

# Albuminuria and Renal Pathology in Right Heart Failure: Congestive Kidney?



**To the Editor:** The term “congestive kidney” or “congestive nephropathy” has recently been used to describe renal dysfunction associated with venous congestion.<sup>1</sup> We encountered a case of proteinuria, which could be related to congestive kidney owing to right heart failure.

A 52-year-old woman with a history of surgery for Tetralogy of Fallot at age 6 years was referred for edema and proteinuria, mainly albuminuria. Imaging results indicated right heart failure and renal congestion owing to repaired Tetralogy of Fallot (Supplementary Figure S1A–D). Her proteinuria persisted despite treatment with diuretics and a renin-angiotensin-aldosterone system inhibitor. She was admitted for a renal biopsy. Laboratory findings are found in Table 1. Serum brain natriuretic peptide levels and urine protein levels (Supplementary Figure S2) revealed a significant positive correlation, suggesting proteinuria can increase when venous congestion worsens.<sup>2</sup>

Renal pathology results revealed normal glomeruli and dilated and atrophic tubules (Figure 1a). The interstitium was slightly edematous, and no interstitial fibrosis was observed (Figure 1b). Notably, peritubular capillaries in the cortex were significantly dilated (>50 μm, normal diameter: 7 μm) (Figure 1c), and vasa recta in the inner medulla were dilated (>30 μm, normal diameter: 7–20 μm) (Figure 1d).<sup>3,4</sup>

In most animal models of venous congestion, renal function is impaired owing to decreased renal arterial blood flow.<sup>1</sup> Notably, in this case, the renal function was relatively normal with slight tubular damage. Despite mildly elevated urinary N-acetyl-β-D-glucosaminidase, urinary liver-type fatty acid-binding

protein, the proximal tubular hypoxic marker, was within normal limits. These findings possibly suggest that tubular abnormalities were induced by factors other than renal ischemia. Another notable finding in our case was the dilated peritubular capillaries and vasa recta. In fact, a previous study revealed peritubular capillary dilation in an infrarenal aortocaval fistula-induced congestive heart failure rat model.<sup>51</sup> Therefore, dilated peritubular capillaries and vasa recta can help in the pathologic diagnosis of congestive kidneys at early or less severe stages of renal impairment.

To the best of our knowledge, this is the first renal biopsy case report on congestive kidney. Dilation of peritubular capillaries and vasa recta may be an initial pathologic change in renal congestion.

## ETHICS APPROVAL AND PATIENT CONSENT

This study was designed in accordance with the Declaration of Helsinki and approved by the Institutional Review Board of St. Marianna University School of Medicine (Institutional Review Board approval number: 4490). This article does not contain any studies with human participants performed by any of the authors.

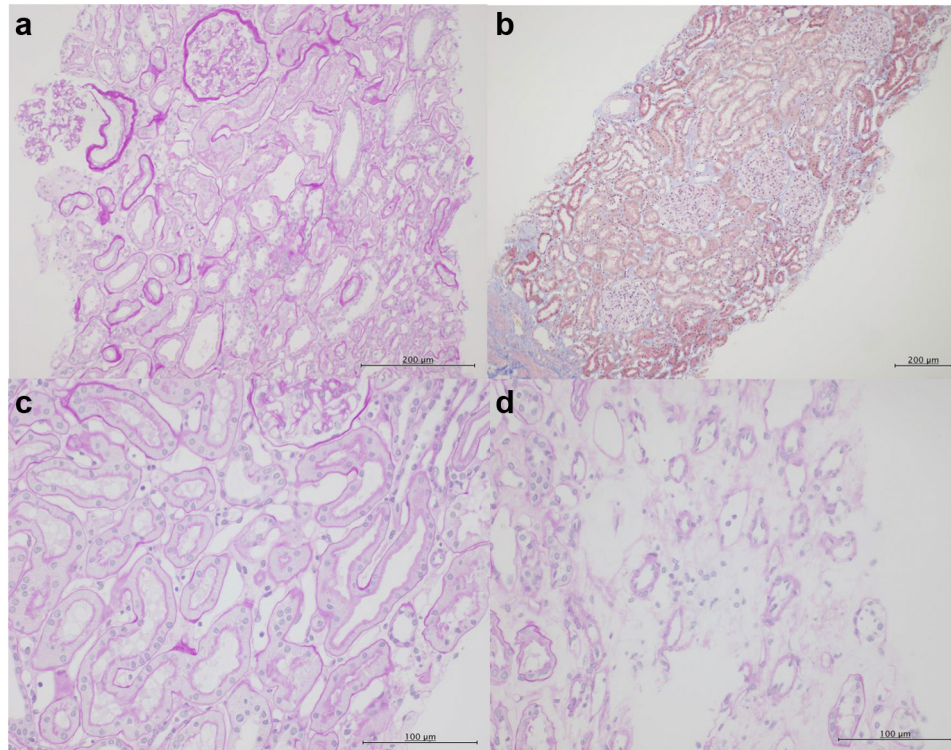
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**Table 1.** Relevant laboratory parameters from referral to admission

Parameters	At referral	2 mo after referral	8 mo after referral	10 mo after referral	18 mo after referral	24 mo after referral	On admission (26 mo after referral)
Body weight (kg)	49	47	47	45	46.7	45	43.6
Cr (mg/dl)	0.66	0.78	0.79	0.77	0.81	0.73	0.62
eGFR (ml/min per 1.73 m <sup>2</sup> )	73.5	61.2	60	61.7	58.4	65.1	77.8
BNP (pg/ml)	ND	110.4	525	178.6	275.4	203.9	180.8
Urine protein (g/gCr)	0.43	0.43	1.95	0.61	0.87	0.43	0.32
Urine NAG (U/gCr)	ND	ND	ND	ND	ND	13.5	11.6
Urine L-FABP (μg/gCr)	ND	ND	ND	ND	ND	1.5	0.8

BNP, brain natriuretic peptide; Cr, creatinine; eGFR, estimated glomerular filtration rate; L-FABP, liver-type fatty acid-binding protein; NAG, N-acetyl-β-D-glucosaminidase; ND, not determined.  
L-FABP, normal value: ≤8.4 μg/gCr; NAG, normal value: 1.6–5.8 U/gCr.



**Figure 1.** Representative images of renal biopsy: (a) a normal-sized glomerulus without obvious changes and dilated tubules with no tubulitis or interstitial inflammation (200 $\times$ , PAS); (b) slight interstitial edema, but no interstitial fibrosis (100 $\times$ , Masson); (c) significantly dilated peritubular capillaries in the cortex (400 $\times$ , PAS); and (d) dilated vasa recta in the inner medulla (400 $\times$ , PAS). PAS, periodic acid–Schiff.

support has been received for the work described in the submission.

## SUPPLEMENTARY MATERIAL

Supplementary File (PDF)

**Figure S1.** Signs indicating right heart failure and venous congestion: (A) chest radiograph reveals cardiomegaly; (B) contrast-enhanced abdominal computed tomography (CT) imaging reveals dilatation of the inferior vena cava (arrow) and left renal vein; (C) Doppler ultrasonography reveals an interrupted biphasic blood flow of the intrarenal vein; and (D) maintained intrarenal artery flow.

**Figure S2.** Positive correlation between serum brain natriuretic peptide (BNP) levels and urine protein levels.

### Supplementary Reference.

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