# Glomerular Lesions Associated with Systemic Diseases

# 1. Diabetic Nephropathy:

- **Glomerular lesions:**
  - Thickening of GBM.
  - Diffuse glomerulosclerosis.
  - Nodular glomerulosclerosis.

- **Arterioles:**
  - Hyaline arteriolosclerosis.

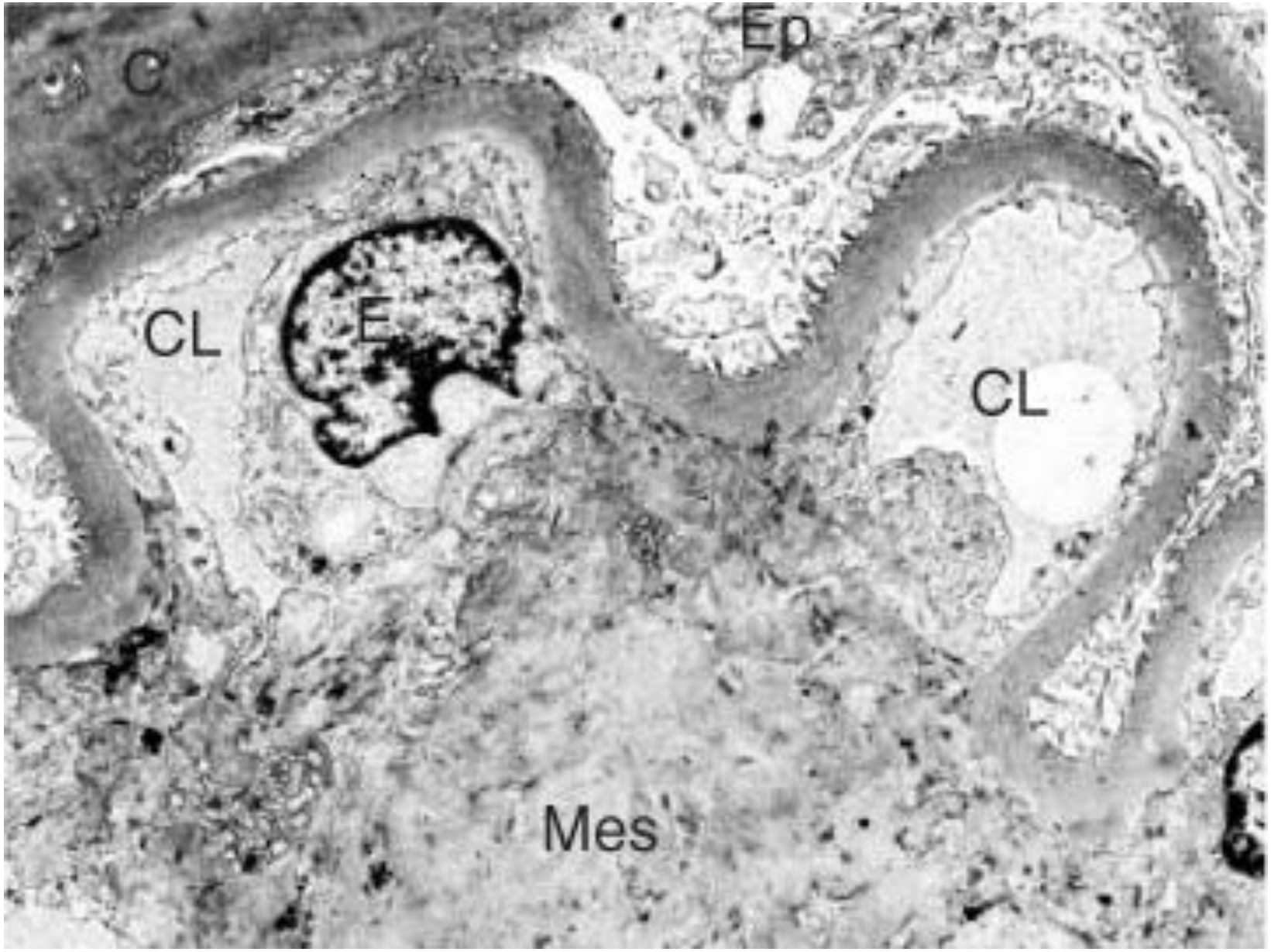
- **Infections in kidney:**
  - Pyelonephritis.
  - Papillary necrosis.

# Glomerular lesions of DM

- **Capillary BM thickening**
  - Occurs in all diabetics.
  - Detected by EM only.
  - Progressive and concurrent with mesangial changes.

- **Diffuse glomerulosclerosis**
  - Increase in mesangial matrix+mild mseng. cell proliferation eventually involve and replace the entire glomerulus.

- **Nodular glomerulosclerosis (*Kimmelstiel-Wilson*):**
  - Spherical hyaline masses at periphery of glomerulus.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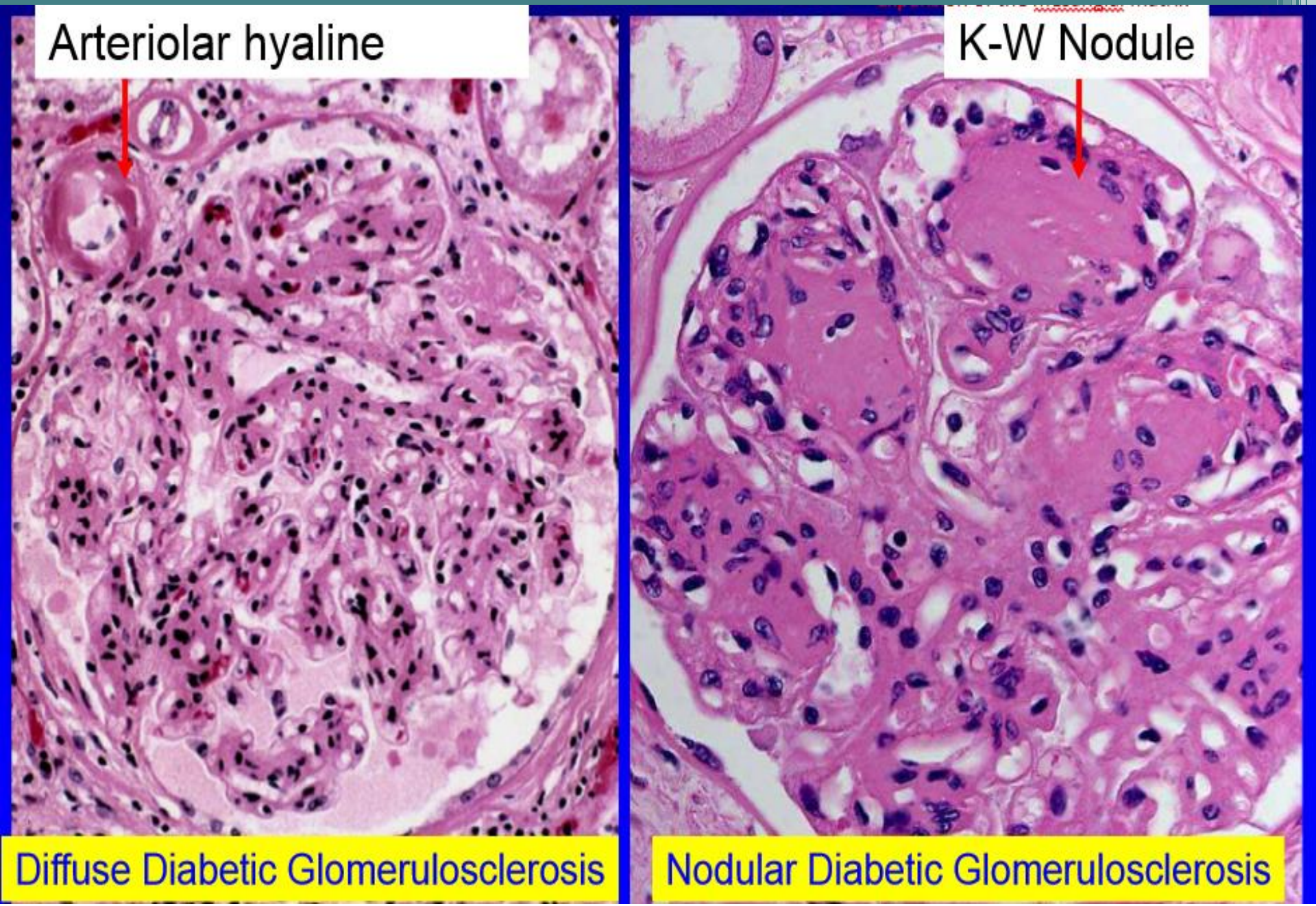

Arteriolar hyaline
K-W Nodule
Diffuse Diabetic Glomerulosclerosis
Nodular Diabetic Glomerulosclerosis

# 2. SLE Nephropathy

- Morphologic evidence of renal involvement can be detected ***in almost all patients with SLE***.
- The morphologic pattern of renal SLE is divided by WHO into 6 classes.
  - **Class I** ---- *Normal* by LM with or without EM & IF deposits by IF, or EM.
  - **Class II** --- *Mesangial hypercellularity*.
  - **Class III** ---- *Focal* proliferative &/ or sclerosing lesions **(<50%** of glom affected)
  - **Class IV** ---- *Diffuse* proliferative &/or sclerosing lesions ( >50% affected ).
  - **Class V** ---- *Diffuse membranous* GN.
  - **Class VI** ---- *Advanced glomerulosclerosis*.

# SLE nephropathy

- **EM:**
  - **Mesangial deposits** present in most of the classes. When abundant extend *peripherally* along the capillary wall (subendothelial & subepithelium) .

- **IF:**
  - **Full house staining** (IgG, IgA, IgM,C3,C4).

- **Prognosis:**
  - Class II progress very slowly while III & IV progress rapidly and indicate poor prognosis.

# DISEASES OF BLOOD VESSELS

# Diseases of blood vessels

- **Benign Nephrosclerosis**
- **Malignant Nephrosclerosis**
- **Thrombotic Microangiopathies**
- Renal artery stenosis.
- Diffuse cortical necrosis.
- Renal infarction.
- Sickle cell disease nephropathy.

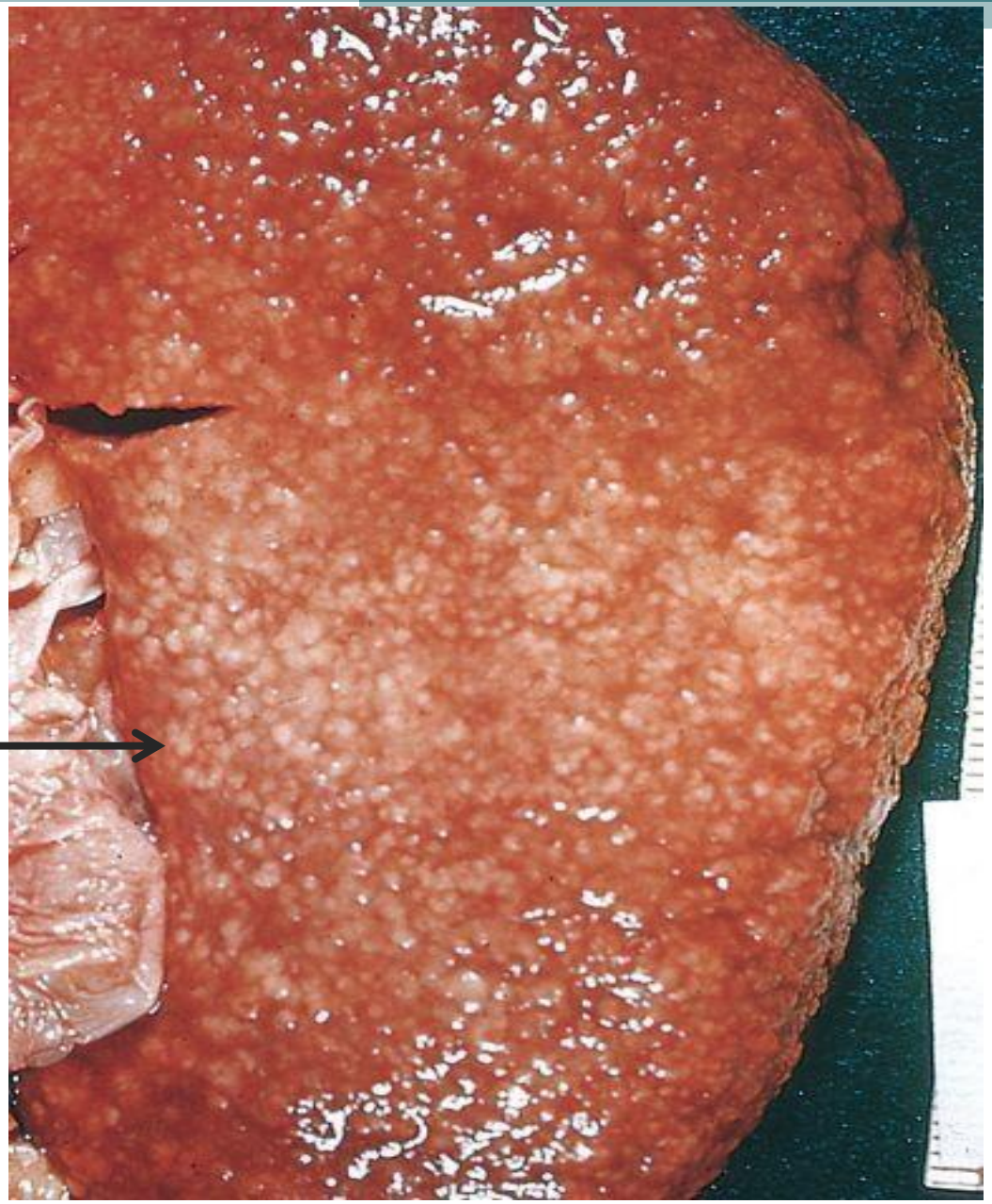
# 1. Benign Nephrosclerosis

- Renal changes in **benign hypertension***.
- This renal lesion is often seen *superimposed* on other primary kidney diseases**.
- **Clinically:**
  - This lesion alone **rarely** cause sever damage → some functional impairment, mild proteinuria is a constant finding.

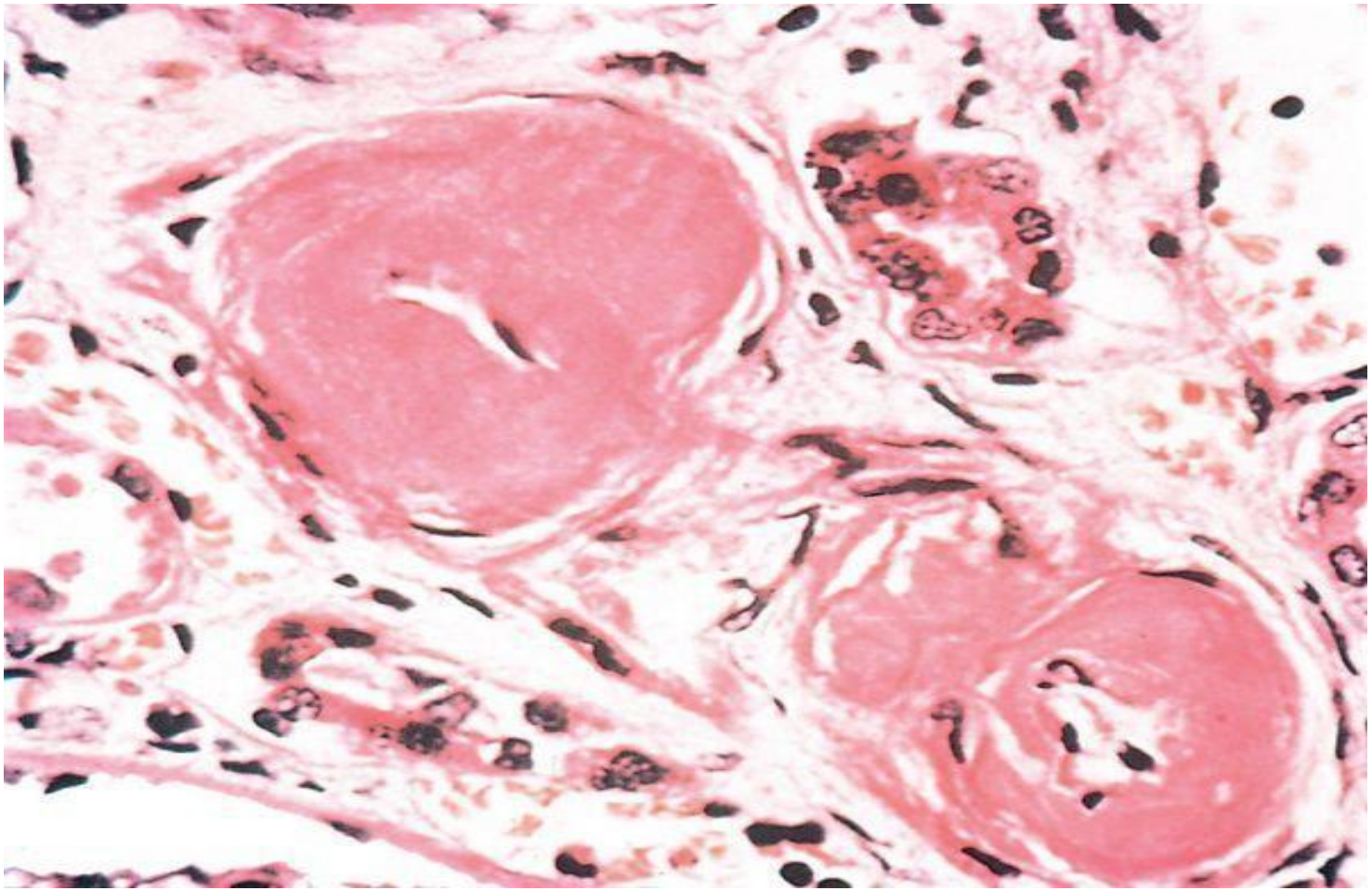
# Morphology

- **Gross:**
  - Kidneys are symmetrically **atrophic** with **diffuse fine granular surface** resembles "*grain leather*".
- **LM:**
  - Small arteries and arterioles show **hyaline arteriolosclerosis** leading to ischemic and atrophic changes (as in chronic GN → late in the disease).
  - Larger arteries show **fibroelastic hyperplasia.**

# Benign nephrosclerosis

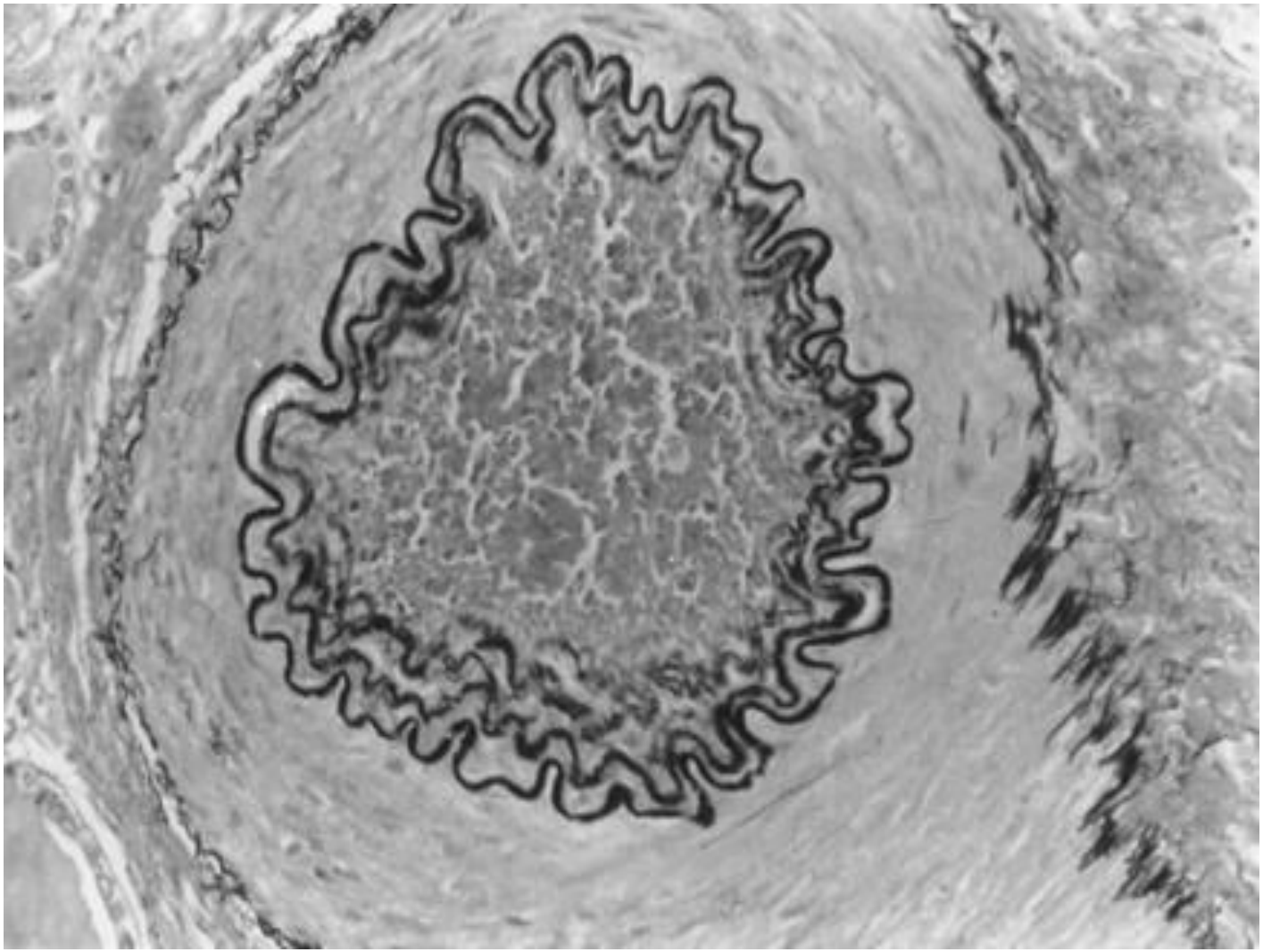



# Hyaline arteriolosclerosis



High-power view of two arterioles with hyaline deposition, marked thickening of the walls, and a narrowed lumen.

# Fibroelastic hyperplasia



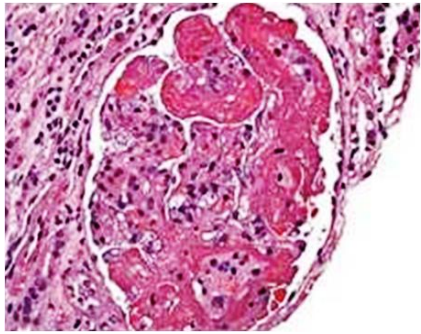
# 2. Malignant hypertension & malignant nephrosclerosis

- Malignant hypertension syndrome is a true medical emergency → About 50% survive at least 5 years.
- MH is far less common than BH.
- May arise **de novo** or more commonly appear in a person who had mild hypertension (5% of persons with elevated blood pressure).

- **Clinical course:**
  - BP > than 200/120 mm Hg.
  - Headache, nausea, vomiting, visual impairments, papilledema, encephalopathy → due to ↑ ICP.
  - Cardiovascular abnormalities.
  - Renal involvement (at onset ): marked proteinuria and micro or macroscopic hematuria*.

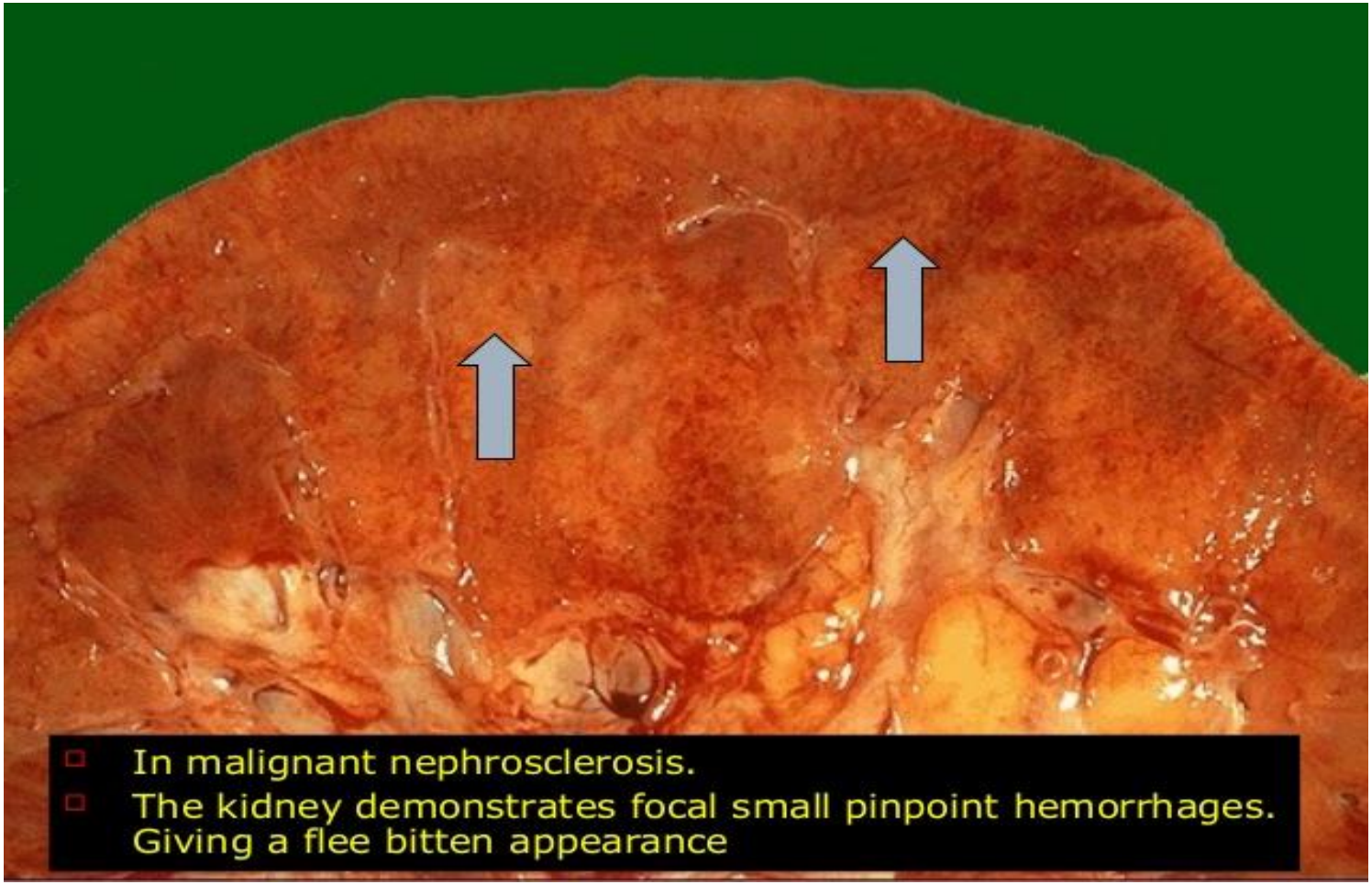
# Morphology

- **Gross:**
  - Normal size or slightly shrunken.
  - Pinpoint cortical petechial hemorrhage (**Flea – bitten appearance** )



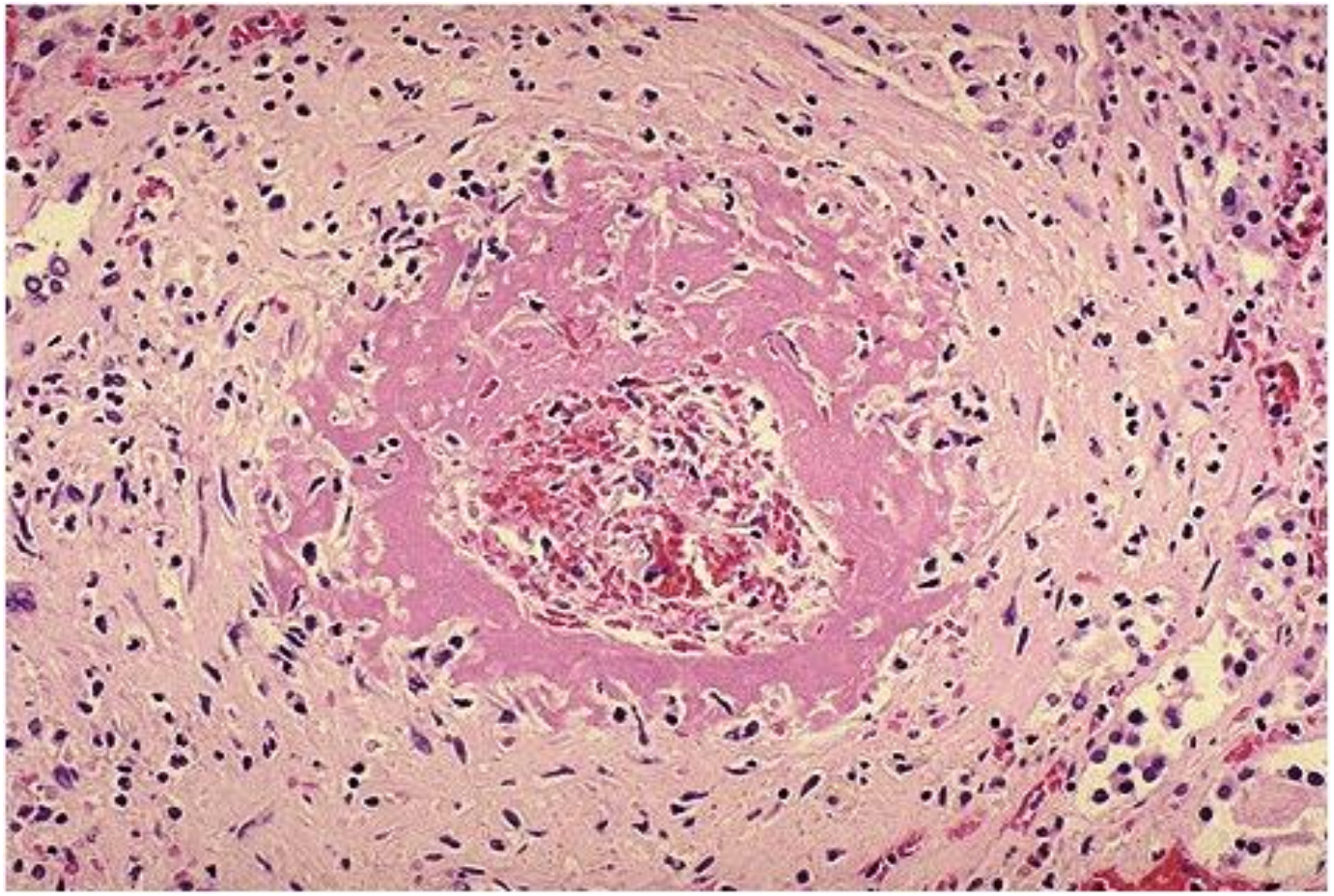
- **LM:**
  - **Fibrinoid necrosis.**
  - **Hyperplastic arteriolosclerosis** (onion skin appearance).
  - Microthrombi in glomeruli and necrotic arterioles.

# Malignant nephrosclerosis



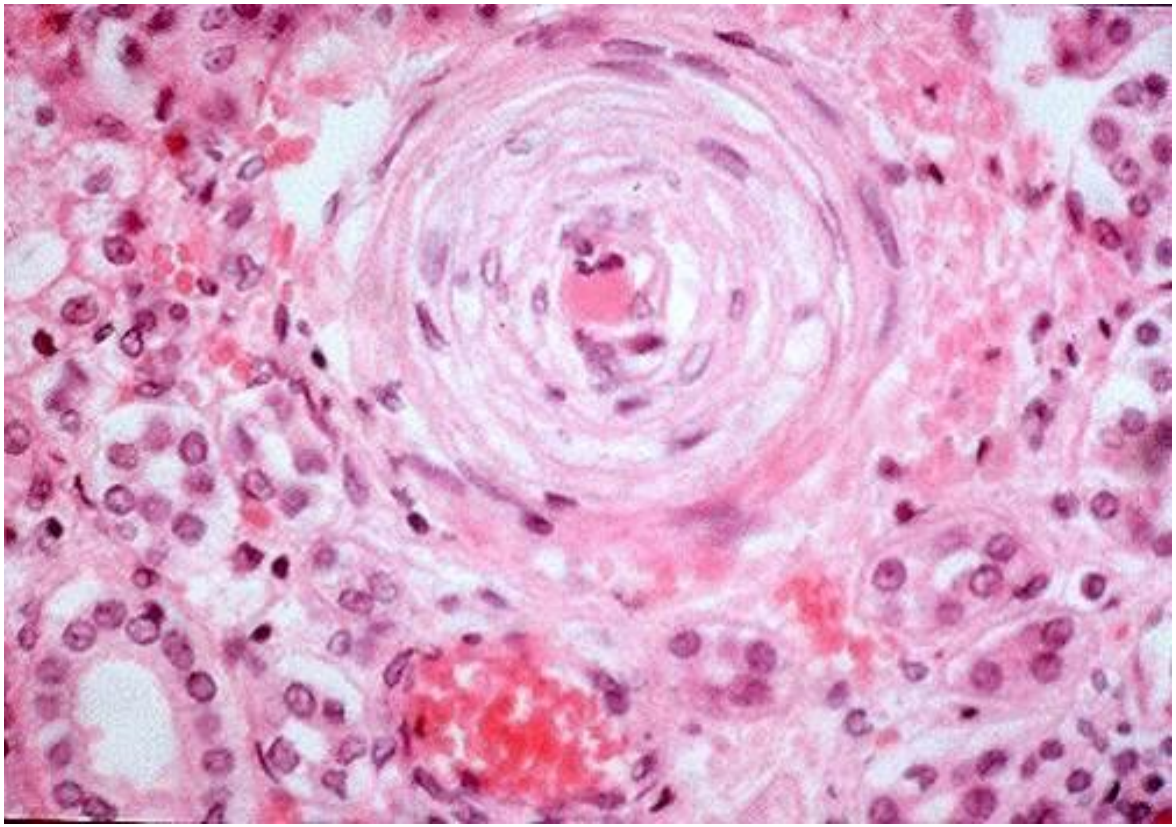

Flea-bitten appearance

# Fibrinoid necrosis



Homogeneous eosinophilic appearance of arteriolar wall masking underlying details. Stains positive for **fibrin**.

# Hyperplastic arteriosclerosis



Proliferation of intimal smooth muscle cells with fine concentric layering of collagen produces an **onion-skin** appearance with marked narrowing of the lumen.

# Renal Failure

# 1. Acute Renal Failure (ARF)

- **ARF:** Rapid ↓ –usually *reversible*– of renal function (with ↑ BUN & Creat.) & urine flow within hours – days to < 400 ml/day/
  - Oliguria – urine flow < 400 ml/ day.
  - Anuria – no or < 50ml/day urine flow.

- Most important aspect of ARF is fluid & electrolyte imbalance + acid-base disturbances.

# Causes of ARF

| | |
|---|---|
| **Prerenal** | ▪Due to decreased blood flow (Ischemia) to kidneys → as in severe hypotension and shock |
| **Renal** | ▪**Acute tubular injury (85%)**<br><br>▪Other TID (10%):<br>Acute papillary necrosis*.<br>Acute drug-induced interstitial nephritis.<br><br>▪Severe glomerular diseases (5%), as RPGN.<br><br>▪Diffuse vascular diseases as PAN, WG, TMA. |
| **Postrenal** | ▪Due to urine outflow obstruction |

# 2. Chronic Renal Failure (CRF)

- **CRF:** Progressive –*irreversible*– deterioration of renal function that develops over years, that causes multisystem derangement.

- Presence of a diminished GFR that is persistently **less than 60 mL/minute/1.73 m2 for at least 3 months, from any cause**, and/or persistent albuminuria.

# Stages of CRF:

- *Diminished renal reserve:* GFR 50% of normal, asymptomatic, no azotemia.
- *Renal insufficiency:* (GFR 25-50% of normal) symptoms appear (azotemia, anemia, hypertension, polyuria, nocturia).
- *Renal failure:* (GFR < 20% of normal) full-blown picture.
- *End-stage renal disease:* (GFR < 5% of normal).

# Causes of CRF

- Diabetic glomerulosclerosis.
- Glomerulonephritis.
- Chronic pyelonephritis.
- Obstructive uropathy.
- Hypertensive nephrosclerosis.
- Polycystic kidneys.
- Drugs & toxins.