



Part 2: UTI in urology (Surgical UTI)

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Kidney Infections

- I) Renal Infection (Bacterial Nephritis):
- The classic symptoms of acute onset of fever, chills, and flank pain are usually indicative of renal infection.
- Or as an insidious onset of nonspecific local or systemic symptoms, or it may be entirely asymptomatic
- The relationship between laboratory findings and the presence of renal infection often is poor. Bacteriuria and pyuria, the hallmarks of UTI, are not predictive of renal infection
- The urine may be sterile: if the ureter is obstructed or the infection is outside of the collecting system

Kidney Infections

- I) Renal Infection (Bacterial Nephritis):
- Acute or chronic pyelonephritis may transiently or permanently alter renal function,
- Nonobstructive pyelonephritis is no longer recognized as a major cause of renal failure
- Pyelonephritis, when associated with urinary tract obstruction or granulomatous renal infection, may lead rapidly to significant inflammatory complications, renal failure, or even death
- I/A) **Acute Pyelonephritis:** defined as inflammation of the kidney and renal pelvis, but the diagnosis is clinical

Kidney Infections

- I/A) **Acute Pyelonephritis:**
- The clinical spectrum ranges from gram-negative sepsis to cystitis with mild flank pain
- The classic presentation is an abrupt onset of chills, fever (38 °C or greater), and unilateral or bilateral flank or costovertebral angle pain and/or tenderness.
- P/E: +ve costovertebral angle tenderness, +ve GI abnormalities: abdominal pain, nausea, vomiting, and diarrhea
- Asymptomatic progression may occur (esp. if immunocompromised) to Chronic Pyelonephritis or ARF.

Kidney Infections

- I/A) **Acute Pyelonephritis:**
- **Labs:** Serum: +ve leukocytosis with a predominance of neutrophils
- Elevated CRP levels, and
- Elevated creatinine levels if renal failure is present
- Urinalysis: usually reveals numerous WBCs, often in clumps, and
- bacterial rods or chains of cocci.
- The presence of large amounts of granular or leukocyte casts in the urinary sediment is suggestive of acute pyelonephritis
- Urine cultures are positive, but 20% of patients have negative results on Gram staining of the urine

Kidney Infections

- **I/A) Acute Pyelonephritis:**
- *E. coli* constitutes a unique subgroup that possesses special virulence factors, accounts for 80% of cases
- P blood group phenotype have special susceptibility to recurrent pyelonephritis caused by *E. coli* that have P pili
- **Imaging W/up:**
- Ultrasound may show focal parenchymal swelling and regions of increased or decreased echogenicity
- CT and MRI also may show focal swelling and diminished and inhomogeneous parenchymal contrast enhancement



Computed tomography of focal pyelonephritis. Arrows show patchy regions of diminished heterogeneous enhancement and swelling.

Kidney Infections

- I/A) **Acute Pyelonephritis:**
- **Differential Diagnosis:**
- **Acute appendicitis, diverticulitis, and pancreatitis can cause a similar degree of pain, but the location of the pain often is different**
- Herpes zoster can cause superficial pain in the region of the kidney but is not associated with symptoms of UTI; the diagnosis will be apparent when shingles appear

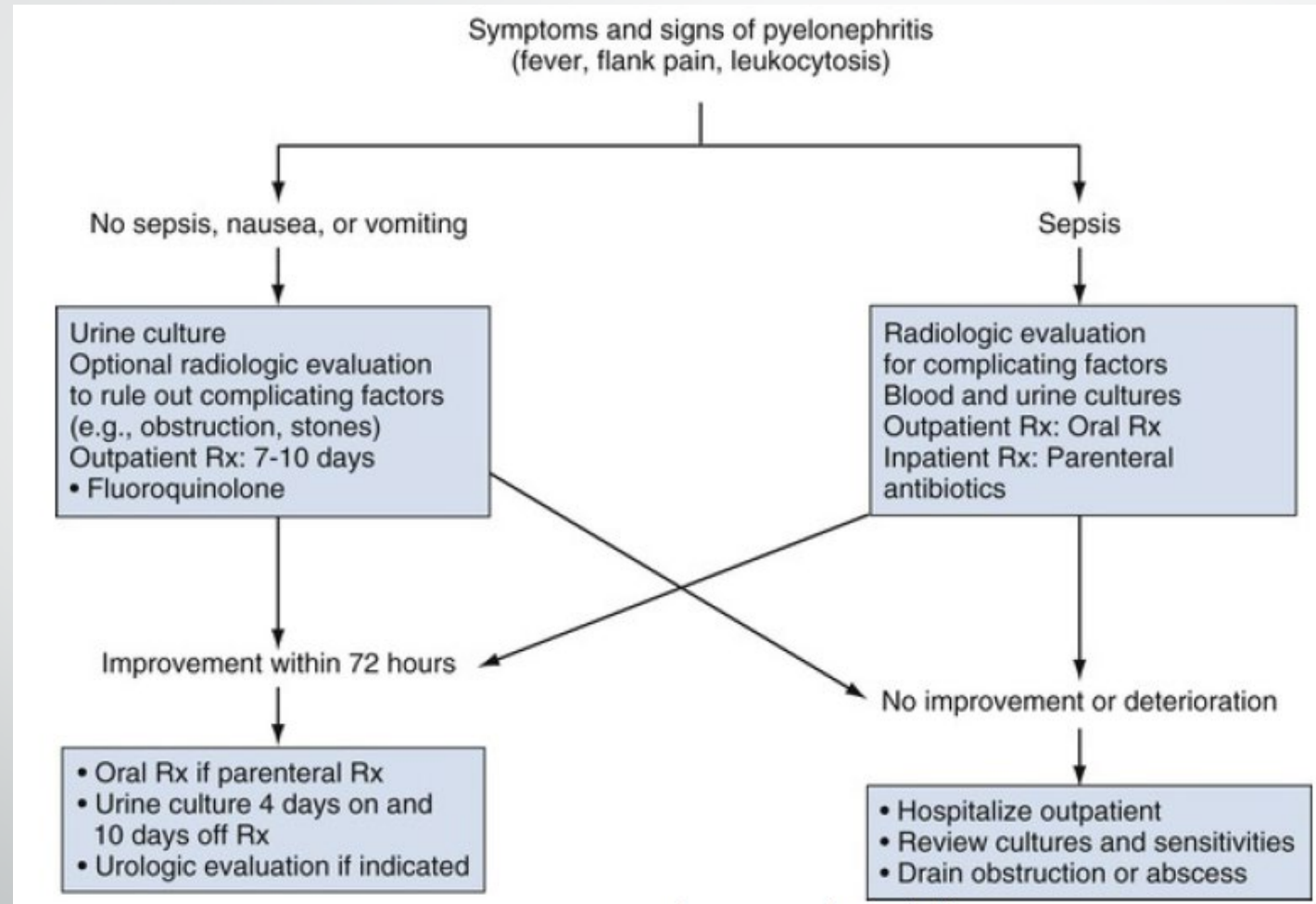
Acute Pyelonephritis/ Management

- It is critical to determine whether the patient has an uncomplicated or complicated UTI because significant abnormalities have been found in 16% of patients with acute pyelonephritis
- In uncomplicated pyelonephritis who will be managed as outpatients, initial radiologic evaluation can usually be deferred, or to do ultrasonography to rule out stones or obstruction in patients with difficult access to later medical care.
- In patients with known or suspected complicated pyelonephritis, CT provides excellent assessment of the status of the urinary tract and the severity and extent of the infection

Acute Pyelonephritis/ Management

- Oral ciprofloxacin (500 mg twice daily) for 7 days is an appropriate first-line therapy in patients not requiring hospitalization
- Initial one-time parenteral dose of a long-acting agent such as 1 g of ceftriaxone is preferable
- **Indications for hospitalization** includes:
 - In uncomplicated infection: high fever, high WBC count, vomiting, dehydration, evidence of sepsis
 - In complicated pyelonephritis
 - Failure to improve during the initial outpatient treatment period

Acute Pyelonephritis/ Management



Acute Pyelonephritis/ Management

- After Admission:
- Hospitalization, IV fluids, and antipyretics are required
- Any substantial obstruction must be relieved expediently by the safest and simplest means, such as ureteral stent or percutaneous nephrostomy tube placement
- Alterations in antimicrobial therapy may be made depending on the patient's clinical response and the results of the culture and susceptibility tests

Kidney Infections

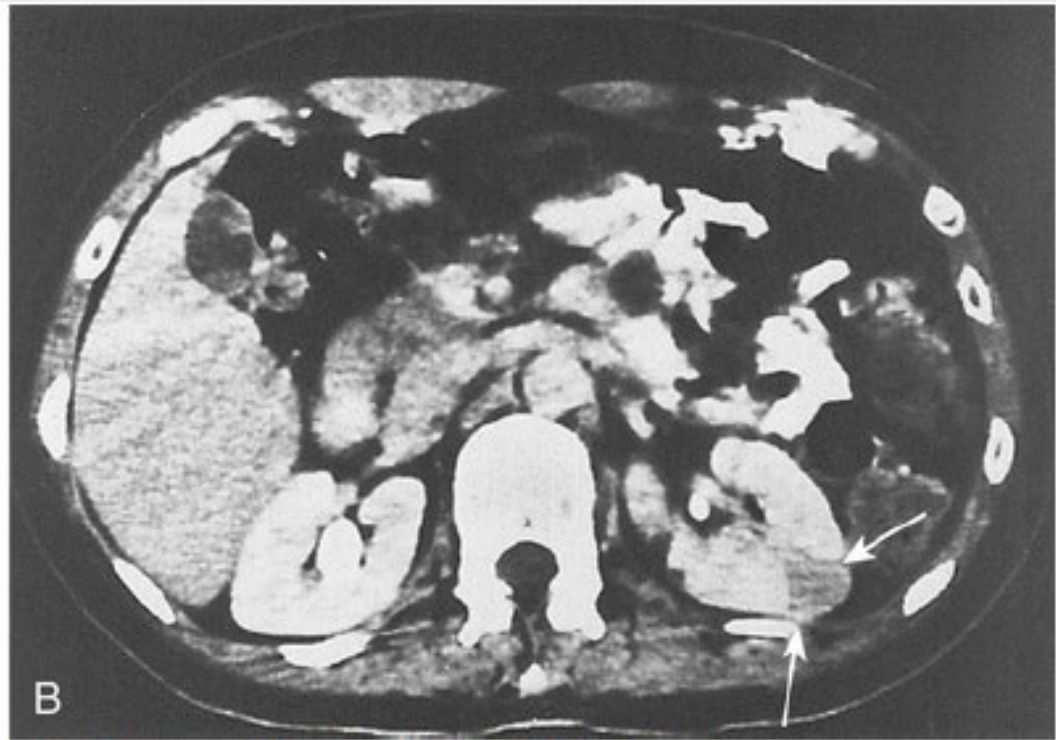
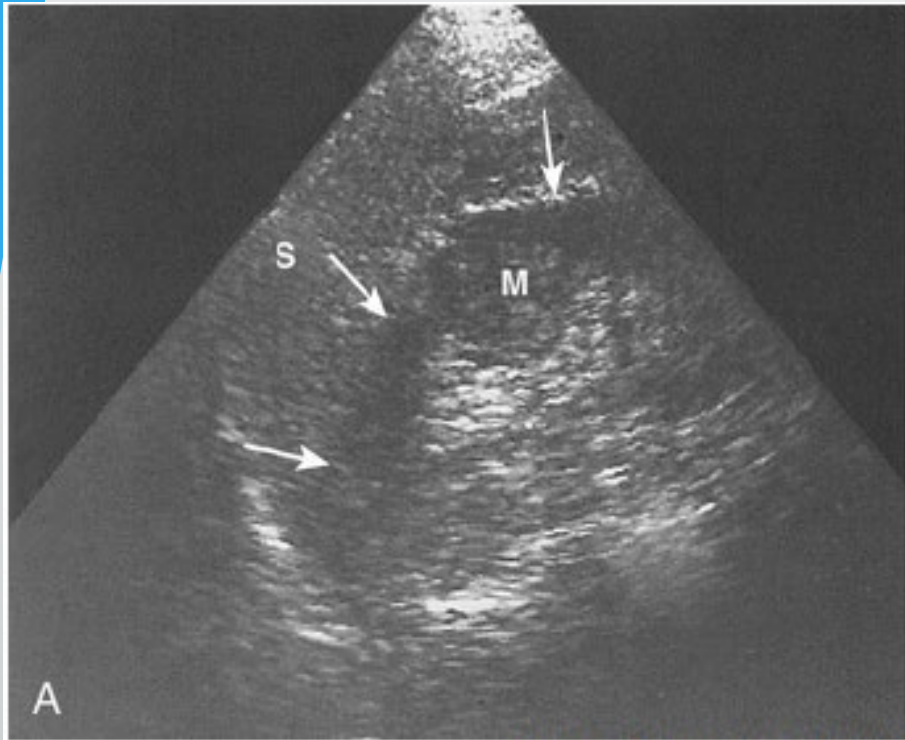
- I/B) **Acute Focal or Multifocal Bacterial Nephritis:**
- Acute focal or multifocal bacterial nephritis is an uncommon, severe form of acute renal infection in which a heavy leukocyte infiltrate is confined to a single renal lobe (focal) or multiple lobes (multifocal)
- The clinical presentation is similar to acute pyelonephritis but usually is more severe and sepsis is common. (50% have DM)
- The diagnosis must be made by radiologic examination
- Ultrasonography and CT with contrast can establish the diagnosis

Kidney Infections

- **I/B) Acute Focal or Multifocal Bacterial Nephritis:**
- **Treatment includes hydration and IV antimicrobial agents for at least 7 days, followed by 7 days of oral antimicrobial therapy**
- Failure to respond to antimicrobial therapy is an indication for appropriate studies to rule out obstructive uropathy, renal or perirenal abscess, renal carcinoma, or acute renal vein thrombosis.

Kidney Infections

- I/C) **Emphysematous Pyelonephritis:** (I= bacterial nephritis)
- a urologic emergency
- acute necrotizing parenchymal and perirenal infection caused by gas-forming uropathogens
- The pathogenesis is poorly understood. Because the condition usually occurs in patients with diabetes, it has been postulated that the high tissue glucose levels provide the substrate for microorganisms such as *E. coli*, which are able to produce carbon dioxide by the fermentation of sugar
- Many patients have urinary tract obstruction associated with urinary calculi or papillary necrosis and significant renal functional impairment



Acute focal bacterial nephritis. (A) Ultrasound image; longitudinal view of the left kidney demonstrates spleen (S) and left kidney (arrows). Note irregular midpole mass (M) of slightly higher echo texture than surrounding normal renal parenchyma. (B) Contrast medium-enhanced computed tomography scan demonstrates a wedge-shaped area of low density (arrows) in the middle portion of the left kidney. The findings resolved after antimicrobial therapy.

Kidney Infections

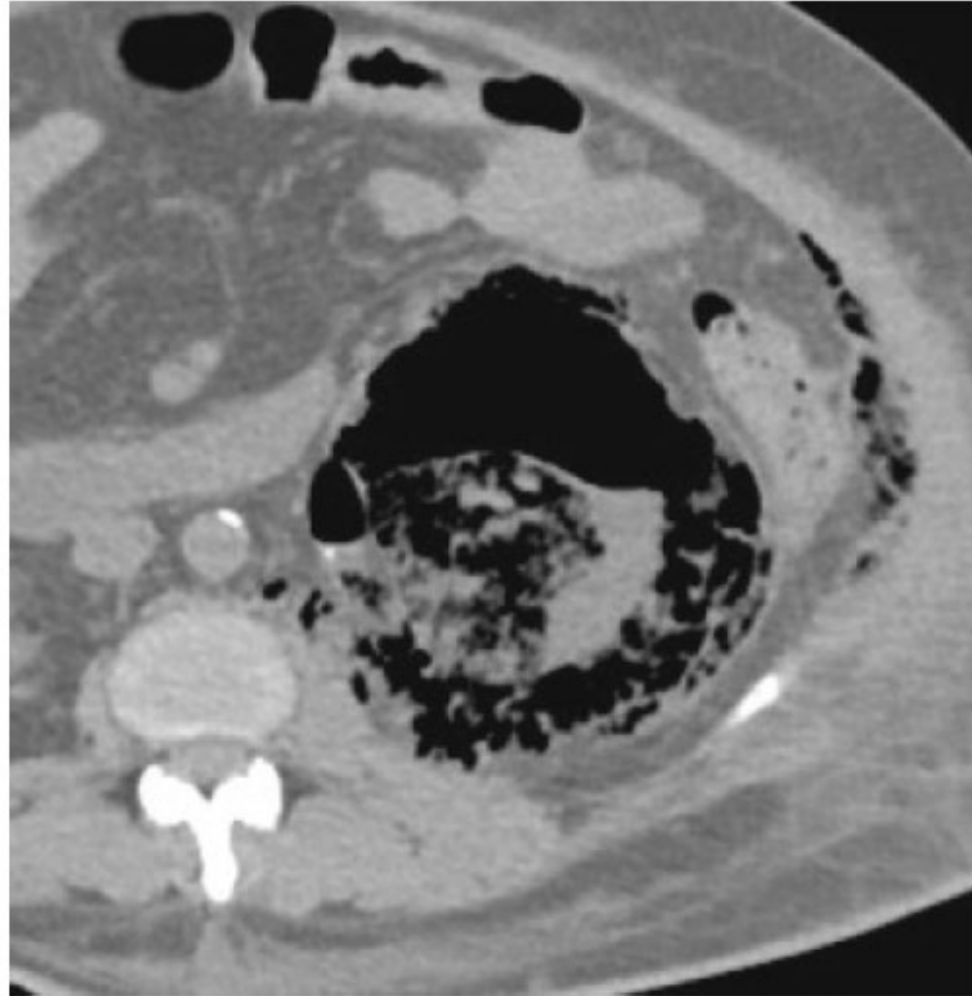
- I/C) **Emphysematous Pyelonephritis:**
- High mortality between 19% - 43%
- Almost all patients display the classic triad of fever, vomiting, and flank pain
- The diagnosis is established radiographically
- Tissue gas that is distributed in the parenchyma may appear on abdominal radiographs as mottled gas shadows over the involved kidney



Emphysematous pyelonephritis; plain film. Extensive perinephric (*long arrows*) and intraparenchymal (*short arrows*) gas secondary to acute bacterial pyelonephritis.

Kidney Infections

- I/C) Emphysematous Pyelonephritis:
- CT is the imaging procedure of choice in defining the extent of the emphysematous process and guiding management.
- An absence of fluid in CT images or the presence of streaky or mottled gas appears to be associated with 50% to 60% mortality rate



Computed tomography of emphysematous pyelonephritis
There is air within and surrounding the left kidney.

Kidney Infections

- I/C) **Emphysematous Pyelonephritis:**
- Most patients are septic, and fluid resuscitation, glucose and electrolyte management, and broad-spectrum antimicrobial therapy are essential
- Ureteral obstruction, if present, is alleviated by a percutaneous nephrostomy tube or a stent.
- Definitive management is by percutaneous drainage, except in cases of extensive diffuse gas with renal destruction; in this latter scenario, ***nephrectomy*** is advised.

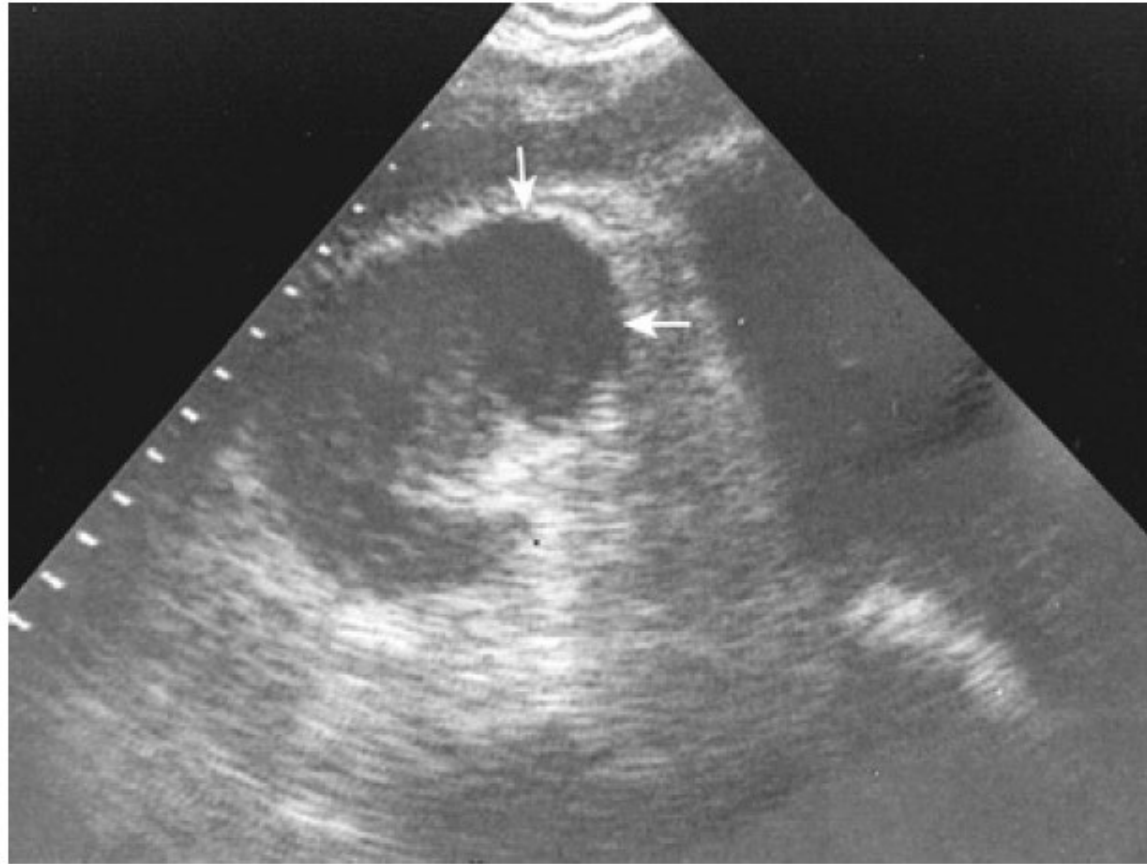
Kidney Infections

- **I/D) Renal Abscess:**
- Renal abscess or carbuncle is a collection of purulent material confined to the renal parenchyma
- The most common organisms include *E. coli*, *Klebsiella*, *Proteus*, and *Pseudomonas spp.*
- The patient may present with fever, chills, abdominal or flank pain, and occasionally weight loss and malaise
- Risk factors: UTI or pyelonephritis in the weeks prior, multiple skin carbuncles, IV drug abuse, & complicated UTIs associated with stasis, calculi, pregnancy, neurogenic bladder, and diabetes mellitus

Kidney Infections

- **I/D) Renal Abscess:**
- Ultrasonography and CT distinguish abscess from other inflammatory renal diseases.
- An echo-free or low-echodensity spaceoccupying lesion with increased transmission is found on the ultrasound image
- The number of echoes depends on the amount of cellular debris within the abscess
- Differentiation between an abscess and a tumor is impossible in many cases

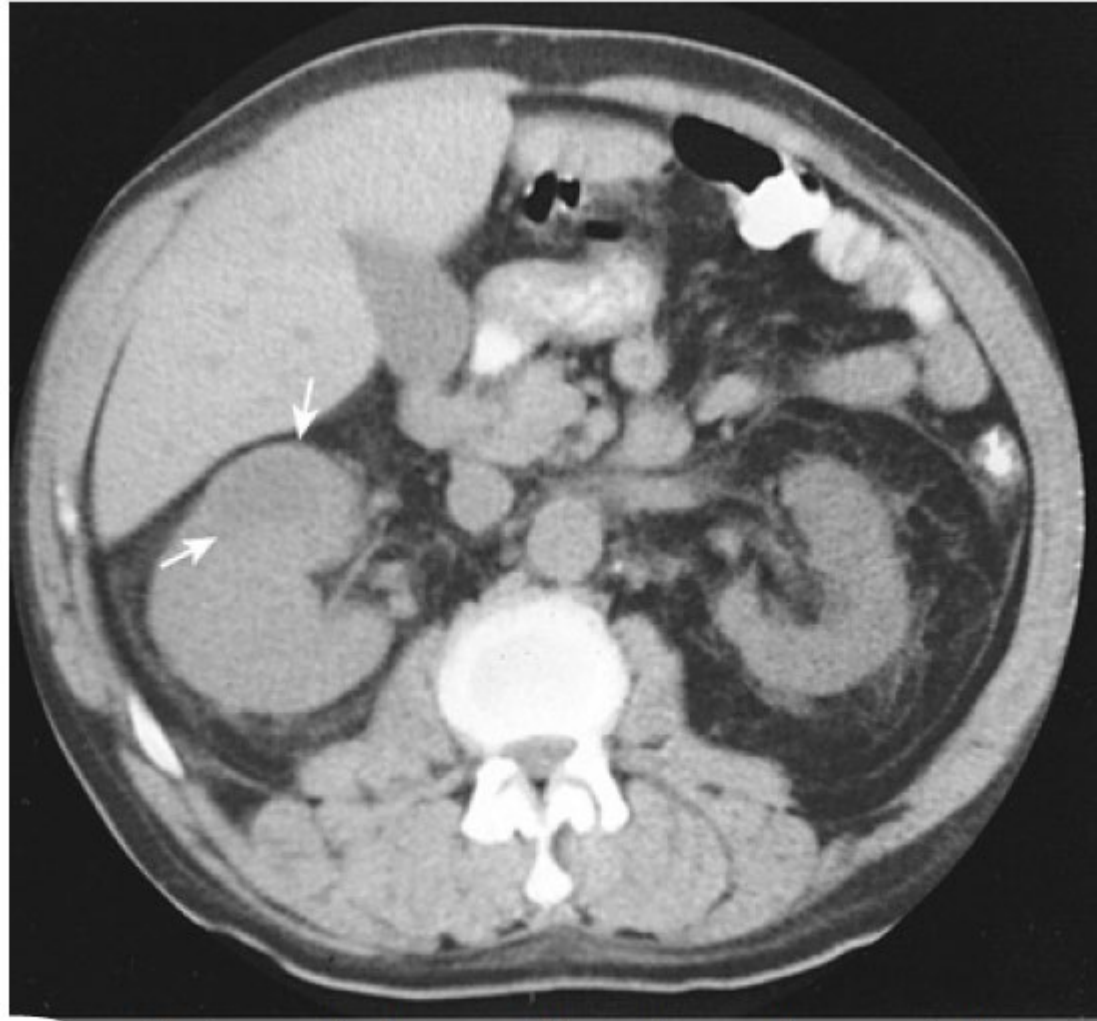
Kidney Infections: Renal Abscess



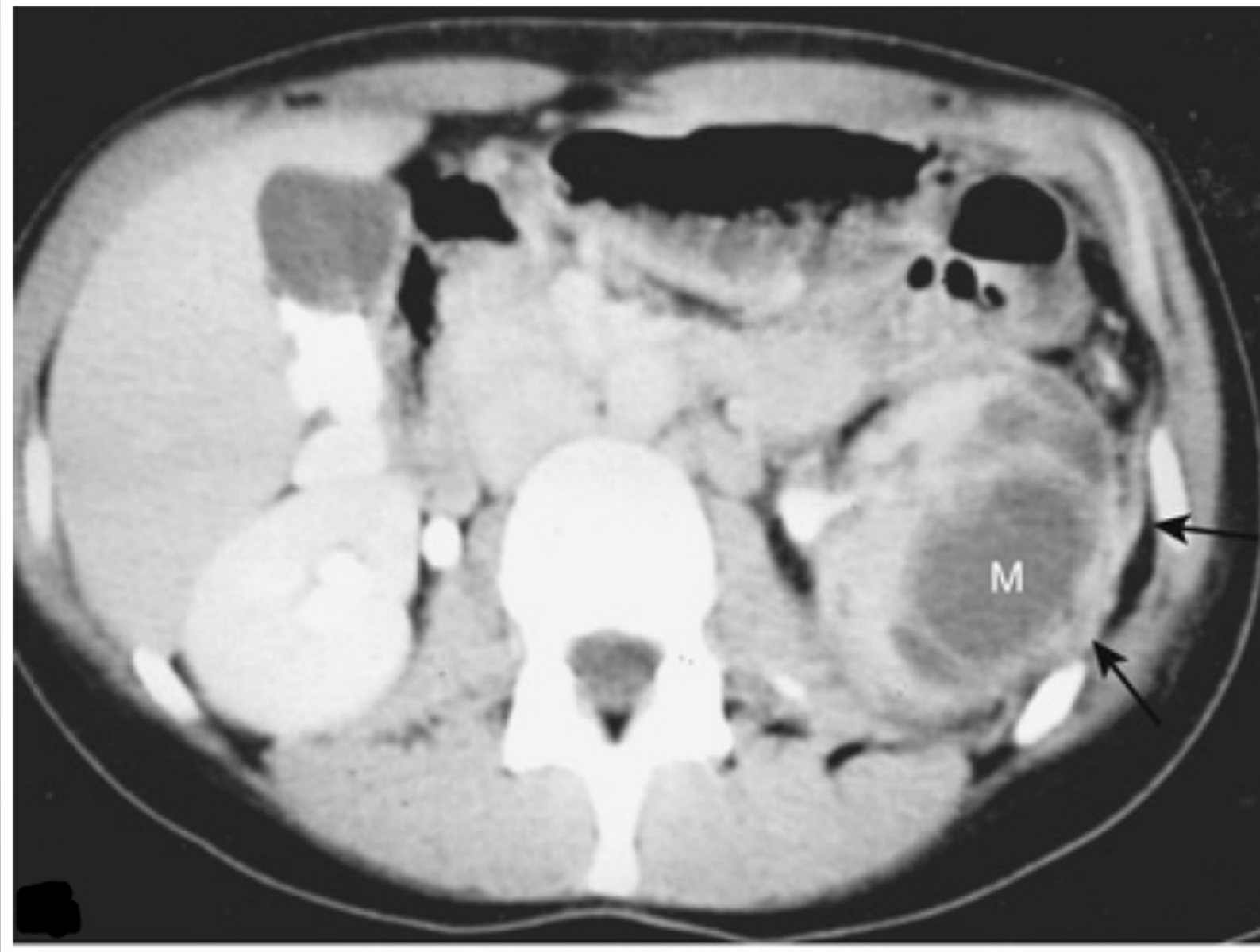
Acute renal abscess. Transverse ultrasound image of the right kidney demonstrates a poorly marginated rounded focal hypoechoic mass (*arrows*) in the anterior portion of the kidney.

Kidney Infections

- **I/D) Renal Abscess:**
- CT appears to be the diagnostic procedure of choice
- On CT, abscesses are characteristically well defined before and after contrast agent enhancement. The findings depend in part on the age and severity of the abscess
- Initially, CT shows renal enlargement and focal, rounded areas of decreased attenuation
- After several days a thick fibrotic wall begins to form around the abscess



Acute renal abscess. Nonenhanced computed tomography scan through the mid pole of the right kidney demonstrates right renal enlargement and an area of decreased attenuation (*arrows*). After antimicrobial therapy, a follow-up scan showed complete regression of these findings.



Kidney Infections

- **I/D) Renal Abscess:**
- The treatment for an abscess is percutaneous or open incision and drainage
- Small abscess less than 3 cm or even 5 cm in a clinically stable patient can be managed conservatively (IV antimicrobial agents and careful observation)
- CT- or ultrasound-guided needle aspiration may be necessary to differentiate an abscess from a hypervascular tumor

Kidney Infections

- **I/E) Infected Hydronephrosis and Pyonephrosis:**
- Infected hydronephrosis is bacterial infection in a hydronephrotic kidney.
- The term pyonephrosis refers to infected hydronephrosis associated with suppurative destruction of the parenchyma of the kidney, in which there is total or nearly total loss of renal function
- Where infected hydronephrosis ends and pyonephrosis begins is difficult to determine clinically

Kidney Infections

- I/E) **Infected Hydronephrosis and Pyonephrosis:**
- The patient is usually very ill, with high fever, chills, flank pain, and tenderness
- A previous history of urinary tract calculi, infection, or surgery is common
- The ultrasonographic **diagnosis** of infected hydronephrosis depends on demonstration of internal echoes within the dependent portion of a dilated pyelocalyceal system
- CT is nonspecific but may show thickening of the renal pelvis, stranding of the perirenal fat, and a striated nephrogram

Kidney Infections

- I/E) **Infected Hydronephrosis and Pyonephrosis:**
- Management: Once the diagnosis of pyonephrosis is made, the treatment is initiated with appropriate antimicrobial drugs and drainage of the infected pelvis
- A ureteral catheter can be passed to drain the kidney, but if the obstruction prevents this, a percutaneous nephrostomy tube should be placed
- When the patient becomes hemodynamically stable, other procedures are usually needed to identify and treat the source of the obstruction

Kidney Infections

- I/F) **Perinephric Abscess:**
- A perinephric abscess extends beyond the renal capsule but is contained by Gerota fascia and usually results from rupture of an acute cortical abscess into the perinephric space, extravasated infected urine from obstruction, or from hematogenous seeding from sites of infection
- CT is particularly valuable for demonstrating the abscess
- Management: <3cm conservative, more than 3cm = percutaneous drainage and IV antibiotics

Kidney Infections

- **I/G) Chronic Pyelonephritis:**
- There are no symptoms of chronic pyelonephritis until it produces renal insufficiency, and then the symptoms are similar to those of any other form of chronic renal failure
- If a patient's chronic pyelonephritis is thought to be a result of many episodes of acute pyelonephritis, a history of intermittent symptoms of fever, flank pain, and dysuria may be elicited
- The diagnosis of chronic pyelonephritis can be made with the greatest confidence on the basis of pyelographic findings

Kidney Infections

- I/G) **Chronic Pyelonephritis:**
- The essential features are asymmetry and irregularity of the kidney outlines, blunting and dilation of one or more calyces, and cortical scars at the corresponding site
- In advanced pyelonephritis, calyceal distortion and irregularity together with cortical scars complete the picture
- **Regardless of the cause of chronic pyelonephritis, CT** findings will be consistent with atrophy, cortical/parenchymal thinning, calyceal clubbing, and possible hypertrophy of residual normal tissue and asymmetry

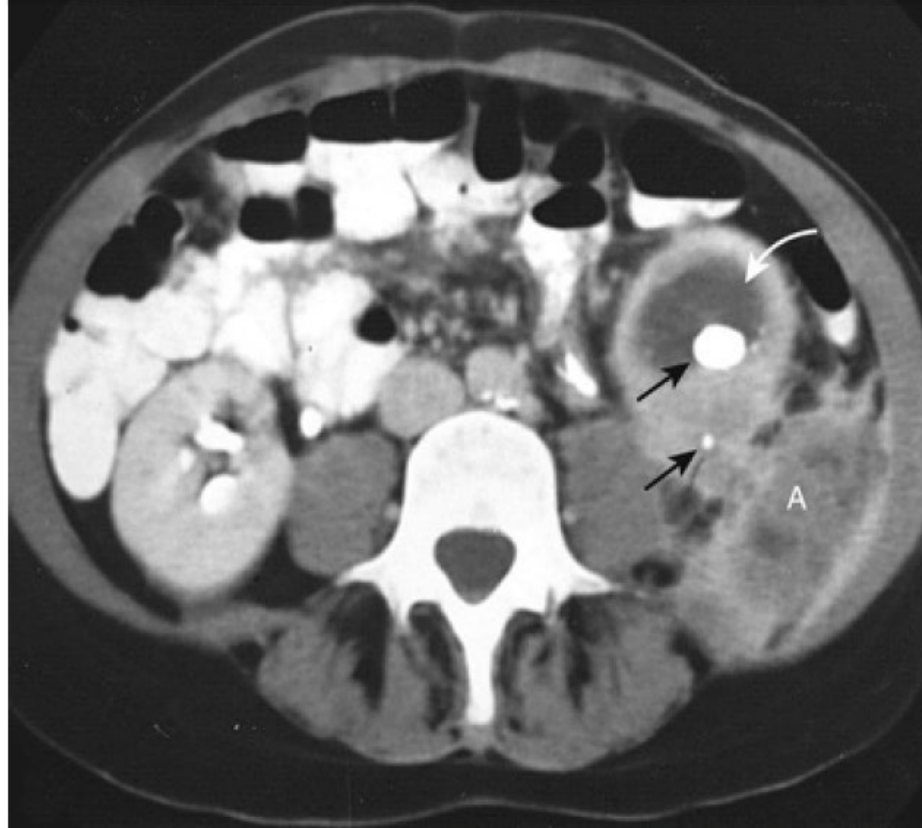
Kidney infections

- II) Infectious Granulomatous Nephritis:
- II/A) Xanthogranulomatous Pyelonephritis:
- Xanthogranulomatous pyelonephritis (XGP) is a rare, severe, chronic renal infection typically resulting in diffuse renal destruction
- Most cases are unilateral and result in a nonfunctioning, enlarged kidney associated with obstructive uropathy secondary to nephrolithiasis.
- characterized by accumulation of lipid-laden foamy macrophages

Kidney infections

- II/A) Xanthogranulomatous Pyelonephritis:
- The primary factors involved in the pathogenesis of XGP are nephrolithiasis, obstruction, and infection
- Clinical Presentation: XGP should be suspected in patients with UTIs and a unilateral enlarged nonfunctioning or poorly functioning kidney with a stone or a mass lesion indistinguishable from malignant tumor
- *Proteus* is the most common organism and *E. coli* is also common
- CT is the most useful radiologic technique in evaluating patients with XGP

- 50-80% of patients show the classic triad of unilateral renal enlargement with little or no function and a large calculus in the renal pelvis



Xanthogranulomatous pyelonephritis. Enhanced computed tomography scan shows collecting system and parenchymal calculi (*straight black arrows*) with lower pole pyonephrosis (*curved white arrow*) and an irregular, predominantly low-density perinephric abscess (A) extending into the soft tissues of the flank.

Kidney infections

- II/A) Xanthogranulomatous Pyelonephritis:
- The primary obstacle to the correct treatment of XGP is incorrect diagnosis
- Because the renal abnormality may be diagnosed preoperatively as a renal tumor and/or is diffuse, **nephrectomy** is usually performed
- If localized XGP is diagnosed preoperatively or at exploration, it is amenable to **partial nephrectomy**.
- Occasionally, long-term antimicrobial therapy will eradicate the infection and restore renal function

Prostatitis

- NIH Classification:
- 1) I. Acute bacterial prostatitis
- 2) II. Chronic bacterial prostatitis
- 3) IIIA. Chronic prostatitis/pelvic pain syndrome, inflammatory
- 4) IIIB. Chronic prostatitis/pelvic pain syndrome, noninflammatory
- 5) IV. Asymptomatic inflammatory prostatitis

Category I Prostatitis: Acute Bacterial Prostatitis (ABP)

- Affects men 20-40 years/ second peak in men over 60
- Causes: Ascending infection (mainly), Direct seeding from a prostate biopsy is a common cause, rarely spreads from the rectum via the lymphatic system, Hematogenous dissemination also can occur.
- Risk factors: unprotected sexual intercourse, phimosis, condom use, indwelling urethral catheters, and urinary tract instrumentation, also dysfunctional voiding and urinary stasis

Category I Prostatitis: ABP

- Presentation:
- acute symptoms of a urinary tract infection (UTI), characteristically including urinary frequency and dysuria.
- Systemic symptoms: malaise, fever, and myalgia.
- Pain in the lower abdomen and perineum
- Urinary retention may be present because of acute swelling of the prostate, pain, or spasm of the bladder neck
- In severe cases, symptoms of sepsis: high fevers and chills, cardiovascular instability, and mental status changes

Category I Prostatitis: ABP

- Diagnosis: It's a Clinical Diagnosis
- Febrile UTI in men can be from pyelonephritis, acute cystitis, or prostatitis; **more than 90% of men's febrile UTIs had increases in PSA and/or prostate volume.**
- DRE: "boggy" prostate from edema from inflammation & **the prostate is tender and swollen in 60% to 90% of cases, Caution should be used to avoid aggressive palpation that could lead to bacterial dissemination and sepsis.**

Category I Prostatitis: ABP

- Labs: CBC, urinalysis, and midstream urine culture.
- Urine culture is positive in 60% to 85% of cases
- Prostate massage should not be performed in the acute setting
- KFT: to help guide antibiotic therapy
- PVR should be made to rule out urinary retention
- PSA testing is not recommended because the level is expected to be high during the acute phase

Category I Prostatitis: ABP

- Treatment:
- Patients with systemic signs of infection need admission for IV antibiotics, hydration, and monitoring of laboratory studies.
- Outpatient: 2-4 weeks of ciprofloxacin has cure rate of 89-97%
- NSAID medications can help with pain and inflammation
- Alpha-blockers if they have LUTS

Category I: Prostatic Abscess

- Should be suspected in men with high fever or a history of immunosuppression such as diabetes or HIV or who do not respond to initial therapy after 48 hours
- Diagnosis: transrectal ultrasound (TRUS) or CT scan
- Treatment:
- Less than 2cm: conservatively with antibiotics
- Large abscess: percutaneous drainage under ultrasound guidance
- Too Large or Recurrent: TURP to unroof the abscess

Category II Prostatitis: Chronic Bacterial Prostatitis (CBP)

- Chronic bacterial prostatitis is characterized by recurrent urinary tract infections with the same organism. This suggests a persistent prostatic source.
- This category accounts for 5% to 10% of cases of prostatitis.
- The symptoms of dysuria and pain generally respond to antibiotic treatment, and, unlike men with category III CP/CPPS, they are then relatively asymptomatic between episodes

Category II Prostatitis: CBP

- Diagnosis:
- pre-massage and post-massage test (urine culture) (or two-glass test): The VB₃ specimen gives information to the persistent prostatic source of bacteria
- Semen cultures: not recommended because of limited detection of causative bacteria and decreased specificity resulting from skin contamination
- In men younger than 45 years old with a first event of acute UTI, No need for Imaging

Category II Prostatitis: CBP

- Diagnosis: Uroflowmetry: Urethral strictures can occur in up to 41% cases
- Indications for imaging: history of diabetes, chronic kidney disease, stones, voiding difficulties, neurologic disease, poor response to antibiotics, or hematuria more than 1 month after the infection
- Treatment: Fluoroquinolones (ciprofloxacin and levofloxacin) are the antibiotics of choice for 4-6 weeks
- Cases resistant to fluoroquinolones but susceptible to TMP-SMX, a 3-month course of TMP-SMX can be given

Category III Prostatitis: CP/CPPS

- The cause and the pathogenesis of CP/CPPS remain unknown.
- However, there is evidence to support a possible role for infection, neurologic causes, and inflammatory/autoimmune, endocrine, and psychological factors
- The symptom that distinguishes category III prostatitis CP/CPPS from other conditions such as BPH is **pain**.
- CP/CPPS is a diagnosis of exclusion, the evaluation must rule out identifiable causes of pelvic pain.
- Workup: Urinalysis: post-prostate massage urine (VB₃) or EPS to categorize men as category IIIA or IIIB.

Category III Prostatitis: CP/CP/PPS

- Management:

I) Pharmacologic Treatment: Antibiotics, Alpha-blockers, Anti-Inflammatory Therapy (NSAIDS), Reductase Inhibitors (finasterides)

II) Bladder Specific: Pentosan Polysulfate: Pentosan polysulfate (PPS) is a medication thought to work by augmenting the bladder's layer of glycosaminoglycans, which acts as a protective barrier.

III) Other Treatments: Lifestyle Changes: Diet and Exercise, Stress Management/Psychological Treatments, Pelvic Floor Physical Therapy and Skeletal Muscle Relaxants.



THANK YOU