Multiple Myeloma with Acute Kidney Injury Due to Microscopic Nephrocalcinosis

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Abstract

Significant renal dysfunction frequently develops in patients with multiple myeloma (MM) and is the second leading cause of death in addition to infection. Cast nephropathy is the most common cause of renal failure in MM patients. We reported a 39-year-old man with MM who presented with hypercalcemia and acute kidney injury (AKI). The renal pathology revealed microscopic nephrocalcinosis without evidence of myeloma casts nephropathy. The hypercalcemia was controlled and the renal dysfunction was reversed after medical treatment. Therefore, MM with AKI is a medical emergency that requires prompt diagnosis and intervention to avoid irreversible renal failure. (Acta Nephrologica 2011; 25: 141-143)

KEY WORDS: acute kidney injury, hypercalcemia, multiple myeloma, nephrocalcinosis

Introduction

Multiple myeloma (MM), a neoplastic monoclonal disorder of plasma cells (1), could lead to several renal pathologic manifestations. The most frequent and typical manifestation is cast nephropathy (2). The manifestation of microscopic nephrocalcinosis has rarely been reported. We reported here a patient with MM who presented with hypercalcemia and acute kidney injury (AKI). The renal pathology revealed microscopic nephrocalcinosis without myeloma casts. Possible mechanisms will also be discussed.

Case Report

A 39-year-old man had been in good health until 2 weeks prior to admission for the complaint of progressive polydipsia, polyuria, nocturia, general malaise, and anorexia. There was no history of vitamin D ingestion, excessive use of milk, or absorbable alkali. His renal function was within normal limits three months prior to admission. On admission, the patient was drowsy with disturbed mental status. The temperature was 37°C, pulse rate was 120/min, respiratory rate was 22/min, and blood pressure was 190/85 mmHg. The skin turgor was dry. A urinalysis showed trace proteinuria; the sediment revealed 2-5 RBC/HPF, and without cellular casts. The hemoglobin was 12.8 g/dL and the white cell count was 8850 × 10⁹/L, with 3% band forms and 78% neutrophils. The biochemical profile were: blood urea nitrogen, 56 mg/dL; creatinine, 4.4 mg/dL; albumin, 3.5 mg/dL; and calcium, 15.35 mg/dL; phosphate, 4.3 mg/dL; arterial pH, 7.43 and HCO₃⁻, 25 mmol/L. Renal sonography showed bilateral enlarged kidneys (right, 12.7 cm; left, 11.3 cm) without obstructive signs of urinary tract. The serum immunoelectrophoresis showed a dense band of IgG-λ monoclonal globulin. The urine immunoelectrophoresis showed a dense band of Bence-Jones protein. The 24-hour urinary λ chain was 2.23 gm. A bone marrow biopsy showed hypercellularity with 50% neoplastic plasma cells. All neoplastic plasma cells were positive for λ chain. X-ray film of the skull revealed multiple punched-out lesions (Fig. 1). The renal histology showed deposition of calcium crystals in the tubular lumen, epithelium, and occasionally in the peritubular
tissues. Regenerative tubules in the resolving phase were also prominent, but without myeloma casts identified (Fig. 2). An immunofluorescent study was negative. A diagnosis of MM, stage IIIB and AKI due to microscopic nephrocalcinosis was made. Under the impression of hypercalcemia and AKI, 0.9% saline (3000 mL daily) was administered in addition to calcitonin and bisphosphonates. The azotemia and hypercalcemia improved gradually. Chemotherapy with vincristine, adriamycin and dexamethasone was also given. He was discharged after 24 days of hospitalization with blood urea nitrogen of 26.4 mg/dL, creatinine of 1.0 mg/dL, and serum calcium level of 6.92 mg/dL.

**Discussion**

The spectrum of renal lesions seen in patients with myeloma includes “myeloma kidney”, or cast nephropathy; light chain amyloidosis; monoclonal Ig deposition disease (MIDD); and, less frequently, cryoglobulinemic glomerulonephritis and proliferative glomerulonephritis (3). Autopsy studies in patients with myeloma found cast nephropathy in 30 to 50%, light-chain deposition disease in 2 to 3%, and amyloidosis in 4 to 5% of cases (4, 5). Other potential renal complications include nephrocalcinosis (6, 7), but nephrocalcinosis without co-existing myeloma casts and AKI has not been reported.

The crucial role of free light chains in cast nephropathy is well known. Characteristically, multiple intraluminal proteinaceous casts are mainly identified in the distal portion of the nephrons. Patients with multiple myeloma rarely present with acute interstitial nephritis without cast nephropathy. Most patients have linear tubular basement membrane deposition of κ light chains associated with the most severe inflammation, and they may be considered a type of LCDD with pathology limited to tubular-interstitial compartment (8). In such cases, there is deposition of calcium crystals in the tubular lumen, tubular epithelial cells, and per-tubular tissues.

Nephrocalcinosis is a pattern of renal injury characterized by abundant renal tubular and interstitial deposits of calcium phosphate, as shown in Fig. 1. Although the limitation is that the Von Kossa stain (specific calcium stain) was not performed, the HE stain of this case typically indicate calcium deposits. The finding of nephrocalcinosis on renal biopsy should prompt investigation into conditions associated with hypercalcemia, including hyperparathyroidism, malignancy, and excessive calcium or vitamin D intake. In the current report, hyperparathyroidism, vitamin D intoxication, or milk-alkali syndrome has been excluded by negative history and laboratory parameters. Improvement in renal function following saline hydration that persists after chemotherapy supports the diagnosis of dehydration-related acute tubular necrosis. One possible mechanism explaining the lack of cast formation in the kidneys may be the low urinary λ.
chain excretion (2.23 g/day).

In summary, this is the first report that describes a patient with IgG-λ MM who presented with hypercalcemia and AKI. Renal biopsy reveals two related but distinct processes. The report highlights the need to consider the diagnosis of MM with microscopic nephrocalcinosis in any patient presenting with AKI.

References