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Case Report

Conn's Syndrome. A Clinical Case of Primary Hyperaldosteronism

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Abstract

The article presents a clinical case of primary hyperaldosteronism (PHA). PHA (Conn syndrome) - characterized by hyperproduction of aldosterone occurs with arterial hypertension (AH), damage to the cardiovascular system, sodium retention and accelerated potassium release, which leads to hypokalemia. Treatment is based on adrenalectomy for aldosterone-producing adrenal adenoma (APAA) or long-term drug therapy with mineralocorticoid receptor antagonists in bilateral adrenal hyperplasia. The presented clinical case reflects the urgency of the problem of timely diagnosis and treatment of PHA in young patients with resistant hypertension. Since high levels of ALT (208 units/l - 380 units/l - 759 units/l) and AST (669 units/l - 1223 units/l - 2152 units/l) were detected in the patient's blood, liver damage was suspected. Therefore, a differential diagnosis was carried out, which included diseases with its lesion. Apparently, in terms of differential diagnosis, the proposed article may be useful for gastroenterologists.

Keywords: Primary Hyperaldosteronism; Cohn Syndrome; Aldosterone-Producing Adenoma; Angiotensin-Renin Ratio; ALT; AST; High Level

Abbreviations

ACTH: Adrenocorticotropic Hormone; AH: Arterial Hypertension; ALT: Alanine Aminotransferase; APAA: Aldosterone-Producing Adrenal Adenoma; APTT: Activated Partial Thrombin Time; ARR: Aldosterone-Renin Ratio; AST: Aspartate Aminotransferase; BBT: Biochemical Blood Test; BMI: Body Mass Index; BP: Blood Pressure; CI: Color Index; CRF: Chronic Renal Failure; CRP: C Reactive Protein; DRC: Direct Renin Concentration; EMC: Emergency Medical Care; ECG: Electrocardiography; Eo: Eosinophils; Er: Erythrocytes; f/v: Field of View; FRM: Frequency of Respiratory Movements; GBT: General Blood Test; GCS: Glucocorticosteroids; GUA: General Urine Analysis; Hb: Hemoglobin; Ht: Hematocrit; ICU: Intensive Care Unit; INT: International Normalized Time; i/m: Intramuscularly; i/v: Intravenously; Leu: Leukocytes; Lym: Lymphocytes; MCRA: Mineralocorticoid Receptor Antagonists; Mo: Monocytes; MRI: Magnetic Resonance Imaging; MRS: Micro-Reaction to Syphilis; PHA: Primary Hyperaldosteronism; Pt: Platelets; RES: Rate of Erythrocyte Sedimentation; Ro: Rods; Se: Segments; u/s: Under the Skin; USI: Ultrasound Investigation

Patient (female) K., 45 years old, was admitted to hospital No. 12 in Kazan city on 12.01.2022 with complaints of general weakness, headache, numbness and weakness in the arms and legs, an increase in systolic blood pressure to 180 mmHg.

Anamnesis morbi

Since 2010, episodes of increased blood pressure have begun to bother. In May 2014, for the first time, a decrease in K+ to 3.2 mmol/l was observed in blood tests. But then (according to the patient) no one attached much importance to this. In December 2020, in preparation for surgery on a curved nasal septum, the attending physician noticed a decrease in K^+ to 2.3 mmol/L. She took potassium preparations (Asparkam and Panangin). Muscle weakness in the extremities, especially in the legs, and an increase in blood pressure with maximum systolic blood pressure up to 180 mmHg also began to worry periodically. Antihypertensive therapy has no effect. Blood test from 30.04.2021: K^+ - 2.22 mmol/l. 05.05.21 an ECG study was performed: sinus bradycardia with a heart rate of 52 per minute, intraventricular block, the U-wave, QT extension, signs of hypokalemia. A cardiologist's consultation is recommended. The cardiologist suggested the diagnosis of "Conn's syndrome". She was referred to an endocrinologist. During the summer and autumn of 2021, she did not apply anywhere. On 01.12.21, she turned to an endocrinologist. It is recommended to perform ultrasound of the thyroid gland, MRI of the retroperitoneal space, donate blood for hormones: aldosterone and renin. On 08.12.21, an MRI of the retroperitoneal space was performed: a nodular thickening in the left adrenal gland up to 0.95 cm was detected. On 17.12.21, she was re-consulted by an endocrinologist with the results of tests: an in-

crease in aldosterone to 74.6 ng/dl, a decrease in renin to 0.5 μmed/ml and hypokalemia, an increase in blood pressure to 170/110 mmHg, cardiac arrest and palpitations were detected in the blood. Prescribed treatment: Selenium 1 tab. 100 mg and Panangin-Forte 1 tab. It was recommended to consult an endocrinologist. It was decided to perform an operation to remove the formation in the adrenal gland after the New Year holidays. Deterioration of the condition since 09.01.22: increased muscle weakness and numbness in the arms and legs. The increase in symptoms is associated with a stressful situation caused by the flight from Perm city to Kazan city. On 10.01.22, she was delivered by the emergency medical care (EMC) to the neurological department of hospital No. 12 in Kazan city. Due to a life-threatening decrease in K^+ on 12.01.22, she was transferred to the intensive care unit f(ICU) or further examination and treatment.

Anamnesis vitae

She worked as a head teacher at a gymnasium. It's not working at the moment. Married, have two children (2 Cesarean sections, 1 frozen pregnancy). Father also had episodes of increased blood pressure (to what numbers he does not remember), mother had arterial hypertension (AH). There are no allergic reactions. Does not smoke, does not drink alcohol. Previous illnesses: AH, chronic cystitis, COVID-19 in October 2021. She did not serve in the army.

Status praesens objectives

Height: 168 cm, weight: 60 kg, BMI = 21 kg/m^2. The condition is severe, the consciousness is clear. The skin and visible mucous membranes are physiologically colored. The peripheral lymph nodes are not enlarged, there is no swelling.

Respiratory system

No special features, frequency of respiratory movements (FRM) - 18 per minute. Breathing is vesicular, there is no wheezing.

Cardiovascular system

The area of the heart does not appear to be changed. The boundaries of the heart are within normal limits. The heart tones are of normal sonority. Systolic noise at all points except the projection point of the tricuspid valve. Heart rate is 96 per minute. Pulse of satisfactory filling, blood pressure 160/80 mmHg.

Digestive system

The tongue is overlaid with a white coating on the back. The belly is soft, painless. The liver and spleen are not enlarged.

The urinary system is without features, F.I.Pasternatsky's symptom (a symptom of pounding) is negative on both sides. Urination is painless, diuresis is normal.

The following laboratory and instrumental studies were carried out (normal values are indicated in parentheses).

General blood test (GBT) from 10.01.22: erythrocytes (Er): 4.8 x10^{12}/l (3.7-4.7 x10^{12}/l), hemoglobin (Hb): 128 g/l (120-140 g/l), color index (CI): 0.8 (0.85-1.05), platelets (Pt): 378x10^9/l (200-400x10^9/l); Hematocrit (Ht): 37.3% (35-50%); Leukocytes (Leu): 12.3x10^9/l (4.0-9.0x10^9/l), the rate of erythrocyte sedimentation (RES): 15 mm/h (2-15 mm/h).

GBT from 11.01.22: Er: 4.52x10^{12}/l, Hb: 118 g/l, CI: 0.78, Pt: 344x10^9/l; Ht: 32.4%; Leu: 10.8x10^9/l, eosinophils (Eo): 1%, rods (Ro): 8%, segments (Se): 80%, lymphocytes (Lym) - 9%, monocytes (Mo): 2%, RES: 17 mm/h.

GBT from 12.01.22: Er: 4.55x10^{12}/l, Hb: 125 g/l, CI: 0.82, Pt: 333x10^9/l; Ht: 38.4%, Leu: 27.78x10^9/l, Eo: 0%, Ro: 11%, Se: 80%, Lym - 4%, Mo: 5%, RES: 10 mm/h.

GBT from 01.13.12: Er: 4.7 x10^{12}/l, Hb: 125 g/l, CI: 0.79, Pt: 368x10^9/l; Ht: 33.8%; Leu: 27.3x10^9/l, RES: 20 mm/h.

General urine analysis (GUA) from 10.01.22: Quantity - 100ml. specific gravity 1020, color – straw yellow, acidic reaction, slight sediment, protein – 0.033, Leu 1-3 in the field of view (f/v), Er - 0-2 in f/v, flat epithelium 7-10 in f/v.

GUA from 01.13.12: Quantity - 100ml. specific gravity 1010, color – straw yellow, acidic reaction, slight sediment, protein – 0.3, Leu 1-2 in f/v, Er. 75-95 in f/v, flat epithelium 1-2 in f/v.

Biochemical blood test (BBT) from 10.01.22: calcium: 1.19 mmol/l (1.05-1.3 mmol/l), potassium: 1.55 mmol/l (3.5-5.5 mmol/l), sodium: 141 mmol/l (N 135-155 mmol/l), blood urea: 4.5 mmol/l (2.8-7.2 mmol/l), glucose: 4.9 mmol/L (3.5-5.5 mmol/l), blood amylase: 73.9 I/l (22-80 I/l), total protein: 72.7 g/l (66-83 g/l), blood creatinine: 67 mmol/l (59-104 mmol/l), Quick prothrombin: 88.1% (70-130%), fibrinogen: 4.0 g/l (2-4 g/l), activated partial thrombin time (APTT): 35.1 (35-40), international normalized time (INT): 1.1 (up to 1.1), total bilirubin: 10.7 mmol/l (5-21 mmol/l), bilirubin direct: 1.7 mmol/l (3.4 mmol/l), bilirubin indirect: 9 mmol/l (1.7-17.0 mmol/l), total cholesterol: 6.1 mmol/l (up to 5.2 mmol/l), alanine aminotransferase (ALT): 208 units/l (<40 units/l), aspartate aminotransferase (AST): 669 units/l (<40 units/l).

BBT from 11.01.22: calcium: 1.19 mmol/l, potassium: 1.47 mmol/l, sodium: 141 mmol/l, ALT: 199 units/l, AST: 630 units/l.

BBT from 12.01.22: calcium: 1.1 mmol/l, potassium: 1.41 mmol/l, sodium: 145 mmol/l, blood urea: 4.7 mmol/l, blood amylase: 60.9 I/l, total protein: 67.4 g/l, blood creatinine: 63 mmol/l, total bilirubin: 9.3 mmol/l, direct bilirubin: 2.0 mmol/l, indirect bilirubin: 7.3 mmol/l, alanine ALT: 380 units/l, AST: 1223 units/l, C reactive protein (CRP): 4.4 mg/l (up to 5 mg/l).

BBT from 01.13.12: calcium: 0.99 mmol/l, potassium: 1.42 mmol/l, sodium: 141 mmol/l, blood urea: 4.7 mmol/l, blood amylase: 74 E/l, total protein: 63 g/l, blood creatinine: 48 mmol/l, total bilirubin: 7.6 mmol/l, direct bilirubin: 3.3 mmol/l, indirect bilirubin: 4.3 mmol/l, ALT: 759 units/l, AST: 2152 units/l, procalcitonin: 0.7 ng/ml (up to 0,5 ng/ml).

Blood test for hormones from 01.19.12: cortisol (without dexamethasone test)<0.8mcg/dl (norm before 10 a.m. - 3.7-19.4 mcg/dl, after 17h – 2.9-17.3 mcg/dl), adrenocorticotropic hormone (ACTH) < 0.8 mcg/dl (norm 0-46 mcg/dl), aldosterone – 209 pg/ml (norm 30 to 172 pg/ml), renin<0.5 micrME/ml (the norm for blood donation in a horizontal position is 2.8-9.9 micrME/ml, in a vertical position 4.4-46.1 micrME/ml). The calculation of aldosterone-renin ratio (ARR) is impossible due to the renin value below the linearity limit.

01.20.12: cortisol (with dexamethasone test) < 1.5 mcg/dl. Normally, cortisol decreases to less than 1.8 mcg/dl (50 mmol/l).

Micro-reaction to syphilis (MRS) from 10.01.22: negative. Antibodies to HIV from 12.01.22: not detected.

Enzyme immunoassay (ELISA) dated 12.01.22: Hbs antigen and antibodies to viral hepatitis C were not detected.

Ultrasound investigation (USI) of the abdominal cavity 11.01.22: Liver: the size of the right lobe is 110 mm, the diameter of the left lobe is 65 mm. The contours are clear and even. The structure is homogeneous, the echogenicity is normal. The intrahepatic bile ducts are not dilated. The vascular pattern has not been changed. Gallbladder: dimensions: 70x20 mm. The walls are normal. The holedoh is 4 mm. The portal vein is 10 mm. Pancreas: the size is not enlarged. The contours are clear and even. Echogenicity is normal. Spleen: 100x35 mm. The contours are clear and even. The structure is homogeneous. Focal changes: not detected. The splenic vein is 5 mm. No free liquid has been detected.

Electrocardiography (ECG) from 11.01.22: sinus rhythm with a heart rate of 77 beats per minute. The electrical axis of the heart is vertical. Violation of atrial and intraventricular conduction, depression ST – 1-1.8 mm in II, aVF, V4-V6, weakly "+" z. T in rel. I, V5, V6. Increasing the QT interval to 0.6 (Figure 1).

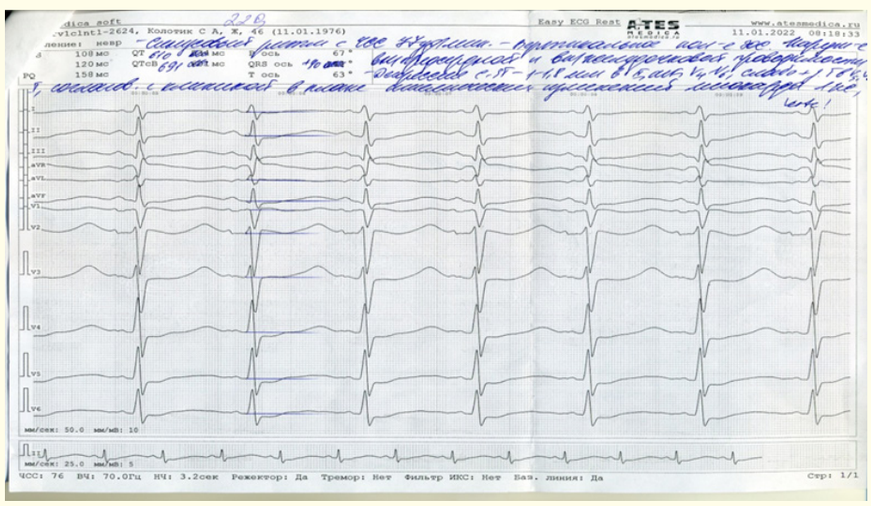

Figure 1: ECG from 11.01.22.

ECG from 12.01.22: sinus rhythm with a heart rate of 71 beats per minute. The electrical axis of the heart is vertical. Depression of ST – 1-2 mm in II, III, aVF, V4-V6 with a transition to weakly "+" z. T. An increase in the QT interval to 0.6. Without significant dynamics (Figure 2).

Based on the above, a diagnosis is made: primary hyperaldosteronism (Conn's syndrome). The diagnosis was made on the basis of complaints of general weakness, headache, numbness and weakness in the arms and legs, an increase in systolic blood pressure to 180 mmHg. History of the disease: BBT from 30.04.2021: K^+ - 2.22 mmol/l, ECG from 05.05.21: signs of hypokalemia. MRI from 08.12.21: a nodular thickening in the left adrenal gland up to 0.95cm was detected. On 17.12.21, she was re-consulted by an endocrinologist with the results of tests: an increase in aldosterone to 74.6 ng/dl, a decrease in renin to 0.5 μmed/ml and hypokalemia, an increase in blood pressure to 170/110 mmHg were detected in the blood. Laboratory and instrumental research data: BBT from 10.01.22: K^+ - 1.55 mmol/l, BBT from 11.01.22: K^+ - 1.47 mmol/l, BBT from 12.01.22: K^+ - 1.41 mmol/l, BBT from 13.01.22: K^+ - 1.42

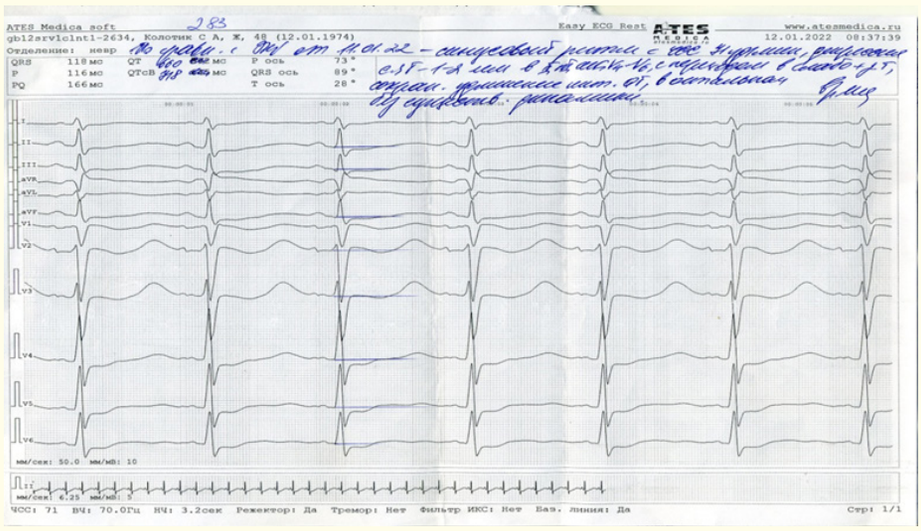

Figure 2: ECG from 12.01.22.

mmol/l. ECG from 11.01.22: sinus rhythm with heart rate 77 beats per minute. The electrical axis of the heart is vertical. Violation of atrial and intraventricular conduction, depression ST – 1-1.8 mm in II, aVF, V4-V6, weakly "+" the prong of T in I, V5, V6. Increasing the QT interval to 0.6.

A course of therapy was conducted: In the neurological department from 09.01.22 to 10.01.22: bed rest, Sol. Prednisoloni 1000 mg + Sol. Natrii chloridi 0.9% - 250.0 i/v cap., Sol. Mexidoli 5.0 + Sol. Natrii chloridi 0.9% - 250.0 i/v cap., Sol. Ceraxoni 4.0 (1000 mg) + Sol. Natrii chloridi 0.9% - 250.0 i/v cap., Sol. Proserini 0.05% - 1.0 under the skin (u/s), Sol. Thiamini chloridi 5% - 2.0 intramuscularly (i/m), Tab.Enalaprili 2.5 mg 2 times a day, Tab. Amlodipini 5 mg 1 time per day, Tab. Indapamide 2.5 mg 1 time per day.

Against the background of the treatment, there was a deterioration in the condition. Complaints of pronounced weakness in the limbs, dizziness, tingling in the hands. Transferred to the intensive care unit.

From 11.01.22: Sol. Kalii chloridi 4% 60.0 + Sol. Glucosae 5% - 250,0 + Sol. Actrapidi 2 ED i/v drip 2 times a day., Sol. Prednisoloni 1000 mg + Sol. Natrii chloridi 0.9% - 250.0 i/v drip, Sol. Heptrali 800 mg + Sol. Natrii chloridi 0.9% - 100.0 i/v drop, Tab.Enalaprili 2.5 mg 2 times a day, Tab. Verospironi 100 mg. Since 12.01.22g. added to the treatment: Sol. Proserini 0.05% - 1.0 u/s, Sol. Thiamini chloridi 5% - 2.0 i/m, Sol. Mexidoli 5.0 + Sol. Natrii chloridi 0.9% - 250.0 i/v drip, Sol. Ceraxoni 4.0 (1000 mg) + Sol. Natrii chloridi 0.9% - 250.0 i/v drip, Tab. Amlodipini 5 mg 1 time per day, Tab. Indapamidi 2.5 mg 1 time per day.

The final diagnosis is Primary hyperaldosteronism (Conn's syndrome).

Taking into account the patient's complaints and anamnesis, clinical manifestations – unsatisfactorily controlled hypertension, pronounced general and muscular weakness, laboratory data (hypokalemia, high aldosterone, low renin, unilateral adrenal gland formation according to MRI data), surgical treatment and ECG monitoring are recommended for the patient. 28.01.22 laparoscopic adrenalectomy on the left was performed.

Blood tests after surgery

GBT from 02.01.12: Er: 4.22x1012/l, average volume of erythrocytes: 81fl (80-100fl); Hb: 115 g/l, CI: 0.82, Pt: 294x10^9/l; average platelet volume: 8.32 (7.4-10.4fl); Ht: 34.4%; Leu: 9.7x10^9/l, Eo: 1%, rods: 1%, Ceg: 64%.

BBT from 01.02.22: calcium: 2.24 mmol/l, potassium: 5.1 mmol/l, sodium: 138.6 mmol/l, blood urea: 5.26 mmol/l, glucose: 5.19 mmol/l, total protein: 77.2 g/l, blood creatinine: 73.2 mmol/l, total bilirubin: 8.5 mmol/l, ALT: 32 units/l, ACT: 24 units/l.

02.03.2012 discharged in satisfactory condition, postoperative wounds healed by primary tension.

Recommendations

Given the long-term use of glucocorticosteroids (GCS) in the preoperative period and low cortisol values, it is recommended to monitor the level of ACTH and blood cortisol after 2 weeks.

If adrenal insufficiency is suspected (hypotension, tachycardia, increased weakness, lack of appetite and other signs), it is recommended to take cortef 15-20 mg per day or prednisone 5-10 mg per day. Initially, blood was taken for ACTH and cortisol.

In case of deterioration of well–being against the background of stressful situations or physical exertion - prophylactic intake of prednisone 5 mg orally and hydrocortisone (cortef) 20mg inside.

In case of colds (temperature over 38^0C) - prophylactic intake of prednisone 5 mg orally and hydrocortisone (cortef) 20mg inside.

For small and short-term surgical interventions (tooth extraction, etc.), 25-100 mg of hydrocortisone (solucortef) should be administered once in the next 1-3 months 1-1.5 hours before the procedure.

With planned major surgical interventions in the next 1-3 months, 1-1.5 hours before surgery, i/m introduce hydrocortisone 100mg (solucortef), then i/m administration of hydrocortisone (solucortef) 75-100 mg every 4-8 hours as with a gradual dose reduction during the first 3 days.

At first, after discharge, the patient complained of general weakness, fatigue, hypotension and visual impairment. The maximum rise in blood pressure is up to 140/90 mmHg. He feels good now.

Dynamic analyses

GBT from 02.16.12: Er: 4.3 $x10^{12}$/l, average volume of erythrocytes: 85fl; Hb: 119 g/l, CI: 0.82, Pt: $253x10^9$/l; average platelet volume: 8.3f); Ht: 37%; Leu: $7.4x10^9$/l, Eo: 3.2%, segments: 50.9%, L – 35%, Mo: 8.7%, RES: 22 mm/h.

BBT from 02.16.12: calcium: 2.34 mmol/l, potassium: 5.2 mmol/l, sodium: 137 mmol/l, glucose: 5.14 mmol/l.

Hormones from 02.16.12: ACTH: 31.4 pg/ml; aldosterone: 7.2 ng/dl, cortisol: 11.2 mcg/dl.

Prolonged use of systemic GCS (about 1 month) could cause loss of bone mineral density (resorption) and increased calcium in the blood, since GCS often lead to secondary hyperparathyroidism, which, in turn, is the cause of glucocorticoid osteoporosis.

Primary hyperaldosteronism (Conn's Syndrome)

Primary hyperaldosteronism (PHA) is a syndrome characterized by arterial hypertension (AH) as a result of autonomous (or relatively autonomous) hyperproduction of aldosterone.

An increase in aldosterone levels is the cause of the clinical and laboratory components of the syndrome: hypertension, damage to the cardiovascular system, sodium retention and accelerated potassium release, which leads to hypokalemia [2].

PHA is also known as Conn's syndrome (named after the researcher who first described the disease, its prevalence and treatment) [3].

Among the causes of PHA are:

- Aldosterone-producing adrenal adenoma (APAA, Conn's syndrome);
- Unilateral or bilateral adrenal hyperplasia;
- In rare cases: hereditary PHA (familial PHA type 1 – sPGA-1 (glucocorticoid-suppressed hyperaldosteronism), familial PHA type 2 – sPGA-2, familial PHA type 3 – sPGA-3, multiple endocrine neoplasia type 1 – MEN 1), adrenocortical cancer [4].

Previously, most experts estimated the prevalence of PHA to be less than 1% of patients with essential hypertension, and it was also assumed that hypokalemia was an indispensable criterion for this diagnosis. The accumulated data led to a revision of the indicators: prospective studies have demonstrated 5-10% of cases of PHA among patients with hypertension. Patients with PHA have a higher cardiovascular morbidity and mortality than patients isolated by age and gender with the same degree of increase in blood pressure (BP) with essential hypertension [8].

Pathogenesis of various forms of hyperaldosteronism: the physiological mechanism of aldosterone concentration regulation is associated with fluctuations in the effective filtration pressure in the afferent arterioles of the glomeruli of the kidney. In order to maintain the filtration pressure at an effective level, a cascade of biochemical changes is launched, which is known as the "renin-angiotensin system". A decrease in pressure in the afferent arterioles of the glomeruli reflexively activates the excretion of renin by the juxtaglomerular apparatus. By acting on angiotensinogen formed in the liver, renin cleaves the decapeptide angiotensin I from it. The latter, in turn, under the influence of the angiotensin-converting plasma enzyme, is transformed into a powerful pressor agent angiotensin II, which:

- Increases systemic blood pressure;
- Selectively increases the tone of the efferent arteriole;
- Activates the secretion of aldosterone by the adrenal cortex.

Aldosterone increases the concentration of sodium in plasma by increasing its reabsorption, reduces the concentration of potassium by accelerating its secretion. As a result of sodium retention, the osmotic pressure of plasma increases, and the volume of circulating blood increases. Additionally, high sodium levels sensitize the vascular wall to the effects of pressor agents. As a result of the multicomponent operation of this homeostatic mechanism, effective filtration pressure in the kidney is maintained.

Hypertension is one constant symptom. The incidence of malignant hypertension in PHA is 6-9%, the incidence of vascular complications is 20-25%. Clinically, hypertension is manifested by headache, dizziness, the appearance of "flies" in front of the eyes, etc. Hypertension in PHA varies from malignant, resistant to antihypertensive therapy, to moderate and mild, correctable with small doses of antihypertensive drugs. It is believed that the higher the concentration of aldosterone, the higher the blood pressure values. Hypertension can be of a crisis nature (up to 50%), or it can be constant.

Neuromuscular conduction and excitability disorders occur in 35-75%. The main symptoms are muscle weakness, paresthesia, seizures, bradycardia, rarely tetany. In recent studies, hypokalemia is detected in a small number of PHA patients (9%). Serum potassium concentrations of less than 3.5 mmol/l are detected in half of patients with APA. Thus, with regard to the diagnosis of PHA, hypokalemia has low sensitivity and specificity, the value of this symptom in relation to the prognosis of the disease is also not high.

Changes in renal tubule function (observed in 50-70% of cases). The clinical symptoms of kidney disorders can be represented by thirst, polyuria, and nocturia [2].

At the outpatient stage, the diagnosis of PHA causes certain difficulties, which, on the one hand, is due to the relatively rare frequency of the disease, on the other hand, insufficient awareness of doctors about its clinical manifestations and the diagnostic algorithm [5].

In the presence of AH in a patient with an adrenal gland tumor, it is recommended to determine the ratio between the level of aldosterone and plasma renin activity (direct renin concentration - DRC) for differential diagnosis and exclusion of primary hyperaldosteronism. In the absence of hypertension in the patient, diagnosis of primary hyperaldosteronism is not recommended. The determination of the aldosterone-renin ratio (ARR) should be carried out in the early morning hours against the background of a salt diet, provided there are no diuretics for 4 weeks before the study [1].

In accordance with Russian and European clinical guidelines for the management of patients with PHA, diagnosis is a three-step process:

- Screening study of the aldosterone-renin ratio (ARR) in patients with hypertension at risk of PHA;
- Upon receipt of a positive result, that is, if the ARR is above the diagnostic threshold value (cut-off), one of the confirmatory tests (sodium load test, saline solution test, suppressive test with fludrocortisone, captopril test) aimed at stimulating or suppressing the renin-angiotensin-aldosterone system is performed.

The diagnosis of PHA is considered established without further confirmatory testing with a combination of spontaneous hypokalemia, undetectable renin level or plasma renin activity, plasma aldosterone concentration of more than 20 ng/dl (550 pmol/l); with a positive result of the confirmatory test, differential diagnosis of aldosterone-producing adrenal adenoma (APAA) and bilateral adrenal hyperplasia is performed, including computed tomography of the adrenal glands and comparative selective venous blood sampling from the adrenal veins in order to detect unilateral aldosterone production [5].

Unilateral endoscopic removal of the adrenal gland eliminates hypokalemia and improves the course of hypertension in almost 100% of patients with unilateral variants of PHA. Complete cure of hypertension (blood pressure less than 140/90 mmHg with antihypertensive therapy) is noted in about 50% (from 35 to 80%) of patients with aldosterone-producing adrenal adenoma, postoperative hypertension increases to 56-77% with target blood pressure during treatment less than 160/95 mmHg.

Patients with a unilateral variant PHA in whom, for some reason, the operation was not performed, drug treatment is indicated [3].

Mineralocorticoid receptor antagonists (MCRA) – effectively reduce blood pressure and provide AH-independent organ protection against excess mineralocorticoids. In bilateral adrenal hyperplasia, the initial dose of spironolactone is 12.5–25 mg once daily [7]. The effective dose is titrated gradually to a maximum dose of 100 mg per day. The starting dose for eplerenone is 25 mg 2 times a day. For patients with stage III chronic renal failure (CRF), spironolactone and eplerenone have a higher risk of hyperkalemia, for patients with stage IV CRF, drugs are contraindicated [6].

Patients with fPGA-1 are recommended to use a minimum titrated dose of GCS. Additional administration of MCRA is acceptable if it is impossible to achieve the target values of blood pressure and potassium. Treatment of fPGA-1 is performed with glucocorticoids in order to partially suppress ACTH. It is recommended to use synthetic glucocorticoids (dexamethasone or prednisone before bedtime for effective suppression of morning, physiologically elevated ACTH levels. To assess the effectiveness of therapy and prevent overdose, it is necessary to determine the ARR and aldosterone concentration. GCS monotherapy does not always lead to normalization of blood pressure, which requires additional administration of MCRA, calcium channel blockers. The starting dose of dexamethasone for adults is 0.125–0.25 mg/day. The starting dose of prednisone is 2.5–5 mg/day [4].

Conclusion

The presented clinical case shows that for early diagnosis of the disease, primary care physicians must have up-to-date information on the problems of diagnosis and treatment of PHA. Given that the frequency of PHA varies between 5-10% among patients with hypertension, it is necessary to widely introduce screening testing of risk groups into clinical practice (ARR study), which allows verifying PHA at the initial stage of differential diagnostic search. Doctors should also carefully analyze the ECG for signs of hypokalemia and QT interval values (norm 0.34-0.42).

What is the reason for the increase ALT and AST in the blood? This could be the reason for the use of drugs in the neurological department (ceraxone, mexidol and others), and cause hepatitis of toxic genesis. Although there is no such side effect from the liver in the instructions for these drugs. In addition, hepatitis occurs with a greater increase in ALT than AST and the De-Ritis coefficient should be less than one. Our patient, on the contrary, has a higher blood level of AST than ALT and the De-Ritis coefficient is greater than one. In addition, hepatitis, in addition to an increase in ALT and AST levels, should have other changes in hepatic biochemical parameters (lowering total cholesterol, prothrombin, albumin and total protein, fibrinogen and an increase in total and direct bilirubin, activated partial thrombin time (APTT), international normalized time (INT)) what our patient did not have. Therefore, we assume that an increase in ALT and AST in the blood is associated with hypokalemic myopathy, including damage not only to skeletal muscles, but also to the myocardium. Hypokalemia leads to rhabdomyolysis (muscle breakdown), which is known to be one of the causes of muscle weakness and myalgia.

The individualization of approaches when performing the diagnostic algorithm makes it possible to optimize the tactics of managing patients with PHA.

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