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Case Report

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# Light Chain Deposition Disease Diagnosed with Renal Biopsy: A Case Report

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## Abstract

Light chain deposition disease (LCDD) is a rare disease and the most common subtype of monoclonal immunglobulin deposition disease (MCDD). The most commonly affected organ is the kidney, characterized by nodular glomerulosclerosis and proteinuria at the nephrotic level. The LCDD is often associated with underlying plasma cell dyscrasias or lymphoproliferative diseases. The investigation of the underlying disease is very important for the treatment. We herein present a case of nodular glomerulosclerosis with nephrotic syndrome—a case of a 53-year-old woman who presented with acute renal failure with no previously known disease and was diagnosed with rarely seen LCDD, and whose subsequent examinations revealed a plasma cell neoplasm.

**Keywords:** Nodular glomerulosclerosis, light chain deposition disease, kidney, multiple myeloma

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## INTRODUCTION

Monoclonal immunoglobulin deposition disease (MIDD) is a rare systemic disease that has three subtypes: light chain deposition disease (LCDD), heavy chain deposition disease, and light and heavy chain deposition disease. The most common form is the LCDD. MIDD is common in the fifth and sixth decades, whereas the LCDD can also be seen in younger patients (1, 2). The LCDD was first described by Randall et al. (3). It is often associated with underlying plasma cell dyscrasias or lymphoproliferative diseases (4). The clinical effect of the LCDD depends on the affected organ. The light chains are filtered through the glomeruli and reabsorbed from the proximal tubules by receptor-mediated endocytosis and destroyed by lysosomal enzymes in the tubular cells (5, 6). For this reason, the kidney is the most commonly involved organ, but the involvement of the heart, liver, lung, and nervous system has been also described (2, 6, 7). The most common histomorphological findings are the focal or diffuse mesangial matrix enlargement and accumulation of nonfibrillar, Congo red negative, PAS positive nodules in the basal membrane or magnesium (8).

## CASE PRESENTATION

A 53-year-old female was admitted to the Gastroenterology Department with the complaints of diarrhea, abdominal pain, and anorexia. Eight g/day proteinuria was detected in urine, and the subsequent blood analysis revealed the creatinine level of 3.05 mg/dL and urea level of 57 mg/dL. The hemoblobin (HGB) level of 8.8 g/dL, ferritin level of 390 ng/mL, and other parameters were within normal limits. The ANCA and anti-ds DNA tests were negative. The patient was diagnosed with acute renal failure, and renal ultrasonography was found to be within normal limits. A kidney biopsy was performed on the patient who had no comorbidities or a family history. The biopsy consisted of three materials, the largest of them being 1 cm and smallest 0.4 cm. Hematoxylin–eosin (H&E) stained sections obtained 25 glomeruli. In the biopsy specimen with the basal membrane thickening, there were the nodular eosinophilic material accumulation in the mesangial

matrix, a mild increase of mesangial cellularity, and periglomerular fibrosis in some glomeruli (Figure 1). There was a global sclerosis, and three glomeruli had fibrous crescent. There was a mild-to-moderate inflammation at the interstitial area involving polymorphonuclear leukocytes, lymphocytes, eosinophils, plasma cells, and histiocytes. The basement membrane thickening and loss of brush border were detected in tubular structures. The wall of the arteries and arterioles was markedly thickened (Figure 1). The PAS, Masson trichrome histochemical staining showed a nodular accumulation in the glomeruler matrix. In the immunohistological evaluation, kappa, lambda, and AA amiloid were not stained. In the immunofluorescence study, kappa showed the nodular granular accumulation in the basal membrane and mesangial matrix (Figure 2). No accumulation was observed with lambda, IgA, IgM, IgG, C3, C1q, fibrinogen, and albumin. Electron microscopy showed amorphous accumulation in the mesangial region and subendothelial areas (Figure 2); however, electron-dense deposits were not observed. With current findings, the case was interpreted as "compatible with LCDD" with nodular glomerulosclerosis. The patient was referred to the Hematology Clinic. The B2 microglobulin level was 7,116 ng/mL, and the patient was scanned with PET for multiple myeloma. A slightly increased metabolic activity was observed in the bone marrow. A histopathological and immunohistochemical examination of the bone marrow biopsy showed an increase in plasma cells and monoclonal staining with kappa. Plasma cell myeloma has been evaluated as compatible.

The serum kappa light chain (139 mg/dL)/lambda light chain (32 mg/dL) ratio was found as 4.3. The therapy was initiated with CyBorD (cyclophosphamide, bortezomide, decort) chemotherapy and prophylactic renal doses of rifampin, valaciclovir, and



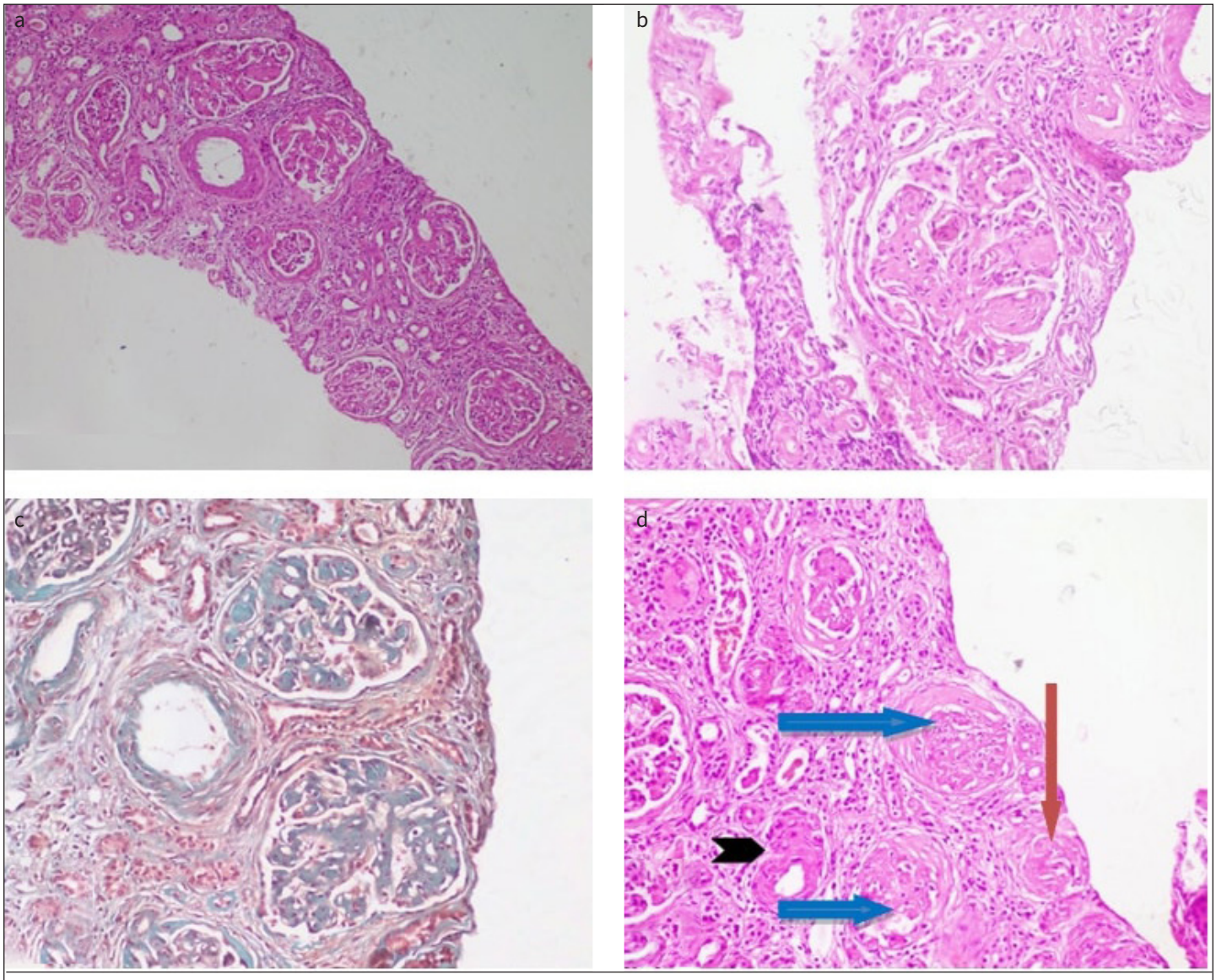


**Figure 1. a-d.** Nodular eosinophilic material accumulation in the mesenchymal matrix, mild mesenchymal cellularity increase (a: H&E×100; b: H&E×200; c: Trichrom×200). Fibrous cresent (blue arrow) and global sclerotic glomeruli (red arrow), wall of arter (black narrow) (d: H&E×200).

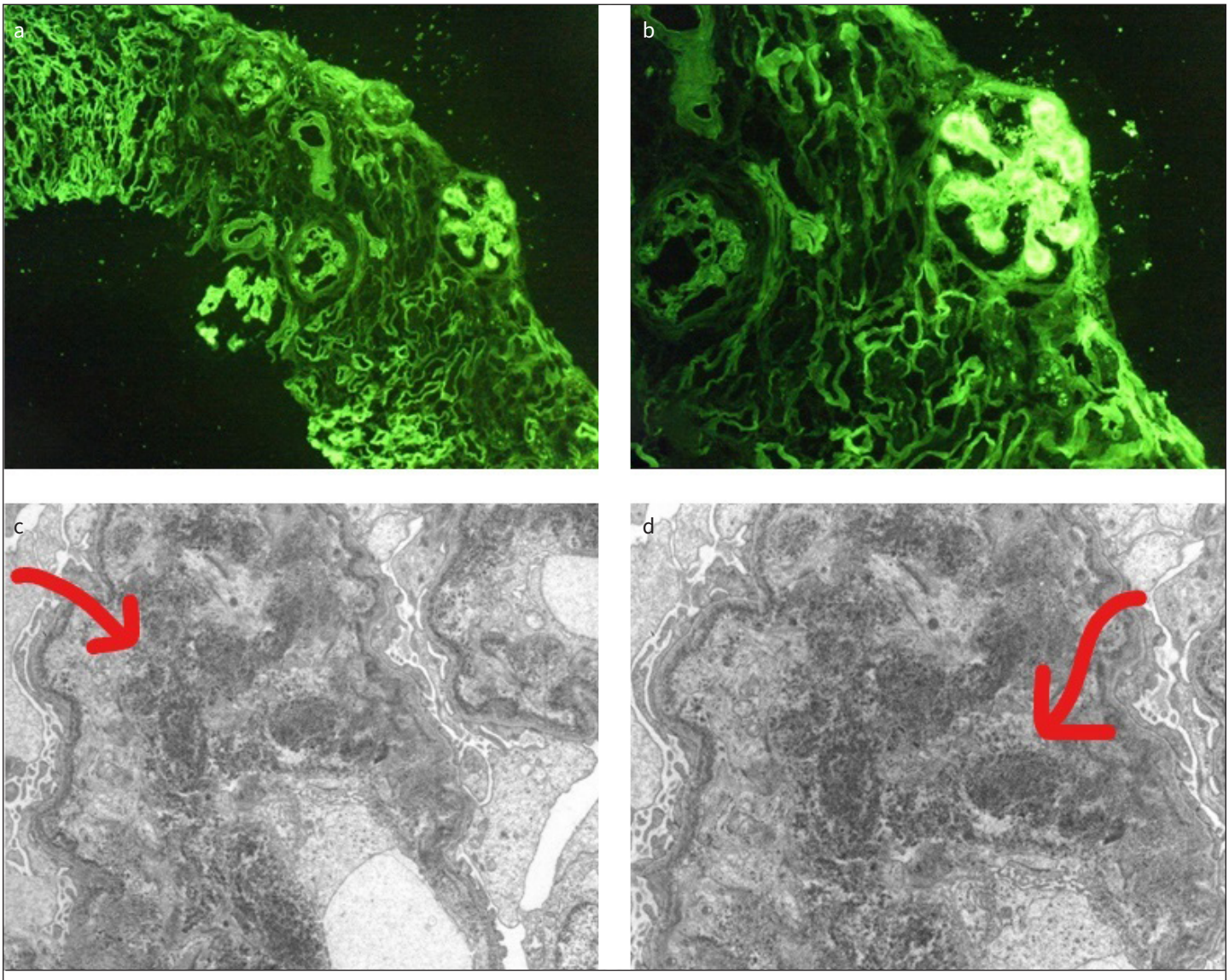




**Figure 2. a-d.** Nodular accumulation foci in glomeruli. In the immunofluorescence study, kappa showed nodular accumulation foci and moderate granular accumulation in the basal membrane (a: Kappa ×100, b: Kappa ×200). Amorphous accumulation in the mesangial region and subendothelial areas (c: EM 26×7.5k; d: EM 30x10k).

fluconazole. After three cycles of chemotherapy, the patient was discharged with the creatinine level of 1.05 mg/dL, the urea level of 38 mg/dL, and HGB of 11.4 g/dL. Written informed consent was received from the patient who participated in this study.

## DISCUSSION

Monoclonal immunoglobulin deposition disease is an infrequent disease with monoclonal heavy or light chain deposition. It is generally seen in the fifth and sixth decades in male patients, but it can be seen at an earlier age (1, 2). It is frequently associated with underlying plasma cell dyscrasia or other lymphoproliferative diseases (4). In the study by Gokden et al. that included of 46 LCDD cases, MM was shown in 44, and lymphoproliferative disease was shown in 2 cases (9). Similarly, in another study with 63 cases, MM was detected in 59% of MIDD cases (10). In patients with clinical symptoms such as proteinuria, as in our case, the LCDD may appear before the diagnosis of MM (11). Monoclonal immunoglobulin accumulation in glomerular basement membranes and tubular basement membranes is the histopathological feature of renal involvement. Light microscopy most commonly shows nodular glomerulosclerosis that lacks cellularity (9). Nodules are less frequent in cases of light deposition disease with cast nephropathy (8). Small nodules may show mild mesangial cellularity. Cellularity decreases with an increase in nodule size, and those nodules lack cells in the middle. These nodules are PAS positive and Congo red negative. There are diseases that similarly present with nodular glomerulosclerosis such as diabetic nephropathy, amiloidosis, mesangioproliferative glomerulonephritis, fibrillary/immuntactoid glomerulonephritis, and idiopatic nodular glomerulosclerosis. This disease differs from amiloidosis by being Congo red negative, from diabetic nephropathy by being

Jones methenamine silver negative, and from other entities by immunfluorescent microscopy because those entities show polyclonal staining with kappa and lambda (6). Crescents may be present as shown in our case (8). They frequently accompany LCDD. Hyaline thickening of the basement membranes of the glomeruli; cortical and medullary tubules; a slight increase in granular material in the walls of the arteries/arterioles and in later stages of the disease; and increased interstitial fibrosis, chronic inflammation, and tubular atrophy are the microscopic findings in this disease (8). Immunofluorescence microscopy is the most important diagnostic method. The kappa chain is responsible for two-thirds of the LCDD cases. Electron microscopic findings are similar in all three subtypes of MCDD. Characteristically, glomerular, and tubular basement membranes are band shaped, while mesangial matrices and nodules are scattered randomly in dark granular deposits (8).



The treatment of MIDD is to control the underlying plasma cell proliferation, to preserve renal function, and to increase survival using chemotherapeutic and autologous hematopoietic cell transplantation. However, the treatment of non-myelomic LCDD cases is unclear (12). MM is important in predicting the overall survival.

## CONCLUSION

Light chain deposition disease is a rare monoclonal immunoglobulin deposition disease which commonly affects the kidneys. LCDD should be suspected and included in the differential diagnosis of patients with proteinuria and nodular glomerulosclerosis. Because of the fact that this condition is usually a sign of another underlying condition (mostly plasma cell dyscrasias and lymphoproliferative diseases), further examination of the patient is warranted.

**Informed Consent:** Written informed consent was received from the patient who participated in this study.

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**Conflict of Interest:** The authors have no conflict of interest to declare.

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