Managing Urinary Tract Infections in the Older Person

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Case Presentation

A 75-year-old female presents with the chief complaint of fever, chills, and right-flank pain. She also has frequency and urgency and occasional stress incontinence. She has a history of recurrent urinary tract infections (UTIs), all managed successfully with oral antibiotics. The physical examination reveals moderate right costovertebral angle (CVA) tenderness. The pelvic exam reveals atrophic vaginal mucosa and a moderate cystourethrocoele. The urinalysis reveals 8-10 white blood cells per high-power field (WBCs/HPF) with bacteriuria. The complete blood count (CBC) has 26,000 WBCs. The urine culture has greater than 10^5 colony-forming units (CFUs)/mL *Escherichia coli* sensitive to gentamicin and ciprofloxacin. A blood culture is negative.

Discussion

Urinary tract infections are a common condition among the elderly population. Urinary tract infections increase with age but are not considered part of the normal aging process. Historically, UTIs are defined by the presence of pyuria, bacteriuria, and greater than 10^5 CFUs/mL on a clean-catch midstream specimen. A more current definition is the presence of as few as 10^3 CFUs/mL in symptomatic patients or when a specimen is obtained by sterile catheterization.

Pathophysiology of UTIs in Older Adults

There is evidence that the aging urinary tract is associated with a decrease in cell-mediated immunity, and as a result, the older patient is more susceptible to UTIs than younger patients. There may be altered bladder defense mechanisms that increase uroepithelial receptivity to bacteria. Other antibacterial factors also decrease with aging. For example, in women who are postmenopausal, there is a decrease in vaginal estrogen. As a result, there is an increase in the vaginal pH secondary to a decrease in the normal flora of lactobacilli. The consequence of this change in the normal vaginal flora is an increase in more pathogenic bacteria from the gastrointestinal tract.

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In older men, benign prostatic hyperplasia (BPH) causes compression of the urethra and leads to bladder outlet obstruction. As a result, there is incomplete emptying of the bladder, which leads to urinary stasis and predisposes men to bladder infections.

Additional risk factors for UTIs in the elderly include:

- becoming critically ill and/or losing bladder control and requiring the use of a catheter, a common source for infection
- a history of diabetes, sickle-cell anemia, HIV, or other disorder that weakens the immune system; abuse of analgesics; kidney stones
- loss of estrogen and a thinning vaginal and urethral lining in menopausal or postmenopausal women

The most common pathogens are gram-negative bacilli. *E. coli* is the most common organism, but its prevalence decreases with advancing age, and the more virulent organisms such as *Proteus, Klebsiella, Providencia, Citrobacter,* and *Pseudomonas* occur in the geriatric population. Gram-positive infections with organisms such as *Enterococcus faecalis* are also prevalent in the elderly.[1] Infections with urea-splitting organisms such as *Proteus* and *Klebsiella* species are often associated with struvite nephrolithiasis. It is not uncommon to see infections with multiple organisms in older persons, and these should not always be assumed to be associated with contamination of the urine specimen.

Diagnosis and Work-up

Patients may not manifest classic UTI signs and symptoms such as dysuria, frequency, urgency, and nocturia.[2-4] Mental status changes, fever, back pain, suprapubic tenderness, unstable gait, and falls are atypical presentations of UTIs in older adults.[2,3] Clinicians should rule out other serious medical conditions before making a diagnosis solely of a UTI in an elderly patient with an atypical presentation.[3]

Often, older persons will present without any urinary symptoms and may present with respiratory symptoms such as cough and dyspnea. Some of these patients have a negative chest x-ray and have been treated for pneumonia. Nearly one-third of elderly patients with a UTI will present with confusion. Only 20% will have urinary symptoms.[5]

The urinalysis is the easiest and most helpful diagnostic test to evaluate a UTI in the older person. The most common findings on the dipstick test are a positive leukocyte esterase and nitrate test. Microscopic examination of a centrifuged clean-catch midstream urine will reveal the presence of WBCs/HPF and often visible bacteriuria.

A positive urinalysis provides a presumptive diagnosis of a UTI and can be confirmed with a urine culture. In the past, more than 10^5 CFUs/mL from a clean-catch specimen was considered confirmatory evidence of a UTI; however, fewer bacteria may be significant and indicate a UTI if the specimen is obtained by urethral catherization. Asymptomatic bacteriuria may represent contamination with skin or vaginal flora. Isolated pyuria may be associated with a noninfectious inflammatory condition such as interstitial cystitis or genitourinary tuberculosis.

The mainstay of UTI diagnosis in the elderly consists of urinalysis, urine culture, and antibiotic sensitivity testing.[2] Clean-catch urine samples may not be easy to obtain in older patients; in-and-out catheterization and suprapubic aspiration may be necessary. The presence of nitrates and leukocyte esterase on dipstick urinalysis are less useful in the geriatric population than in younger patients. While culture is necessary to diagnose infection in the elderly, final diagnosis depends on clinician interpretation of the patient as being symptomatic. Asymptomatic bacteriuria is defined as 10^5 CFUs/mL in a patient without signs or symptoms. Infection is diagnosed with as few as 10^3 CFUs/mL in the symptomatic elderly patient.[4] Furthermore, culture and sensitivity testing allows identification of causative organisms and their antibiotic resistance patterns, which is especially useful in institutionalized and catheterized patients and in those with a history of antibiotic treatment.[2]

E. coli, the predominant cause of UTI in younger patients, remains an important, though less predominant, cause in older adults. *Proteus mirabilis, Klebsiella pneumoniae, Enterococcus faecalis*, group B streptococci, and coagulase-negative staphylococci are also important pathogens.[2-5] Polymicrobial UTIs are more common in elderly patients, especially those who are institutionalized and catheterized. Long-term catheter use is associated with infection by gram-negative rods,[2,4] although *Enterococcus* and methicillin-resistant *Staphylococcus aureus* may also be involved. Urinary tract infections of fungal origin are an additional source of infection in patients with indwelling catheters. Catheter and antibiotic use also places patients at risk for more resistant pathogens, such as *Pseudomonas aeruginosa, Enterobacter, Citrobacter*, and *Serratia marcescens*.[2]

Up to 20% of elderly men and women may have bacteriuria without symptoms. Although early studies noted an association between bacteriuria and excess mortality, more recent studies have failed to demonstrate any such link.

Treatment of Uncomplicated UTIs

The clinician should initiate empiric therapy for uncomplicated infections, since medication can be adjusted once antibiotic sensitivity data become available.[2] Oral fluoroquinolones are considered first-line agents for uncomplicated cystitis in patients of both genders. Elderly women should be treated for 10 days and men for 14 to 28 days. Trimethoprim-sulfamethoxazole is an additional first-line agent for women only. Second-line agents include amoxicillin/clavulanate potassium, second- and third-generation cephalosporins, and nitrofurantoin. A trial of topical estrogen therapy may help to prevent UTIs in elderly women.[2-5] Several factors determine which antibiotics are prescribed, including effectiveness, cost, side effects, and the possibility that the antibiotic could contribute to the development of bacterial resistance in serious infections. Some treatment guidelines follow:

- The use of broad-spectrum antibiotics to treat simple infections, such as uncomplicated UTIs, may lead to the development of resistance in the treatment of more serious infections. For this reason some experts advise reserving broad-spectrum antibiotics for more serious infections and using narrow-spectrum antibiotics.
- Take the time to speak with patients about the rationale for the use, or non-use, of antibiotics. If an antibiotic is prescribed, explain how to properly use the antibiotic and the importance of patient adherence to these instructions, including finishing the prescription even if symptoms disappear to ensure that all bacteria are killed.
- Before antibiotics begin to take effect, patients can relieve some discomfort with a heating pad or a warm bath.

- Patients should drink fluids in order to dilute the bacteria within the urinary tract. Drinking cranberry juice may diminish bacterial adherence to the bladder wall, thus enhancing bacterial eradication.

Treatment of Complicated UTIs

Complicated UTIs in older persons include acute pyelonephritis, urinary retention, hydronephrosis, renal abscess, and acute prostatitis. These patients are usually sick, febrile, have nausea, and may be markedly debilitated. Elderly patients who are unable to tolerate oral fluids and who are febrile should probably be admitted to the hospital to receive parenteral fluids and antibiotics.

For patients with acute pyelonephritis, the recommendation is to use drugs that provide high kidney tissue levels. Aminoglycosides and fluoroquinolones achieve higher real tissue levels, relative to serum levels, than do beta-lactams.[6,7]

It is important to know the antimicrobial susceptibility profile of uropathogens in your community to help guide the therapeutic decisions for the empiric treatment of acute pyelonephritis. In our community, the drugs of choice are a fluoroquinolone and an aminoglycoside, which require close monitoring of the BUN/creatinine levels in patients with decreased renal function. If enterococcus is suspected based upon the Gram stain, ampicillin (1-2 g IV/every 6 hr) plus the aminoglycosides are appropriate empiric therapies.

Once the patient is afebrile, the WBC has returned to normal, the patient can tolerate oral fluids, and the results of the blood and urine cultures are back, the patient can be switched to oral antibiotics based on the sensitivity testing of urine and blood cultures.

Duration of therapy remains controversial. Six-week regimens are not more effective than 14-day regimens for pyelonephritis. Not only is the cost a consideration, but the longer regimen is associated with more side effects.[7] Follow-up therapy consists of a repeat urine culture 1-2 weeks after completion of therapy.

Patients with urinary retention or hydronephrosis with infection need the insertion of a catheter or the insertion of a ureteral stent, respectively, to relieve the obstruction. Failure to do so in a timely fashion can risk the development of urosepsis.

For patients with symptoms of pyelonephritis who do not respond to initial antibiotic therapy, a renal abscess must be ruled out. This can often be detected on a computed tomography (CT) scan or a nuclear medicine gallium scan, as was the case with this patient. These patients need percutaneous drainage of the abscess or, occasionally, an open surgical procedure to drain the abscess fluid (see the "Outcome of the Case Patient" section).

Catheter-related symptomatic infections require sterile replacement of the indwelling catheter and treatment with a broad-spectrum antibiotic. Options include 2-3 weeks of ampicillin plus gentamicin, a third-generation cephalosporin, piperacillin/tazobactam, aztreonam, or a carbapenem.[2,5] Treat *Candida albicans* with 3-5 days of oral fluconazole; treat severe symptomatic catheter-related infections with other *Candida* species with amphotericin B bladder irrigation. Limiting the use of indwelling catheters is the best strategy for preventing UTIs.[2]

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Asymptomatic Bacteriuria in Older Adults: Definition and Diagnosis

The term *asymptomatic bacteriuria* refers to the presence of high quantities of a uropathogen in the urine of a patient who has *no* urinary complaints such as burning, frequency, or pain, or other clinical symptoms as noted in the description of symptomatic UTIs. It is not well understood why certain patients do not develop symptoms, as the organisms recovered are the same as those that cause symptomatic UTIs, with the most common being *E. coli.* Up to 20% of elderly men and women may have bacteriuria without symptoms.[8] Although early studies noted an association between bacteriuria and excess mortality, more recent studies have failed to demonstrate any such link.[9] In fact, aggressively screening elderly persons for asymptomatic bacteriuria and subsequent treatment of the infection has not been found to reduce either infectious complications or mortality.

The 2005 Infectious Diseases Society of America (IDSA) guidelines for the diagnosis and treatment of asymptomatic bacteriuria in adults recommend the following criteria for the diagnosis of asymptomatic bacteriuria:

- For asymptomatic women, bacteriuria is defined as two consecutive clean-catch voided urine specimens

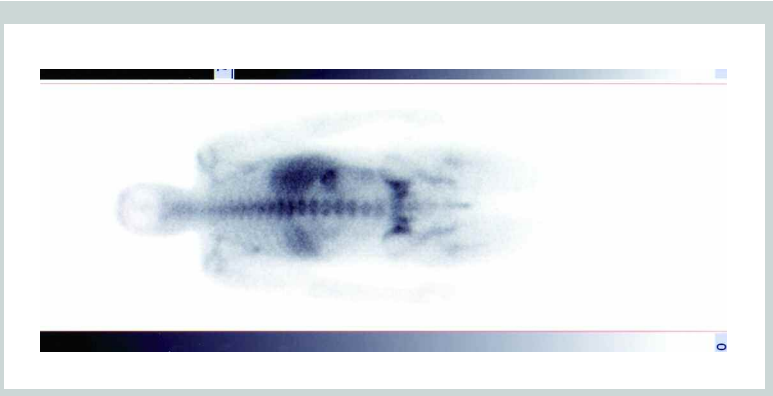

Figure. A gallium scan shows an accumulation of radioactivity in the area of the right kidney.

with isolation of the same bacterial strain in counts greater than or equal to 10^5 CFUs/mL.[10]

- For any asymptomatic patient, bacteriuria is defined as a single catheterized urine specimen with one bacterial species isolated in counts greater than or equal to 10^2 CFUs/mL.[10] A more practical definition that is used by most clinicians is 10^3 CFUs/mL.

Treatment of Asymptomatic Bacteriuria. According to the 2005 IDSA guidelines there are no clinical benefits of screening for or treatment of asymptomatic bacteriuria.[11-13] There was no decrease in the rate of symptomatic infection or improvement in survival[12,13] in those patients who were treated with antibiotics, and there were no changes in chronic genitourinary symptoms[12] associated with antimicrobial therapy. Treatment of asymptomatic bacteriuria was associated with significantly increased adverse antimicrobial effects and reinfection with organisms of increasing resistance.[13]

The IDSA does NOT recommend regular screening and treatment of asymptomatic bacteriuria in the elderly due to the high costs and increased antimicrobial resistance due to repeated antibiotic treatments. However, if these patients have a genitourinary procedure planned, such as cystoscopy, it is recommended that they receive preoperative antibiotic therapy.

Outcome of the Case Patient

This patient had clinical pyelonephritis and was started on intravenous gentamicin and ciprofloxacin. A CT scan revealed a cystic mass in the lower pole of the right kidney. She became afebrile in 48 hours, but the right CVA pain persisted. The follow-up CBC showed only a modest decrease in her WBC. A gallium scan was ordered, and at 48 hours this demonstrated an accumulation of radioactivity in the area of the right kidney in the region of the cystic mass described by the previous CT scan (Figure). A follow-up CT scan demonstrated a mass in the lower pole of the right kidney compatible with a perinephric abscess. With CT guidance the abscess was drained percutaneously, and the drain was left in place for 48 hours. Her pain subsided, her WBC returned to normal, and she was discharged on oral antibiotics for 2 weeks. Follow-up urinalysis and renal ultrasound were normal. ■

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