KIDNEY

(TUBULES, INTERSTITIUM & BLOOD VESSELS)

TUBULAR DISEASES

- ACUTE TUBULAR NECROSIS
- TUBULOINTERSTITIAL NEPHRITIS
  - PYELONEPHRITIS
    - ACUTE
    - CHRONIC
  - DRUGS
  - TOXINS
- URATE NEPHROPATHY
- HYPERCALCEMIA/NEPHROCALCINOSIS
- MULTIPLE MYELOMA

ACUTE TUBULAR NECROSIS

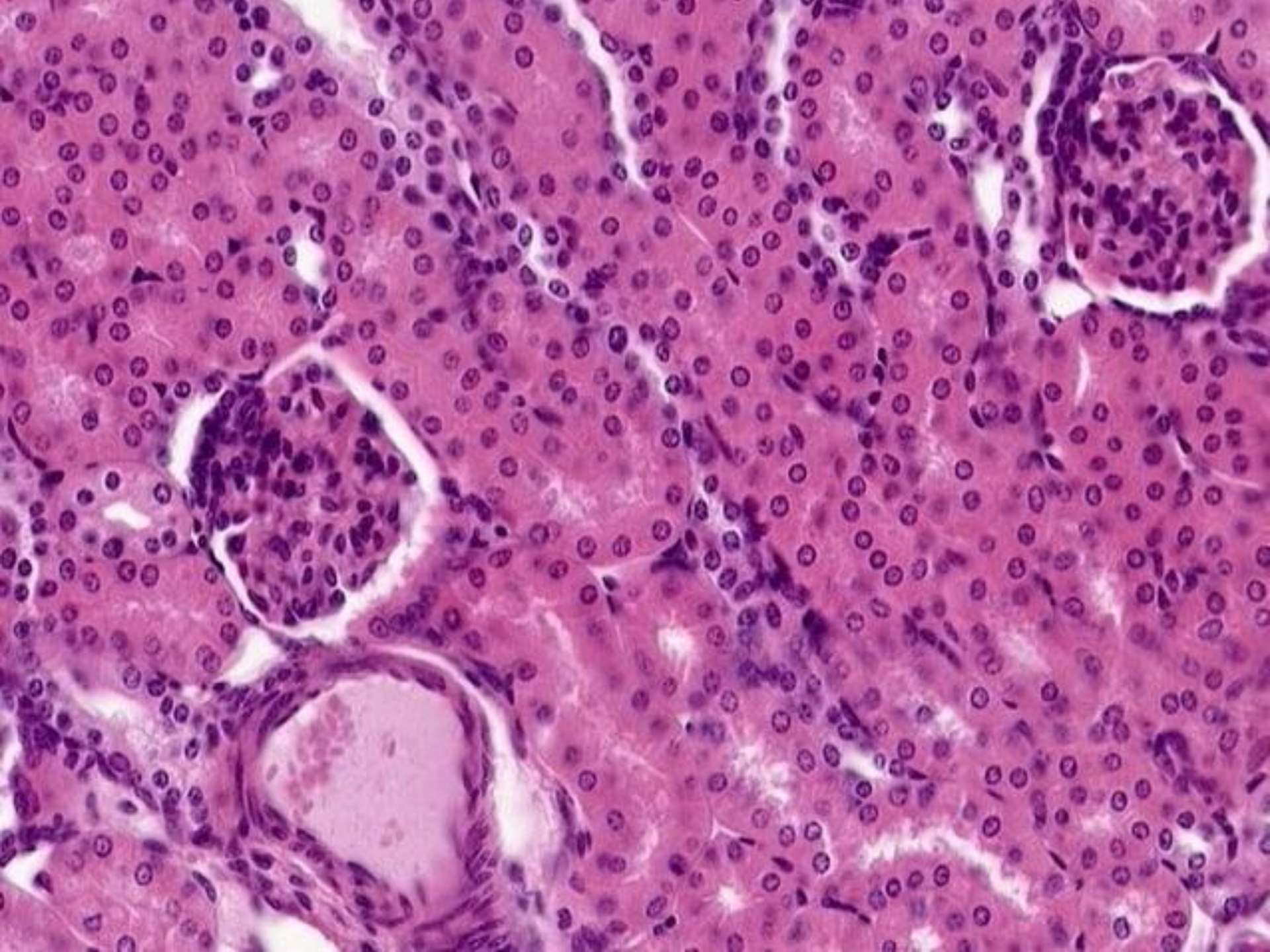
- Destruction of renal TUBULAR epithelium
- Loss of renal function
- 50% of ACUTE renal failure
- Two types:

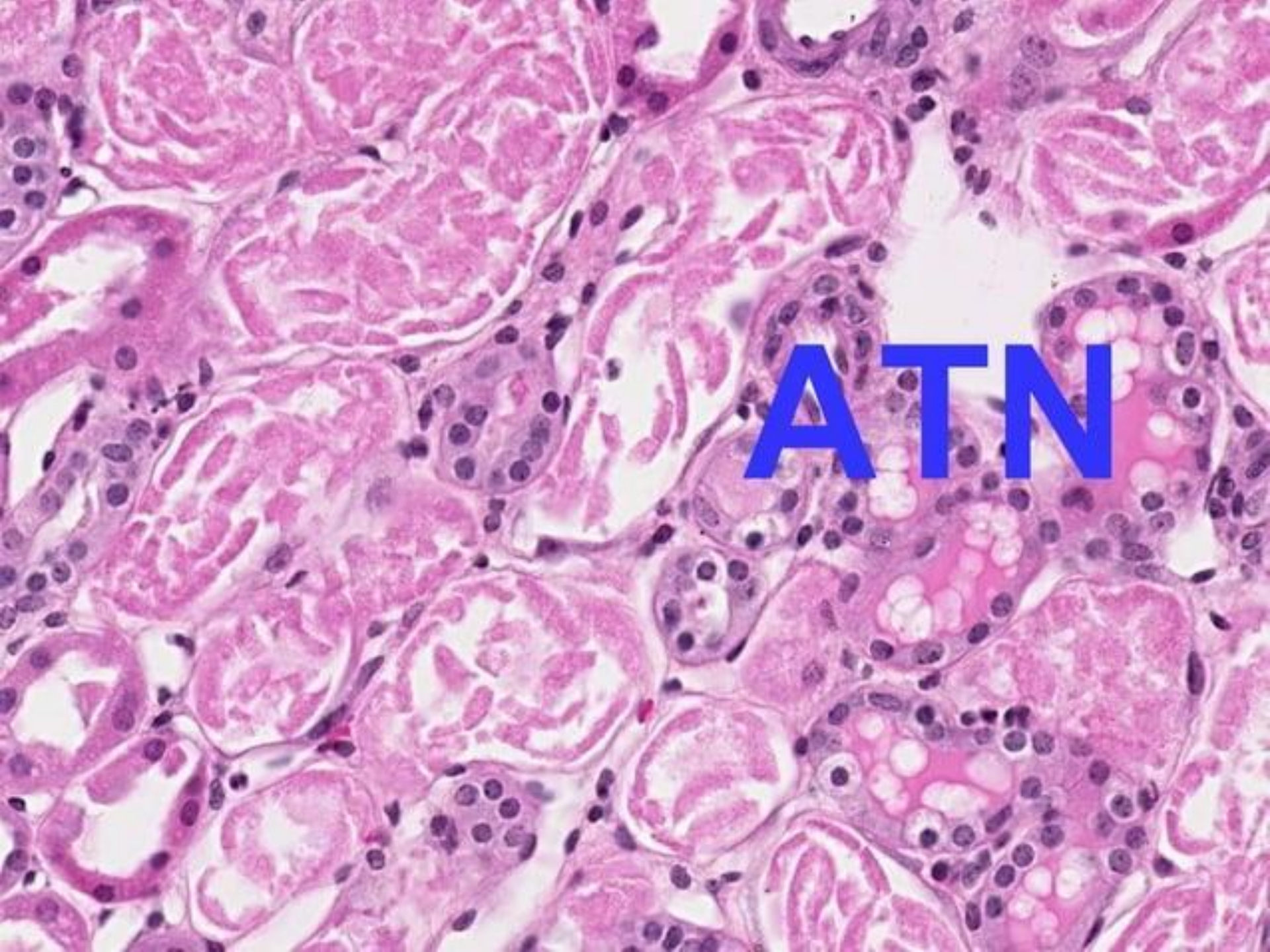
ISCHEMIC
NEPHROTOXIC

-AMINOGLYCOSIDES

-AMPHOTERICIN B

-CONTRAST AGENTS

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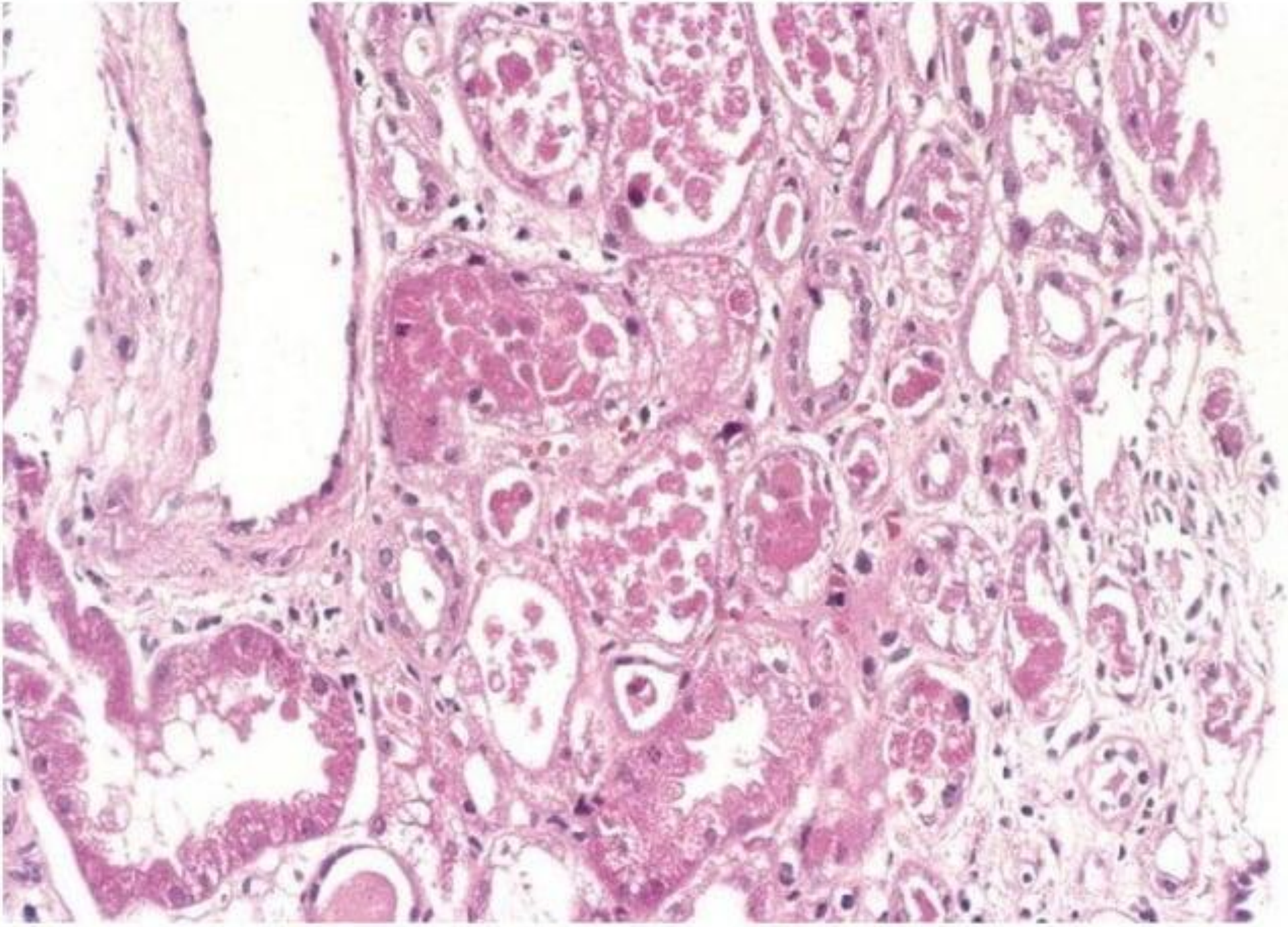
ATN PATHOGENESIS

- BLOOD FLOW DISTURBANCES (ISCHEMIC)
- TUBULAR INJURY (NEPHROTOXIC)



CLINICAL COURSE

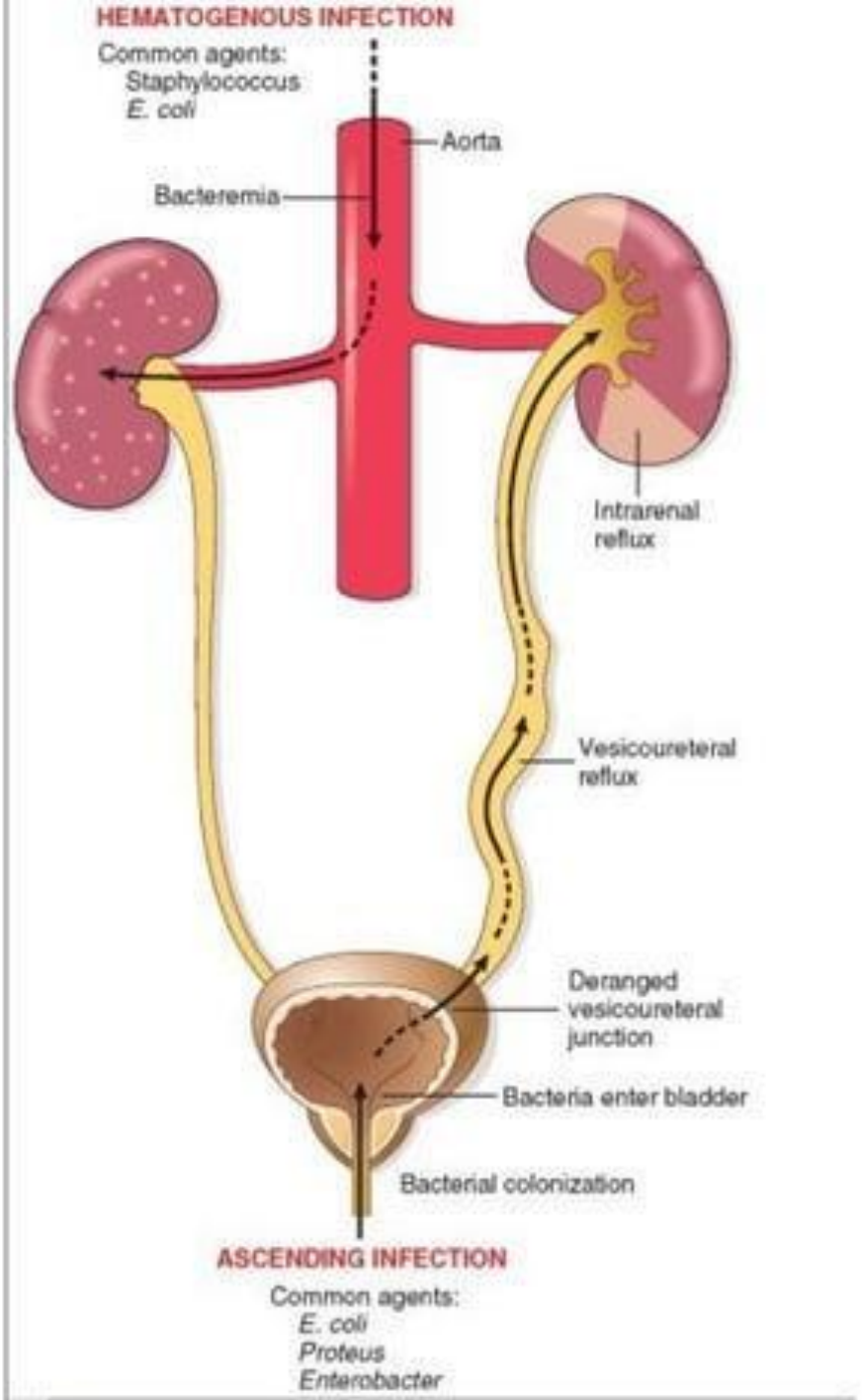
- INITIATION (36 hours)
  - Mild OLIGURIA
  - Mild AZOTEMIA
- MAINTENANCE
  - More OLIGURIA
  - More AZOTEMIA
  - DIALYSIS NEEDED
- RECOVERY
  - HYPOKALEMIA main problem
  - BUN, CREATININE return to normal

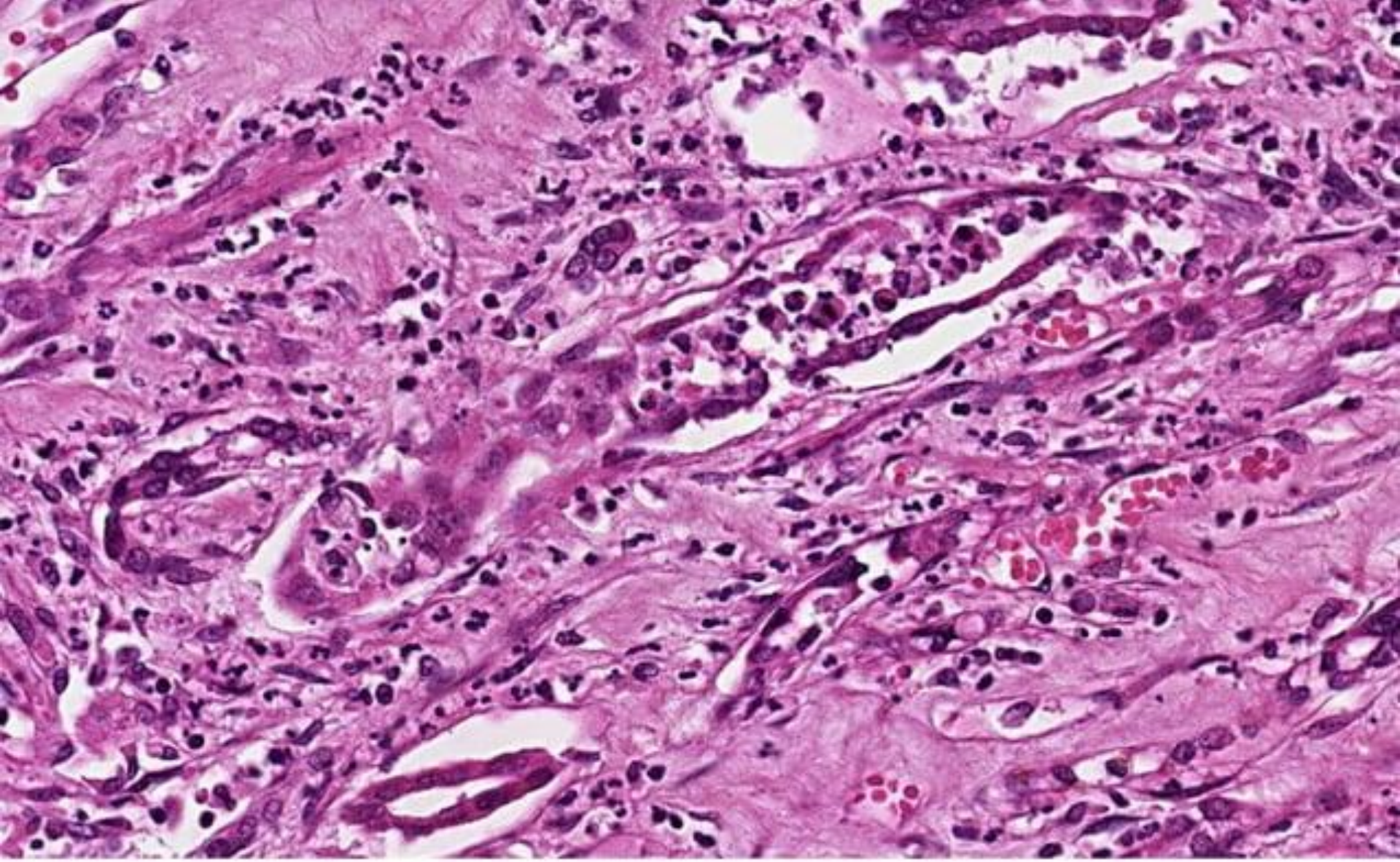
TUBULO/INTERSTITIAL NEPHRITIS

- INFECTIONS, i.e., pyelonephritis
- TOXINS, heavy metals, chemo, NSAIDS
- METABOLIC, urates, Ca++, Oxalates
- PHYSICAL, obstruction, radiation
- IMMUNOLOGIC, esp. transplant rejection

PYELONEPHRITIS

- GI Gram NEGATIVES: E. COLI, Proteus, Klebsiella, Enterobacter, Strep. faecalis, usually "NORMAL" flora
- ASCENDING, by FAR, the most common, i.e., reflux, obstruction
- HEMATOGENOUS too
- ACUTE PYELONEPHRITIS, neutrophils
- CHRONIC PYELONEPHRITIS, lymphocytes, scars


HEMATOGENOUS INFECTION
Common agents:
Staphylococcus
E. coli
Aorta
Bacteremia
Intrarenal reflux
Vesicoureteral reflux
Deranged vesicoureteral junction
Bacteria enter bladder
Bacterial colonization
ASCENDING INFECTION
Common agents:
E. coli
Proteus
Enterobacter

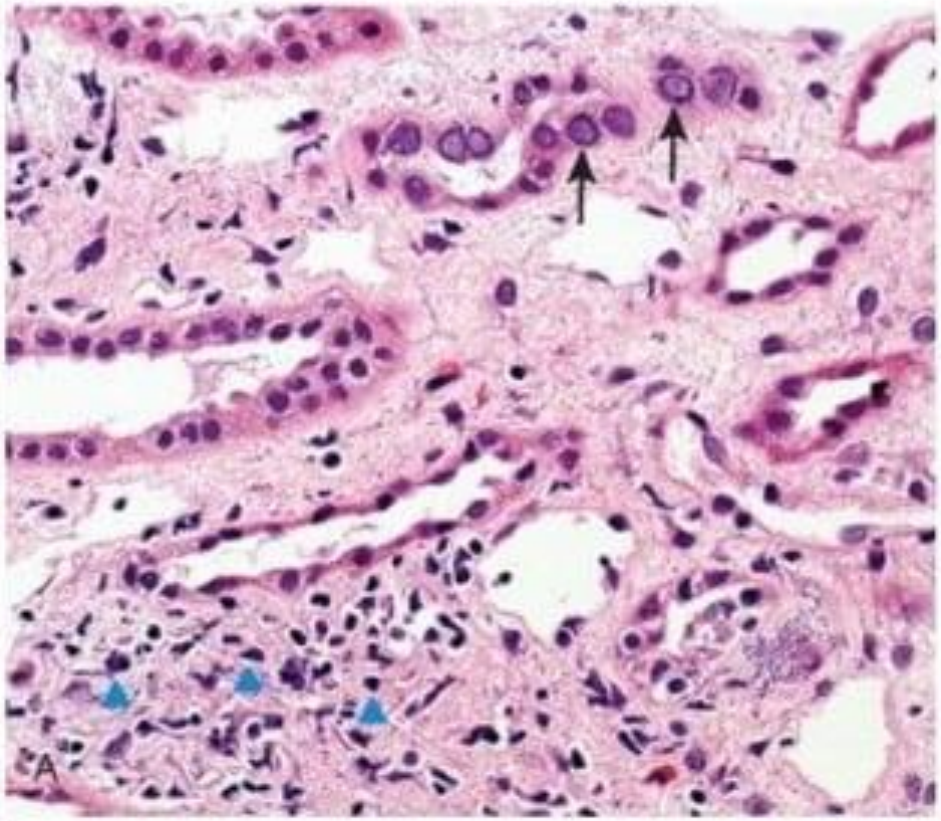


ACUTE or CHRONIC PYELONEPHRITIS?

MORPHOLOGY

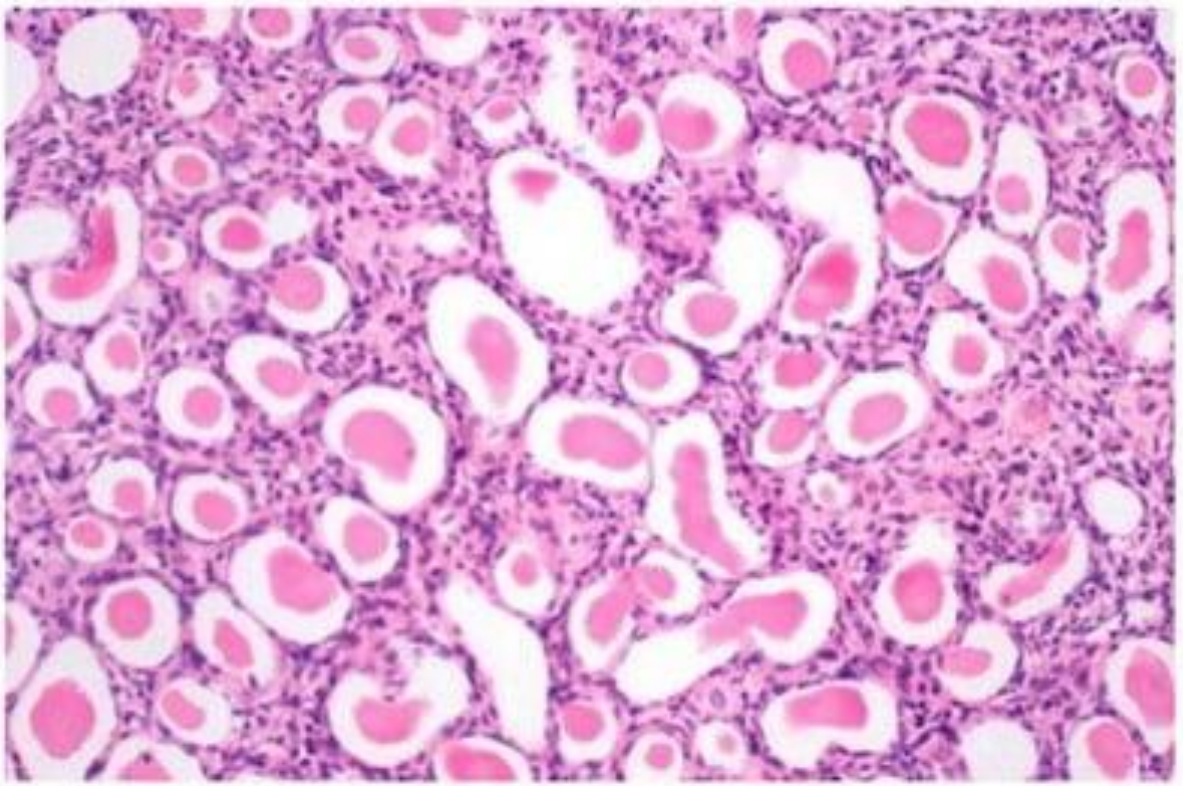
- **patchy interstitial suppurative inflammation, intratubular aggregates of neutrophils, and tubular necrosis**.

- Complication:
  - Papillary necrosis
  - Pyonephrosis
  - Perinephric abscess


A


B

ACUTE or CHRONIC PYELONEPHRITIS?



ACUTE or CHRONIC PYELONEPHRITIS?

FORMS OF PYELOPNEPHRITIS

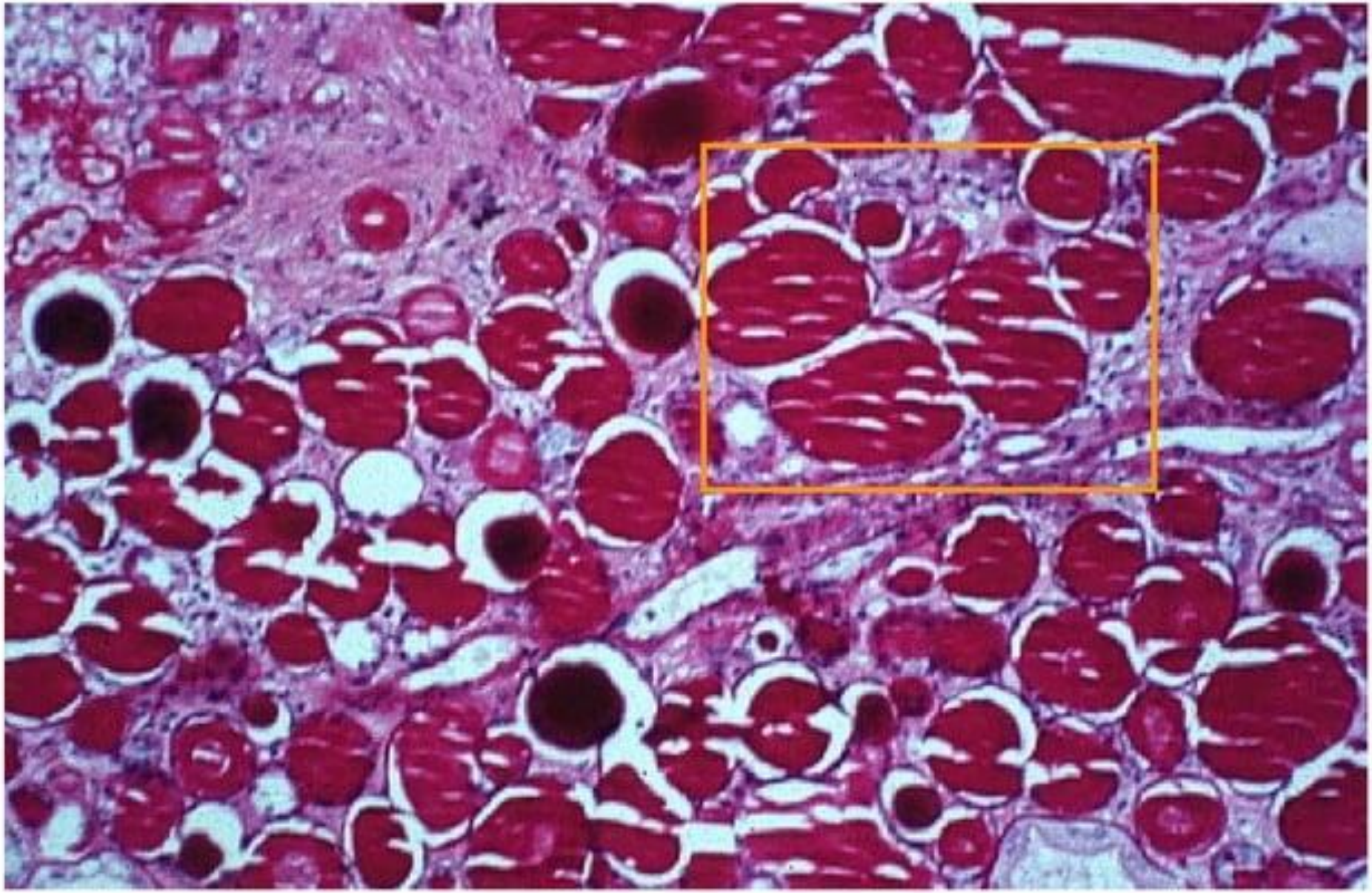
- Chronic pyelonephritis can be divided into two forms:

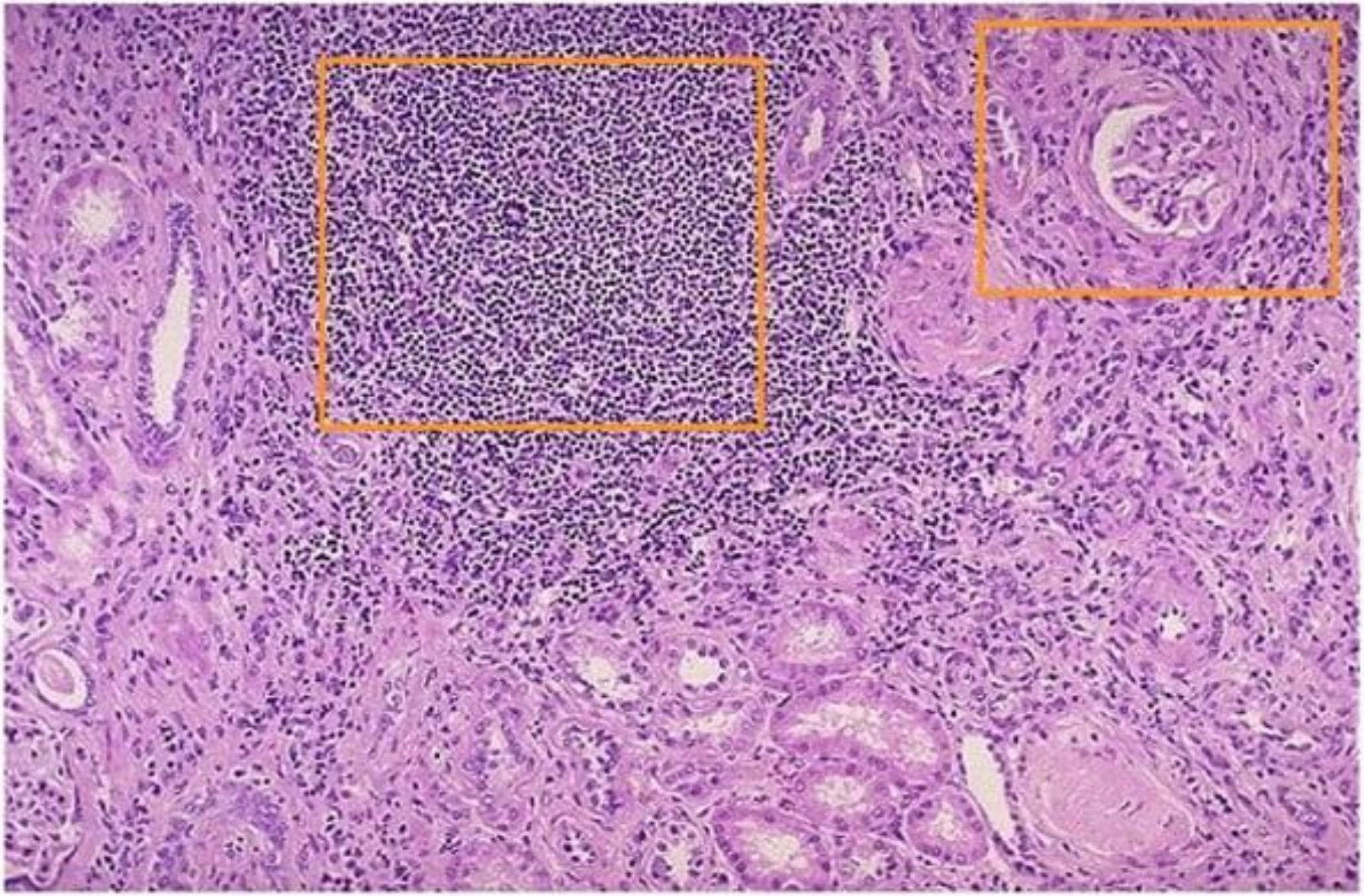
→ REFLUX NEUROPATHY

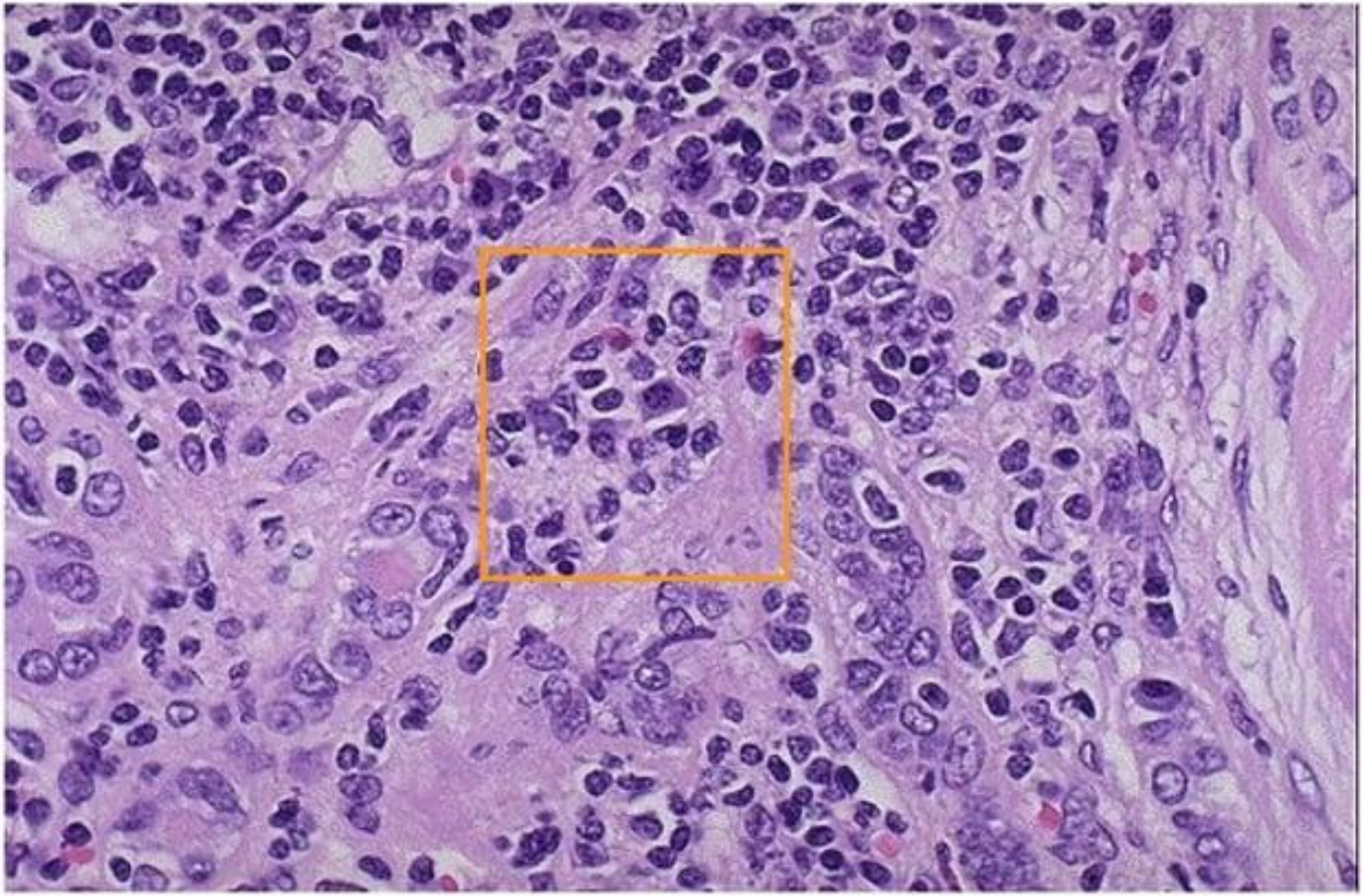
→ CHRONIC OBSTRUCTIVE PYELONEPHRITIS

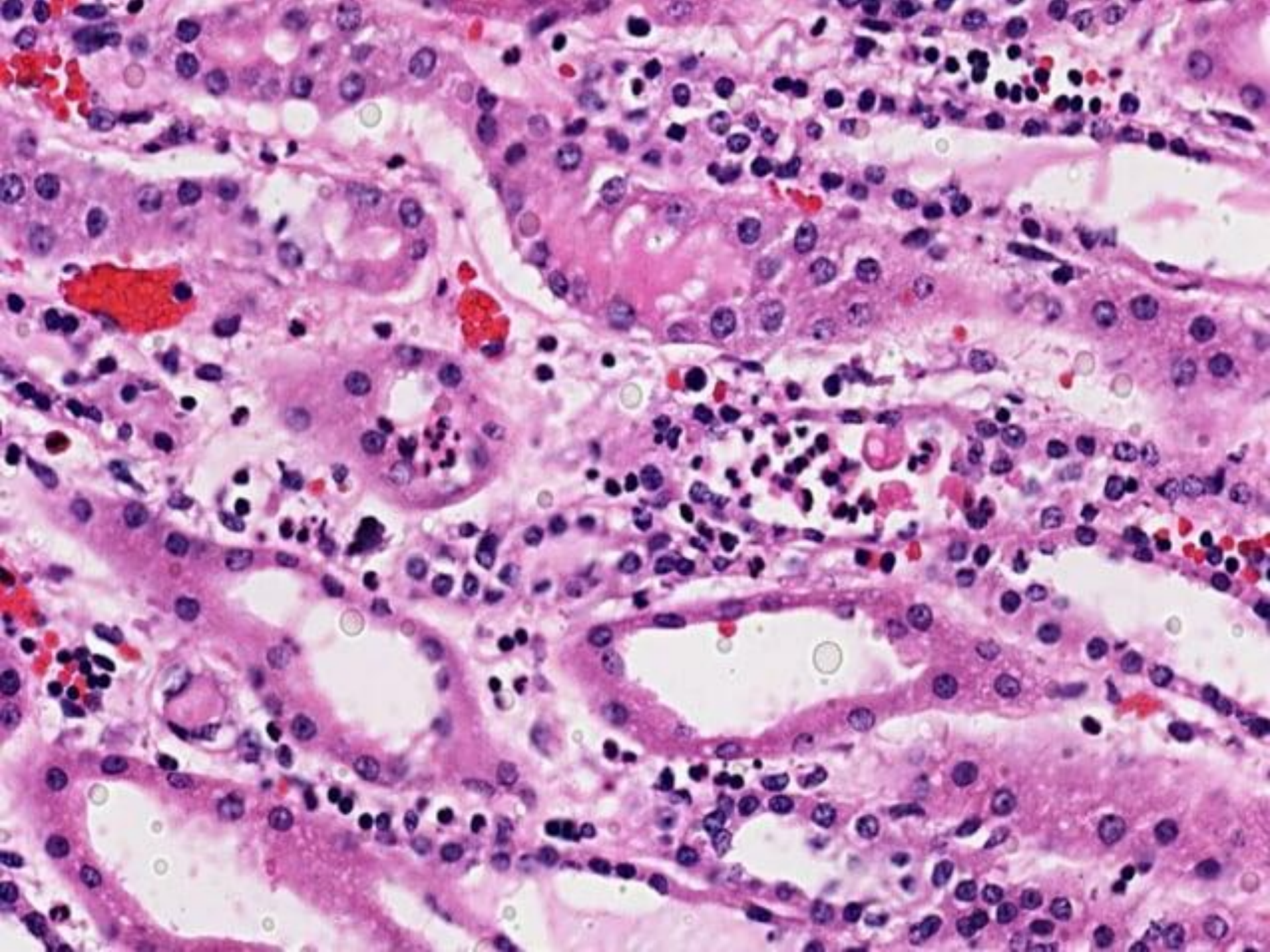
GROSS

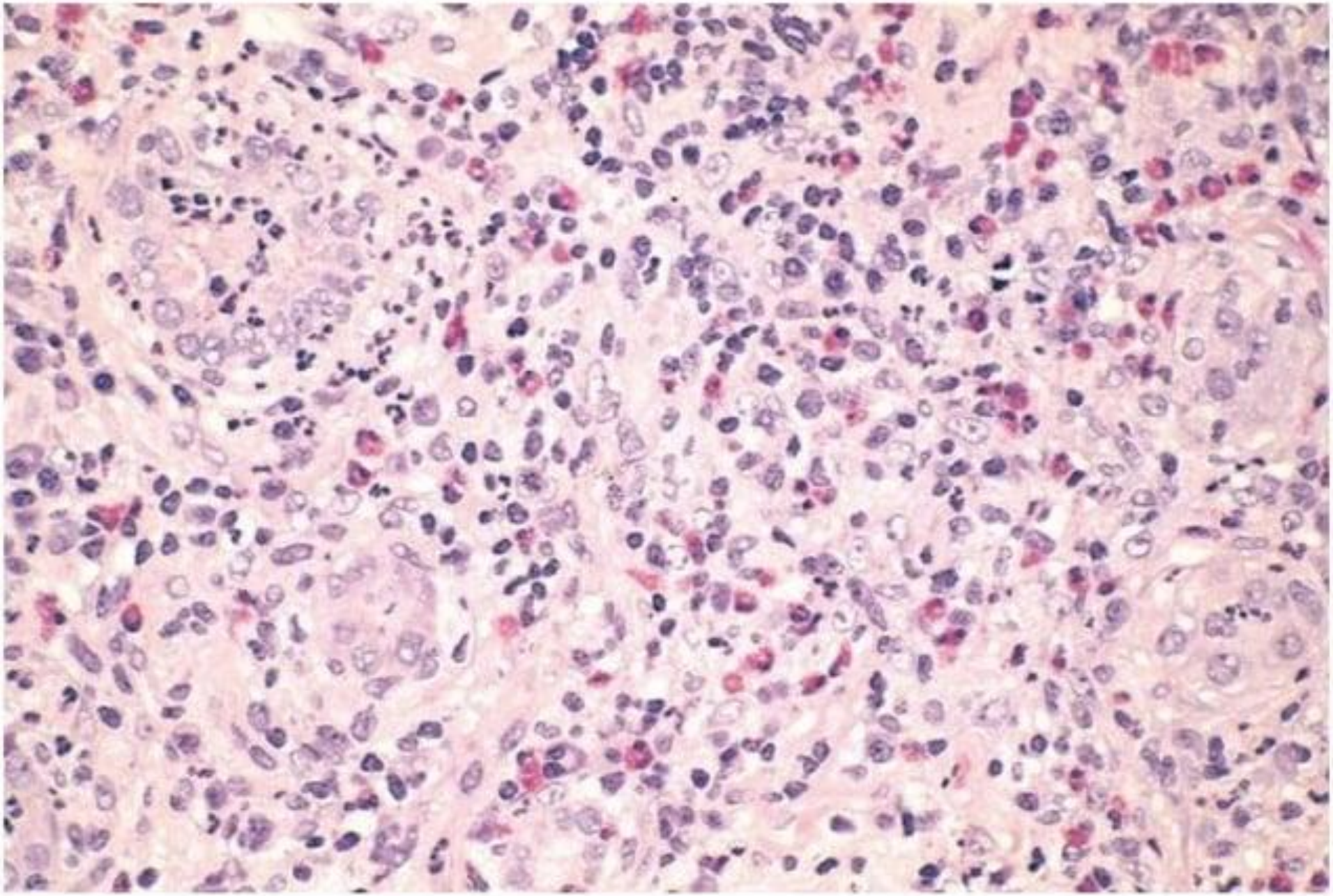
- Shrunken , scarred kidneys.
- If both kidneys are involved - involvement is asymmetrical (in constrast with chronic glomerulonephritis in which the kidneys are symmetrically involved).
- Coarse , discrete cortico - medullary scarring overlying blunted deformed calyces.





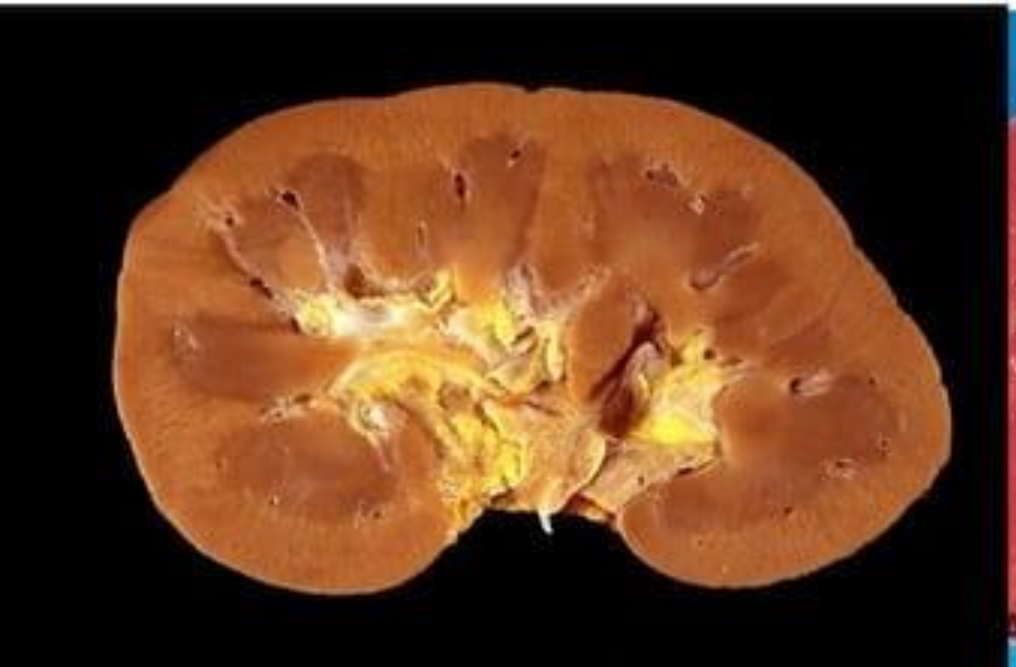






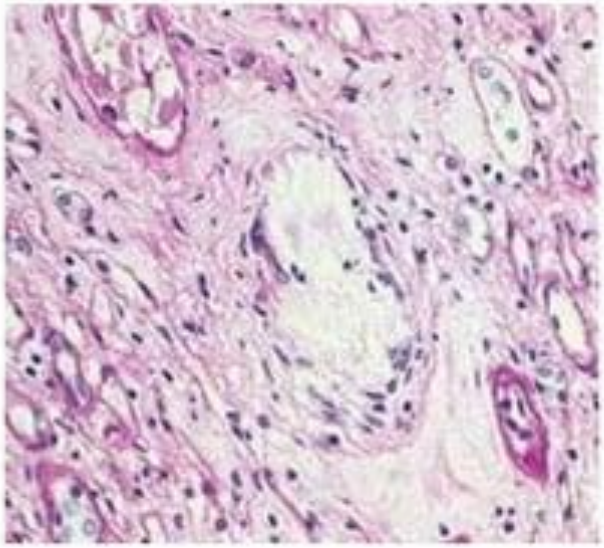
ANALGESIC NEPHROPATHY

- ASPIRIN, TYLENOL, NSAIDS
  - TUBULOINTERSTITIAL NEPHRITIS
  - PAPILLARY NECROSIS (also Dm & HbS)

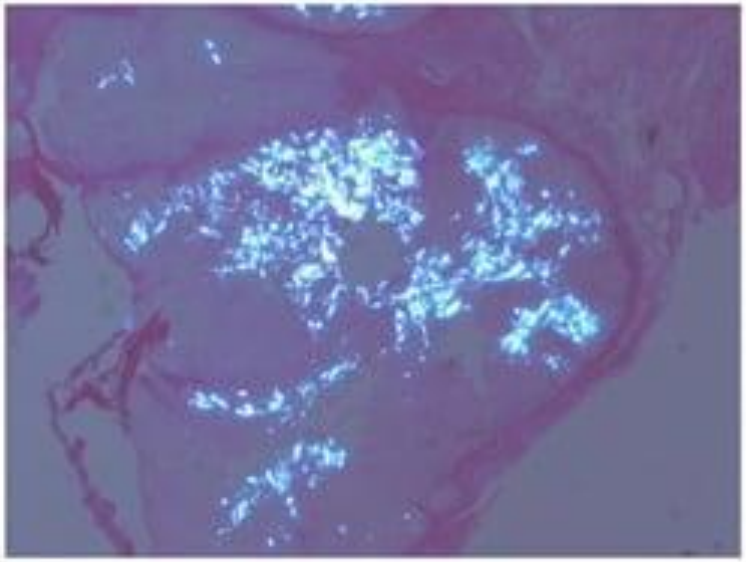


URATE NEPHROPATHY

- **Precipitation of Uric Acid Crystals in the TUBULES, especially in a LOWER than usual PH situation (mini-TOPHUS)**



H & E alcohol fixed



POLARIZED LIGHT MICROSCOPY

- Three forms:
  - Acute uric acid nephropathy … chemotherapy related
  - Chronic urate nephropathy … gouty, tophi
  - Nephrolithiasis … stones

HYPERCALCEMIA NEPHROCALCINOSIS

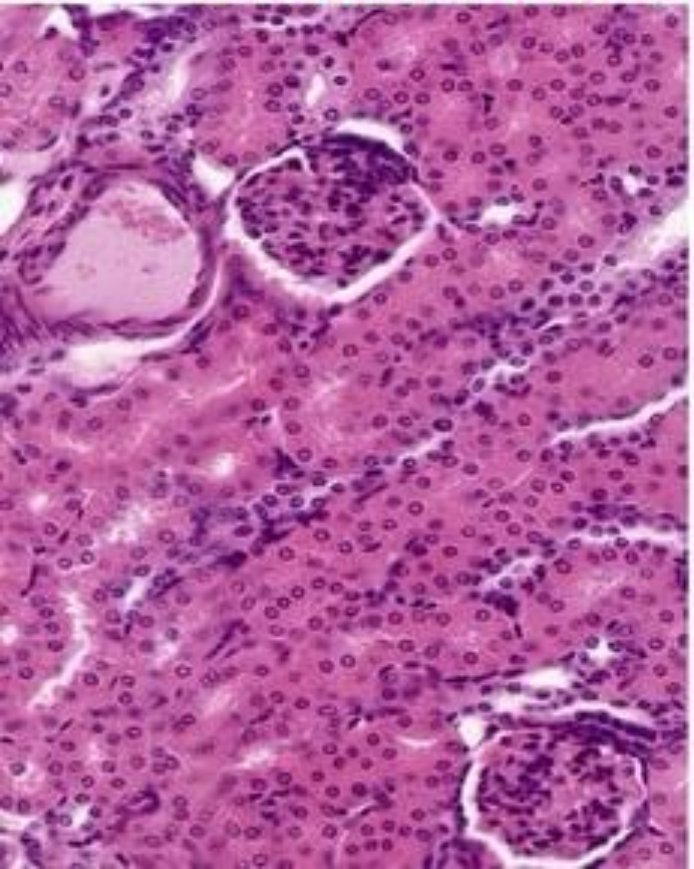
PRINCIPLE: In extreme or uncontrolled or chronic HYPERCALCEMIA, calcium stones form in the tubulo-interstitium of the kidney, which can eventually lead to tubular obstruction and loss of function

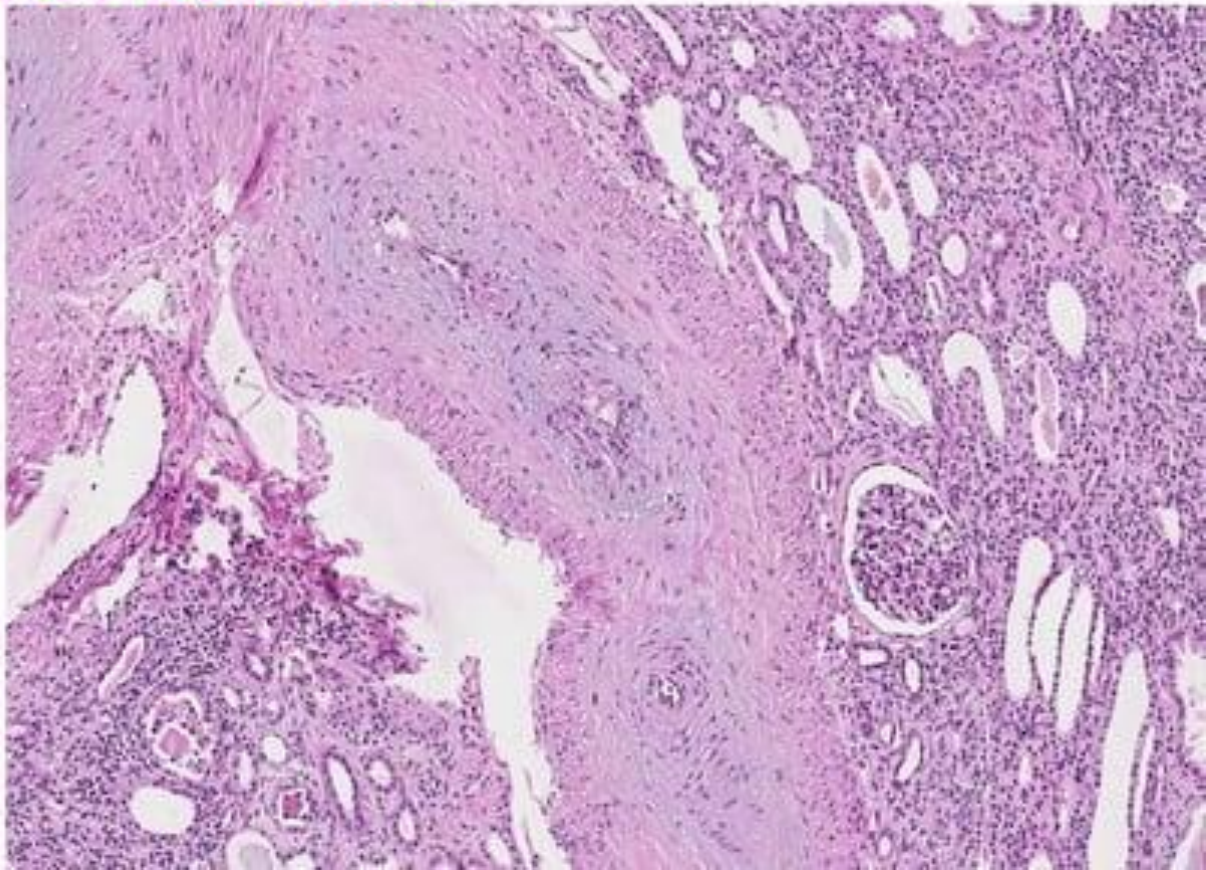
VASCULAR DISEASES

- BENIGN NEPHROSCLEROSIS
- MALIGNANT NEPHROSCLEROSIS (i.e., malignant hypertension)
- RENAL ARTERY STENOSIS
- THROMBOTIC MICROANGIOPATHIES
  - Hemolytic-Uremic Syndromes, Child, Adult, TTP
- THROMBI, EMBOLI, INFARCTS
  - SICKLE CELL
  - DIFFUSE CORTICAL NECROSIS

BENIGN NEPHROSCLEROSIS

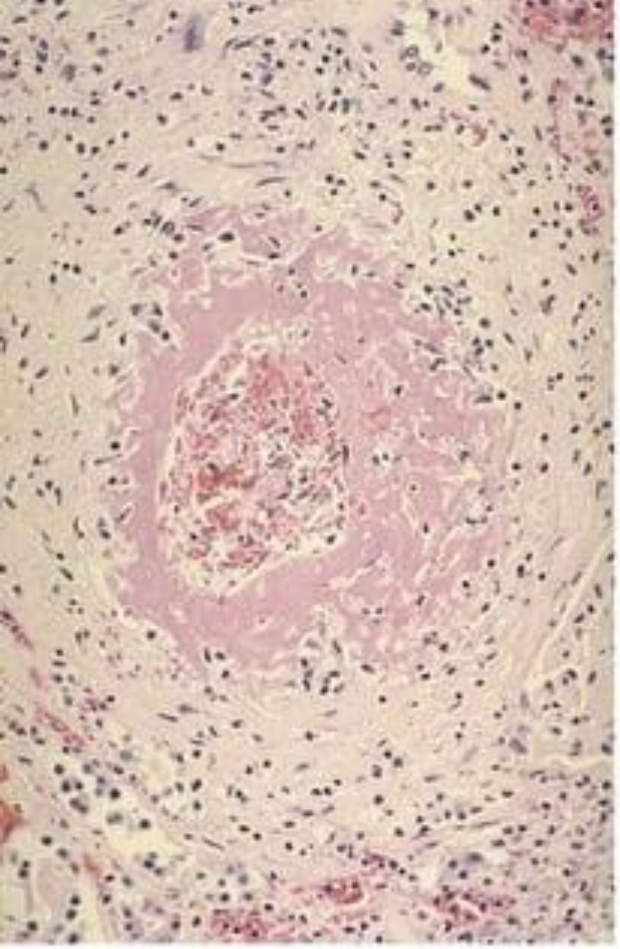
- Sclerosis, i.e., "hyalinization" of arterioles and small arteries, i.e., arterio-, arteriolo-
- Is this part of "routine" atherosclerosis????
- VERY VERY VERY common

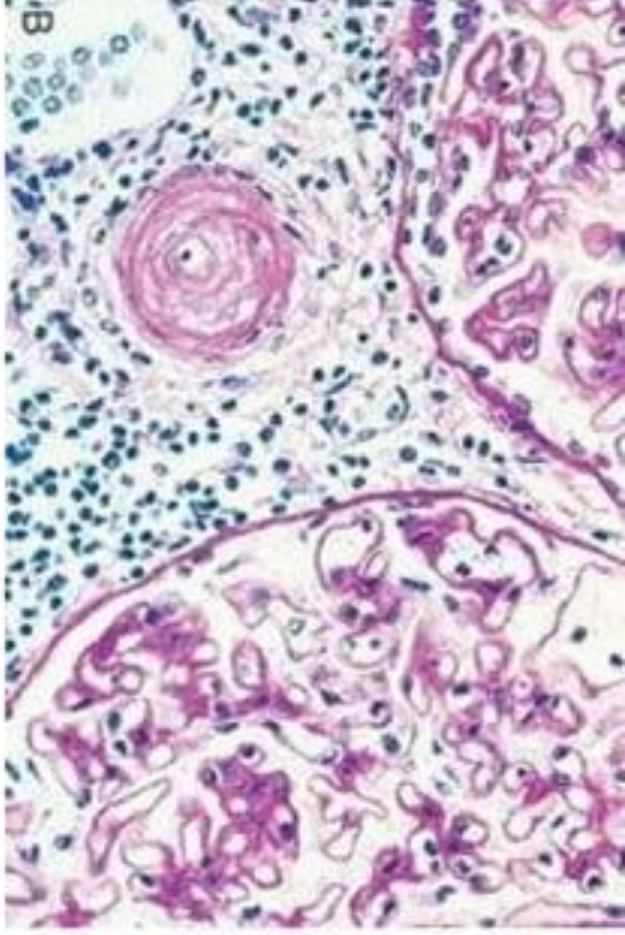




MALIGNANT NEPHROSCLEROSIS (i.e., malignant hypertension)

- NOT a part of "routine" atherosclerosis
- By definition, associated with rapidly progressive hypertension (1-2% of HTN)
- VASCULAR DAMAGE
- FIBRINOID NECROSIS
- "ONION SKINNING"
- SIGNIFICANT LUMENAL NARROWING





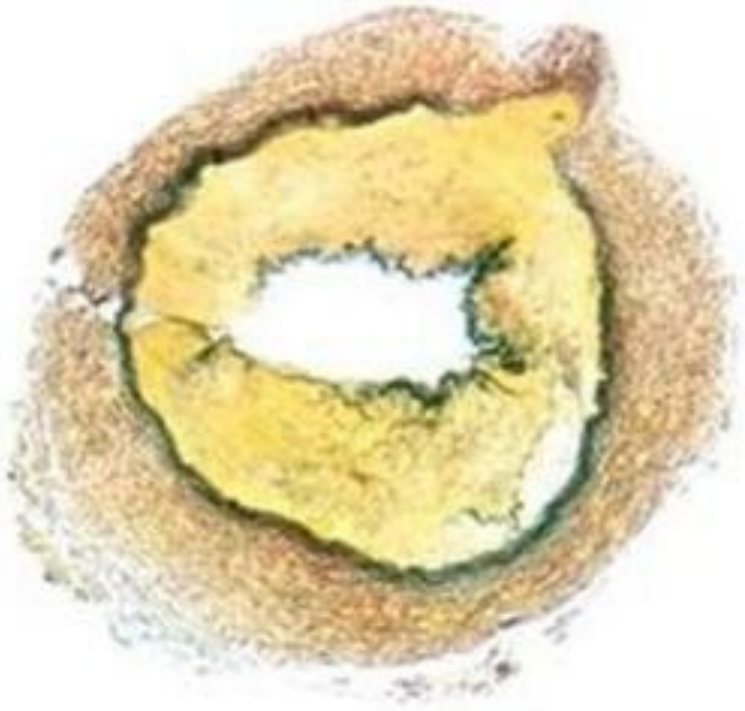
What is “onion-skinning”?

What is an onion?

What is “fibrinoid” necrosis?

Renal Artery Stenosis

- Rare cause of HTN
- SMALL Kidney
- 1) Plaque type is usual cause, yes regular old atherosclerosis
- 2) Fibromuscular "dysplasia" type:
  - INTIMAL HYPERPLASIA
  - MEDIAL HYPERPLASIA
  - ADVENTITIAL HYPERPLASIA
  - In younger women



PLAQUE, i.e.,

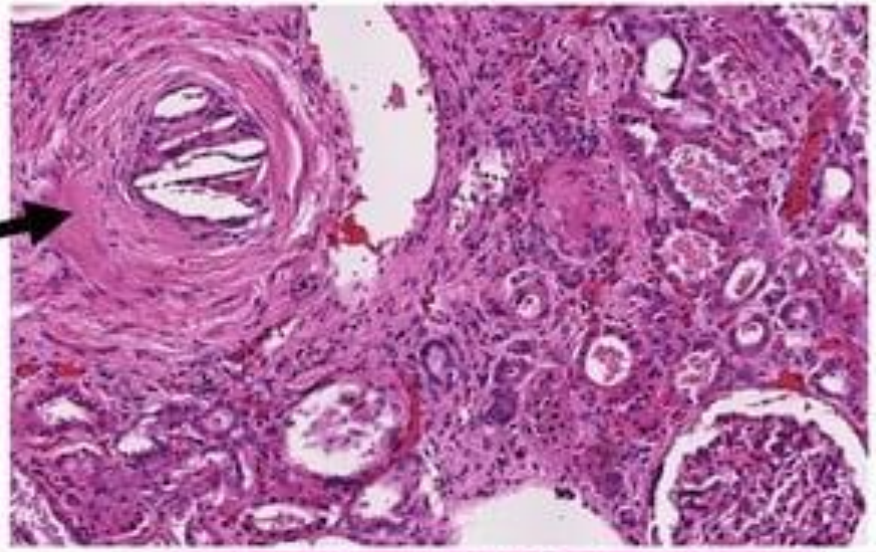
ATHEROSCLEROSIS

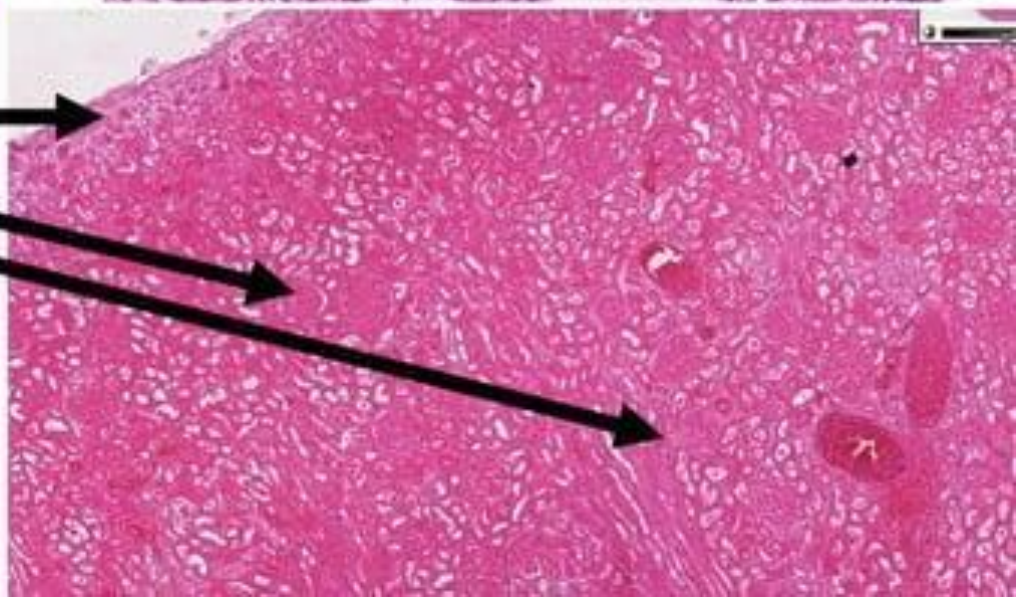
FIBROMUSCULAR

DYSPLASIA

OTHER VASCULAR

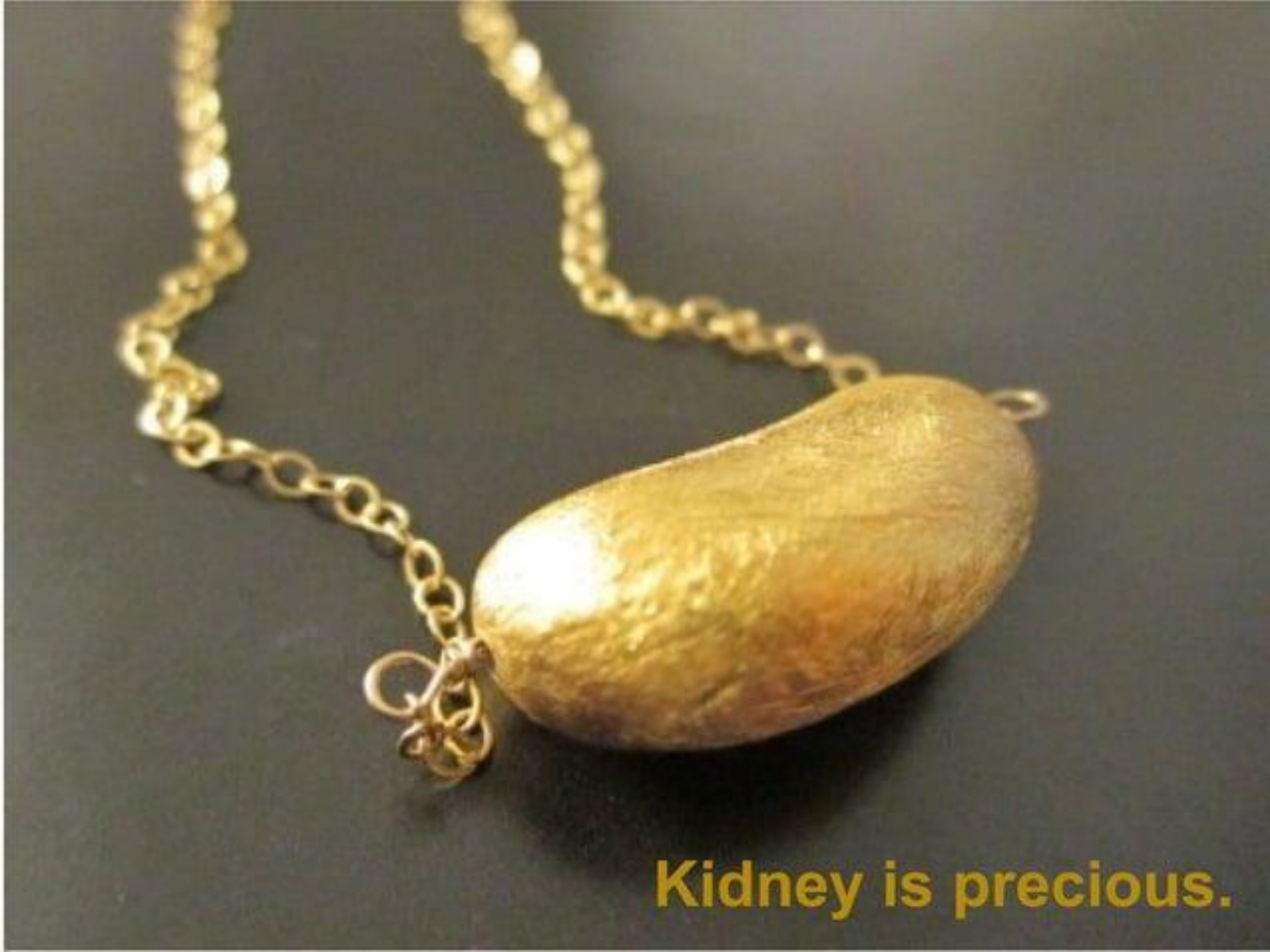
- Atherosclerosis
- Atheroemboli
- Sickle Cell
- Diffuse Cortical Necrosis





RENAL INFARCTS

- WEDGE SHAPED
- WELL DELINEATED
- "WHITE" (anemic) INFARCT
- Perhaps a little "YELLOW"
- HEAL WITH A SCAR


Kidney is precious.