A Case of Nephrocalcinosis Associated with Primary Aldosteronism

Keiko Yasuda¹, Koichi Sasaki¹, Masaya Yamato¹, Hiromi Rakugi², Yoshitaka Isaka² and Terumasa Hayashi³

Abstract

Herein, we report a 37-year-old man presenting with nephrocalcinosis associated with primary aldosteronism. Primary hyperaldosteronism is reported to facilitate urinary calcium excretion; however, renal calculi or calcinosis in this disorder has been rarely reported. The patient had renal dysfunction and calcification in the renal medulla on both kidneys. A kidney biopsy was performed. His renal dysfunction seemed to be mainly caused by hypertension and tubulointerstitial damage. Furthermore, von Kossa-positive stones were seen in some tubules. X-ray element analysis revealed that the stones were composed of calcium phosphate.

Key words: nephrocalcinosis, primary aldosteronism, kidney biopsy

(Intern Med 51: 625-627, 2012)  
(DOI: 10.2169/internalmedicine.51.6543)

Introduction

Primary hyperaldosteronism is reported to facilitate urinary calcium excretion and induce negative calcium balance (1). Because reports of renal calculi or nephrocalcinosis associated with primary aldosteronism are rare (2-5), we describe a patient with nephrocalcinosis who was diagnosed as having primary aldosteronism.

Case Report

In June 2008, a 37-year-old man presented to our hospital with muscle pain. He had a 5-year history of hypertension. On admission, his blood pressure was 146/99 mmHg. Biochemical findings were: sodium 147 mEq/L, potassium 1.6 mEq/L, chloride 93 mEq/L, blood urea nitrogen 10.9 mg/dL, creatinine 1.43 mg/dL, total protein 5.8 g/dL, albumin 3.7 g/dL, AST 17 IU/L, uric acid 6.8 mg/dL, alkaline phosphatase 230 IU/L, serum calcium 8.6 mg/dL, phosphorus 2.29 mg/dL, magnesium 1.99 mg/dL. Findings from 24-hour urine collections were: sodium 290 mEq, potassium 129.8 mEq, calcium 132 mg, phosphorus 360.6 mg. Venous blood gas analysis showed pH 7.470, pO₂ 56.7 mmHg, HCO₃⁻ 40.3 mmHg, and pCO₂ 56.7 mmHg. Urine analysis showed pH 7.5, measured using a dipstick. Results from the hormone study were: PTH 60 pg/mL, 1,25-(OH)₂ vitamin D 26.8 pg/mL. Plasma renin activity and aldosterone concentration before and after adrenalectomy were as follows: plasma renin activity 0.2 ng/mL (preoperative), 1.8 ng/mL (postoperative), aldosterone 2,510 ng/dL (preoperative), 146 ng/dL (postoperative). Abdominal computed tomography (CT) scan showed a 33x25 mm tumor in a left adrenal gland. To further clarify the cause of the mass, we performed adrenal venous sampling, and we diagnosed it as primary aldosteronism. Thus, a retroperitoneoscopic left adrenal extraction was performed. Shortly after the operation, the electrolyte imbalance and high blood pressure completely improved, and amount of 24 hours urinary excretion of calcium decreased (5.6 mg), but renal dysfunction did not recover. CT revealed calcification in the renal medulla on both kidneys (Fig. 1). A kidney biopsy was performed. Four of 18 glomeruli present in the sample showed global sclerosis. The remaining glomeruli were unremarkable. Diffuse interstitial inflammation was observed with lymphocytes, neutrophils and eosinophils. There was moderate to severe tubular atrophy and interstitial fibrosis. Arteries and arterioles showed moderate sclerosis of the intima, and some von
Kossa-positive stones were seen in some tubules (Fig. 2). The patient did not have a history of nephrolithiasis, and no stones were available for analyzing their elements. He had no family history of nephrolithiasis. Thus, we performed X-ray element analysis using the kidney biopsy specimen and found that the main element comprising the stones was calcium phosphate. Medication following left adrenal extraction was not required. A year after the operation, impaired renal function remains, but has not progressed. Serum creatinine level remains at 1.48 mg/dL.

**Discussion**

Renal impairment caused by hypertension is well known to be associated with primary aldosteronism. Nishimura et al reported that 24.1% of patients with primary aldosteronism exhibit proteinuria, and 6.9% exhibit renal dysfunction (6). In the present case, CT revealed calcification in the renal medulla on both kidneys. We performed a kidney biopsy, and we considered that the main cause of his renal dysfunction was prolonged hypertension and tubulointerstitial damage. Moreover, von Kossa-positive stones were seen in some tubules. Chronic potassium deficiency results in tubulointerstitial injury (7-9), but we did not see cyst formation. Well-known causes of nephrocalcinosis are milk-alkali syndrome, vitamin D intoxication, sarcoidosis, renal tubular acidosis, medullary sponge kidney, autosomal-dominant hypocalcemia, Batter’s syndrome, cystic fibrosis, Dent’s disease, hypophosphatemia with nephrolithiasis, hypomagnesemic hypercalciuric nephrocalcinosis, Liddle’s syndrome, Lowe’s syndrome, primary hyperoxaluria types 1 and 2, X linked hypophosphatemia, Williams’ syndrome, Wilson’s disease, and prolonged use of diuretics (10). Renal calculi or nephrocalcinosis are most commonly associated with overt hypercalcemia or hypercalciuria.

Renal calculi or nephrocalcinosis associated with primary aldosteronism has been rarely reported (2-5). Primary aldosteronism is reported to elevate urinary calcium excretion (10). Urinary calcium correlates with sodium excretion; each 100 mEq/dL increment in sodium excretion promotes an increase of 40 mg/dL in calcium excretion (11). Increased urinary calcium excretion in primary aldosteronism could be due to the reduced reabsorption of sodium in aldosterone-insensitive tubular sites (12). Moreover, excretion of acidic urine due to increased tubular reabsorption of bicarbonate induced by elevated aldosterone may also enhance urate crystallization and promote formation of urate stones. Results from the present patient suggest that prolonged hypercalciuria in primary aldosteronism can be one of the causes of nephrocalcinosis. When he first was admitted to our hospital, his 24-hour urinary excretion of calcium was not very high. It might be because, at that time, his serum calcium level was low. In the past, his urinary excretion of calcium was higher, but we could not detect it. Following removal of the adrenal gland, there was no hypercalciuria. To assess the possibility of calcification caused by abnormal metabolic syndrome, we analyzed urinary amino acids. The results were normal, so we could eliminate the possibility of primary oxalosis. We also attempted to determine the composition of the von Kossa-positive stones by performing X-ray element analysis using a kidney biopsy specimen. Detailed methods about X-ray element analysis have been reported by Ishida et al (13). This analysis revealed that the main element of the von Kossa-positive stones was calcium phosphate.

We finally considered that the nephrocalcinosis was associated with primary aldosteronism. To our knowledge, the analysis of nephrocalcinosis components associated with primary aldosteronism has not been reported. Because it is impossible to dissolve calcium phosphate stones, it is important to follow-up the patient’s renal function as a chronic kidney disease.

The authors state that they have no Conflict of Interest (COI).

**Acknowledgement**

We would like to thank Dr. Kuhara at the Division of Human Genetics, Medical Research Institute, Kanazawa Medical University for analyzing the urine amino acid. We also thank Dr. Miyoshi at Division of Tumor Pathology, Department of Pathologi-
X-ray element analysis of the specimen obtained by kidney biopsy.

References


© 2012 The Japanese Society of Internal Medicine
http://www.naika.or.jp/imindex.html