Abstract

Thyroid dysfunction is related to many kidney diseases. We herein present the case of a 39-year-old woman who exhibited obesity-related glomerulopathy-like pathologic features in combination with hyperthyroidism. She displayed hyperthyroidism in spite of receiving anti-thyroid drug treatment, with massive proteinuria (4.5 g/gCr). A renal biopsy demonstrated glomerular hypertrophy (average diameter, 280 μm) and an increased number of capillary vessels, both of which are compatible with a diagnosis of obesity-related glomerulopathy. Following thyroidectomy, the proteinuria gradually decreased in association with an improvement in hyperphagia and normalization of the thyroid function. Obesity-related nephropathy associated with hyperthyroidism is very rare. In this report, we discuss the relationship between hyperthyroidism and obesity-related glomerulopathy-like pathologic features.

Key words: hyperthyroidism, obesity, hyperphagia, glomerular hypertrophy, podocytes

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Introduction

Both hypothyroidism and hyperthyroidism affect the kidney function and are related to many kidney diseases. Under hyperthyroid conditions, the renal plasma flow and glomerular filtration rate are increased and the serum creatinine level is typically quite low. Many kidney diseases are associated with thyroid dysfunction (1).

In addition, thyroid dysfunction is associated with various glomerular diseases, such as membranous nephropathy (2-5), IgA nephropathy, membranoproliferative glomerulonephritis (6) and minimal-change glomerulonephritis (5, 7). Among tubular diseases, tubulointerstitial nephritis with uveitis has been reported in association with hyperthyroidism (8).

Obesity-related nephropathy is an increasingly common disease entity that occurs in obese individuals (BMI>30 kg/m²) and presents with typical renal pathologic features of glomerulomegaly and focal segmental sclerosis (9). Although thyroid dysfunction causes various types of glomerular disease, cases of obesity-related nephropathy associated with hyperthyroidism are rare.

We herein describe a case of hyperthyroidism with obesity-related glomerulopathy-like pathologic features and discuss the relationship between these two reciprocal disease conditions.

Case Report

A 39-year-old woman was admitted to our hospital for an examination of proteinuria. The patient had no history of proteinuria during her school years. She had been diagnosed with Graves’ disease two years prior to the current admission and had been prescribed thiamazole (10 mg/day), propranolol (30 mg/day) and potassium iodide (50 mg/day). On admission, she exhibited hyperthyroidism (T3, >30 pg/mL; FT4, 4.43 ng/dL; thyroid stimulating hormone (TSH), <0.004) despite the administration of these treatments. She reported consuming five meals per day before admission. Her blood pressure was 153/93 mmHg and her pulse rate was 100 beats/min. Her body mass index was 25.8 kg/m² and her body weight had changed from approximately 55 kg to 65 kg during the course of the hyperthyroidism. An enlarged thyroid, hyperhidrosis and finger tremors were observed on a physical examination. A urinalysis showed mas-
proteinuria (4.5 g/gCr) and microscopic hematuria (20-29 erythrocytes per high-power field); however, nephrotic syndrome was not detected. The laboratory data on admission showed a serum creatinine level of 0.33 mg/dL and a blood urea nitrogen level of 9.0 mg/dL. The creatinine clearance was 148 mL/min, and the levels of hemoglobin and serum albumin were 12.5 and 3.5 g/dL, respectively. Mean-ance was 148 mL/min, and the levels of hemoglobin and se-

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The foot process fusion was less than 5% (Fig. 2). These pathological features were compatible with a diagnosis of obesity-related glomerulopathy. Based on these results, we speculated that the cause of proteinuria in our patient was obesity-related glomerulopathy due to hyperphagia related to hyperthyroidism and the inappropriate treatment of hyperthyroidism. Six months after the renal biopsy, thyroidectomy was performed to treat the hyperthyroidism. The patient’s proteinuria gradually decreased to 1 g/gCre. In addition, her body weight decreased to 54 kg three months after thyroi-
dectomy in association with an improvement in hyperphagia and normalization of the thyroid function.

Discussion

Various types of glomerular disease are associated with hyperthyroidism (Table). The most frequent form of glomerular disease related to hyperthyroidism is membranous nephropathy associated with nephrotic syndrome (3-5). Associations with minimal-change nephrotic syndrome and IgA nephropathy have also been reported (5-7). In patients with autoimmune thyroid disease, such as Graves’s disease and Hashimoto’s thyroiditis, the formation and deposition of immune complexes are the cause of glomerulonephritis. In general, the formation of immune complexes is often involved in the pathogenesis of glomerulonephritis associated with thyroid disease. Furthermore, propylthiouracil is well known to cause myeloperoxidase-antineutrophil cytoplasmic antibody-associated vasculitis. In the present case, there were no immunological abnormalities among the clinical and pathological findings, and the patient was not taking propylthiouracil. The primary pathological feature in this case was glomerular hypertrophy. The light microscopy and electron microscopy findings were similar to the pathological features of obesity-related nephropathy. To our knowl-
edge, this is the first report showing a relationship between

Figure 1. Light microscopy findings. The glomeruli exhibited glomerular hypertrophy with an increased number of capillary vessels (PAS staining, original magnification ×200).

Figure 2. Electron microscopy findings. The thickness of the glomerular basement membrane was normal, and no electron-dense deposits were observed (original magnification ×2,150).
perphagia, and the subsequent excess energy intake resulted in Dale et al.'s study was 5.42±0.46 kg, while following treatment for hyperthyroidism is often observed. The obesity-related nephropathy. Furthermore, weight gain following treatment for hyperthyroidism is often observed. The typical amount of weight gain following treatment for hyperthyroidism in Dale et al.'s study was 5.42±0.46 kg, while the mean BMI increase was 8.49±0.71% (10). In the present patient, insufficient treatment may have induced hyperphagia, and the subsequent excess energy intake resulted in her overweight condition.

The pathophysiology of obesity-related nephropathy is not fully understood. Podocyte depletion due to hyperinsulinemia and glomerular hyperfiltration is considered to be one cause of the generation of obesity-induced focal segmental glomerulosclerosis (11). Under conditions of hyperthyroidism, an elevated glomerular filtration rate is associated with mechanical stress on podocytes. Furthermore, the abnormal glucose tolerance observed in the present patient may have contributed to podocyte damage. We consider that these conditions may have caused the obesity-related glomerulopathy-like pathologic features observed in this case.

The pathophysiology of obesity-related nephropathy is not fully understood. The accumulation of various cases of obesity-related glomerulopathy may elucidate the pathogenesis of the disease and result in the development of novel therapeutic strategies.

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

References


Table. Renal Pathology and Status of the Patients with Graves’ Disease

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