

LESSON OF THE MONTH

An unusual cause of acute renal failure in systemic sclerosis

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Background: Scleroderma renal crisis is one of the most life threatening complications of scleroderma. Enteric hyperoxaluria complicates extensive disease or resection of the small intestine in the presence of an intact colon, and is associated with calcium oxalate nephrolithiasis. This cause of renal failure may be underestimated and should be considered in all patients with malabsorption and renal failure.

Case report: A 78 year old woman with systemic sclerosis affecting the bowel developed acute renal failure caused by oxalate nephropathy.

Results: The patient's renal failure improved on an oxalate free diet.

The gastrointestinal tract is commonly affected in systemic sclerosis. The most common abnormalities are oesophageal.¹ Involvement of the small intestine is also common, reaching a 40–80% prevalence,² and may occur in the absence of significant involvement of the skin.³ It often leads to life threatening complications. To our knowledge this is the first described case of a patient with systemic sclerosis and enteric hyperoxaluria who developed acute renal failure from oxalate nephropathy.

CASE REPORT

We present a 78 year old white woman, with a five year diagnosis of the sine scleroderma form of systemic sclerosis with predominant small bowel involvement, pancreatic insufficiency, gastro-oesophageal reflux, and Raynaud's syndrome. Skin and other organ involvement was absent. Small bowel fluoroscopy studies showed a number of dilated loops of small bowel in the pelvis, with marked thickening of the valvulae conniventes, the so-called "stacked coin" sign. There was a delayed transit time of three hours. She had manometric evidence of oesophageal dysfunction: low, lower oesophageal sphincter pressure and low amplitude oesophageal peristaltic waves. A hydrogen breath test was negative. Creon and Imodium controlled her main gastrointestinal complaint of steatorrhoea, and a proton pump inhibitor her reflux. Four years into her diagnosis treatment was started with perindopril 4 mg every day and frusemide 40 mg every day to control hypertension and bilateral pedal swelling. A year later, she was admitted after two weeks of diarrhoea and lassitude.

On examination she was dehydrated with a blood pressure of 90/50 mm Hg. Systemic examination was unremarkable. Investigations showed sodium 139 mmol/l (normal 136–144), potassium 4.3 mmol/l (3.5–5.0), urea 33.2 mmol/l (2.3–7.5), creatinine 410 µmol/l (<135), antinuclear antibody and Scl-70 positive. Blood gases, liver function tests, full blood count, acute phase protein, p- and cANCA, extractable nuclear antigens, glomerular basement membrane antibody, and serum complement C3, C4, were all normal.

Pelvic ultrasound scan showed multiple dilated fluid-distended loops of peristaltic bowel. Renal ultrasound scan

confirmed that pyramids of both kidneys were prominent with increased reflectivity of the cortex, suggesting renal parenchymal disease. No evidence of collecting system dilatation or obstruction was seen, and both kidneys measured 11 cm in diameter. Renal biopsy showed tubular necrosis with associated crystal precipitation (fig 1). There was no demonstrable vasculitis or interstitial nephritis and, specifically, no glomerulonephritis.

She was maintained on a strict fluid regimen of 1.5 litres a day and a low oxalate diet, which requires excluding: strawberries, tea, coffee, chocolate, rhubarb, spinach, and beetroot. Repeat 24 hour urinary oxalate excretion after two weeks on this diet showed an improvement from 896 µmol/l to 402 µmol/l. At four weeks after discharge, she had no diarrhoea, felt well in her self, and her renal function had improved: sodium 135 mmol/l, potassium 4.7 mmol/l, urea 16.3 mmol/l, creatinine 315 µmol/l.

DISCUSSION

The scleroderma pulmonary renal syndrome and the scleroderma renal crisis (SRC) are distinct syndromes with different clinical presentations, histopathological manifestations, treatments, and outcomes. The scleroderma pulmonary renal syndrome is an autoimmune vasculitis of kidney and lung associated with normal blood pressure. Treatment is supportive, and prognosis is dismal.⁴ In contrast, SRC is associated with systemic hypertension. The main pathological changes seen in scleroderma kidney are oedema and proliferation of intimal cells, glomerular changes with thickening, and obliteration of arteries, leading to decreased renal perfusion and increased rennin release.⁵ The use of angiotensin converting enzyme (ACE) inhibitors in patients with SRC is life saving.

Oxalate nephropathy is usually seen in patients with primary hyperoxaluria types 1 and 2 and in patients with end stage renal disease managed with long term dialysis.^{6,7}

Enteric hyperoxaluria complicates extensive disease or resection of the small intestine in the presence of an intact colon, and is associated with calcium oxalate nephrolithiasis.^{8,9} Secondary hyperoxaluria is well recognised in malabsorption. It has been documented in Crohn's disease, jejunal ileal bypass, but could be expected in all causes of malabsorption.^{10,11} Normally much of the oxalate in the gut lumen is complexed as insoluble calcium oxalate, but in malabsorption calcium becomes complexed with luminal fatty acids, leading to increased levels of soluble and therefore absorbable sodium oxalate. Alterations in both the magnitude and direction of oxalate fluxes across the intestine can occur in systemic sclerosis as a result of the bowel abnormalities associated with this condition.¹² This patient's steatorrhoea will have contributed to the prolonged transit time through the "ileal brake".¹³ This patient had

Abbreviations: ACE, angiotensin converting enzyme; SRC, scleroderma renal crisis

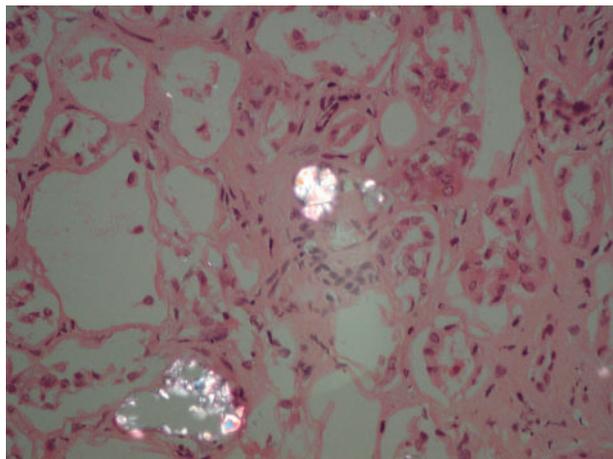


Figure 1 The crystals on polarisation had features of oxalate crystals and were only demonstrable in the haematoxylin and eosin sections and not in the periodic acid-Schiff or silver stained sections. There was no demonstrable vasculitis or interstitial nephritis and, specifically, no glomerulonephritis.

pancreatic insufficiency and dilated loops of small bowel, which resulted in prolonged transit time. This further enhances absorption of oxalate by the large intestine through increased permeability of a shunt conductance induced by malabsorbed bile salts and fatty acids.¹⁴

Crystals of calcium oxalate monohydrate and excess oxalate ions stimulate an array of responses, inducing localised injury and inflammation in the kidneys.¹⁵

Sloughing of the damaged necrotic tissue causes the interstitial crystals to ulcerate the papillary surfaces.¹⁶⁻¹⁸

Because anecdotal reports and short term studies have shown that ACE inhibition may preserve renal function in patients with scleroderma,¹⁹ treatment had been started with ACE-I for her hypertension. Oxalate nephropathy is a recognised cause of hypertension²⁰ and might have contributed to this in her case. However, our patient did not have SRC, which in essence is characterised by the onset of new severe hypertension, associated with a rapid increase in serum creatinine concentration, microangiopathic haemolytic anaemia, and a characteristic histological picture. It therefore needs to be borne in mind that hypertension in scleroderma induced by oxalate nephropathy can present as SRC.

The presence of diarrhoea, the use of ACE-I and diuretic contributed to the renal failure by potentially causing hypotension and dehydration, which provided the right environment for oxalate crystal formation. Renal failure from oxalate nephropathy resulting from enteric hyperoxaluria may be reversible if recognised and treated early by a low oxalate diet.^{6, 21}

This case emphasises that enteric hyperoxaluria should be looked for in patients with malabsorption caused by bowel scleroderma, and appropriate treatment started as soon as possible.

THE LESSONS

- In systemic sclerosis, enteric hyperoxaluria may be an easily overlooked complication.

- A high degree of awareness is necessary as oxalate nephropathy can potentially cause hypertension and acute renal dysfunction.
- 24 Hour urinary oxalate estimation in patients with bowel systemic sclerosis is a useful investigation to identify enteric hyperoxaluria.
- Management requires a simple low oxalate diet and careful fluid balance.

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REFERENCES

- 1 **Rose S**, Young MA, Reynolds JC. Gastrointestinal manifestations of scleroderma. *Gastroenterol Clin North Am* 1998;**27**:563-94.
- 2 **Young MA**, Rose S, Reynolds JC. Gastrointestinal manifestations of scleroderma. *Rheum Dis Clin North Am* 1996;**22**:797-823.
- 3 **Poormoghim H**, Lucas M, Fertig N, Medsger TA Jr. Systemic sclerosis sine scleroderma: demographic, clinical, and serologic features and survival in forty-eight patients. *Arthritis Rheum* 2000;**43**:444-51.
- 4 **Cossio M**, Menon Y, Wilson W, deBoisblanc BP. Life-threatening complications of systemic sclerosis. *Crit Care Clin* 2002;**18**:819-39.
- 5 **Shor R**, Halabe A. New trends in the treatment of scleroderma renal crisis. *Nephron* 2002;**92**:716-18.
- 6 **Cuvelier C**, Goffin E, Cosyns JP, Wauthier M, De Strihou CV. Enteric hyperoxaluria: a hidden cause of early renal graft failure in two successive transplants: spontaneous late graft recovery. *Am J Kidney Dis* 2002;**40**:E3.
- 7 **Maldonado I**, Prasad V, Reginato AJ. Oxalate crystal deposition disease. *Curr Rheumatol Rep* 2002;**4**:257-64.
- 8 **Chadwick VS**, Modha K, Dowling RH. Pathogenesis of secondary hyperoxaluria in ileal resection. *Gut* 1972;**13**:840.
- 9 **Sutton RA**, Walker VR. Enteric and mild hyperoxaluria. *Miner Electrolyte Metab* 1994;**20**:352-60.
- 10 **Chadwick VS**, Modha K, Dowling RH. Mechanism for hyperoxaluria in patients with ileal dysfunction. *N Engl J Med* 1973;**289**:172-6.
- 11 **Admirand WH**. Hyperoxaluria and bowel disease. *N Engl J Med* 1972;**286**:1412-13.
- 12 **Caspary WF**. Enteric hyperoxaluria. *N Engl J Med* 1977;**296**:1357.
- 13 **Spiller RC**, Trotman IF, Higgins BE, Ghatei MA, Grimble GK, Lee YC, et al. The ileal brake—inhibition of jejunal motility after ileal fat perfusion in man. *Gut* 1984;**25**:365-74.
- 14 **Hatch M**, Freel RW. Alterations in intestinal transport of oxalate in disease states. *Scanning Microsc* 1995;**9**:1121-6.
- 15 **Thamilselvan S**, Khan SR. Oxalate and calcium oxalate crystals are injurious to renal epithelial cells: results of in vivo and in vitro studies. *J Nephrol* 1998;**11**(suppl 1):66-9.
- 16 **Khan SR**, Shevock PN, Hackett RL. Acute hyperoxaluria, renal injury and calcium oxalate urolithiasis. *J Urol* 1992;**147**:226-30.
- 17 **Khan SR**, Thamilselvan S. Nephrolithiasis, a consequence of renal epithelial cell exposure to oxalate and calcium oxalate crystals. *Mol Urol* 2000;**4**:305-11.
- 18 **Umekawa T**, Chegini N, Khan SR. Oxalate ions and calcium oxalate crystals stimulate MCP-1 expression by renal epithelial cells. *Kidney Int* 2002;**61**:105-12.
- 19 **Hollenberg NK**, Raij L. Angiotensin-converting enzyme inhibition and renal protection. An assessment of implications for therapy. *Arch Intern Med* 1993;**153**:2426-35.
- 20 **Toblli JE**, Stella I, de Cavanagh E, Angerosa M, Inserra F, Ferder L. Enalapril prevents tubulointerstitial lesions by hyperoxaluria. *Hypertension* 1999;**33**:225-31.
- 21 **Wharton R**, D'Agati V, Magun AM, Whitlock R, Kunis CL, Appel GB. Acute deterioration of renal function associated with enteric hyperoxaluria. *Clin Nephrol* 1990;**34**:116-21.