1. Urinary Tract Infections

Michael Barza, MD

2. Epidemiology

- Mainly a disease of women
  - Half of adult women have had UTI
  - Young, sexually active 0.5 episodes per yr
- Men: 1 per 1,000 years
  - Longer urethra
  - Prostatic antibacterial substances
3. Topics

- Pathogenesis
- Diagnosis and treatment
  - Cystitis
  - Pyelonephritis
- Relapse vs. reinfection
- “Complicated” UTI
- Asymptomatic bacteriuria

4. Urinary Tract Infections: Slide 4
5. Sticky Bugs, Sticky Cells

**Sticky Bugs, Sticky Cells**

- 25% of E. coli have P fimbriae (“sticky”)
  - These cause most infections
- Epithelial cells of some women “sticky”
  - Correlates with ABH blood groups
  - Bulky blood group sugars block access of E. coli fimbriae to receptors on epithelial cells

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6. Defenses Against Infection

**Defenses Against Infection**

The flushing effect of urine
Sloughing of epithelial cells

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7. Risk Factors for UTI

- Women
  - Sexual intercourse (3X)
  - Diaphragm, spermicide
  - History of UTI (5X)
- Men
  - Prostatic hypertrophy

8. Cystitis vs. Pyelonephritis

- Cystitis: superficial infection
  - Dysuria, urgency, frequency
  - Intracellular, biofilm like pods
    - (Anderson, Science 2003; 301: 105)

- Pyelonephritis
  - Invasion of kidney, +/- bloodstream
  - Fever, chills, flank pain, tenderness, ↑WBC
9. Diagnosis by Culture

- Three categories of “positives”
  - Symptomatic bacteriuria (accept $> 10^2$ cfu/ml)
  - Asymptomatic bacteriuria (require $> 10^5$)
    - Most don’t require treatment – see later
  - Contamination (low counts increase if urine at room temp for hours)

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10. Diagnosis by Pyuria

- Urinalysis for pyuria
  - $> 5$ WBC/HPF or
  - positive leukocyte esterase
- Truly infected (vs contamination) usually +
  - But many with asymptomatic bacteriuria and some noninfectious inflammation also have pyuria
- Therefore, test is sensitive but not specific

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11. Acute Dysuria Syndromes (1)

**Acute Dysuria Syndromes (1)**

- **Cystitis**
  - Pyuria; > $10^2$ bacteria/ml
  - 85% E. coli; 10% S. saprophyticus; 5% other

- **Urethritis (STD)**
  - Pyuria; < $10^2$ bacteria/ml
  - C. trachomatis; GC
  - New partner; gradual onset; cervicitis

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12. Acute Dysuria Syndromes (2)

**Acute Dysuria Syndromes (2)**

- **Vaginitis**
  - No pyuria; < $10^2$ bacteria/ml
  - Trichomonas; Candida, NSV
  - External pain; vaginal discharge, lesions

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13. Treatments

Treatments

- TMP-SMX or quinolone best
  Superior to B-lactams - higher cure rates
  Increasing resistance to TMP-SMX (20-30%)

- Cystitis: superficial – 3 days

- Pyelonephritis: invasive – 14 days

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14. Recurrent UTI - 2 Types

Recurrent UTI - 2 Types

- Relapse: same organism
  - Interval to recurrence < 2 wks
  - Suggests uneradicated focus

- Reinfection: same bug or different
  - Interval to recurrence > 2 wks
  - Most recurrences are reinfections
  - Original risk factors persist (sticky cells, etc)

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15. Relapses

Relapses

- If after short course Rx for cystitis
  - Usually signals missed “subclinical pyelo”
  - Re-treat – but for 14 days
- If relapse again, image urinary tract for anatomic abnormality
  - Spiral CT or U/S
  - Treat for > 2 wks

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16. Reinfections

Reinfections

- Treat as usual for cystitis
  - No need to image (low yield)
- Uncertain benefit
  - Voiding after intercourse (↓ bacteriuria)
  - Cranberry juice (50% benefit; ↓ adherence)

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17. Frequent Reinfections

- Change contraceptive
  - From diaphragm/spermicide to pill
- Postmenopausal: vaginal estriol cream
  - 90% reduction in episodes
- Daily low dose TMP-SMX or quinolone
  - Or Self-Rx for occasional episodes

18. “Complicated UTI”

- UTI in patient with anatomic abnormality
  - Foley catheter
  - Obstructive lesion (tumor, stone)
- Leads to relapses, multiple Rx courses
  - Fosters antibiotic-resistant organisms
  - May need longer course of Rx
19. Foley Catheter

20. Catheter-Associated Bacteriuria

- Bacteriuria rate: 5% per day
- Organisms enter mainly by extraluminal route
- Biofilm on outside of catheter
- Polymicrobial, changing flora
- Antibiotic prophylaxis: no value
21. Rx of Catheter-Associated Bacteriuria

**Rx of Catheter-Associated Bacteriuria**

- For **asymptomatic** patient with long-term catheter
  - No benefit of treatment
- If **symptomatic** UTI
  - Culture urine, Rx for 2 wks or longer

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22. Asymptomatic Bacteriuria

**Asymptomatic Bacteriuria**

- Treatment indicated in
  - Pregnant women (7 d: TMP-SMX, amoxicillin, nitrofurantoin)
  - Newborns (reflux)
  - Urologic manipulation
- Other groups (e.g. elderly, diabetic)
  - Don’t treat (no benefit), Don’t screen!

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23. Key Points (1)

Key Points (1)

- Quinolones, TMP-SMX, superior
- Cystitis: superficial, short-course
- Relapse vs reinfection
  - Relapse: longer course, x-ray
  - Reinfections: D/C diaphragm; estriol cream; prophylactic antibiotics

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24. Key Points (2)

Key Points (2)

- Asymptomatic bacteriuria
  - Treat: pregnant; newborns; urologic manipulation
  - Don’t treat: elderly, diabetic, Foley catheter

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25. Case 1

Case 1

- 27 yo woman
- 5 episodes of cystitis past 12 mos
  - 4 E. coli; 1 Klebsiella pneumoniae
  - Each responded to short course TMP-SMX
  - 2 wks – 4 months between attacks
- Is this relapse or reinfection?
  - Image? Rx?

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26. Case 2

Case 2

- 30 yo woman
- Acute dysuria x 5 days
  - Culture: K. pneumoniae
  - Rx: Quinolone x 3 d
- One week later, dysuria
  - Culture: K. pneumoniae (susceptible)
- Is this relapse or reinfection?
  - Image? Rx?

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27. **Case 3**

**Case 3**

- 70 yo man, often has difficulty voiding
- Cystitis: culture yields E. coli
  - Rx: 2 wks ampicillin
- 5 days after end of Rx, E. coli UTI (susc)
- Treat with quinolone x 2 wks → recurrence
- Relapse or reinfn? Pathogenesis? Rx?

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28. **Case 4**

**Case 4**

- 75 yo man, DM, had stroke, decubiti
- Foley catheter placed for long term
  - Bacteriuria $10^5$ cfu/ml, pyuria
  - Clinically no change from baseline
- Treat?

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