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Introduction

We report the case of an 81-year-old female with a long-standing history of recurrent urinary tract infections with *Escherichia coli*. The patient had adverse reactions to a number of antibiotics, making management very challenging. Following a review of the world literature and consultation with our department of microbiology, the patient was commenced on a one-week course of intravesical gentamicin. Following treatment, her symptoms abated, with negative urine cultures, and no adverse effects.

Urinary tract infections (UTIs) are common, leading to almost 7 million medical consultations in the United States annually.¹ Recurrent UTIs can be defined as two UTIs in the last six months or three UTIs within the preceding 12 months.² The chief pathogen causing recurrent UTIs in women is *Escherichia coli* (*E. coli*), which is responsible for approximately 80% of all episodes of infection.³ Furthermore, when *E. coli* is the cause of the initial UTI, there is a higher risk of re-infection within the first six months.⁴ The predilection of *E. coli* in causing UTIs may be associated with the ability of uropathogenic *E. coli* to build intracellular bacterial communities in the urinary tract, thereby allowing them to evade host defence mechanisms.⁵ With regards to medical co-morbidities, diabetes mellitus has been shown to increase the risk of recurrent UTIs.⁶

In the case of multi-drug-resistant UTIs, effective treatment can be challenging. One potential management option can be intravesical antibiotic treatment. There is evidence (Supplementary Table 2) that intravesical gentamicin can be used to manage recurrent UTIs with multi-resistant *E. coli*.^{7–10} Work by van Nieuwkoop et al.⁷ demonstrated that following intravesical gentamicin management of two females suffering with recurrent UTIs, the patients were

asymptomatic on follow-up, with negative cultures, and no side effects.

We present the case of a patient with a history of recurrent *E. coli* UTIs and adverse reactions to a number of antibiotics, who was successfully managed with intravesical gentamicin.

Case report

An 81-year-old woman, with a background of type 2 diabetes mellitus (diagnosed in 2006), had a 10-year history of active recurrent *E. coli* UTIs. She has adverse reactions to multiple antibiotics (Table 1) including nitrofurantoin, trimethoprim, penicillins, cephalosporins, nystatin, erythromycin and doxycycline. The UTIs usually present with moderate to severe dysuria, and the number of adverse reactions to the various antibiotics had made it challenging to treat the infections effectively in the past. This patient had initially been admitted for five days of intravenous gentamicin (3 mg/kg). At the end of this period, her mid-stream urinalysis was still positive for *E. coli* and she was still symptomatic.

On review of the literature and with consultation with our microbiology department, the patient was admitted for a five-day course of daily intravesical gentamicin. The concentration of gentamicin used was 80 mg in 100

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mls of normal saline, administered twice daily. The intravesical gentamicin was administered to an emptied bladder via a catheter which was removed. The patient was asked to hold the intravesical gentamicin in her bladder as long as possible before voiding. During her admission, a flexible cystoscopy and bladder biopsy was performed and the histology results showed erythematous and inflamed tissue, with the absence of any interstitial cystitis or malignancy. An ultrasound of the renal tract was also normal, with no hydronephrosis or any bladder masses or stones. Following the course of intravesical gentamicin treatment, her lower urinary tract symptoms had resolved and a mid-stream urine culture showed no growth of organisms. However, a repeat urine culture performed by the general practitioner in the community two weeks later grew *E. coli*. The patient was re-admitted into hospital four months later for a chest infection, and a urine culture also showed *E. coli*. She was given a further

five-day course of intravesical gentamicin, using the previously administered doses. A urine culture at the end of treatment was clear and a repeat test two weeks later was still negative, with the patient becoming asymptomatic. A further urinalysis is planned in three months to ensure stability.

Discussion

Recurrent UTIs can affect the quality of life of a patient because of the persistence of lower urinary symptoms, and is a challenging condition to manage effectively. Combined with multi-drug-resistant bacteria and the presence of any patient adverse reactions to antibiotics, the problem is amplified. In our case report, we found that in such challenging cases, repeat administration of intravesical gentamicin may be of benefit in order to prevent recurrent infection. According to the European Association of Urologist guidelines,⁶ other potential non-antibiotic-guided (albeit limited) management options in post-menopausal females include intra-vaginal oestrogen and cranberry juice. Intravesical gentamicin treatment thereby offers another potential management option for treatment of patients with recurrent UTIs as highlighted by this case report and previous work by van Nieuwkoop et al.⁷ There are only a limited number of case reports in the world literature (Table 2).^{7–10} There is no clear evidence on what dose, duration or dilution should be used and this case report adds a small piece of further evidence to the literature regarding the beneficial use of intravesical antibiotics, especially in patients with no other possible treatment options.

Table 1. List of antibiotics against which the patient has adverse reactions. The adverse effects are not specific for any one drug, with the patient experiencing the various adverse effects following several years of antibiotic treatment.

Antibiotic	List of adverse effects
Nitrofurantoin	Rash
Trimethoprim	Gastrointestinal upset
Nystatin	Pruritus
Erythromycin	
Doxycycline	
Metronidazole	
Penicillin	
Cephalosporins	

Table 2. List of papers highlighting the use of intravesical gentamicin for the management of urinary tract infections.

Author	Study	Patient group	Management	Follow-up	Outcome
McGuire and Savastano ⁸	Case reports	Four adult females	Daily intravesical administration of 4.8–7.2 mg gentamicin	Range: 12–88 weeks	Sterile urine cultures in all patients who were receiving treatment
Wan et al. ⁹	Prospective case series	Ten children with neurogenic bladders	Daily intravesical administration of 30–60 mls of gentamicin (480 mg/l l saline) BD	One week	Urine cultures all sterile after one week of treatment
Defoor et al. ¹⁰	Retrospective case series	Eighty children. Eleven had indwelling SPCs, sixty-nine performed CIC	Daily intravesical administration of gentamicin (14 mg in 30 mls saline) OD or BD	Range: 3–1095 days	Twenty-one patients had breakthrough UTIs, of which five were gentamicin resistant. All of the affected patients were on an OD dose
van Nieuwkoop ⁷	Case reports	Two adults	Daily intravesical administration of gentamicin (80 mg/20 mls saline) OD in patient A, BD in patient B	Eight months and nine months, respectively	Urine cultures were sterile on follow-up in both cases

SPC: suprapubic catheter; CIC: clean intermittent catheterisation; OD: once daily; BD: twice daily; UTI: urinary tract infection.

Conflict of interest

None declared.

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