

## AKI in a Patient with Pyuria and an Alkaline Urine

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### Case Description

A 70-year-old man was admitted to hospital with AKI. One year earlier, he had prostatic adenocarcinoma treated by prostatectomy, external radiotherapy, and hormone therapy. Then 4 months before admission, he developed obstructive AKI with thickening of the bladder wall, suspected to be of neoplastic origin. Cystoscopy revealed diffuse inflammation of the bladder and double-J stents were inserted. Bladder biopsies showed necrotic tissue with intense mononuclear leukocyte infiltration, but no evidence of neoplasia (Figure 1).

On admission, the patient had nausea, abdominal pain, gross hematuria, and oliguria. Serum creatinine level was 5.8 mg/dl, and C-reactive protein was 42 mg/L. Urinary examination showed pyuria, alkaline pH (9), and struvite crystals. A computed tomography (CT) scan of the abdomen showed bilateral ureterohydronephrosis despite double-J stents, associated with bilateral kidney stones (Figure 2A) and the presence of thin opacities outlining the bladder wall (Figure 2B).

### Discussion

The association of alkaline urine, pyuria, struvite crystals with thickening, and linear calcifications of the bladder wall is specific to encrusted cystitis.

Encrusted cystitis is defined as the presence of encrustations (the deposition of magnesium ammonium phosphate crystals) in the bladder wall, sometimes extending to the ureter and pelvicaliceal system (encrusted pyelitis) (1). *Corynebacterium urealyticum*, also called CGD2, is implicated in most patients. CGD2 is a Gram-positive microorganism that frequently colonizes the skin of hospitalized patients. Its high urease activity is responsible for ammonia formation creating alkaline urine, which precipitates struvite and calcium phosphate crystals leading to mucosal encrustations and stones. Encrusted cystitis is nosocomially acquired, and requires predisposing factors such as immunodepression, the presence of urinary catheters or diversions, an underlying urologic disease leading to urologic manipulations, and the selective role of prolonged broad-spectrum antibiotics in debilitated patients (2). Kidney transplant recipients are at particular risk but encrusted pyelitis can also involve the native kidneys (3).

Clinical symptoms are not specific. Pain and gross hematuria are frequently present. Search for CGD2 remains difficult and may be missed in routine cultures. It requires cultures for longer than 48 hours on enriched and selective media.

Treatment includes glycopeptides antibiotic, acidification of urine and chemolysis, and surgical removal of encrustations if needed. Chemolysis dissolves calcified encrustations by continuous instillation of acidic solutions (such as Thomas or Suby G solution) *via* a nephrostomy catheter, as described by Meria *et al.* (1). Treatment duration is ultimately determined by the efficacy noted on repeat CT scan.

### Teaching Points

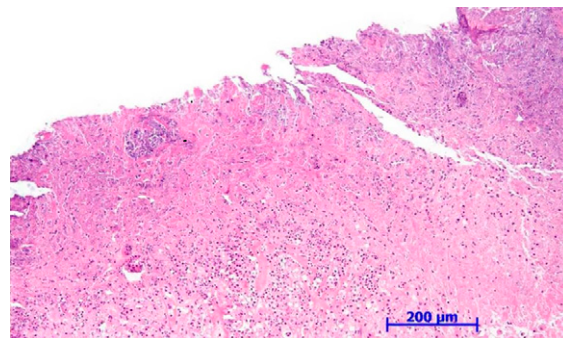
- Pyuria, alkaline urine, and struvite crystals should suggest encrusted cystitis in patients at increased risk.
- Diagnosis of encrusted cystitis essentially relies on noncontrast CT scan showing linear calcifications of pelvicaliceal or bladder urothelium.
- Treatment of encrusted cystitis includes antibiotics, acidification of urine and chemolysis, and surgical removal of encrustations.

### Disclosures

All authors have nothing to disclose.

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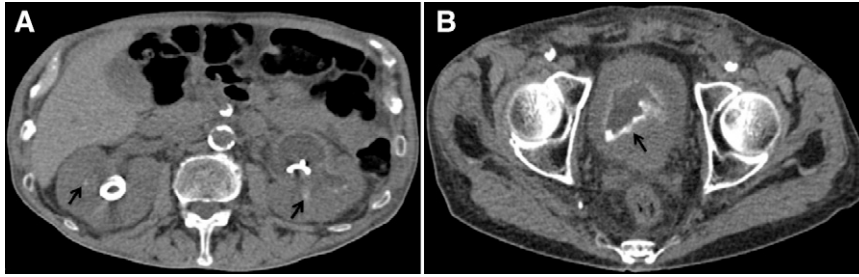
None.



**Figure 1.** | Haematoxylin and eosin staining of bladder biopsies showing the mucosa devoid of epithelium and the replacement of the submucosa by a thick collagen layer containing inflammatory cells and calcium salts ( $\times 10$  objective).

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**Figure 2. | Radiologic findings of the patient.** Computed tomography of the abdomen revealed bilateral ureterohydronephrosis despite double-J stents, associated with bilateral kidney stones (A) and thin opacities outlining the bladder wall (B). 81×46 mm (300×300 DPI).

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#### Author Contributions

B. Anthonissen and J-F. Cambier wrote the original draft; J-F. Cambier was responsible for supervision; and J-F. Cambier and J-P. Lengelé reviewed and edited the manuscript.

#### References

1. Meria P, Desgrappes A, Arfi C, Le Duc A: Encrusted cystitis and pyelitis. *J Urol* 160: 3–9, 1998 [https://doi.org/10.1016/S0022-5347\(01\)63009-X](https://doi.org/10.1016/S0022-5347(01)63009-X)
2. Meria P, Jungers P: Encrusted pyelitis: An underdiagnosed condition? *Nephrol Dial Transplant* 15: 943–945, 2000 <https://doi.org/10.1093/ndt/15.7.943>
3. Hertig A, Duvic C, Chretien Y, Jungers P, Grünfeld JP, Rieu P: Encrusted pyelitis of native kidneys. *J Am Soc Nephrol* 11: 1138–1140, 2000

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