Kidney in systemic diseases

Dr. Badri Paudel

- The kidneys may be directly involved in a number of multisystem diseases or secondarily affected by diseases of other organs.
- Involvement may be at a
  - prerenal,
  - renal (glomerular or interstitial) or
  - postrenal level.

DIABETES MELLITUS

- Called as `diabetic nephropathy`
- After 20 years of disease, the chance of nephropathy is 30-40% in type I., and 15-20% in type II.
- Progression into nephrotic syndrome – screening: microalbuminuria
- Hypertension develops
- ESRD, renal replacement therapy (hemodialysis) – poor prognosis

Slower the progression:

- Strict glycemic control
- Treatment of hypertension
- ACEI and ARB

Pathology:

- diffuse glomerulosclerosis is most common, but nodular glomerulosclerosis is pathognomic (Kimmelstiel-Wilson disease)
- Kidneys are enlarged – due to cellular hypertrophy and proliferation

Patients with diabetes mellitus are prone to other renal diseases:

- Papillary necrosis
- Chronic interstitial nephritis
- Type IV renal tubular acidosis
- Acute renal failure after the use of contrast material

HEPATIC-RENAL DISEASE

- **IgA nephropathy** is more common in patients with liver disease.
- Severe hepatic dysfunction may cause a haemodynamically mediated type of renal failure, **hepatorenal syndrome**.
- It also predisposes the kidney to develop **acute renal failure (acute tubular necrosis)** in response to relatively minor insults including bleeding and infection.
- Patients with such severe hepatic failure are often difficult to treat by dialysis and have a poor prognosis.

PULMONARY-RENAL DISEASE

- The pulmonary-renal syndrome is a dramatic presentation with renal and respiratory failure.
  - Goodpasture's disease
  - Small-vessel vasculitis

MALIGNANT DISEASES

Paraneoplastic effects on the kidneys:

- **Immune reaction**
  - Glomerulonephritis: especially membranous nephropathy
  - Systemic vasculitis (rarely): usually ANCA-negative
- **Metabolic consequences**
  - Hypercalcaemia
  - Uric acid crystal formation in tubules: usually in tumour lysis syndrome
- **Remote effects of tumour products**
  - Light chains in myeloma, amyloidosis
  - Antibodies in cryoglobulinaemia

TUBERCULOSIS OF THE KIDNEY AND URINARY TRACT

- Tuberculosis of the kidney is secondary to tuberculosis elsewhere and is the result of blood-borne infection.
- Initially, lesions develop in the renal cortex; these may ulcerate into the renal pelvis and involve the ureters, bladder, epididymis, seminal vesicles and prostate.
- Calcification in the kidney and stricture formation in the ureter are typical.

Clinical features:

- symptoms of bladder involvement (frequency, dysuria);
- haematuria (sometimes macroscopic);
- malaise, fever, night sweats, lassitude, weight loss;
- loin pain;
- associated genital disease;
- chronic renal failure as a result of urinary tract obstruction or destruction of kidney tissue.

- Neutrophils are present in the urine but routine urine culture may be negative (**'sterile pyuria'**).
- Special techniques of microscopy and culture may be required to identify tubercle bacilli and are most usefully performed on early morning urine specimens.
- Bladder involvement should be assessed by cystoscopy.
- Radiology of the urinary tract and a chest X-ray to look for pulmonary tuberculosis are mandatory.
- Anti-tuberculous chemotherapy follows standard regimes. Surgery to relieve urinary tract obstruction or to remove a very severely infected kidney may be required.

SICKLE CELL DISEASE

- Renal dysfunction is due to sickling of red blood cells in the renal medulla because of low oxygen tension and hypertonicity
- Congestion and stasis lead to hemorrhage, interstitial inflammation and papillary infarcts, hematuria is common
- Diminished concentration ability – isosthenuria (urine osmolality equal to that of serum) – patients can easily become dehydrated, papillary necrosis occurs as well
- Sickle cell glomerulopathy is less common, but will progress to ESRD. Proteinuria is the primary manifestation.
- Optimal treatment is adequate hydration and control of the sickle cell disease

VASCULAR DISEASES AFFECTING THE KIDNEYS

- Hypertension
- Hypotension/ bilateral cortical necrosis
- Thrombotic diseases/DIC
- Vasculitis
- Systemic Lupus Erythematosis

Hypertension:

- Most common cause of renal failure in older adults
- Diastolic BP 95 mm Hg or higher

Two types of hypertension are recognized:

- Benign Hypertension
  - Chronic, long-standing, most older adults
- Malignant hypertension
  - M>F, Younger age group (40)
  - Diastolic Pressure >115 mm Hg
  - Headache, retinopathy, ARF, CRF

Hypertension can either be primary or secondary:

- Primary hypertension is usually idiopathic (no known cause) in 95% of cases
- Secondary hypertension can be attributed to:
  - 1- Renal causes: Acute GN, Chronic GN, Renal artery Stenosis, vasculitis…etc.
  - 2- Endocrine causes: Adrenocortical hyperfunction..etc.
  - 3- Vascular diseases (atherosclerosis)

SYSTEMIC VASCULITIS

- Inflammation of the blood vessels
- Mostly autoimmune diseases
- Circulating antibodies

Small-vessel vasculitis

- focal inflammatory glomerulonephritis, usually with focal necrosis, and often causes crescentic changes
- associated with a systemic illness with acute phase response, weight loss and arthralgia
- in some patients causes pulmonary haemorrhage, which can be life-threatening
- in other patients it presents as a kidney-limited disorder, with rapidly deteriorating renal function and crescentic nephritis

The most important causes of this syndrome:

- microscopic polyangiitis
- Wegener's granulomatosis (ear, nose and throat involvement and lung disease)
  - they are usually associated with antibodies to neutrophil granule enzymes (ANCA), but these antibodies are non-specific and cannot be relied upon to make the diagnosis so biopsy of the affected tissue may be required.
- Henoch-Schönlein purpura is associated with IgA nephropathy and ANCA are usually absent.
- Vasculitis in other organs may give clues to the underlying systemic disorder and its subtype

SYSTEMIC LUPUS ERYTHEMATOSUS (SLE)

- Subclinical renal involvement, with low-level haematuria and proteinuria but minimally impaired or normal renal function, is common in SLE.
- Usually this is due to glomerular disease, although serologically and sometimes clinically overlapping syndromes (e.g. mixed connective tissue disorder, Sjögren's syndrome) may cause interstitial nephritis.
- SLE can produce almost any histological pattern of glomerular disease and an accordingly wide range of clinical features, ranging from rapidly progressive glomerulonephritis to nephrotic syndrome.

Diffuse proliferative lupus nephritis

- Typically, patients present with **subacute disease** and **inflammatory features** (haematuria, hypertension, variable renal impairment), accompanied by **heavy proteinuria** that often reaches nephrotic levels.
- In severely affected patients the most common histological pattern is an inflammatory, diffusely proliferative glomerulonephritis with distinct features to suggest lupus.
- Controlled trials have shown that the risk of ESRF in this type of disease is significantly reduced by **cyclophosphamide** treatment, often given as regular intravenous pulses.

Thrombotic Diseases that affect the kidney:

- DIC
- Thrombotic Thrombocytopenic Purpura (TTP)
- Hemolytic Uraemic Syndrome (HUS): E. coli poisoning, metastatic breast cancer, drugs, oral contraceptives