital day 15, the patient underwent left-sided adrenalectomy. Histopathology confirmed the presence of adrenocortical adenoma (*Figure 4*).

The postoperative course was uneventful. The dosage of spironolactone was reduced to 50 mg/day and subsequently discontinued. The patient was discharged from hospital with a potassium level of 4.93 mmol/L and BP stabilised at 140–145/80 mmHg with lercanidipine 20 mg/day, indapamide 2.5 mg/day, valsartan 160 mg/day, and bisoprolol 2.5 mg/day.

One year later, the patient presented for a follow-up visit. In the office her BP was 140/90 mmHg and was maintained within the 130–145/80–90 mmHg range on serial home BP measurements while taking lercanidipine 20 mg/day, indapamide 2.5 mg/day, valsartan 160 mg/day, and bisoprolol 5 mg/day. Her ECG was still notable for strain pattern of LV hypertrophy, QTc interval was 423 msec. The potassium level was 4.63 mmol/L. No episodes of ventricular arrhythmia were registered during the follow-up.

Discussion

The present case demonstrates an atypical presentation of PH with PMVT. The disease was not recognised in the primary care setting, which led to delayed diagnosis. Because of this, the patient developed significant structural heart disease (marked LV hypertrophy). In our opinion, a possible cause of such an atypical presentation was hypokalaemia and QT prolongation associated with structural heart disease. This case re-emphasises the importance of early diagnosis of PH, as post-surgery clinical success is dependent on presence or absence of deleterious vascular, cardiac, and renal changes determined by the preceding aldosterone-induced hypertension [11]. Thus, in the described case, arterial hy-

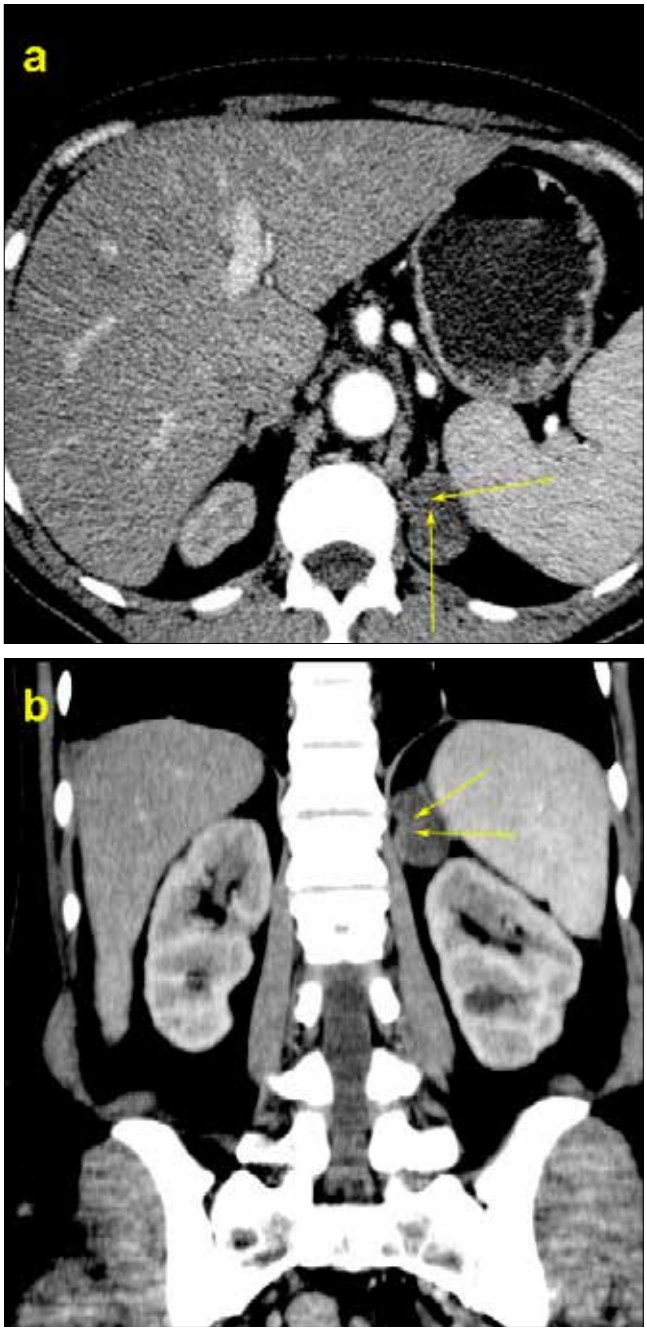

Figure 3. Axial (a) and coronal (b) abdominal CT scans showing a left adrenal homogeneous mass (arrows) with well defined borders consistent with adenoma

pertension persisted despite removal of the adenoma, and BP was controlled with 4 medications. Current guidelines define groups of patients which should be screened for PH and these comprise ≈50% of patients with hypertension [5,6].

It is possible that the described patient had a concomitant essential hypertension, which after surgery, according to the latest ESC guidelines [12], could be classified as resistant. On the other hand, the cure rates of patients undergoing adrenalectomy for hyperaldosteronism vary between 30–60%, while the remaining patients have residual hypertension. Of these, a significant proportion has controlled hypertension, while ≈10% experience resistant hypertension [13]. Therefore, residual resistant hypertension was most likely in our patient. The pathogenesis of the latter remains controversial, with duration of preoperative hypertension (18 years in the case of our patient) and vascular remodeling being the strongest predictors [14].

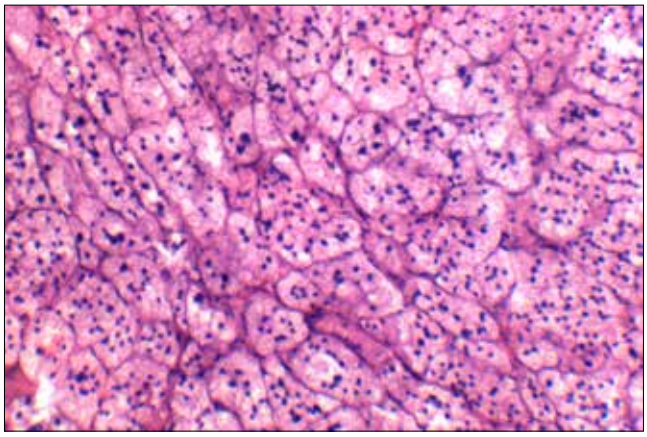

Figure 4. Light microscopy image of adrenocortical adenoma showing large densely arranged adrenocorticocyte-type cells with lipid-rich cytoplasm separated by thin connective tissue septae (hematoxylin and eosin stain, 400 × magnification)

In addition, the present case demonstrates that ventricular tachycardia may not always be due to a primary cardiac disorder. Other causes, especially endocrine-related etiologies, should be considered [15]. Potassium depletion in hyperaldosteronism increases the duration of the action potential of cardiomyocytes and, consequently, prolongs the QT interval on ECG. This increases the risk for development of ventricular arrhythmias [16,17]. The alternative causes of hypokalaemia leading to ventricular tachycardia, according to previously published case reports (excluding cases due to diarrhoea or vomiting and diuretic-induced hypokalaemia), have been summarised in *Table 1*, and should also be considered in the differential diagnosis.

A limitation of our case report is the lack of magnesium and calcium measurements on admission, as both hypomagnesaemia and hypocalcaemia may accompany hypokalaemia and contribute to Q-T prolongation. However, considering the presence of profound hypokalaemia, hypertension, increased aldosterone-to-renin ratio, and CT findings, the diagnosis of PH was rather straightforward.

In light of the recently updated classification of rare cardiovascular diseases and disorders [30], this patient, in our opinion, should be discussed within class VI (cardiac arrhythmogenic disorders and arrhythmias): group 2 (arrhythmias in specific clinical settings).

Conclusions

Late diagnosis of PH may contribute to adverse outcomes related to hypokalaemia and target organ damage and have a negative impact on cure rates of hypertension. The presented case suggests that PH may present with malignant ventricular arrhythmias, especially in patients with profound hypokalaemia and prolonged QTc. Therefore, ventricular tachycardia is not always due to pri-

Table 1. Summary of reported causes of hypokalaemia leading to ventricular tachycardia

Causes of hypokalaemia[a]	Case report / review details	References
Hyperthyroidism	Reports of thyrotoxic periodic paralysis[b] resulting from Graves' disease or transient thyrotoxic phase of painless thyroiditis complicated by ventricular tachycardia	[18,19,20]
Hypokalaemic periodic paralysis[c]	An overview of 27 cases of hypokalaemic periodic paralysis with reported cardiac complications	[21]
Panhypopituitarism (Sheehan's syndrome)	A 35-year-old female with PMVT in the setting of postpartum pituitary necrosis with hypokalaemia, hypomagnesaemia, prolonged Q-T	[15]
Gitelman's syndrome, Bartter's syndrome[d]	Reports of congenital hypokalemic hypomagnesaemic hypocalciuria with metabolic alkalosis in patients presenting with ventricular tachycardia	[22,23,24]
Steroid therapy	Reports of ventricular tachyarrhythmias in patients with hypokalaemia caused by steroid therapy	[25,26]
Licorice use	A 38-year-old female with recurrent PMVT secondary to persistent hypokalaemia necessitating > 40 DC shocks	[27]
Cesium chloride intake	A 47-year-old female taking cesium chloride (3 g/day) as a „strategy" to prevent breast cancer, hospitalised with PMVT secondary to hypokalaemia and prolonged Q-T	[28]
Therapeutic hypothermia	A report of 11 patients who developed sustained PMVT associated with potassium decline during therapeutic hypothermia, 8 of these occurred during the cooling phase	[29]

DC – direct current; PMVT – polymorphic ventricular tachycardia
[a]Well established causes (such as diarrhoea, vomiting, use of diuretics, laxatives) were excluded.
[b]This disorder, secondary to thyrotoxicosis, is characterised by abrupt onset of hypokalaemia and paralysis, and affects mostly Asian men.
[c]Hypokalaemic periodic paralysis is a rare genetic skeletal muscle channelopathy characterised by episodic attacks of moderate to severe flaccid tetraparesis accompanied by hypokalaemia.
[d]As compared with Gitelman's syndrome, patients with Bartter's syndrome present at a younger age.

mary cardiac issues, but may be occasionally associated with endocrine and other disorders.

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References

1. Katayama Y, Takata N, Tamura T, et al. A case of primary aldosteronism due to unilateral adrenal hyperplasia. Hypertens Res 2005;28:379–384.
2. Calhoun DA. Aldosteronism and hypertension. Clin J Am Soc Nephrol 2006;1:1039–1045.
3. Monticone S, Burrello J, Tizzani D, et al. Prevalence and clinical manifestations of primary aldosteronism encountered in primary care practice. J Am Coll Cardiol 2017;69:1811–1820.
4. Buffolo A, Monticone S, Burrello J, et al. Is primary aldosteronism still largely unrecognized? Horm Metab Res 2017;49:908–914.
5. Funder JW, Carey RM, Mantero F, et al. The management of primary aldosteronism: case detection, diagnosis, and treatment: an Endocrine Society Clinical Practice Guideline. J Clin Endocrinol Metab 2016;101:1889–1916.
6. Williams TA, Reincke M. Diagnosis and management of primary aldosteronism: the Endocrine Society guideline 2016 revisited. Eur J Endocrinol 2018;179:R19-R29.
7. Gordon RD. The importance of not overlooking curable hypertension: primary aldosteronism rarely screened for reflecting poor uptake of Endocrine Society Guidelines. J Hypertens. 2016;34: 2143–2144.
8. Wolley MJ, Stowasser M. New advances in the diagnostic workup of primary aldosteronism. J Endocr Soc 2017;1:149–161.
9. Mulatero P, Stowasser M, Loh KC, et al. Increased diagnosis of primary aldosteronism, including surgically correctable forms, in centers from five continents. J Clin Endocrinol Metab 2004;89: 1045–1050.
10. Ghanem N, Altehoefer C, Thürl C, et al. Computertomographie und Magnetresonanztomographie in der Differenzialdiagnose von Nebennierenraumforderungen. Med Klin 2004;99:447–452.
11. Williams TA, Lenders JWM, Mulatero P, et al. Outcomes after adrenalecromy for unilateral primary aldosteronism: an international consensus on outcome measures and analysis of remission rates in an international cohort. Lancet Diabetes Endocrinol 2017;5:689–699.
12. Williams B, Mancia G, Siering W, et al. for the ESC Scientific Document Group. 2018 ESC/ESH Guidelines for the management of arterial hypertension. Eur Heart J 2018;39:3021–3104.
13. Wang W, Hu WL, Zhang XM, et al. Predictors of successful outcome after adrenalectomy for primary aldosteronism. Int Surg 2012;97:104–111.
14. Rossi GP, Bolognesi M, Rizzoni D, et al. Vascular remodeling and duration of hypertension predict outcome of adrenalectomy in primary aldosteronism patients. Hypertension 2008;51:1366–1371.
15. Shinde SD, Sabnis GR, Lanjewar CP, et al. A rare endocrine cause of electrical storm – a case report. Eur Heart J – Case Reports 2017;1:1–5.
16. Foglia PEG, Bettinelli A, Tosetto C, et al. Cardiac work up in primary renal hypokalemia-hypomagnesemia (Gitelman syndrome). Nephrol Dial Transplant 2004;19:1398–1402.
17. Khan IA. Clinical and therapeutic aspects of congenital and acquired long QT syndrome. Am J Med 2002;112:58–66.
18. Chang KY, Lee SH, Park SH, et al. Severe hypokalemia and thyrotoxic paralysis from painless thyroiditis complicated by life-threatening polymorphic ventricular tachycardia and rhabdomyolysis. Intern Med 2014;53:1805–1808.
19. Hakami O, Ahmad MA, Al Johani N. A case of nonfatal ventricular arrhythmia due to thyrotoxic periodic paralysis in a Saudi patient as an initial presentation of Grave's disease. Clin Med Insights Case Rep 2016;9:5–9.
20. Lee JI, Sohn TS, Son TS, et al. Thyrotoxic periodic paralysis presenting as polymorphic ventricular tachycardia induced by painless thyroiditis. Thyroid 2009;19:1433–1434.
21. Stunnenberg BC, Deinum J, Links TP, et al. Cardiac arrhythmias in hypokalemic periodic paralysis: hypokalemia as only cause? Muscle Nerve 2014;50:327–332.

22. Pachulski RT, Lopez F, Sharaf R. Gitelman's not-so-benign syndrome. N Engl J Med 2005;353:850–851.
23. Vanga SR, Annapureddy C, Biria M, et al. Monomoprhic outflow tract ventricular tachycardia: unique presenting manifestation of Gitelman's syndrome. J Atr Fibrillation 2010;2:229.
24. Rauf MA, Zef S, Adil M, et al. A 13-year-old girl with muscle weakness and ventricular tachycardia. Pak Heart J 2012;45:133–137.
25. Sakamoto M, Sato N, Goto M, et al. Three cases of corticosteroid therapy triggering ventricular fibrillation in J-wave syndromes. Heart Veseels 2014;29:867–872.
26. Araki T, Konno T, Itoh H, et al. Brugada syndrome with ventricular tachycardia and fibrillation related to hypokalemia. Circ J 2003;67:93–95.
27. Panduranga P, Al Rawahi N. Licorice-induced severe hypokalemia with recurrent torsade de pointes. Ann Noninvasive Electrocardiol 2013;18:593–596.
28. Saliba W, Erdogan O, Niebauer M. Polymorphic ventricular tachycardia in a woman taking cesium chloride. Pacing Clin Electrophysiol 2001;24:515–517.
29. Mirzoyev SA, McLeod C, Bunch J. Hypokalemia during the cooling phase of therapeutic hypothermia and its impact on arrhythmogenesis. Resuscitation 2010;81:1632–1636.
30. Podolec P, Kopeć G, Rubiś P, et al. Clinical classification of rare cardiovascular diseases and disorders: 2018 update. J Rare Cardiovasc Dis 2018;3:230–235.