

LESSON
ON THE THEME:
“Urinary Tract Infections (UTI)”

DEPARTMENT OF PEDIATRICS

Elaborated by

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Definition

- a significant bacteriuria (exceeding 10⁵ bacteria per ml urine) in the presence of symptoms.

Etiology

- 75-90% of all UTI are caused by Esch.coli, followed by Klebsiella, Proteus, Citrobacter, Enterobacter and other's Gram-. Gram+ organisms and viral infections are common in lower UTI: Staph.aureus, Strept.viridans, Adenoviruses.
- Urinary tract infections accounts for 40% of all nosocomial infections and are the most common source of nosocomial Gram-negative bacteremia.

The predisposing factors of the carrier:

- The diminishing of mechanical, physico-chemical factors of urinary tract protection.
- The presence of specific complementary receptors on epithelial cells of urinary tract for bacterial fimbriae (genetically determined).
- Female sex: short, wide and straight urethra, topographic zone
- Age, local hygiene, sexual activity, pregnancy, vesical sounding.
- Vesico-uretral reflux.
- Obstructive uropathies
- Congenital or obtained systemic or local immunologic deficit the progressing of pyelonephritis

Natural mechanisms of urinary tract protection

- Normal natural flux, complete voiding of urinary bladder - mechanical washing of bacteria.
- Local antibacterial anti-adherent mechanisms of urinary tract. Chemical composition of urine.
- The urinary bladder mucosa secretes mucus and mucine with proper bactericide effect. The wall of urinary bladder contents polymorphonuclear leucocytes with anti-adherent role.
- Normal urethral peristaltic the valves of urinary tract protect the ascension of infection.
- Urinary immunoglobulins S IgA –with bactericide and antiadherent effect.

Summary of pathogenesis

- Acute pyelonephritis- leads to enlargement of the kidney, edema, acute inflammatory infiltrates in the medulla and pelvis. In untreated diseases may lead to the formation of renal microabscesses.
- When obstruction is present the inflammation result in chronic pyelonephritis, causes of renal scars, glomerular and interstitial fibrosis, atrophy of the tubules.
- Infection by urea-splitting organisms such as Proteus produce alkaline pH and lead to stone formation.
- Parasitic infections, constipations, chronic foci of infections.
- Genetic predisposition through HLA system.

Classification of UTI

- Localisation and evolution

- Pyelonephritis acute, chronic.
- Cystitis acute, chronic.

Predispose factors.

- Anatomic and structure abnormalities.
- Obstructions (intravesical reflux, VUR, intrarenal reflux, stone formation).
- Neurogenic bladder dysfunction.

Renal function

- Normal
- Acute renal failure.
- Chronic renal failure

Clinical manifestation

Pyelonephritis - symptoms

- generalized symptoms of infections toxicosis, fever, shivers,
- Pallor, pastosity, anemia, physical retardation.
- digestive symptoms, violent abdominal pain,
- lombar pain, Giordani's manoever,
- urinary syndrome,
- kidney enlarged in volume,
- arterial hypertension, edemas positive

Clinical picture of UTI

- Generalized toxico-infections syndrome
- Digestive symptoms (vomiting, diarrhea, loss of appetite, hypotrophy)
- Pallor of skin, jaundice, dry skin, dehydration
- Isolated fever, frequently in suckling
- rare urinary symptoms-rare or frequent urination, specific smell of urine.
- Such masks as pneumonia, enterocolitis, neurotoxicosis

Clinical picture of UTI – older children

- Generalized toxico-infections syndrome.
- Fever with shivers, perspiration
- Abdomenal pains in flanks, suprapubian, lombar pains
- Dysuric syndrome

Chronic obstructive urinary infection:

- Prolonged febrile and subfebrile syndrome
- Marked pallor of skin and mucosa without other causes; circles round the eyes, edemas
- Stopped growing, pubertal retardation
- Repeated crises of abdominal pains, retention of urine, fever.

Low urinary infection

- Cystitis: dysuria,
- pollakiuria until incontinence of urine, enuresis,
- suprapubian pain, muddy urine, sometimes macroscopic hematuria,
- urine with fetid smell.

The program of UTI diagnosis in children

I stage-establishing of bacteriologic state.

1.General analysis of urine: colour, transparence, sediment, urinary Ph.

- Leucocyturia (pyuria) by polymorphonuclear character; more than 30 l/ field of view correlates with marked leucocyturia. Quantitative tests (Addis > 2000/ml).
- Leucocytar cylinders, crystals of tripelphosphates
- presence of bacteria in centrifugated urine, Gram coloration; >5 bacteria in the field of view correlates with 10^5 in uroculture
- Tubular proteinuria < 1 g/l, microhematuria
- Greiss- screening nitrite test (Esch.coli transformed nitrates in nitrites, + test in 40-50% of young children with UTI)

2. Uroculture, specific test: slow of urine on special media, antibiogram.

II stage –establishing of functional renal state

- Renal tubular function: Zimnitzki's test (rhythm, volume, dilution and concentration of urine); urinary ph, seric and urinary ionogram, acido-basic equilibrium.
- Glomerular renal function: creatine, urea, uric acid in serum and urine, clearance of creatinin.

III stage Establishing of morphologic renal state

- The abdominal echography is accessible, noninvasive procedure. Information about: urinary bladder, kidneys: dimensions, form, collectory system, renal parenchyma, lithias, cyst, abscess, some anomalies.
- Retrograde transurethral cystography: pre-intra- and postmictional.
- Excretory intravenous urography.
- Cystoscopy, cystomanometry, electromyography
- Radioisotopic techniques: isotopic cystourethrography, isotopic scintigraphy

Differential diagnosis

- Urethritis (chemical; from irritants such as soap), vaginitis, trauma, and hypercalciuria can cause dysuria.
- Detrusor/sphincter dysfunction can cause incontinence. Primary enuresis describes the child who never fully gains bladder control. Secondary enuresis describes those children who maintain control for more then 6 months and later revert to involuntary voiding.
- Pneumonia, gastroenteritis, appendicitis, and pelvic inflammatory disease can be associated with symptoms similar to acute pyelonephritis.
- In baby with leukocyturia and sterile pyuria tuberculosis will be excluded.

Complications.

- Septicemia: more likely to be present in neonates or in children with abnormal urinary tracts.
- Renal scarring: can develop years after infections that occurred in infancy or early childhood; it is associated with hypertension, toxemia, and the risk of chronic renal failure leading to end-stage renal disease. The characteristic renal scars of VUR are often present at the time of initial diagnosis of chronic pyelonephritis.
- Calculi can form in the presence of repeated infections.

Treatment

Diet and lifestyle

- Increased water intake offers several benefits; it dilutes urine, increases voiding frequency, and reduces constipation. Stool softeners should be considered if the latter problem persists.
- Irritants, particularly soap, should be avoided near the perineum in prepuberty girls. Counseling the parents to try to establish more normal patterns of voiding and defecation may be helpful in controlling recurrences.

The criteria for ideal antibiotic in UTI treatment:

- Possibility of oral administration, optimal intestinal absorption

- High renal elimination with therapeutically efficient urinary concentration
- Good tolerance, minimal secondary effects
- Wide spectrum of action in monotherapy (both fecal and vaginal flora).
- Stable active indifferently from urinary Ph.

Duration of Treatment in UTI

- Acute cystitis afebrile 5-7 days Nitrofurantoin (Furadantin, Macrochantin)- synthetic nitrofuran that interferes with bacterial carbohydrate metabolism, bacteriostatic at low concentrations 5-8 mg/kg/day divided 4 times daily; the liquid form of Nitrofurantoin is not well tolerated.
- Acute pyelonephritis -the penicillins (amoxicillin) or/and 3 rd-generation of cephalosporins with activity against gram-negative rods and good oral bioavailability for 14 days,
- Therapy may be continued to Sulfamethoxazol (Bactrim) or Nitrofurantoin in VUR such basic treatment
- In baby 3-6 month- Sulfamethoxazole 6-10 mg/kg/day divided twice daily or Nitrofurantoin 5-8 mg/kg/day.
- Complicated infections in infants younger than 6 months of age are necessary intravenous antibiotics and hospitalization.
- Older children- Septra, Bactrim inhibiting synthesis of dihydrofolic acid of bacteria. Prophylaxis. Standard dosage Cotrimoxazole 1-2 mg/kg trimethoprim daily.
- Nitroxolin, 5-NOK1-2mg/kg/d. Both of the medications should be avoided in infants younger than 6 mo of age or in the presence of reflux.
- in a renal abscess or an abnormal urinary tract treatment should be 14 days or longer
- Therapy of hypertension- ACE inhibitors prevent renal failure

Surgical treatment

- Surgical care in VUR Stages I and II VUR is reflux without ureteral dilatation. Continue antibiotic therapy until puberty or until reflux resolves.
- Stages III and IV VUR (severe reflux) should be surgically treated
- Infection in the presence of obstruction requires effective drainage of the urinary tract (eg. Nephrostomy, bladder catheterization) in addition to antibiotic therapy.

Antirecivedivant , prophylactic and prolonged suppression treatment.

- The goal: maintaining of sterile urine, absence of clinical sings of pyuria
- Indications: frequently recurrent pyelonephritis, 2-3 times per year;
- chronic pyelonephritis with destruction of renal parenchyma;
- Vesico-ureteral reflux. Other anomalies with urinary stasis;
- Patient with gallbladder stones and UTI
- Patient with vesical unstability, enuresis, UTI.

Follow-up and management.

- Follow-up cultures should be obtained in children with febrile UTIs a week after the treatment, at 3mo intervals for 1-2 yr to assure an appropriate response and even when the child is asymptomatic. Urinalysis, serum creatinine and blood urine nitrogen may be indicated.
- Infants and young children with documented vesicoureteral reflux should remain on antibiotic prophylaxis until the reflux resolves. Some children with recurrent infections benefit from a short course of prophylactic therapy even when reflux is not present, or when recurrent cystitis causes such symptoms as incontinence, frequency and urgency of urination, which are perpetuated by frequent reinfections
- Other indications for long-term prophylaxis: neurogenic bladder, urinary tract stasis, obstruction and calculi.

