Case Report

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Type I renal tubular acidosis caused by Sjögren's syndrome with hypokalemia as the first symptom: a case report

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Abstract

Sjögren's syndrome is a chronic inflammatory autoimmune disease characterized by exocrine gland involvement and marked lymphocytic infiltration. Numerous reports of patients with Sjögren's syndrome have described kidney damage, mainly involving distal tubule dysfunction, severe renal calcification, kidney stones, and rickets. We herein describe a patient with primary Sjögren's syndrome who developed type I renal tubular acidosis with hypokalemia as the first symptom. This case highlights the possibility that an underlying autoimmune disorder should be considered in a patient presenting with distal tubular acidosis or recurrent hypokalemic periodic paralysis because treatment of the primary disease improves the outcome.

Keywords

Sjögren's syndrome, renal tubular acidosis, hypokalemia, case report, exocrine dysfunction, kidney damage

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Introduction

Sjögren's syndrome (SS) is a chronic inflammatory autoimmune disease that mainly involves the exocrine glands.[1] In addition to damage to the salivary glands and lacrimal glands, SS affects other exocrine glands and extracorporeal organs, and involvement of organs such as the kidneys and

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liver is frequently reported.[2,3] Because SS is insidious, the clinical manifestations are diverse, and it is easy to misdiagnose or even miss. We herein report a case of type I renal tubular acidosis (RTA) caused by primary SS with hypokalemia. After a series of treatments involving potassium, anti-inflammatory agents, immune regulation, iron supplementation, gastric acid suppression, improvement of kidney function, and alkalinization of body fluid, the patient's clinical condition substantially improved with normalization of muscle power. Moreover, no hypokalemia occurred within 2 years. This case is being reported to emphasize that an underlying autoimmune disorder should be considered in a patient presenting with distal RTA or recurrent hypokalemic periodic paralysis.

Case report

A 29-year-old Chinese woman presented with an 8-hour history of limb fatigue and pain. Eight hours previously, she had developed sudden limb weakness and pain and experienced instability while standing. The patient's medical history included symptoms such as dry mouth and dry eyes that had appeared in recent months, two previous embryonic developments, and one intrauterine stillbirth. One month previously, the patient had undergone surgical treatment of mumps at another hospital.

On physical examination, the patient's vital signs were within the normal limits, and her higher mental functions were intact. Her oral cavity was dry, and she had no lymphadenopathy. The proximal muscle strength of the upper limbs was grade 1, and the distal muscle strength was grade 2; the muscle strength of the lower limbs was grade 1^{+}. The tendon reflex was negative, and the muscle tension of the limbs was weak. No sensory deficit was present, and cranial nerve examination findings were unremarkable. Cardiovascular, respiratory, gastrointestinal, and thyroid examination findings were normal.

The patient presented to the emergency department, and initial investigations revealed severe hypokalemia of 2.1 mmol/L (reference range, 3.5–5.5 mmol/L), hyperchloremia of 116.0 mmol/L (reference range, 98–111 mmol/L), and hypophosphatemia of 0.42 mmol/L (reference range, 0.97–1.61 mmol/L). An electrocardiogram showed ST-T-U changes. Cranial computed tomography revealed a high-density flaky shadow, which may have been calcification, on the left side of the cerebral falx.

The patient was intravenously administered 1.5 g of potassium chloride, and her serum potassium level was 2.0 mmol/L the next morning. The intravenous injection of potassium chloride was repeated, and oral potassium chloride tablets were administered. After a series of treatments, her clinical condition substantially improved and her muscle power normalized.

We repeated the relevant examinations after the patient's condition had stabilized (Table 1) and found a urinary pH of 6.0, with no history of diuretic use, vomiting, or diarrhea. The basic metabolic panel suggested low potassium, high chlorine, and hypophosphatemia, and an arterial blood gas analysis (Table 2) indicated metabolic acidosis with severe hypokalemia (serum potassium of 2.1 mmol/L). A diagnosis of RTA was made. SS was suspected based on the patient's history of abortion and xerostomia/xerophthalmia without secondary causes, and SS was later confirmed by antinuclear antibody, SSA, Ro-52, and SSB positivity (Table 3). Some related analyses were also conducted. Abdominal B-mode ultrasound and adrenal computed tomography suggested bilateral kidney stones. Optical coherence tomography showed that the retinal structure of the macular area of the eyes was almost normal. The thickness of the retinal nerve fiber layer in each quadrant of the binocular optic disc

Table 1. Routine laboratory tests results.

Test	Result	Reference range
Hb (g/L)	85.0	110–150
WBC count (10^9/L)	7.0	4–10
Platelets (10^9/L)	349.0	100–300
ESR (mm/1_{st} hour)	62.0	0–20
Serum K^+ (mmol/L)	2.1	3.5–5.5
Serum Cl^- (mmol/L)	116.0	98–111
Serum P^{3+} (mmol/L)	0.43	0.8–1.2
Serum Mg^{2+} (mmol/L)	0.88	0.8–1.2
TSH (μIU/mL)	1.680	0.34–5.6
AST (U/L)	67	10–40
ALT (U/L)	88.5	5–40
ALP (U/L)	235.7	40–150
GGT (U/L)	112.9	<50
TBIL (μmol/L)	8.8	5.0–21.0
DBIL (μmol/L)	1.9	0–3.4
Urea (mmol/L)	5.9	3.2–7.1
UA (μmol/L)	510.6	155–357
Cre (μmol/L)	118.7	44–97
Cystatin C (mg/L)	2.51	0–1.02
CK (U/L)	143.2	26–140
Fe (μmol/L)	5.7	9.0–30.4
UIBC (μmol/L)	80.77	25–50.1
TIBC (μmol/L)	86.47	54–77
TRF (g/L)	3.9	2.02–3.36
Ferritin (ng/mL)	7.5	11.0–306.8
HAV-IgM	(−)	(−)
Urine pH	6.0	5–7.5
SG	1.005	1.010–1.030

Hb: hemoglobin, WBC: white blood cell, ESR: erythrocyte sedimentation rate, TSH: thyroid-stimulating hormone, AST: aspartate aminotransferase, ALT: alanine aminotransferase, ALP: alkaline phosphatase, GGT: γ-glutamyl transpeptidase, TBIL: total bilirubin, DBIL: direct bilirubin, UA: uric acid, Cre: creatinine, CK: creatine kinase, UIBC: unsaturated iron-binding capacity, TIBC: total iron-binding capacity, TRF: transferrin, HAV-IgM: hepatitis A virus-IgM, SG: specific gravity.

Table 2. Arterial blood gas analysis.

Test	Result	Reference range
pH	7.28	7.35–7.45
PO_2 (mmHg)	105.5	83–108
PCO_2 (mmHg)	22.5	35–45
SO_2 (%)	97.4	91.9–99
HCO_3^- (mmol/L)	10.6	21–29
BEB (mmol/L)	−13.8	−3 to 3
HB (g/L)	98.0	120–160
HCT (%)	29.0	35–49

pH: hydrogen ion concentration, PO_2: partial pressure of oxygen, PCO_2: partial pressure of carbon dioxide, SO_2: oxygen saturation, HCO_3^-: bicarbonate, BEB: base excess in blood, HB: hemoglobin, HCT: hematocrit.

Table 3. Autoimmune antibody detection.

Test	Result	Reference range
IgG (g/L)	27.10	7.51–15.6
IgA (g/L)	2.69	0.82–4.53
IgM (g/L)	2.76	0.46–3.04
Complement C3 (g/L)	1.12	0.79–1.52
Complement C4 (g/L)	0.23	0.16–0.38
RF (U/mL)	1410.0	0–20
Anti-CCP (U/mL)	<0.5	<5.0
BJP	(−)	(−)
KAP (g/L)	21.90	6.29–13.5
LAM (g/L)	8.62	3.17–7.23
ANA	Cytoplasmic particle type (+) 1:100	<1:100 (−)
SSA	(+)	(−)
Sm	(−)	(−)
Ro-52	(+)	(−)
SSB	(+)	(−)

Ig: immunoglobulin, RF: rheumatoid factor, Anti-CCP: anti-cyclic peptide containing citrulline, BJP: Bence-Jones protein, KAP: immunoglobulin light chain kappa, LAM: immunoglobulin light chain lambda, ANA: antinuclear antibody.

was slightly thinner than normal. The thickness of the retinal nerve fiber layer under the optic disc was thinner in the left than right eye, and binocular ultrasonography revealed no abnormalities. The following were also observed: intraocular pressure, 17 mmHg in the right eye and 18 mmHg in the left eye; tear secretion, 4 mm in the right eye and 4 mm in the left eye; tear breakup time, 2 seconds in the right eye and 3 seconds in the left eye; corneal fluorescence

staining, negative with no obvious abnormality in the visual field; static imaging of salivary glands, severe impairment of bilateral salivary gland secretion; and double parotid gland + cervical lymph node ultrasound, bilateral parotid gland enlargement with heterogeneous echogenicity, bilateral submandibular gland heterogeneous echogenicity, and lymph node enlargement (Figure 1).

Discussion

Hypokalemia is one of the most common electrolyte disorders observed clinically. The many causes of hypokalemia can be

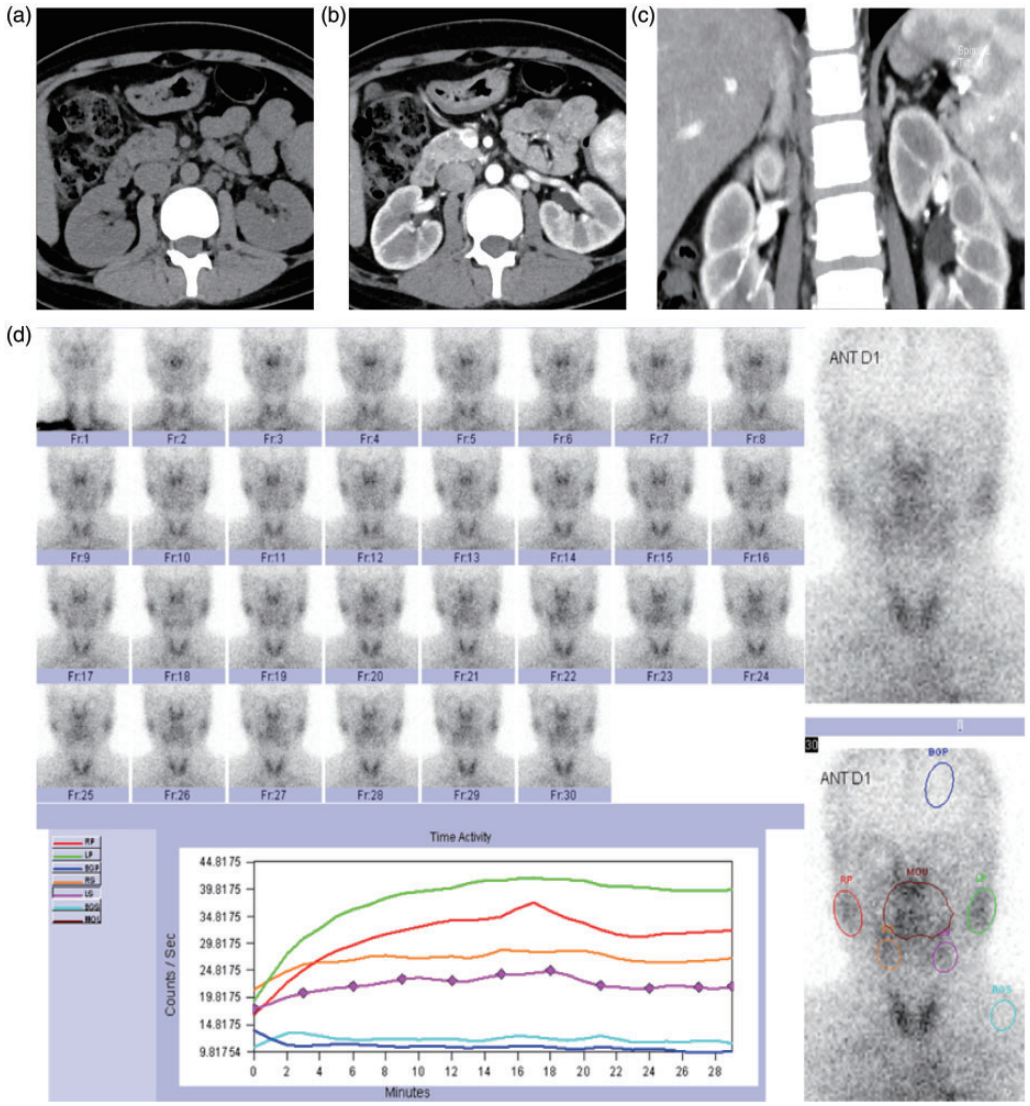

Figure 1. Imaging findings. (a) Plain adrenal scan. (b, c) Contrast-enhanced adrenal scan. (d) Salivary gland static imaging.

divided into three categories: insufficient potassium intake, excessive discharge, or changes in the intracellular and extracellular potassium distribution. Among these categories, hypokalemia caused by endocrine diseases mainly results from renal potassium loss; thus, it is important to identify whether renal potassium loss has occurred. Endocrine diseases with renal potassium loss mainly include primary aldosteronism, congenital adrenal hyperplasia, Liddle syndrome, RTA, and Bartter syndrome.[4–7]

In combination with the clinical examination in the present case, the blood gas analysis indicated metabolic acidosis, the urine pH was neutral, and electrolyte analysis suggested low potassium and high chlorine. Additionally, adrenal B-mode ultrasound indicated bilateral kidney stones. Based on these examination findings, the diagnosis of type I RTA was clear. RTA is a group of clinical syndromes caused by tubular hydrogen secretion or carbonate reabsorption disorders. The main clinical manifestations are metabolic acidosis with hyperchloremia and a normal anion gap and glomerular filtration rate; the urine is alkaline. RTA is divided into four types according to the lesion: type I RTA (classical distal RTA), type II RTA (proximal RTA), type III RTA (mixed RTA), and type IV RTA (hyperkalemic RTA). Type I RTA is the most common.[8] Type I RTA can be divided into primary and secondary according to the cause; primary RTA is mostly related to heredity disease, and secondary RTA is mostly related to multiple diseases. SS is an important cause of RTA. In addition to the development of hypokalemia in this case, the blood gas analysis also indicated significant metabolic acidosis.

SS is an autoimmune disease mainly involving exocrine glands, such as the lacrimal glands and salivary glands. SS is characterized by lymphocyte infiltration and specific autoantibodies (anti-SSA/SSB). Because the salivary gland is an exocrine gland composed of columnar epithelial cells, SS is characterized by local xerostomia. Indeed, 70% to 80% of patients complain of dry mouth; approximately 50% of patients present with intermittent alternating parotid swelling and pain involving one or both sides, and approximately 20% have liver damage, especially patients with autoimmune hepatitis or primary biliary cirrhosis.[9] SS occurs more often in women, and the age of onset is 40 to 50 years. SS can also occur in children.[10,11] The kidney is one of the most commonly involved organs in patients with primary SS. In China, approximately 30% to 50% of patients with primary SS have kidney damage.[12] The incidence of primary SS is the second leading cause of kidney damage among autoimmune diseases, second only to systemic lupus erythematosus. Clinically, SS can be characterized by distal or proximal RTA, kidney stones, renal diabetes insipidus, or Fanconi syndrome, and distal RTA is more common. The exocrine glands, especially lacrimal and salivary glands, are the target organs of primary SS, and the mammary gland has the same anatomical, histological, and immunological characteristics,[13] which may be the pathological basis for breast cancer in patients with primary SS.

In conclusion, the patient in the present case was treated for hypokalemia and, based on her medical history and examination findings, was diagnosed with primary SS combined with liver and kidney damage. The findings of this case suggest that patients with hypokalemia should pay attention to their symptoms, including dry mouth, dry eyes, joint pain, and rampant caries. In addition, female patients should be asked about their birth history to obtain the diagnosis of primary SS as soon as possible.

Ethics

No experiments were performed in this study; clinical effects were only observed. Therefore, approval by an ethics committee was not required.

Consent

This article does not report an unconventional means of treatment; disease progression was only observed. Therefore, patient consent was not required.

Declaration of conflicting interest

The authors declare that there is no conflict of interest.

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