Renal Infection

Acute pyelonephritis

Is inflammation of the kidney and renal pelvis.
The diagnosis is usually clinical based on the presence of Chills, fever, flank pain, and tenderness at CVA, often with an elevated WBC count. There are usually accompanying LUTS (frequency, urgency, dysurea). Nausea and vomiting are common. Septicemia may complicate acute pyelonephritis. It may affect one or both kidneys.The sources of bacteria are usually ascending infection from lower tract and some times haematogenic.

***Differential diagnosis*:** cholecystitis, pancreatitis, diverticulitis, appendicitis & lower pole Pneumonia.
Risk factors: vesicoureteric reflux (VUR); urinary tract obstruction; calculi; spinal cord injury (neuropathic bladder); diabetes mellitus; congenital malformation; indwelling catheters.
***Pathogenesis and microbiology*:** initially, there is patchy infiltration of neutrophils and bacteria in the parenchyma. Later changes include the formation of inflammatory bands extending from renal papilla to cortex, and small cortical abscesses. 80% of infections are secondary to E.coli (possessing P pili virulence factors). Other infecting organisms: Entero-cocci (Streptococcus faecalis), Klebsiella, Proteus, and Pseudomonas.
Urine culture will be positive for bacterial growth, but the bacterial count may not necessarily be >10 cfu/ml of urine Thus, if you suspect a diagnosis of acute pyelonephritis from the symptoms of fever and flank pain, but there are $<10^5$cfu/ml of urine, manage the case as acute pyelonephritis.
Investigation and treatment

- For those patients who have a fever but are not systemically unwell managed as outpatient . Culture the urine and start oral antibiotics according to your local antibiotic policy (which will be based on the likely infecting organisms and their likely antibiotic sensitivity). We use oral ciprofloxacin for 10 days.
- If the patient is systemically unwell should be admitted to hospital, culture urine and blood, start intravenous fluids and intravenous antibiotics, again selecting the antibiotic according to your local antibiotic policy. We use IV ampicillin and gentamicin.
- Arrange a KUB X-ray and renal ultrasound, to see if there is an underlying upper tract abnormality (such a ureteric stone), unexplained hydronephrosis, or (rarely) gas surrounding the kidney (suggesting emphysematous pyelonephritis).
- If the patient does not respond within 3 days to this regimen of appropriate intravenous antibiotics, arrange a CTscan. This suggests the possibility of renal abscess, a pyonephrosis a perinephric abscess, or emphysematous pyelonephritis. The CTU may demonstrate an obstructing ureteric calculus that may have been missed on the KUB X-ray, and ultrasound may show a perinephric abscess.
- If the patient responds to IV antibiotics, change to an oral antibiotic of appropriate sensitivity when they become apyrexial, and continue this for approximately 10-14 days.

Chronic pyelonephritis

The term chronic pyelonephritis refers to the small, contracted, atrophic kidney or to the coarsely scarred kidney that has been produced by bacterial infection, whether recent or remote.
It is not a clinical diagnosis, but it is a radiological or pathological diagnosis. The scarring can be due to previous infection or it can occur from the long-term effects of reflux (with or without superimposed infection). It may cause hypertention and if bilateral lead to renal failure.

Renal Abscess or carbuncle

is a collection of purulent material confined to the renal parenchyma
The patient may present with fever, chills, abdominal or flank pain, and, occasionally, weight loss and malaise. Symptoms of cystitis may occur.
The patient typically has marked leukocytosis. The blood cultures are usually positive.
Ultrasonography is the quickest and least expensive method to demonstrate a renal abscess. An echo-free or low–echo-density space-occupying lesion with increased transmission is found on the sonogram
CT appears to be the diagnostic procedure of choice for renal abscesses
Management: IV antimicrobials and careful observation of a small abscess less than 3 cm in diameter and the classic treatment for an abscess has been percutaneous or open incision and drainage

Infected hydronephrosis: is bacterial infection in a hydronephrotic kidney.

Pyonephrosis

Refers to infected hydronephrosis associated with suppurative destruction of the renal parenchyma, in which there is total or nearly total loss of renal function.
The causes are essentially those of hydronephrosis, where infection has supervened (e.g. ureteric obstruction by stone, PUJ obstruction).
Clinical Presentation : The patient is usually very ill, with high fever, chills, flank pain, and tenderness.
Diagnosis : by ultrasound (show fluid depris level with dependent echoos that shift with positional changes) and CT-scan (pus densities in the dilated pelvis) and both may show the cause of obstruction.
Management: IV antibiotics (as for pyelonephritis) , IV fluids, 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.

Perinephric abscess

Perinephric abscess develops as a consequence of extension of infection outside the parenchyma of the kidney in acute pyelonephritis, or more rarely, nowadays, from haematogenous spread of infection from a distant site.
The abscess develops within Gerota's fascia. These patients are often diabetic, and associated conditions such as an obstructing ureteric calculus may be the precipitating event leading to development of the perinephric abscess.
Failure of an acute pyelonephritis to respond to intravenous antibiotics within a few days arouses the suspicion that there is an accumulation of pus in or around the

kidney, or obstruction with infection. Imaging studies, such as ultrasound and more especially CT will establish the diagnosis, and allow radiographically controlled percutaneous drainage of the abscess. If the pus collection ' is large, formal open surgical drainage under general anaesthetic will provide more effective drainage.

Emphysematous pyelonephritis

A rare, severe form of acute pyelonephritis caused by gas-forming organisms. It is characterized by fever and abdominal pain, with radiographic evidence of gas within and around the kidney (on plain radiography or CT). It usually occurs in diabetics, and in many cases is precipitated by urinary obstruction. The high glucose levels of the poorly controlled diabetic provides an ideal environment for fermentation by Enterobacteria, carbon dioxide being produced during this process.
It presents as a severe acute pyelonephritis (high fever and systemic upset) which fails to respond within 2-3 days with conventional treatment in the form of intravenous antibiotics. Commonly caused by E. coli, less frequently Klebsiella and Proteus. On KUB X-ray a crescent or kidney-shaped distribution of gas may be seen around the kidney. Renal ultrasonography often demonstrates strong focal echoes, indicating gas within the kidney. Intra-renal gas is seen on CT scan.
Patients with emphysematous pyelonephritis are usually very unwell and mortality is high. In selected cases, it can be managed conservatively, by intravenous antibiotics and fluids, percutaneous drainage, and careful control of diabetes. In those where sepsis is poorly controlled, emergency nephrectomy is required.

Xanthogranulomatous pyelonephritis

This is a severe renal infection usually occurring in association with underlying renal calculi and renal obstruction. The severe infection results in destruction of renal tissue leading to a non-functioning kidney. E. coli and Proteus are common causative organisms. The lipid-laden macrophages become deposited around abscesses within the parenchyma of the kidney. The infection may be confined to the kidney or extend to the perinephric fat. The kidney becomes grossly enlarged and macroscopically contains yellowish nodules, pus, and areas of hemorrhagic necrosis; it can be very difficult to distinguish the radiological findings from a renal cancer on imaging studies such as CT. Indeed, in most cases the diagnosis is made after nephrectomy.
Presentation: acute flank pain, fever and a tender flank mass. Renal ultrasonography shows an enlarged kidney containing echogenic material. On CT, renal calcification is usually seen within the renal mass. Non-enhancing cavities are seen, containing pus and debris. On radioisotope scanning, there may be some or no function in the affected kidney.
Treatment is nephrectomy.

Renal Hydatid Cyst

Echinococcosis is a parasitic infection caused by the larval stage of the tapeworm Echinococcus granulosus
Clinical Findings
The symptoms of echinococcosis are those of a slowly growing tumor. Most patients are asymptomatic or have a flank mass, dull pain, or hematuria
Excretory urography typically shows a thick-walled cystic mass, occasionally calcified
Treatment is surgical excision or nephrectomy
Tuberculosis

Tuberculosis (TB) of the genitourinary (GU) tract is caused by Mycobacterium tuberculosis. TB predominantly affects Asian populations, with a higher incidence in males than females.

Pathogenesis

Primary TB The primary granulomatous lesion forms in the mid to upper zone of the lung. There is early spread of bacilli via the bloodstream to the GU tract; however, immunity rapidly develops, and the infection remains quiescent. Acute diffuse systemic dissemination of tubercle bacilli can result in symptomatic miliary TB.

Kidney Haematogenous spread causes granuloma formation in the renal cortex, associated with caseous necrosis of the renal papillae and deformity of the calyces, leading to release of bacilli into the urine. This is followed by healing fibrosis and calcification, which causes destruction of renal architecture and autonephrectomy.

Ureters Spread is directly from the kidney, and can result in stricture formation (vesicoureteric junction, pelviureteric junction, and midureteric)

Bladder T.B ls usually secondary to renal infection, although iatrogenic TB can be caused by intravesical BCG treatment for carcinoma in situ. The bladder wall becomes edematous, red, and inflamed, with ulceration and tubercles (yellow lesions with a red halo). Disease progression causes fibrosis and contraction (resulting in a small capacity 'thimble' bladder), obstruction, and calcification.

Prostate and seminal vesicles Haematogenous spread causes cavitation and calcification, with palpable, hard-feeling structures. Fistulae may form to the rectum or perineum.

Epididymis Haematogenous spread results in a 'beaded' cord. Infection may spread to the testis.

Presentation Early symptoms include fever, lethargy, weight loss, night sweats, and UTI not responding to treatment. Later manifestations include LUTS, haematuria, and flank pain.

Investigations

• Urine: at least 3 early morning urines (EMUs) are required, but often many more EMU specimens will be needed before a positive culture for TB is obtained. A typical finding is sterile pyuria (leucocytes, but no growth). Ziehl-Neelsen staining will identify these acid- and alcohol-fast bacilli (cultured on Lowenstein-Jensen medium).

• CXR and sputum.

• Tuberculin skin test.

IVU: findings include renal calcification, irregular calyces, infundibular stenosis, cavitation, pelviureteric and vesicoureteric obstruction, and a contracted, calcified bladder.

• Cystoscopy and biopsy.

Treatment

6 months of isoniazid, rifampicin, and pyrizinamide . Regular follow-up imaging with IVU is recommended to monitor for ureteric strictures, which may need stenting, nephrostomies, or ureteric reimplantation. Severe bladder disease may require surgical augmentation, reconstruction, or urinary diversion.