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Diagnostic approach and management of encrusted cystitis: A case report

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Abstract

Encrusted Cystitis (EC) is a rare chronic inflammatory condition of the bladder characterized by calcified encrustations on the mucosa, primarily affecting patients with prior urological abnormalities. We report the case of a 77-year-old female with a history of cervical cancer treated with radio chemotherapy and non-muscle invasive bladder cancer. Six months after transurethral resection of the bladder tumor, she developed symptoms of frequent urination and urinary stone passage. The diagnosis of encrusted cystitis was suspected due to alkaline urine pH and presence of struvite crystals. Cystoscopy confirmed the diagnosis, which was further supported by histological and spectrophotometric analyses of the resected lesions.

Keywords: Corynebacterium urealiticum; Alkaline urine pH; Struvite crystals; Encrusted cystitis; Case report.

Abbreviations: EC: Encrusted Cystitis; TURBT: Transurethral Resection of Bladder Tumor; CU: Corynebacterium Urealyticum; CT: Computed Tomography.

Introduction

Encrusted Cystitis (EC) is a rare chronic bacterial infection of the lower urinary tract characterized by calcified plaques on the bladder urothelium associated with ulceronecrotic and inflammatory lesions. The condition primarily affects elderly or debilitated adults and has become increasingly uncommon due to the widespread use of antibiotics. The pathogenesis of EC is closely linked to the urease activity of urea splitting bacteria, particularly Corynebacterium urealyticum, which raises urinary pH and promotes the precipitation of struvite and apatite crystals. The resultant alkaline urine environment facilitates the formation of encrustations and bladder wall inflammation [1].

Delayed diagnosis of encrusted cystitis is common [2], often leading to complications. Early recognition and treatment are crucial, as timely intervention markedly improves patient prognosis. This case report aims to review the pathogenesis, clinical features, diagnostic approaches, and management strategies for encrusted cystitis to enhance awareness and facilitate prompt therapeutic decision-making.

Case presentation

We report the case of a 77-year-old female passive smoker with a 5-year history of cervical neoplasia currently in remission following radio chemotherapy, and a 2-year history of high-risk recurrent nonmuscle-invasive bladder tumor. The patient had undergone five Transurethral Resections of Bladder Tumor (TURBT). Six months after the fifth TURBT, she presented with left lower back pain, pollakiuria, and passage of urinary calculi. Laboratory investigations are mentioned in (Table 1).

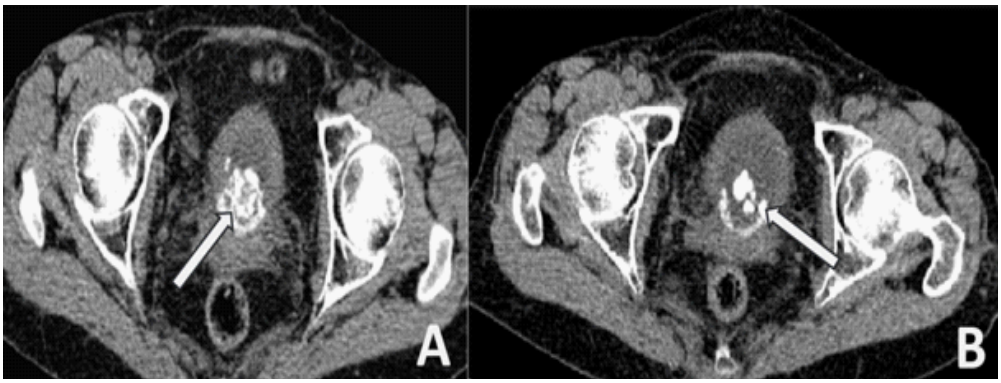

Figure 1: CT Axial view of the pelvis demonstrating a small capacity bladder with thickened wall. Arrows denote encrusted bladder stones (**A** and **B**).

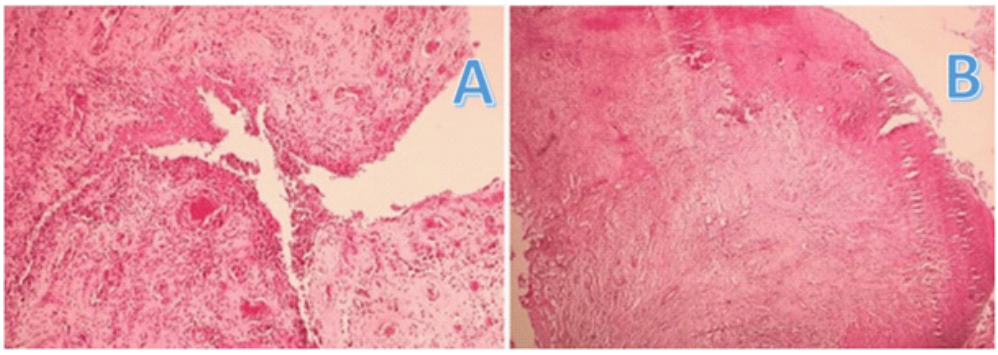

Figure 2: Histology: Inflammatory infiltrate with ulcerated and necrotic materiel Histopathology. **A** and **B**: Hematoxylin and eosin staining demonstrated inflammatory granulation tissue within the bladder wall with areas of necrosis and calcification (100× and 40× magnifications, respectively).

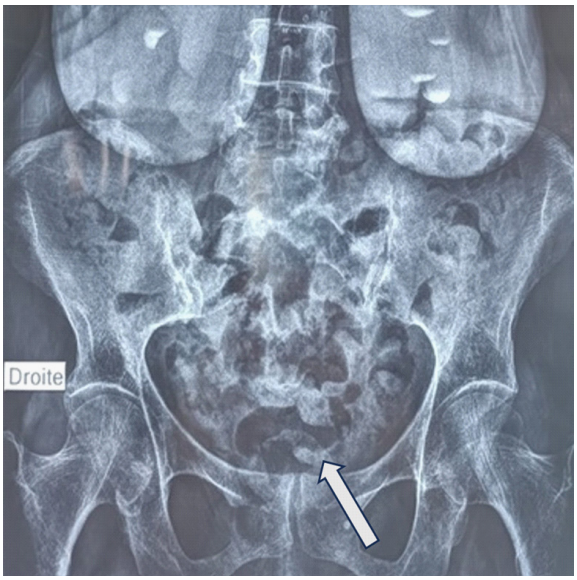

Figure 3: Standard imaging of the urinary tract. Arrow denotes bladder wall calcifications.

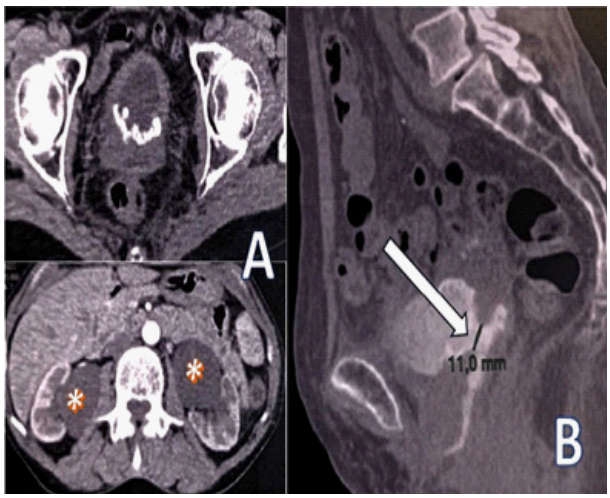

Figure 4: CT abdomen and pelvis sections.
(A) Axial view revealing a small bladder capacity with encrusted deposits. Asterisk denotes hydronephrosis.
(B) Sagittal section of the CT scan demonstrating a vesicovaginal fistula (arrow), identified by the opacification of the vagina through an 11 mm orifice during the delayed phase of contrast agent injection.

Table 1: Laboratory findings including reference values and units.

Laboratory parameter	Result	Reference values	Units
Blood Creatinine	17	6-12	mg/L (milligrams per liter)
Urine pH	8 (alkaline)	4.5-8.0	pH
Leukocytes in Urine	50	0-10	leukocytes/mm³ (per cubic millimeter)

Urinalysis showed an alkaline pH and the presence of ammonium and magnesium phosphate crystals. Urine cultures on standard media were negative. Computed Tomography (CT) of the abdomen and pelvis demonstrated left ureterohydronephrosis and bladder calculi (Figures 1A and 1B).

Cystoscopic examination identified multiple encrusted bladder stones located at the trigonal and retrotrigonal regions, covering the left ureteral meatus. Endoscopic fragmentation of the calculi was performed, along with resection of encrusted plaques. The left ureteral meatus, initially not visible, was identified by methylene blue injection via a left percutaneous nephrostomy and successfully repermeabilized.

Histopathological analysis of resected tissue revealed necrotic debris, ulcerated mucosa, and dystrophic calcifications with non-specific inflammatory changes (Figure 2).

Spectrophotometric analysis of the calculus revealed a triple-component infectious stone composed of struvite (50%), ammonium acid urate (30%), and carbapatite (20%).

The patient was started on teicoplanin-based antibiotic therapy, resulting in clinical improvement and a decrease in blood creatinine to 8 mg/L, which remained stable.

Three months later, symptoms recurred. Imaging showed bladder wall calcifications (Figure 3).

The previous therapeutic approach was repeated, but without significant improvement. Four weeks later, the patient developed bilateral lumbago and permanent urinary incontinence. A vesicovaginal fistula was diagnosed. Uro-CT revealed bilateral ureterohydronephrosis, a small capacity bladder with thickened walls, multiple micro calculi (Figure 4A), and an 11 mm fistulous tract between the posterior bladder wall and vagina (Figure 4B).

A radical cystectomy was then performed. The postoperative course was favorable, with improved renal function and resolution of bilateral ureterohydronephrosis on follow-up ultrasound.

Discussion

Encrusted cystitis, a rare and complex urinary tract infection, was first described in 1914. It is characterized by the presence of “eggshell” deposits on the ulcerated and necrotic parts of the bladder mucosa, with potential involvement of the upper urinary tract urothelium [1]. Our case highlights key risk factors for this condition, including immunodeficiency and underlying urological disorders such as recurrent urinary tract infections, bladder trauma, and tumors. Additionally, a history of endourological procedures that damage the urothelium, prolonged bladder catheterization, and intravesical chemotherapy significantly contribute to disease development [1,3,4].

The pathogenesis is predominantly associated with urea-splitting bacteria, particularly Corynebacterium Urealyticum (CU). This gram-positive bacillus, part of the skin flora, is frequently encountered in nosocomial settings, colonizing up to 12% of the general population and 30% of hospitalized individuals [5]. Its urease activity splits urea into ammonium and carbonate, leading to urine alkalinization and the subsequent precipitation of ammonium magnesium phosphate and calcium phosphate [1]. Although a urinary pH above 7.1 is typically required for pathogenesis, cases with lower pH values have been documented [6]. The resulting struvite deposits form in necrotic and ulcerated bladder mucosa, with ammonia disrupting the protective glycosaminoglycan layer, facilitating bacterial adherence [2]. While CU is a primary pathogen, other urease-producing bacteria such as Ureaplasma urealyticum, Streptococcus haemolyticus, Klebsiella, and Proteus species may also contribute, particularly in upper urinary tract infections [1].

Clinically, encrusted cystitis presents with dysuria, suprapubic pain, hematuria, voiding of encrustations, and turbid urine. Lesions can extend to cause encrusted ureteritis or pyelitis [1,5].

Diagnosis is often suspected through urine analysis revealing alkaline pH, ammonium magnesium phosphate crystals, and identification of causative bacteria [3]. However, culturing CU is challenging due to its slow growth (>48 hours) on specialized media such as blood agar at 37°C, leading to diagnostic delays [1,7]. In difficult cases, Polymerase Chain Reaction (PCR) may assist in bacterial identification [2]. Imaging especially computed tomography-typically demonstrates a thickened, calcified bladder wall with associated edema and possible ureterohydronephrosis [1]. Cystoscopy remains the key diagnostic tool, revealing calcified plaques with ulcerated, hemorrhagic mucosa. Struvite deposits vary in size and preferentially locate at the trigone, ureteral orifices, bladder neck, and previous urothelial injury sites such as transurethral resection scars [1]. Histological examinations confirm the diagnosis by revealing ulcerated necrotic tissue embedded with crystals and an inflammatory infiltrate colonized by bacteria, lymphocytes, and neutrophils, forming an inflammatory granuloma [1,3]. Treatment involves three complementary strategies: Targeted antibiotics, iterative endoscopic resection of plaques, and urinary acidification (chemolysis) [2]. Intravenous vancomycin or teicoplanin administered for 4 to 6 weeks is recommended [3]. This antibiotic regimen may be sufficient in cases of early diagnosis or when the patient’s general condition is compromised. Antibiotic therapy should invariably precede urinary acidification and urological interventions [1]. Endoscopic plaque resection is critical, often requiring multiple sessions for extensive lesions to eradicate infection fully [2,3]. For refractory cases, local irrigation with acidic solutions helps dissolve encrustations but may cause side effects such as pain, metabolic acidosis, and candiduria [2]. Oral acetohydroxamic acid, a urease inhibitor, can be considered, though its delayed onset and poor tolerance limit use [3,8].

Additionally, bladder instillation of hyaluronic acid and injection of botulinum-A neurotoxin into the bladder submucosal tissue have been reported as effective adjunct therapies, promoting mucosal rehabilitation and symptom relief in encrusted cystitis [9].

Radical cystectomy, primarily reserved for bladder cancer, may be justified in severe encrusted cystitis unresponsive to conventional measures to prevent complications like reduced bladder capacity and persistent ureterohydronephrosis. Though

associated with high morbidity and lifelong urinary diversion, cystectomy effectively removes diseased tissue, protects renal function, and improves quality of life in carefully selected patients after a thorough discussion of risks and benefits [1,10].

In our case, radical cystectomy significantly improved renal function and quality of life following failure of conservative treatments. The coexisting high-risk bladder cancer further supported this intervention, addressing both malignancy risk and infection source and ultimately improving our patient's quality of life and overall prognosis.

Encrusted cystitis can lead to serious complications if not managed properly. Therefore, it is imperative to adopt a comprehensive and timely therapeutic strategy to mitigate these risks and improve patient outcomes [3].

Conclusion

Despite its rarity, encrusted cystitis should be suspected in patients presenting with crystals in alkaline urine, particularly those with underlying urological disorders. Clinicians should not exclude this diagnosis solely due to negative urine cultures on standard media. Early recognition is critical to achieving better functional outcomes. Treatment modalities range from antibiotic therapy to more aggressive interventions such as cystectomy in complicated or refractory cases. In our patient, conservative management proved insufficient, and the presence of high-risk recurrent bladder cancer further justified radical cystectomy, which provided substantial clinical benefits by addressing both conditions effectively. This case underscores the importance of timely and decisive intervention in managing encrusted cystitis to optimize patient outcomes.

Declarations

Ethics approval and informed consent: Ethical approval is not required by our institution. Written informed consent was obtained from the patient

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Authors' contributions: Bourimi Chadi: Conception and redaction El Abidi Hamza, Tariqi Reda, Boujondar Youssef: Collect of data Boualaoui Imad, Ibrahimi Ahmed, Nouini Yassine: Supervision of redaction and revision of the final manuscript.

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