Aetiology

- Ascending: (commonest) vesicoureteric reflux, stasis and calculi are common contributory factors.
- Haematogenous: from tonsils, skin (boils or a carbuncle)

Bacteriology

- E. coli (commonest)
- Gram negative organism

Types

- Acute pyelonephritis
  - In childhood
  - In pregnancy
  - With urinary obstruction
- Chronic pyelonephritis
  - Reflux nephropathy
- Pyonephrosis
- Renal abscess
- Perinephric abscess

**Acute pyelonephritis**

- More common in females (childhood, at puberty, after intercourse, during pregnancy & during menopause).
- Right kidney > left
- Pain (usually sudden)
- Vomiting
- Rigor, temperature rises to 39.0°C or more
- Urgency, frequency and dysuria.
- Tenderness in hypochondrium and loin.

Investigation

- GUE: pyuria and occasionally haematuria
- CBC: leucoytosis
- BUN
- Urine for culture and sensitivity
- Blood for culture and sensitivity (sever cases)

Differential diagnosis

- Pneumonia
- Acute appendicitis
- Acute cholecystitis

Pyelonephritis of pregnancy

- 4th - 6th months of gestation
- Past history of recurrent UTI
- In 10%: severe and protracted course and occasionally leads to abortion or premature birth.
Urinary infection in childhood

- May damage growing kidney.
- Young children
  - Often non-specific symptoms
  - May pass cloudy or offensive urine
  - Suspect if a child fails to thrive or unexplained pyrexia
  - Screaming on micturition may occur.
- Older child
  - Loin pain
  - Urinary frequency and secondary enuresis.
- 50% of children with urinary infection have an underlying anatomical abnormality (e.g. reflux or obstruction).
- The diagnosis of infection is confirmed by examination of a clean-catch specimen or a specimen obtained by suprapubic needle puncture.
- On culture, a pure growth of more than 10^5 organisms/ml with a significant pyuria
- Ultrasound scan
- Assess renal function and scarring
- Vesicoureteric reflux of urine is detectable in about 35% of children with recurrent UTI
- Renal damage results from the combination of reflux and urinary infection early in life
- Reflux nephropathy is the most common cause of ESRD in the UK.
- Long-term prophylactic antibiotic
- If fail surgery

Treatment

- Prompt, appropriate and prolonged.
- Oral or IV antibiotic
- If urine is acidic alkalinisation of the urine by potassium citrate
- Non-steroidal anti-inflammatory agents or opiate
- Drink copiously; if not possible because of nausea and vomiting, an intravenous infusion
- Treat underlying disease

Chronic pyelonephritis

- Often associated with VUR
- Important cause of renal damage and death from ESRD
- Pathology: interstitial inflammation and scarring of the renal parenchyma

Clinical features

- Women : men 3 : 1
- May remain clinically silent
- Dull pain and non-specific symptoms
- Hypertension 40% of cases
- Lassitude, malaise, anorexia, nausea and headache
- Normochromic anaemia
- A common cause of ESRD
- Often associated with VUR
- May be symptomatically silent
- Leads to progressive renal scarring
Investigations

- Protienuria (< 3 g daily)
- White cells are plentiful in GUE.
- E. coli, Streptococcus faecalis, Proteus spp. or Pseudomonas spp are found in the urine.

Treatment

- Treat obstruction or stones
- Treating the infection, often with repeated courses of antibiotic
- Nephrectomy or partial nephrectomy if unilateral
- Patients with ESRD require renal replacement therapy.

Pyonephrosis

- Multilocular sac containing pus or purulent urine
- Complication of renal calculus disease (common) or from infection of a hydronephrosis
- Usually unilateral

Clinical features

- Anaemia, fever and a swelling in the loin
- Symptoms of cystitis

Investigations

- US, KUB: calculus, dilatation of the pus-filled collecting system.

Treatment

- Surgical emergency
- Parenteral antibiotics
- Kidney drainage (PCN or open nephrostomy)

Renal carbuncle

- Source
  - blood-borne (especially coliforms or Staphylococcus aureus)
  - infection of a haematoma
- Causes: diabetics, intravenous drug abusers, chronic disease and patients with acquired immunodeficiency.

Clinical features

- Ill-defined tender swelling in the loin
- Persistent pyrexia

Investigation

- Leucocytosis
- Space-occupying lesion in the kidney may be confused with a renal adenocarcinoma

Treatment

- PCN or open nephrostomy
Perinephric abscess

- Extension of cortical abscess
- Extension of appendix abscess
- Via periureteral lymphatics
- Haematogenous
- Infection of a perirenal haematoma

Clinical features

- High swinging pyrexia
- Abdominal tenderness
- Fullness in the loin
- White cell count always high
- No pus cells or organisms in the urine.

Imaging

- Psoas shadow obscured on the plain abdominal radiograph.
- May be a reactionary scoliosis
- Elevation and immobility of the diaphragm on the affected side
- A calculus may be present
- Ultrasonography and CT are diagnostic.

Treatment

- PCN or
- Open drainage if thick pus

Renal tuberculosis

Aetiology and pathology

- Haematogenous infection from a distant focus that is often impossible to identify.
- Usually one kidney
- Mycobacteria and pus cells discharge into the urine
- Untreated lesions enlarge and a tuberculous abscess may form
- Often associated with tuberculosis of the bladder and typical tuberculous granulomas may be visible in the bladder wall
- In male, tuberculous epididymo-orchitis may occur without apparent infection of the bladder.

Clinical features

- 20 and 40 years of age,
- Men : women 2:1
- Right kidney > left.
- Urinary frequency (earliest symptom )
- ‘Sterile’ pyuria (Routine urine culture is negative).
- Suprapubic pain
- Haematuria
- A tuberculous kidney is oedematous and friable and is more liable to damage than a normal kidney.
- Malaise and weight loss are usual and a low-level evening pyrexia is typical
Investigation

- 3 complete specimens of early-morning urine for microscopy & culture before specific chemotherapy is started.
- Staining of the urine sediment with the Ziehl–Neelsen stain occasionally shows the presence of acid-fast bacilli, but proof that these are pathological mycobacteria must await prolonged culture on Löwenstein–Jensen medium.
- KUB may show calcified lesions.
- IVU
  - Early (normal)
  - Later: calyceal stenosis and/or hydronephrosis caused by stricture of the renal pelvis or the ureter draining the affected kidney
  - The bladder may appear shrunken, wall irregular or thickened
- Cystoscopy
  - Not routine
  - If haematuria or unexplained bladder symptoms
  - First stages nil
  - Later the urothelium is studded with granulomas, tuberculous ulcer.
  - The bladder wall fibroses
  - The bladder capacity decreases.
  - Ureteric orifice, (the so called ‘golf-hole’ orifice).
- Chest radiography
  - A chest radiograph is indicated to exclude an active lung lesion.

Treatment

- Need physician with experience of the most modern drug
- Prognosis in renal tuberculosis is good if the patient completes the course of chemotherapy.

Operative treatment

- Should be conservative, aiming to remove large foci of infection, which are difficult to treat with drugs, and correct the obstruction caused by fibrosis.
- The optimum time for surgery is between 6 and 12 weeks after the start of anti-tuberculous chemotherapy.
- Strictures of renal pelvis need a pyeloplasty.
- Ureteric stenosis and shortening may require a Boari operation or a bowel interposition,
- If the kidney has no function it is best to perform a nephroureterectomy
- A bladder too contracted to function as a reservoir for urine may be replaced with a neobladder fashioned from a loop of bowel in a substitution cystoplasty.