Case Report

Kidney biopsies taken before and after oral sodium phosphate bowel cleansing

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Introduction

Acute renal failure due to phosphate nephropathy following bowel cleansing with an oral sodium phosphate solution is a rare, but well-known, complication [1]. Several authors have reported diffuse tubular injury and tubular deposition of calcium phosphate in biopsies taken from such patients [1–4]. In these patients, the term acute phosphate nephropathy more aptly describes this entity than the previously used term acute nephrocalcinosis [1]. It has been a matter of debate whether these changes are directly induced by the phosphate load or whether they were being present before the procedure [3]. We, therefore, report a patient with acute phosphate nephropathy who had kidney biopsies taken before and after bowel cleansing with sodium phosphate.

Case report

In 2002, a 69-year-old woman was send to the out-patient clinic because of a nephrotic syndrome including proteinuria of 8.8 g/24 h, hypertension and oedema. In 1977, she had been surgically treated for breast cancer and had lymphoedema in the right arm after surgery. She was diagnosed with unspecified colitis in 1991, and had been treated for hypothyroidism with 0.1 mg of thyroxin daily for several years. Six months before the first consultation, she started treatment for hypertension with a combination of 50 mg losartan and 12.5 mg hydrochlorothiazide. Two weeks before the first consultation, she was admitted to hospital for 2 days with transient ischaemic attack, and treatment with acetylsalicylic acid (160 mg) was started. At the first consultation at the out-patient clinic she was in good general condition, but complained of stiffness and pain in large muscles of the thighs and the buttocks. S-creatinine (Cr) was 70 μmol/l; creatinine clearance: 87 ml/min; S-albumin (Alb): 19 g/l; cholesterol: 11.5 mmol/l (HDL: 1.7 mmol/l); Hb: 12.8 g/100 ml; erythrocyte sedimentation rate (SR): 103 mm. Antinuclear antibodies (ANA), antineutrophil cytoplasmic auto-antibodies (ANCA), glomerular basement membrane antibodies (anti-GBM), C3, C4 and circulating immune-complexes were normal. Hepatitis B and C were negative. S-calcium (Ca): 2.22 mmol/l, s-phosphate (P): 1.4 mmol/l, s-sodium: 136 mmol/l, s-potassium: 4.2 mmol/l, s-chloride: 106 mmol/l. IgG: 11.7 g/l, IgA: 3.3 g/l, IgM: 0.3 g/l. S-electrophoresis: unspecified active process. Treatment was started with bumetanide: 1 mg two times a day.

The first kidney biopsy was taken in June 2002, 2 weeks after the first consultation. The initial diagnosis suspected from light microscopy was minimal change disease, and treatment with prednisolone 1 mg/kg/day was started (Figure 1). This had an immediate effect on her muscle-stiffness and pain, and SR declined to 16 in 1 month. A probable diagnosis was polymyalgia rheumatica in addition to the kidney disease. After electron microscopy, the kidney diagnosis was changed to membranous glomerulonephritis. The dose of prednisolone was reduced to 10 mg and, after a while, 7.5 mg/day. In order to exclude malignant diseases, several diagnostic procedures were performed, including a colonoscopy, that was done in October the same year. A standard bowel preparation was administered, including 45 ml of sodium phosphate the evening before and 45 ml the morning of the procedure. One month before this procedure, Ca was 2.46 mmol/l, Alb: 31 g/l and Cr: 80 μmol/l.
The following day, she had a previously scheduled appointment with her nephrologist. She felt sick, but had neither vomiting nor diarrhoea. She was hospitalized. Cr: 382 µmol/l, P: 2.2 mmol/l, Ca: 2.20 mmol/l, Alb: 36 g/l, blood pressure: 173/96. Her Cr increased to 528 µmol/l during the next 5 days, and a second biopsy was taken. This biopsy confirmed the primary diagnosis of membranous glomerulonephritis, but in addition, calcium phosphate deposits were seen in tubular cells and tubules, and interstitial oedema without leucocytes infiltration was found (Figure 1). Phosphate remained elevated for 11 days. The other electrolytes were normal. At the time of the second biopsy she was on the following medication: 50 mg losartan in combination with 12.5 mg hydrochlorothiazide; thyroxine: 0.1 mg/day; acetylsalicylic acid: 160 mg; amlodipine: 5 mg; atorvastatin: 20 mg; a combination of calcium carbonate (1.25 g) and cholecalciferol (10 µg) (prophylaxes for osteoporosis); prednisolone: 7.5 mg; bumetanide: 1 mg two times/day.

Cr declined during the following months, and remained stable at ~150 µmol/l for the next 3½ years. Protein/creatinine in urine has been normalized: 4.5 mg/mmol. She has used 7.5 mg prednisolone until recently for polymyalgia rheumatica.

**Biopsy methods**

Standard processing of both renal biopsies was performed at the same laboratory including light microscopy, immunofluorescence and electron microscopy. For light microscopy, both biopsies were stained with Von Kossa stain. For immunofluorescence a double immunofluorescence technique with polyclonal antibodies (FITC or MRTIC) to IgG, IgM, IgA, C3 and C1q were performed. Electron microscopy was performed on both biopsies.

**Discussion**

We present a patient who developed acute phosphate nephropathy following oral administration of a sodium phosphate bowel purgative. Previous case studies have described similar histological findings [1,2,4,5], but none has described a patient with biopsies taken before and after the sodium phosphate load. Therefore, the causality between the phosphate load and the nephropathy may be questioned [3]. In this report, a biopsy taken only 2 months before the acute kidney disease showed no sign of the calcium phosphate deposits found in the second biopsy. We therefore conclude that the phosphate load given to the patient caused the findings in the second biopsy.
Our patient had membranous glomerulonephritis with nephrotic syndrome. Blood samples taken 1 month before the second biopsy showed normal renal function. The proteinuria was reduced (3.9 g/day) and s-albumin increased (31 g/l), which indicated partial remission from the nephrotic syndrome. To our knowledge, there is no association between membranous glomerulonephritis and acute phosphate or calcium nephropathies.

The patient complained of nausea, but had not vomited. She was taking angiotensin-converting enzyme inhibitor together with a small dose of hydrochlorothiazide and a loop-diuretic. Even though she had stopped using the loop-diuretic when she started to feel sick, this medication may cause a volume-depleted state resulting in renal failure. On the other hand, she was treated with intravenous fluid starting early after the bowel cleansing procedure, and her blood pressure was not lower than usual at hospital admission. Thus, it is unlikely that hypovolaemia alone caused the acute renal failure.

At the time of the acute phosphate nephropathy, she was using 10 mg of prednisolone daily, together with calcium carbonate in combination with cholecalciferol for osteoporosis prophylaxis. These drugs might increase serum levels of calcium and phosphate, but in this patient, calcium was normal just a month before colonoscopy, at a time when she used these medicines (phosphate was not analysed on this occasion). We did not measure the secretion of calcium (or phosphate) in the urine, but it is unlikely that the secretions of these electrolytes were elevated before the phosphate load was given. To our knowledge, no previous reports have mentioned concurrent administration of calcium carbonate and cholecalciferol in connection with acute phosphate nephropathy.

We, therefore, present this case report as one of the increasing number of reports connecting the use of oral sodium phosphate bowel cleansing purgative to acute renal failure.

Conflict of interest statement. None declared.

References

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