Urinary Tract Infection

Medical Student Case-Based Learning

American Urological Association
Education & Research, Inc.

Advancing Urology™

A 64 year old woman presents with a 3 year history of recurrent urinary tract infections (UTIs) treated with multiple antibiotic courses by a walk-in clinic.

What are the clinical symptoms associated with UTI?

UTI clinical symptoms

- May be non-specific for infection
  - Irritative symptoms
    - Urgency
    - Frequency
  - Dysuria
  - Hematuria
  - Foul odor
  - Suprapubic pain
- Upper tract infections (pyelonephritis) also associated with fevers, rigors, flank pain, and often nausea and emesis

The patient reports presumed bladder infections which occur every month or two associated with dysuria, urgency, and frequency. No gross hematuria, flank pain, or fevers.

What is the differential diagnosis?

Many processes and conditions may mimic the symptoms of bacterial urinary tract infection, so it is critical to rule out other causes during the evaluation prior to initiating treatment

- Urologic neoplasm
- Atrophic vaginitis
- Prostatitis
- Overactive bladder
- Trauma
- Congenital abnormalities
- Urethral diverticulum
- Sexually transmitted diseases
  - Herpes, Chlamydia, Trichomonas, Gonorrhea
- Urinary lithiasis
- Interstitial cystitis/painful bladder syndrome
- Sepsis from non-urologic source

How would you diagnose a urinary tract infection?

Diagnosis of UTI

- Clinical symptoms
  - Urgency, frequency, dysuria, hematuria, pain, odor
- Physical exam for atrophic vaginitis, prostatitis, epididymitis, urethral diverticulum, etc.
- Clean-catch midstream urine sample
- Chemical (dipstick) urinalysis
- Quantitative urine culture
  - In general > 10^5 colonies/ml diagnostic

Diagnosis of UTI

- Dipstick evaluation
  - Leukocyte esterase 63-90% specific
  - Nitrite very specific for gram negative but only 50% sensitive
- Positive dipstick + symptoms: consider treatment
- Negative dipstick + symptoms: consider culture

When do you need radiologic imagining or further evaluation for diagnosis of UTI?

Indications for further evaluation

- Generally, uncomplicated cystitis or pyelonephritis does not benefit from imaging
- Consider CT, ultrasound, voiding cystourethrogram (VCUG) and further evaluation with cystoscopic or ureteroscopic evaluation for patients with known anatomic abnormality or those who do not respond to treatment

What factors are important for genesis of UTI

Pathogenesis

- Ascending infection from the periurethral area critical
- Hematogenous spread is uncommon
- Risk factors
  - Reduced urine flow
    - Obstruction, stricture, neurogenic bladder
  - Factors that promote colonization
    - Sexual activity, spermacide, estrogen depletion
  - Facilitation of ascent
    - Catheterization, incontinence, residual urine

What bacteria are associated with urinary infections and what pathogenic factors from both bacteria and the host contribute to colonization?

Uropathogens

- **Escherichia coli (80% of outpatient UTIs)**
  - **Uropathogenic E. coli (UPEC)**
- Klebsiella
- Enterobacter
- Proteus
- Pseudomonas
- Staphylococcus saprophyticus (5-15%)
- Enterococcus
- Candida
- Adenovirus
- Normal perineal flora: Lactobacillus, Corynebacteria, Staphylococcus, Streptococcus, anaerobes

What are some correctable Urologic abnormalities that may provoke bacterial persistence?

Bacterial persistence: complex

- Infected stones
- Chronic bacterial prostatitis
- Fistula disease (colovesical, vesicovaginal)
- Unilateral infected atrophic kidneys
- Ureteral duplication and ectopic ureters
- Foreign bodies (such as retained ureteral stent)
- Urethral diverticula
- Unilateral medullary sponge kidneys
- Infected ureteral stump after nephrectomy
- Infected urachal or renal cyst
- Papillary necrosis

Patient found on exam to have poor water intake, atrophic vaginitis, and urine dipstick consistent with acute bacterial infection.

What are the treatment options for UTI?

Treatment Options

- Encourage hydration and behavioral measures to increase fluid intake
- Treat atrophic vaginitis with topical transvaginal estrogen if appropriate
- Determine if infection represents uncomplicated or complicated infection

Uncomplicated UTI Treatment

- 3 day course of trimethoprim/sulfamethoxazole (TMP/SMX), or nitrofurantion for 5 days, or fosfomycin as a single dose
- For local TMP/SMX resistance pattern > 20% , consider fluoroquinolones
- Full 7 day course in patients with diabetes, long duration of symptoms, pregnancy, > 65 years old, past history of pyelonephritis

Complicated UTI Treatment

- Culture is essential
- Ampicillin + aminoglycoside or Amp/Vancomycin + aminoglycoside or 3rd generation cephalosporin
- Adjust according to culture results
- If good clinical response, switch to oral agents in 48 hours
- Treat for 14 days

Follow-up

- Test for cure by repeat culture in special situations such as pregnancy, pyelonephritis, and complicated or relapsing UTI
- Consider single dose post-coital self-treatment in select cases
- Do not treat asymptomatic bacteruria
- Treatment is generally not indicated for patients on self-catheterization protocols

References and further reading

- Pontari, M. AUA Core Curriculum for Residents: “Urinary Tract Infections”
- Shoskes, D. (2011): Urinary Tract Infections Retrieved From: The American Urological Association Educational Review Manual in Urology: 3rd Edition Chapter: 23 Page: 737-766
- Smith's General Urology 16th edition 2004. Tanagho and McAninch, eds. Chapter 13. "Bacterial Infections of the Urinary Tract" Nguyen, Hiep. pp. 203 - 227.
- Stamm, WE, Norrby, SR. Urinary Tract Infections: Disease Panorama and Challenges. J Infect Dis. 2001 Mar 1; 183 Suppl 1:S1-4.
- Hooten, TM, Scholes, D, Hughes, JP, et al. A Prospective Study of Risk Factors for Symptomatic Urinary Tract Infection in Young Women. NEJM 1996; 335: 468-74