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CASE REPORT

Antibiotics therapy was effective in preventing bilateral staghorn renal matrix stones

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Abstract Herein we report a case for which antibiotic therapy was effective in preventing bilateral staghorn renal matrix stones. A 34-year-old man was referred to our hospital for right lower abdominal pain and fever. Blood data and urinary analysis indicated a urinary tract infection and renal failure. The diagnosis was bilateral pyelonephritis for staghorn renal matrix stones. He had undergone percutaneous neprolithotripsy (PNL) for bilateral staghorn renal matrix stones. Almost all fragments were removed by the grasper. However, 3 months after the operation, bilateral staghorn renal matrix stones rapidly developed, so he underwent PNL again. After the operation, low-dose antibiotic therapy was continued to prevent pyelonephritis. As a result renal matrix stones did not reoccur. Until now, 1 year after the start of antibiotic therapy, no further sign of relapse has been noted.

Keywords Matrix stone · Staghorn renal stone · Antibiotic therapy · Urinary tract infection

Introduction

Matrix renal stones are rarely encountered and it is difficult to detect, diagnose and treat them. In this case, after PNL for bilateral staghorn renal matrix stones, antibiotic therapy proved effective for preventing recurrence of renal matrix stones.

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Case report

A 34-year-old man suffered from symptoms of left flank pain with fever and pyuria. Urinalysis revealed a pH of 7.0 with a white cell count 60–70 in a high-power field and proteinuria. Urine culture grew *Enterobacter agglomerans*. The blood data indicated infection (WBC 11200, CRP 8.92) and normal serum creatinine, calcium, uric acid, and phosphorus. The 24-h urine collection results were also normal for calcium, oxalate, uric acid and phosphorus excretion. Computer tomography (CT) showed left hydronephrosis and left ureteral stone (but actually the renal pelvis was filled with a matrix stone as a low-density soft tissue mass). The diagnosis was left pyelonephritis due to the left ureteral stone. We recommended that he receive left percutaneous nephrostomy (PNS) immediately, but he refused, because he was diagnosed urolithiasis for the first time 6 years ago and had a long history of recurrent urolithiasis (the past stone composition was calcium phosphate (98%) and was not matrix stone) and urinary tract infection (UTI), following many previous treatments such as transurethral lithotripsy (TUL), PNL, Extracorporeal shock wave lithotripsy (ESWL), ureteral stent placement and/or PNS once or twice every year. On this occasion ESWL was performed to treat the left ureteral stone first, but the stone was not crushed. Therefore left TUL was performed. A mud-like white soft stone was found in the ureter and the renal pelvis. The grasper was able to remove the soft stone, but not all of the stone was removed. Thus a left ureteral stent was indwelled to maintain drainage. After the operation, the infection gradually improved. Stone analysis revealed

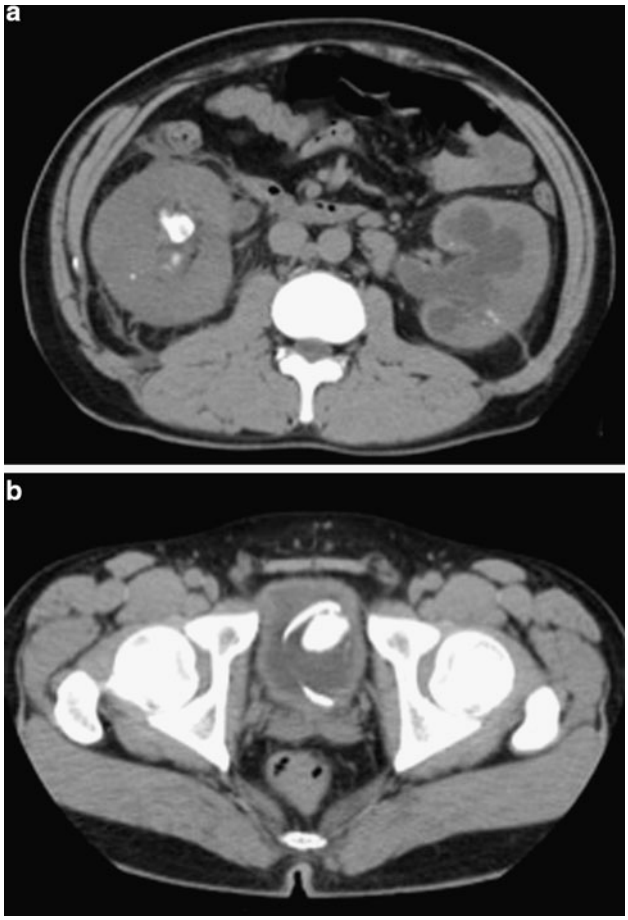

Fig. 1 Computer tomography revealed bilaterally a radiolucent mass with calcification in the renal pelvis (**a**), and calcium, which was attached to the left D-J stent (**b**)

protein as the main component with 98% of the remaining quantity being the mineral substance calcium phosphate. Thus we diagnosed this disease as left ureteral matrix stone.

Two months later, a follow-up CT showed a calcified low-density mass in the left renal pelvis, and DIP showed a filling defect within the left renal pelvis. Certainly the matrix stone had become worse. We suggest that he undergo left PNL immediately, but since he was asymptomatic for UTI, he refused.

Two months later, he visited our hospital suddenly complaining of right lower abdominal pain and fever. Blood data indicated infection and renal failure (WBC 26,900, CRP 20.6, Cr 4.7). CT showed a low-density mass like a soft tissue bilaterally in the renal pelvis and calcium was attached to the left D-J stent (Fig. 1a, b).

After obtaining his permission, bilateral PNS was performed. The bacteria isolated were once again *Enterobacter agglomerans*. Bilateral PNL and transurethral cystolithotripsy were performed in that order. Almost all stones were removed (Fig. 2). Stone components were the same as before. We recommended him to rule out neurogenic bladder

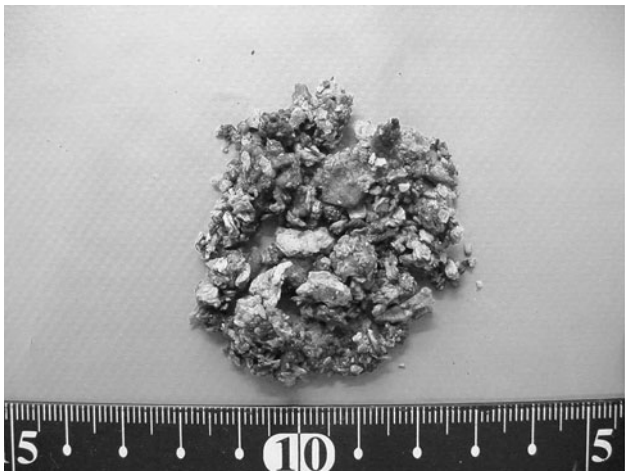

Fig. 2 Gross appearance of matrix stones removed by PNL and transurethral cystolithotripsy

and receive vesicoureteral reflex (VUR) test. But he refused these tests. Glomerular filtration rate (GFR) test showed slight left renal failure (right 75 ml/min, left 30 ml/min).

One month later DIP did not show any recurrence (Fig. 3a), but 3 months later, DIP showed a filling defect bilaterally within renal the pelvis as before (Fig. 3b).

We recommended that he receive bilateral percutaneous nephrostomy but he refused it and chose to keep taking antibiotics. Meanwhile, fever and pain did not reoccur. Two months later, left PNL and right PNL were performed in that order. After the operation, he continued taking antibiotics such as sulfamethoxazole in low dose. There has since been no recurrence for 1 year since he started the antibiotic therapy.

Discussion

Matrix renal stones are an uncommon form of urinary calculi. Since the first description by Gage et al. in 1908 [1], there have been infrequent case reports of these calculi. The mean matrix component of these calculi is 65%, compared with 2.5% of the dry weight in calcigerous calculi [2].

Matrix stones have been reported in patients of all age groups [3]. They also tend to occur in patients who are stone formers especially if they previously had surgery for stone disease. In this case, the patient previously had undergone surgery for stone disease. UTI, usually *Proteus* species or *Escherichia coli*, is known to be a factor in the development of matrix stones [4]. Stoller et al. [4] found that they were three times more common in females. It might be due to their increased susceptibility to infection. In this case, the bacterium isolated was *Enterobacter agglomerans*. Additionally, matrix stones have also been reported in patients with chronic renal insufficiency [5] and

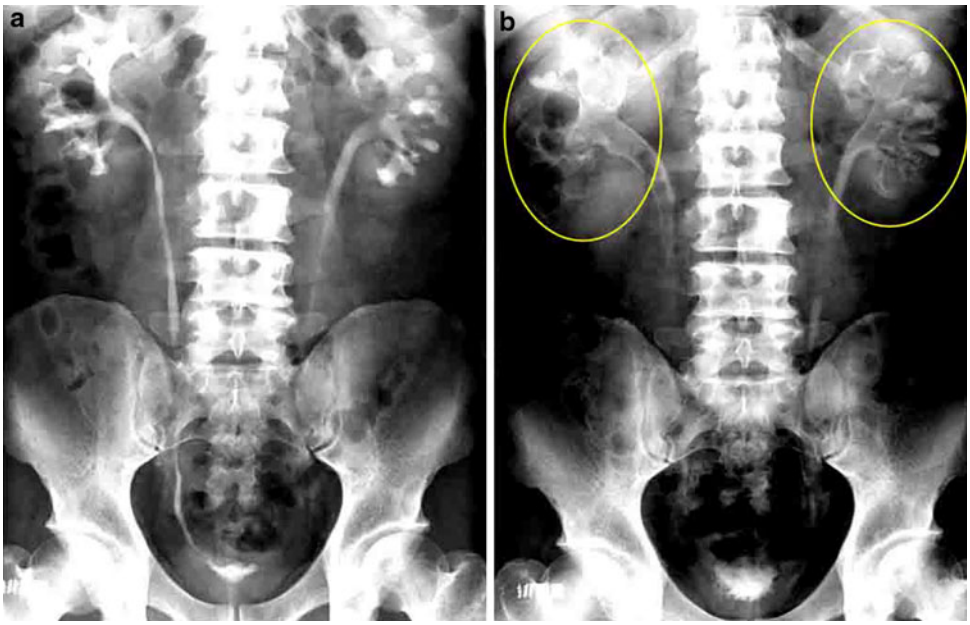

Fig. 3 One month after the PNL for bilateral renal matrix stones, DIP did not show any recurrence (**a**), but 3 months later, DIP showed filling defects bilaterally within the renal pelvis as before (**b**)

those on hemodialysis [6]. In this case, GFR test revealed slight left renal failure. It might be caused by chronic pyelonepritis but VUR test was not performed. Proteinuria may contribute to an increased risk of matrix stone formation. Moreover, these patients' matrix stones have shown to include both microfibrillar protein and β2-microglobulin [6, 7]. In this case, urinalysis revealed proteinuria. For the stone's protein analysis, sodium dodecyl sulfate-polyacrylamide gel electrophoresis (SDS-PAGE) was performed and two main proteins were found. The analysis of amino acid sequences revealed outer membrane protein S1 (OMP S1) and protein S100-A8. Interestingly, OMP S1 comes from Salmonella typhi. Though we could not detect *Salmonella typhi* from the history of urine cultures, we suspected the possibility of the patient's *Salmonella*'s infection and it caused renal matrix stones.

Moreover, Rowley et al. [3] said that smoking is another possible risk factor.

It is necessary for the diagnosis of matrix stones to be familiar with this disease before the treatment [4]. Matrix stones are usually radiolucent. In retrograde pyelography (RP) and DIP studies, matrix stones should be included with the differential diagnoses of filling defect of the urinary tract such as blood clots, tumors, polyps, small uric acid or cystine stones [8]. Indeed matrix stone diagnosis is usually made intraoperatively from the gross appearance and consistency of the stone material.

Matrix stones are usually large in volume and unlikely to pass spontaneously. ESWL is usually ineffective due to the gelatinous nature of the stones and lack of disruptable mineral content [8]. Ureteroscopic removal of matrix stones is also often inadequate, due to the large stone burden [8]. Therefore, PNL may be the best method to remove matrix stones completely. In this case, the renal pelvis was filled with matrix stone, but the stone was soft and free flowing and it was easy to remove with a grasper.

Matrix stones are said to have very low recurrence rates once they are completely removed [3, 9]. In a recent study by Rowley et al. of the nine patients, one patient continued antibiotic prophylaxis after PNL. Unfortunately, this patient's stone recurred rapidly. I believed the reason for this was inadequate control of UTI. It is said that antibiotic prophylaxis is effective to combat matrix stone recurrence, but there has been no clear evidence offered indicating what period of time would be best for continuing the antibiotic therapy. Interestingly, Inger et al. said that long-term treatment with ammonium chloride seems to prevent the development of infected stone recurrences and decreases the need for long-term antibiotic treatment. Thus, we concur that urinary acidification might be a useful therapeutic complement in the management of the patient with infected renal stone [10]. Otherwise, recent paper showed intravesical administration of hyaluronic acid (HA) is effective for prevention of UTI recurrence to repair of the mucosal damage [11]. So HA lavage through the nephrostomy after the PNL might be effective for prevention of matrix stones recurrence.

Thus it is necessary to collect multi-institutional collaborative data to develop better management of renal matrix stones.

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