CASE REPORT

Unforeseen renal pathological findings in a patient with type 2 cardiorenal syndrome who died after 4 years of continuous ambulatory peritoneal dialysis

Masaru Matsui, Satoshi Okayama, Kenichi Samejima, Yoshihiko Saito

First Department of Internal Medicine, Nara Medical University, Nara, Japan

Correspondence to

Dr Satoshi Okayama,
satosi01@naramed-u.ac.jp

SUMMARY

A man in his 30s with dilated cardiomyopathy was admitted to our hospital with heart failure exacerbation. Despite optimal medical treatment, his renal function progressively declined to end-stage renal failure. Type 2 cardiorenal syndrome (CRS) was diagnosed and continuous ambulatory peritoneal dialysis was started. He died of a brainstem infarction 4 years later. Postmortem renal pathology revealed no significant changes in the glomeruli except for shrinkage, normal arterioles and focal degeneration of the tubules with peritubular fibrosis. This suggests that renal replacement therapy can be withdrawn from some patients with type 2 CRS.

BACKGROUND

Cardiorenal syndrome (CRS) is a pathophysiological disorder in which cardiac dysfunction can result in or be caused by renal dysfunction, and its understanding is considered important for improving the prognosis of patients with cardiac and/or renal dysfunction.^{1–2} CRS is classified into five subtypes according to the potential underlying pathophysiological mechanisms, and type 2 CRS is defined as chronic abnormalities in cardiac function causing progressive chronic kidney disease.^{3–4} The mechanism is considered to be renal hypoperfusion and congestion, and although activation of the renin-angiotensin-aldosterone system is associated with heart failure, it remains to be fully clarified.⁵ A renal biopsy is difficult to obtain from many patients with type 2 CRS because of unstable haemodynamics and being on antiplatelet/coagulation therapy, and few reports have described the renal pathology of such patients.^{6–7} Here, we describe the autopsy finding of a man with type 2 CRS who died after 4 years of continuous ambulatory peritoneal dialysis (CAPD).

CASE PRESENTATION

A man in his 30s was admitted to our hospital with orthopnea and bilateral lower leg oedema. Dilated cardiomyopathy (DCM) had been diagnosed 10 years previously by echocardiography, coronary angiography and an endomyocardial biopsy. He had later been repeatedly admitted to a hospital with heart failure exacerbation, and cardiac resynchronisation therapy with an implantable cardioverter defibrillator was performed in the year previous to the present admission. Although he had no diseases leading to renal dysfunction such as nephritis, collagen disease, renal artery stenosis, hypertension,

diabetes mellitus or obstruction between the kidneys and urethra, his renal function had nevertheless progressively declined over the past several years. We considered that he had type 2 CRS. His family history included a father, brother and an uncle with DCM.

INVESTIGATIONS

He had a regular heart rate of 108 beats/min, blood pressure of 94/60 mm Hg and decreased oxygen saturation of 94% despite oxygen inhalation. Cardiac auscultation revealed a third heart sound and no murmur. Neurological findings were normal and peripheral oedema was severe. Urinalysis showed no abnormalities. Complete blood counts revealed mild anaemia with haemoglobin 11.1 g/dl, and biochemical analysis revealed a low-estimated glomerular filtration (eGFR) rate of 20.1 ml/min/1.73 m² and a high B-type natriuretic peptide (BNP) value of 671 pg/ml. Chest x-rays revealed cardiac enlargement, pulmonary congestion and bilateral pleural effusion. These findings confirmed a diagnosis of heart failure exacerbation.

TREATMENT

Despite optimal medical treatment, systolic blood pressure and urine output decreased to 50 mm Hg and 100 ml/day, respectively, and eGFR further declined to be 9.1 ml/min/1.73 m². Continuous haemodiafiltration improved his haemodynamics but could not be withdrawn, and CAPD was started 8 months later. He was discharged with improved cardiac symptoms and a BNP concentration of 156 pg/ml. He died of a brainstem infarction after 4 years of CAPD.

OUTCOME AND FOLLOW-UP

An autopsy proceeded 1 h postmortem. The heart weighed was 1208 g with a small amount of pericardial fluid. No significant coronary atherosclerosis and LV hypertrophy were found. Microscopically, a reduced number of cardiomyocytes and diffuse interstitial fibrosis without inflammation was compatible with DCM (figure 1). The weight of both kidneys was slightly decreased (right and left, 106 and 116 g, respectively) and both cortices were slightly thinner than normal. No renal artery stenosis or obstruction between the kidneys and urethra was detected. Microscopically, focal degeneration of the tubules with peritubular fibrosis was more common in the medulla than in the cortex, but most glomeruli were not significantly changed except for

To cite: Matsui M, Okayama S, Samejima K, et al. *BMJ Case Reports* Published Online First: [please include Day Month Year] doi:10.1136/bcr-2012-008103

Figure 1 Microscopic pathology of heart muscle with H&E staining. A reduced number of cardiomyocytes and diffuse interstitial fibrosis without inflammation are compatible with dilated cardiomyopathy.

shrinkage. Arterioles also showed no significant morphological changes (figure 2). Immunofluorescence staining was negative for IgG, IgA, IgM, C3 and fibrinogen. These findings suggest that his renal failure had in fact been reversible.

DISCUSSION

We described the renal pathological findings of a man with type 2 CRS who died after 4 years of CAPD. The significance of these findings is that even a patient requiring long-term renal replacement therapy for type 2 CRS can have glomeruli with no significant changes except for shrinkage and normal arterioles.

On the basis of autopsy findings from cases with both non-ischæmic heart failure and renal dysfunction (eGFR 29.9 ± 10.5 ml/min), Tanaka *et al* characterised the renal histology of type 2 CRS as follows: (1) interstitial fibrosis without glomerular degeneration and arteriolar thickening; (2) dilated peritubular capillaries and (3) no proteinuria and no hematuria.⁷ These features were evident in our patient.

Patients with type 2 CRS on long-term renal replacement therapy are conventionally regarded as having irreversible renal dysfunction due to suspected glomerular deterioration. However, the present case suggests that some patients might have numerous surviving glomeruli, and thus renal replacement therapy might be

safely withdrawn. Accordingly, renal biopsies might need to be obtained, even from patients with type 2 CRS on renal replacement therapy, and effort must be directed towards finding ingenious ways to withdraw renal replacement therapy from such patients.

Learning points

- ▶ The prevalence of cardiorenal syndrome (CRS) has been steadily increasing worldwide, and it is closely related to the prognosis of patients with cardiac and/or renal dysfunction.
- ▶ Type 2 CRS is defined as chronic abnormalities in cardiac function causing progressive chronic kidney disease.
- ▶ Peritoneal dialysis is one of the most successful treatments for patients with type 2 CRS, especially when haemodynamics are unstable.
- ▶ Some patients with type 2 CRS on renal replacement therapy have normal arterioles and glomeruli with no significant changes except for shrinkage, which suggests that the potential for the withdrawal of such therapy.

Competing interests None.

Patient consent Obtained.

Provenance and peer review Not commissioned; externally peer reviewed.

REFERENCES

- 1 Parfrey PS, Foley RN. The clinical epidemiology of cardiac disease in chronic renal failure. *J Am Soc Nephrol* 1999;10:1606–15.
- 2 Mann JF, Gerstein HC, Poque J, *et al*. Renal insufficiency as a predictor of cardiovascular outcomes and the impact of ramipril: the HOPE randomized trial. *Ann Intern Med* 2001;134:629–36.
- 3 Ronco C, Haapio M, House AA, *et al*. Cardiorenal syndrome. *J Am Coll Cardiol* 2008;52:1527–39.
- 4 Ahmed MS, Wong CF, Pai P. Cardiorenal syndrome—a new classification and current evidence on its management. *Clin Nephrol* 2010;74:245–57.
- 5 Jois P, Mebazaa A. Cardio-renal syndrome type 2: epidemiology, pathophysiology, and treatment. *Semin Nephrol* 2012;32:26–30.
- 6 Haas M, Kain R, Mayer G, *et al*. Heart transplantation or combined heart/kidney transplantation? *Nephrol Dial Transplant* 1999;14:1014–15.
- 7 Tanaka M, Yoshida H, Furuhashi M, *et al*. Deterioration of renal function by chronic heart failure is associated with congestion and oxidative stress in the tubulointerstitium. *Intern Med* 2011;50:2877–87.

Figure 2 Microscopic pathology of kidney. Image shows no significant changes in glomeruli except for shrinkage and normal arterioles, although interstitial fibrosis is evident (A, $\times 100$; H&E stain. B, $\times 400$; Periodic acid-Schiff stain).

Copyright 2013 BMJ Publishing Group. All rights reserved. For permission to reuse any of this content visit <http://group.bmj.com/group/rights-licensing/permissions>.
BMJ Case Report Fellows may re-use this article for personal use and teaching without any further permission.

Become a Fellow of BMJ Case Reports today and you can:

- ▶ Submit as many cases as you like
- ▶ Enjoy fast sympathetic peer review and rapid publication of accepted articles
- ▶ Access all the published articles
- ▶ Re-use any of the published material for personal use and teaching without further permission

For information on Institutional Fellowships contact consortiasales@bmjgroup.com

Visit casereports.bmj.com for more articles like this and to become a Fellow