Urinary tract infection

Problem

- ✓ Urinary tract infections (UTIs) are among the most prevailing infectious diseases with a substantial financial burden on society
- ✓ Approximately 10-15% of all community-prescribed antibiotics in the world are dispensed for UTI
- ✓ Development of resistance



Pathogenesis

- ✓ Ascent of microorganisms from the urethra is the most common pathway
- ✓ A single insertion of a catheter into the urinary bladder in ambulatory patients results in urinary infection in 1-2% of cases.
- ✓ Indwelling catheters with open-drainage systems result in bacteriuria in almost 100% of cases within 3-4 days.
- ✓ Haematogenous infection of the urinary tract is restricted to a few relatively uncommon microbes, such as Staphylococcus aureus, Candida sp., Salmonella sp. and Mycobacterium tuberculosis

Pathogenesis

- Bacterial strains are uniquely equipped with specialised virulence factors, e.g. different types of pili, which facilitate the ascent of bacteria from the faecal flora, introitus vaginae or periurethral area up the urethra into the bladder, or less frequently, allow the organisms to reach the kidneys

UTI classifications

Based on Anatomical level of infection

- ✓ Upper urinary tract Infections:
  - ✓ **Pyelonephritis**
  - ✓ **Pyelitis**
  - ✓ **ureteritis**
- ✓ Lower urinary tract infections
  - ✓ **Cystitis** ("traditional" UTI)
  - ✓ **Urethritis** (often sexually-transmitted)
  - ✓ **Prostatitis**
- ✓ UROSEPSIS- bacteria in blood stream

Symptoms of Urinary Tract Infection

- ✓ Dysuria
- ✓ Increased frequency
- ✓ Hematuria
- ✓ Fever
- ✓ Nausea/Vomiting (pyelonephritis)
- ✓ Flank pain (pyelonephritis)

Findings on Exam in UTI

- ✓ Physical Exam:
  - ✓ CVA tenderness (**pyelonephritis**)
  - ✓ Urethral discharge (**urethritis**)
  - ✓ Supra pubic tenderness

- ✓ Labs: Urinalysis
  - ✓ More likely gram-negative rods
  - ✓ WBCs
  - ✓ RBCs

Culture in UTI

- ✓ The number of bacteria is considered relevant for the diagnosis of a UTI
- ✓ Positive Urine Culture = $>10^5$ CFU/mL
- ✓ It has recently become clear that there is no fixed bacterial count that is indicative of significant bacteriuria, which can be applied to all kinds of UTIs and in all circumstances

Culture in UTI

Following bacterial counts are clinically relevant:

- ✓ > 103cfu/mL of uropathogens in a mid-stream sample of urine (MSU) in acute uncomplicated cystitis in women.
- ✓ > 104cfu/mL of uropathogens in an MSU in acute uncomplicated pyelonephritis in women.
- ✓ > 105 cfu/mL of uropathogens in an MSU in women, or > 104cfu/mL uropathogens in an MSU in men, or in straight catheter urine in women, in a complicated UTI.
- ✓ In a suprapubic bladder puncture specimen, any count of bacteria is relevant

Culture in UTI

- ✓ Most common pathogen for **cystitis**, **prostatitis**, **pyelonephritis**:
  - ✓ *Escherichia coli*
  - ✓ *Staphylococcus saprophyticus*
  - ✓ *Proteus mirabilis*
  - ✓ *Klebsiella*
  - ✓ *Enterococcus*
- ✓ Most common pathogen for urethritis
  - ✓ *Chlamydia trachomatis*
  - ✓ *Neisseria Gonorrhea*

Lower Urinary Tract Infection - Cystitis

- ✓ Uncomplicated (Simple) cystitis
  - ✓ In healthy woman, with no signs of systemic disease
- ✓ Complicated cystitis
  - ✓ In men, or woman with comorbid medical problems.
- ✓ Recurrent cystitis

Uncomplicated (simple) Cystitis

Definition

- ✓ Healthy adult woman (over age 12)
- ✓ Non-pregnant
- ✓ No fever, nausea, vomiting, flank pain

Diagnosis

- ✓ Dipstick urinalysis (no culture or lab tests needed)

Risk factors:

- ✓ Sexual intercourse
- ✓ Post-coital voiding or prophylactic antibiotic use recommended.
- ✓ Urine cultures are recommended for those with: (i) suspected acute pyelonephritis; (ii) symptoms that do not resolve or recur within 2-4 weeks after the completion of treatment; and (iii) those women who present with atypical symptoms

Uncomplicated (simple) Cystitis

- Treatment
  - Trimethroprim/Sulfamethoxazole or fluoroquinolone for **3 days**

- Women who present with atypical symptoms as well as those who fail to respond to appropriate antimicrobial therapy should be considered for additional diagnostic studies
- Routine post-treatment urinalysis or urine cultures in asymptomatic patients are not indicated
- Recurrence of symptoms-Retreatment with a 7-day regimen using another agent should be considered

Complicated Cystitis

Definition

- ✓ Females with comorbid medical conditions
- ✓ All male patients
- ✓ Indwelling foley catheters
- ✓ Urosepsis/hospitalization

Diagnosis

- ✓ Urinalysis, Urine culture
- ✓ Further labs, if appropriate.

Treatment

- ✓ Fluoroquinolone (or other broad spectrum antibiotic)
- ✓ **7-14 days** of treatment (depending on severity) in females

Special cases of Complicated cystitis

- ✓ Indwelling foley catheter
  - ✓ Try to get rid of foley if possible!
  - ✓ Only treat patient when symptomatic (fever, dysuria)
    - ✓ Leukocytes on urinalysis
    - ✓ Patient's with indwelling catheters are frequently colonized with great deal of bacteria.
- ✓ Candiduria
  - ✓ Frequently occurs in patients with indwelling foley.
  - ✓ If grows in urine, try to get rid of foley!
  - ✓ Treat only if symptomatic.
  - ✓ If need to treat, give fluconazole (amphotericin if resistance)

Acute Pyelonephritis

- ✓ **Defn**; Infection of the kidney with triad of fever with chills flank pain and pyuria
- ✓ Suggested by fever, nausea, vomiting, headache and costovertebral angle tenderness features of cystitis may not be present
- ✓ Diagnosis:
  - ✓ Urinalysis, urine culture, CBC, RFT
  - ✓ Evaluation of the upper urinary tract with ultrasound should be performed to rule out urinary obstruction or renal stone disease

Additional investigations, such as an unenhanced helical computed tomography (CT), excretory urography, or dimercaptosuccinic acid (DMSA) scanning, should be considered if the patients remain febrile after 72 h of treatment

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Acute Pyelonephritis

Treatment:

- ✓ **2-weeks** of fluoroquinolone
- ✓ Cotrimoxazole is not recommended unless sensitivity is known
- ✓ Hospitalization and IV antibiotics if patient unable to take po.
- ✓ Initial empirical therapy with an aminoglycoside or carbapenem has to be considered if resistance to fluoroquinolones and other antibiotics is >10% in the community

Acute Pyelonephritis

Complications:

- ✓ Perinephric/Renal abscess:
  - ✓ Suspect in patient who is not improving on antibiotic therapy.
  - ✓ Diagnosis: CT with contrast, renal ultrasound
  - ✓ May need surgical drainage.
- ✓ Nephrolithiasis with UTI
  - ✓ Suspect in patient with severe flank pain

Acute Pyelonephritis

- ✓ In women whose pyelonephritis symptoms do not improve within 3 days, or resolve and then recur within 2 weeks, repeated urine culture and antimicrobial susceptibility tests and an appropriate investigations are required

- ✓ If no urological abnormality, it should be assumed that the infecting organism is not susceptible to the agent originally used, and an alternative treatment should be considered based on culture results

- ✓ For patients who relapse with the same pathogen, the diagnosis of uncomplicated pyelonephritis should be reconsidered. Appropriate diagnostic steps are necessary to rule out any complicating factors

Recurrent UTI's in women

- ✓ Two episodes in 6 months or 3 episodes in a year
- ✓ Quiet common in sexually active female even though there is no anatomical or physiological abnormality
- ✓ Recurrent UTIs to be diagnosed by urine culture
- ✓ Apart from Ultrasound KUB ,Excretory urography, cystography and cystoscopy are not routinely recommended for evaluation of women with recurrent UTIs

Prevention of recurrent UTI's

- ✓ Antimicrobial prophylaxis
- ✓ Immunoactive prophylaxis
- ✓ Prophylaxis with probiotics
- ✓ Prophylaxis with cranberry

Antimicrobial prophylaxis

- ✓ After counselling and behavioural modification has been attempted
- ✓ Before any prophylaxis regimen is initiated, eradication of a previous UTI should be confirmed
- ✓ Continuous or postcoital antimicrobial prophylaxis

Cephalexin 250 mg once daily

Norfloxacin 200 mg once daily

Ciprofloxacin 125 mg once daily

Immunoactive prophylaxis

- ✓ Uro-Vaxom, an oral vaccine against Escherichia coli
- ✓ Has been shown to be more effective than placebo in several randomised trials.
- ✓ Recommended for immunoprophylaxis in female patients with recurrent uncomplicated UTI

Prophylaxis with probiotics

- ✓ Restore the vaginal lactobacilli
- ✓ Compete with urogenital pathogens
- ✓ Prevent bacterial vaginosis, a condition that increases the risk of UTI



Prophylaxis with cranberry

- ✓ Useful in reducing the rate of lower UTIs in women
- ✓ Daily consumption of cranberry products, giving a minimum of 36 mg/day proanthocyanindin A (the active compound)



UTI's in post menopausal women

- ✓ In older institutionalised women, urine catheterisation and functional status deterioration most important risk factors associated with UTI
- ✓ Atrophic vaginitis
- ✓ Incontinence, cystocele and post-voiding residual urine
- ✓ UTI before menopause
- ✓ Non-secretor status of blood group antigens.

UTI's in post menopausal women

- ✓ History, physical examination and urinalysis, including culture
- ✓ Rule out urinary tract obstruction such as urethral stenosis
- ✓ Genitourinary symptoms are not necessarily related to UTI and an indication for antimicrobial treatment

UTI's in post menopausal women

- ✓ Treatment is similar to premenopusal women however asymptomatic bacteriuria should not be treated
- ✓ Cystoscopy and urethral dilatation in obstructive symptoms with high PVR on USG



UTI's in post menopausal women

- ✓ Oestrogen cream(vaginal) can be administered for prevention of UTI
- ✓ Alternative methods, such as cranberry and probiotic lactobacilli, can contribute but they are not sufficient to prevent recurrent UTI.

UTI's in pregnancy

- ✓ Urinary tract infections and asymptomatic bacteriuria are common during pregnancy
- ✓ 20-40% of women with asymptomatic bacteriuria develop pyelonephritis during pregnancy
- ✓ Ultrasound of the kidneys and urinary tract is necessary
- ✓ Pregnant women should be screened for bacteriuria during the first trimester

UTI's in pregnancy

- ✓ Nitrofurantoin 100 mg q12 h, 3-5 days (Avoid in G6PD deficiency)
- ✓ Amoxicillin 500 mg q8 h, 3-5 days
- ✓ Co-amoxicillin/clavulanate 500 mg q12 h, 3-5 days
- ✓ Cephalexin 500 mg q8 h, 3-5 days
- ✓ Trimethoprim q12 h, 3-5 days Avoid trimethoprim in first trimester/term

UTI's in pregnancy

- ✓ Urine cultures should be obtained 1-2 weeks after completion of therapy for asymptomatic bacteriuria and symptomatic UTI in pregnancy
- ✓ Postcoital prophylaxis should be considered in pregnant women with a history of frequent UTIs before onset of pregnancy, to reduce their risk of UTI

Antibiotics for pyelonephritis

- ✓ Ceftriaxone 1-2 g IV or IM q24 h
- ✓ Aztreonam 1 g IV q8-12 h
- ✓ Piperacillin-tazobactam 3.375-4.5 g IV q6 h
- ✓ Cefepime 1 g IV q12 h
- ✓ Imipenem-cilastatin 500 mg IV q6 h
- ✓ Ampicillin + 2 g IV q6 h
- ✓ Gentamicin 3-5 mg/kg/day IV in 3 divided doses

Urethritis

- ✓ *Chlamydia trachomatis*
  - ✓ Frequently asymptomatic in females, but can present with dysuria, discharge or pelvic inflammatory disease.
  - ✓ Send UA, Urine culture (if pyuria seen, but no bacteria, suspect Chlamydia)
  - ✓ Pelvic exam – send discharge from cervical or urethral os for chlamydia PCR
  - ✓ Chlamydia screening is now recommended for all females ≤ 25 years
  - ✓ Treatment:
    - ✓ Azithromycin – 1 g po x 1
    - ✓ Doxycycline – 100 mg po BID x 7 days
- ✓ *Neisseria gonorrhoeae*
  - ✓ May present with dysuria, discharge, PID
  - ✓ Send UA, urine culture
  - ✓ Pelvic exam – send discharge samples for gram stain, culture, PCR
  - ✓ Treatment:
    - ✓ Ceftriaxone – 125 mg IM x 1
    - ✓ Cipro – 500 mg po x 1
    - ✓ Levofloxacin – 250 mg po x 1
    - ✓ Ofloxacin – 400 mg po x 1
    - ✓ Spectinomycin – 2 g IM x 1
  - ✓ ***You should always also treat for chlamydia when treating for gonnorhea!***

Thank you