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CASE REPORT

PRIMARY HYPERALDOSTERONISM IS AN UNUSUAL CAUSE OF PERIODIC PARALYSIS: A CASE REPORT

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Abstract:

Primary hyperaldosteronism a synonym for Conn's syndrome is characterized by hypernatremia, arterial hypertension, and, in certain situations, potentially fatal hypokalemia. A rare class of neuromuscular disorders known as periodic paralysis (PP) is brought on by an affection of the skeletal muscle's ion channels. In patients with hypokalaemic PP, potassium levels are normal in between attacks, but they remain low in those with secondary hypokalaemic PP. Although secondary causes of PP have been documented in the literature, the majority of cases are hereditary. We report the case of a 46-year-old man who had a history of hypertension and was admitted to the neurology ward after experiencing sudden onset weakness in all four limbs, primarily affecting the lower limbs, two days earlier. This present case demonstrates a peculiar and severe primary hyperaldosteronism manifested by PP.

Keywords: *Primary hyperaldosteronism, Conn's syndrome, Periodic Paralysis. Hypokalemic periodic paralysis*

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Introduction:

Primary hyperaldosteronism or Conn's syndrome is characterized by an independent and excessive production of aldosterone in the adrenal cortex[1]. It accounts for approximately 2% of cases of systemic arterial hypertension in unselected patients. Moreover, elevated renal potassium excretion can result in potentially severe and refractory hypokalaemia, which should always be ruled out in hypokalaemic hypertensive patients3. The clinical presentations of primary aldosteronism are headaches, paresthesia, muscle weakness, arterial hypertension, polyuria, and polydipsia, [2,3]

Hypokalemic periodic paralysis is a rare disorder characterized by transient attacks of flaccid paralysis of varying intensity and duration [4]. The condition has

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the potential to be life-threatening. Early detection and rapid diagnosis are crucial, as some of the underlying causes are correctable. Although mostly familial in etiology, several sporadic cases of different etiologies have been reported, including rare cause like primary hyperaldosteronism (PA)[5]. This article reports the case of a middle aged man presented as quadriparesis due to hypokalaemia as a result of PA.

Case report:

A 46-year-old male was admitted to the neurology department with the chief complaint of sudden weakness of all four limbs for the last 2 days. He had hypertension since last 5 years and irregularly on treatment. Weakness first appeared in bilateral lower limbs, symmetrical in onset and in next 6 - 8 h progressively involved upper limbs. There is also mild weakness of neck causing drooping of neck. He had no respiratory or swallowing difficulty no weakness facial muscles. On query, he had history of three episodes of limb weakness for last 3 years. Every time his weakness recovered completely with taking rest within a period of 2-3 days. His weakness was not provoked by rest following intense exercise or by a high-carbohydrate meal. He denied any history of upper respiratory tract infection and diarrhea. Patient denies any history of fever, joint pain, trauma, weight loss, heat intolerance, excessive sweating and polyuria. He denied any bowel, bladder involvement.

On physical exam, the patient's pulse rate was P: 70 b/min, regular, and his blood pressure was 220/110 mm of hg, with no postural drop. No thyromegaly or lymphadenopathy were appreciated. Cardiac examination revealed tachycardia with a regular rhythm and no murmurs. Examinations of the chest and abdomen were unremarkable. There were no deformities or edema of the extremities, and distal pulses were present and equal bilaterally. Neurologic examination revealed the cranial nerve intact. There was grossly flaccid paralysis of all extremities, which involved the proximal and distal muscles and included the hips and shoulders. Muscle powers in the lower and upper limbs were 2/5 and 3/5, respectively. Sensation was intact, but deep tendon reflexes were diminished.

Investigations revealed low potassium levels (1.34 mmol/L) and normal renal function, liver function, and thyroid function tests (Table 1). ECG findings revealed flattening of the T wave with prolongation of the PR interval and QRS duration, suggesting hypokalaemia (Fig. 1). Serum electrolytes suggested severe hypokalemia with metabolic alkalosis. Urinary chloride level was 36 mmol/L, urinary potassium 33 mmol/L, and urinary potassium 40 mmol/L, and serum PTH was 74.3 pg/mL. USG for abdomen shows bilaterally raised renal cortical echogenicity but no adrenal mass, and eGFR 53.. The patient was managed on the line of hypokalemic periodic paralysis with potassium supplementation. To rule out any possibility of Cushing's syndrome, the serum cortisol (Morning sample) level was found to be7.5 µg/dl (7.26 – 32.28 µg/dl)Case report:

Table - I

Laboratory test of Serum potassium , renal n, liver n and thyroid function

Sodium(Na+)	143.00 mmol/L	138.0 mmol/L	139.0 mmol/L	143.0 mmol/L	139
Potassium(K+)	1.34 mmol/L	2.0 mmol/L	2.2 mmol/L	2.6 mmol/L	3.6
Chloride(Cl-)	100.00 mmol/L	105.0 mmol/L	105.0 mmol/L	107.0 mmol/L	111
Carbondioxide(TCO2)	29.00 mmol/L	26.0 mmol/L			

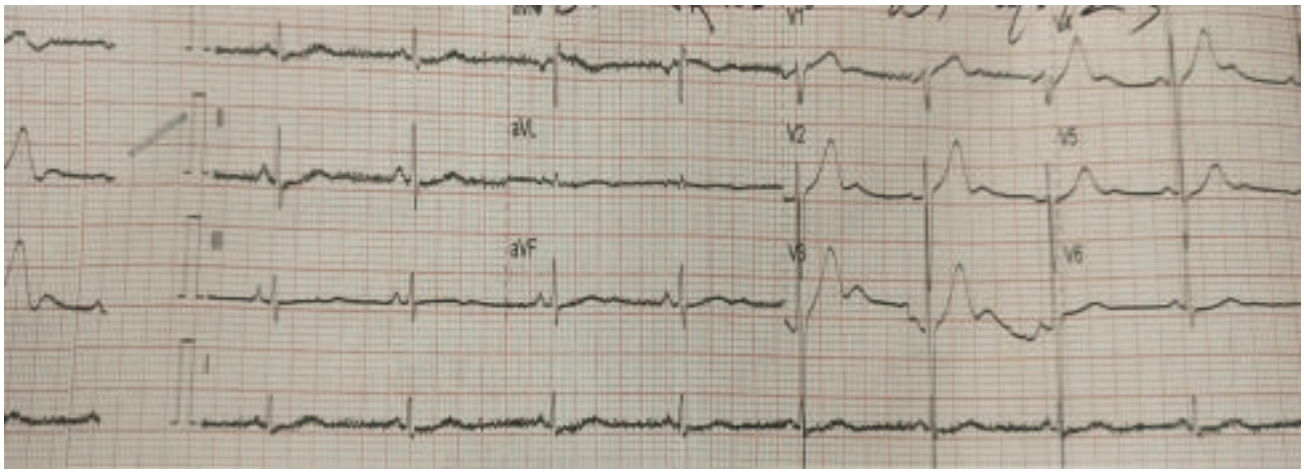

Fig:1 *ECG finding revealed flattening of T wave with prolongation of PR interval and QRS duration suggestive of hypokalemia*

In view of hypertension, hypokalemia, metabolic alkalosis, and normal serum cortisol, serum aldosterone and plasma renin activity were measured after normalizing plasma potassium levels. Further laboratory studies revealed an elevated plasma aldosterone level, with renin activity levels being inappropriately reduced (Table 2).

Plasma aldosterone concentration (PAC) upright was 446.20 pg/ml (normal 30–400 pg/ml), plasma renin activity (PRA) was 1.02 pg/ml (normal 4.0–37.52 pg/ml), and the Aldosterone–Direct Renin concentration ratio (ARR) was 437.45:1 (primary aldosterinism >91 pmol/L/µIU/ml). ARR are considered sensitive test and lack specificity. Upto 50% of elevated APR may be "false-positives". So we go for confirmatory testing; an aldosterone suppression test with a saline infusion test was done. Plasma aldosterone was found to be non-suppressible with a level of 495.40 pg/ml (normal 30.0–400.0 pg/ml, 5 ng/dL) after the saline infusion test (Table III).

To find out its cause, a CECT of the abdomen was performed. CECT of abdomen showed no adrenal adenoma or hyperplasia (Fig:2) . So the final diagnosis is Conn's syndrome with a rare presentation of quadriparesis and recurrent hypokalaemic paralysis. The patient was managed with spironolactone 100 mg and amlodipine 20 mg. The patient responded very well to treatment, and the patient's BP and serum K+ levels were well controlled with the drugs.

Table II

Laboratory test for plasma aldosterone level with renin activity levels

Test	Result	Reference value
Aldosteron	446.20 pg/ml	Early Morning :20.0 – 180.0 pg/ mlUpright 2 hours :30.0 – 400pg/ml
Renin	1.02 pg/ml	4.0 – 37.52 pg/ml
Cortisol (Morning sample)	7.5 µg/dl	7.26 – 32.28 µg/dl
Serum Aldosterone(Upright)	446.20 pg/ml	Early morning: 20-180 pg/mlUpright 2 hours: 30-400 pg/ml
Plasma Direct Renin Concentration(fasing)	1.02 pg/ml	4.0 – 37.52 pg/ml
Aldosteron –Direct Renin concentration Ratio(ARR)	437.45 : 1	>91 pmol/L /µIU/ml : PrimaryAldosterinism probable

Table III

Results of saline suppression test.

Test	Result	Normal rang Reference value es
Serum. Aldosterone(First sample- Before saline infusion)	633.90 pg/ml	Early Morning : 20.0 – 180.0 pg/ mlUpright 2 hours : 30.0 – 400.0 pg/ml
Fasting plasma Renin	1.10 pg/ml	4.0 – 37.52 pg/ml
Serum Aldosterone(Last sample-	495.40 pg/ml	Early Morning : 20.0 – 180.0 pg/ml
After saline infusion)		Upright 2 hours : 30.0 – 400.0 pg/ml

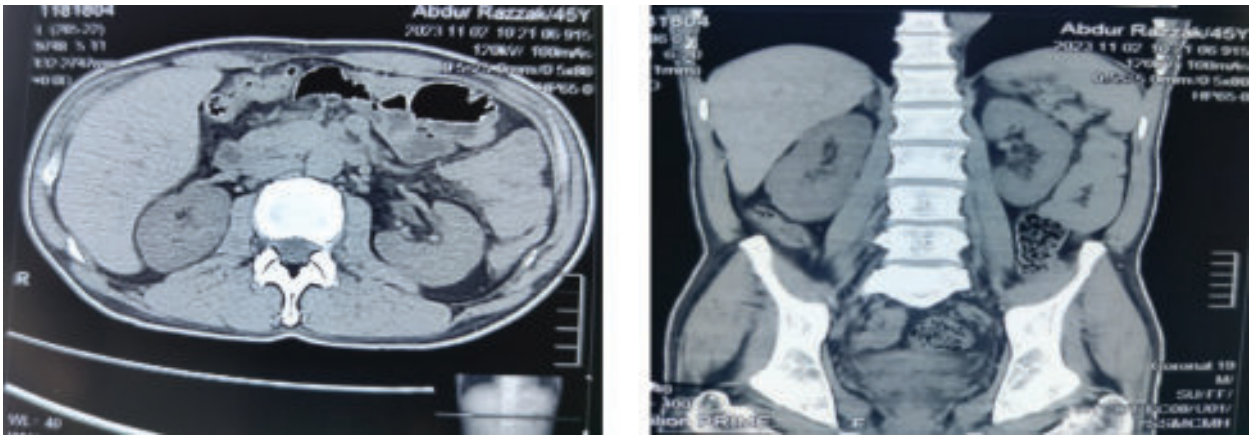

Fig.-2: *CT features consistent with mild hepatomegaly tiny right renal calculi but no adreanal adenoma/ hyperplasia*

Discussion:

Periodic paralysis (PP) is a rare group of neuromuscular diseases that occur due to the affection of the ion channels of the skeletal muscle. Typically, blood potassium levels are used to distinguish between hypokalemic and hyperkalemic PP [6]It is estimated that 1 in 100,000 people have hypokalemic PP, however the precise prevalence is unknown [7]]. Although secondary causes of PP have been documented in the literature, the majority of cases are hereditary. . THyrotoxic hypokalemic poisoning (PP) is the most commonly acquired form of secondary PP and a rare but potentially fatal complication of a thyrotoxic state[8]

This case illustrates the uncommon case of a middle aged man with poorly controlled HTN and PA diagnosis after three episodes of severe hypokalemia. Once described as a rare disease, PA diagnosis has increased prevalence mainly due to wide screening in hypertensive patients [6].

PA diagnosis was formerly thought to be an uncommon disease, but it has become more common as a result of widespread screening for hypertensive patients 8.PP episodes can last anywhere from a few minutes to several days. While the majority recover on their own, severe potassium deficiency can result in tetraplegia, respiratory muscle failure, and/or fatal arrhythmias [6,7].

As demonstrated in this case report, early causal investigation for hypokalemia while treating the electrolyte disturbances is fundamental. The most common causes include excessive thiazide diuretics use, laxatives, diarrhea, and vomiting episodes . Renal loss of potassium also may occur with Type I and Type II renal tubular acidosis. Other rarer etiologies like thyrotoxic periodic paralysis, Andersen-Tawil, Batters, Gilteman syndromes, and familial hypokalemic periodic paralysis should be evaluated if the initial diagnostic workup is unclear [9]. In the presented case, they were ruled out based on physical examination and laboratory results. Primary hyperaldosteronism, also known as Conn's syndrome, is the second most frequent endocrinopathy causing PP [8], when severe hypokalemia occurs, as in our case. This presentation is reported more frequently in East Asians and is very rare in Western countries [9]

The aldosterone-producing adrenal adenoma is the main cause of primary aldosteronism. Clinical manifestations include arterial hypertension, muscle weakness, headache, paresthesia, polydipsia, and polyuria [9]. The aldosterone to renin ratio is used to support the diagnosis (raised aldosterone levels with renin levels being normally low). Several confirmatory tests such as oral sodium loading test, saline infusion test, and furosemide upright test are used. CT imaging is helpful in detecting adrenal lesions but it carries significant false results: idiopathic adrenal hyperplasia or small adenomas (< 1 cm) can be falsely interpreted as normal in CT, and non-functioning adrenal macroadenomas can be misinterpreted as functioning tumors [10]. Adrenal Vein Sampling (AVS) may be required to confirm lateralization before surgery11. Additionally, surgical removal of the unilateral tumor has been shown to cure HTN in 50-60% of patients [11].

Patients with PA have higher cardiovascular and renal risks compared to patients with essential HTN, so early diagnosis is important to prevent comorbidities and mortality [7,8]. In our case CT scan is normal and there is no adenoma or adrenal hyperplasia, so did not go for AVS (Fig:2) and planned for medical treatment . Due to the higher cardiovascular/renal risk in patients with PA compared to those with essential HTN, early diagnosis is vital to prevent comorbidity and mortality[9].

Conclusion:

A high clinical index of suspicion of Conn's syndrome should be kept in every hypertensive and hypokalemic patients to make its early diagnosis. More importantly, the detrimental effect brought about by aldosterone in multiple tissues may go far beyond a pure complication from hypertension, and early treatment, surgically (adrenalectomy) or medically (spironolactone) will effectively relieve these adverse events and potentially prevent permanent end organ damage.

Conflict of Interest:

The authors stated that there is no conflict of interest in this study

Funding:

This research received no external funding.

Ethical consideration:

The study was conducted after approval from the ethical review committee of Sir Salimullah Medical College. The confidentiality and anonymity of the study participant was maintained.

Consent:

For the purpose of publishing this case report and any related photos, the parents are written informed consent was acquired.

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