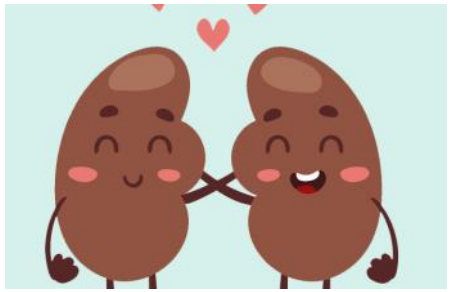
PATHOLOGY OF THE RENAL SYSTEM, LAB 2

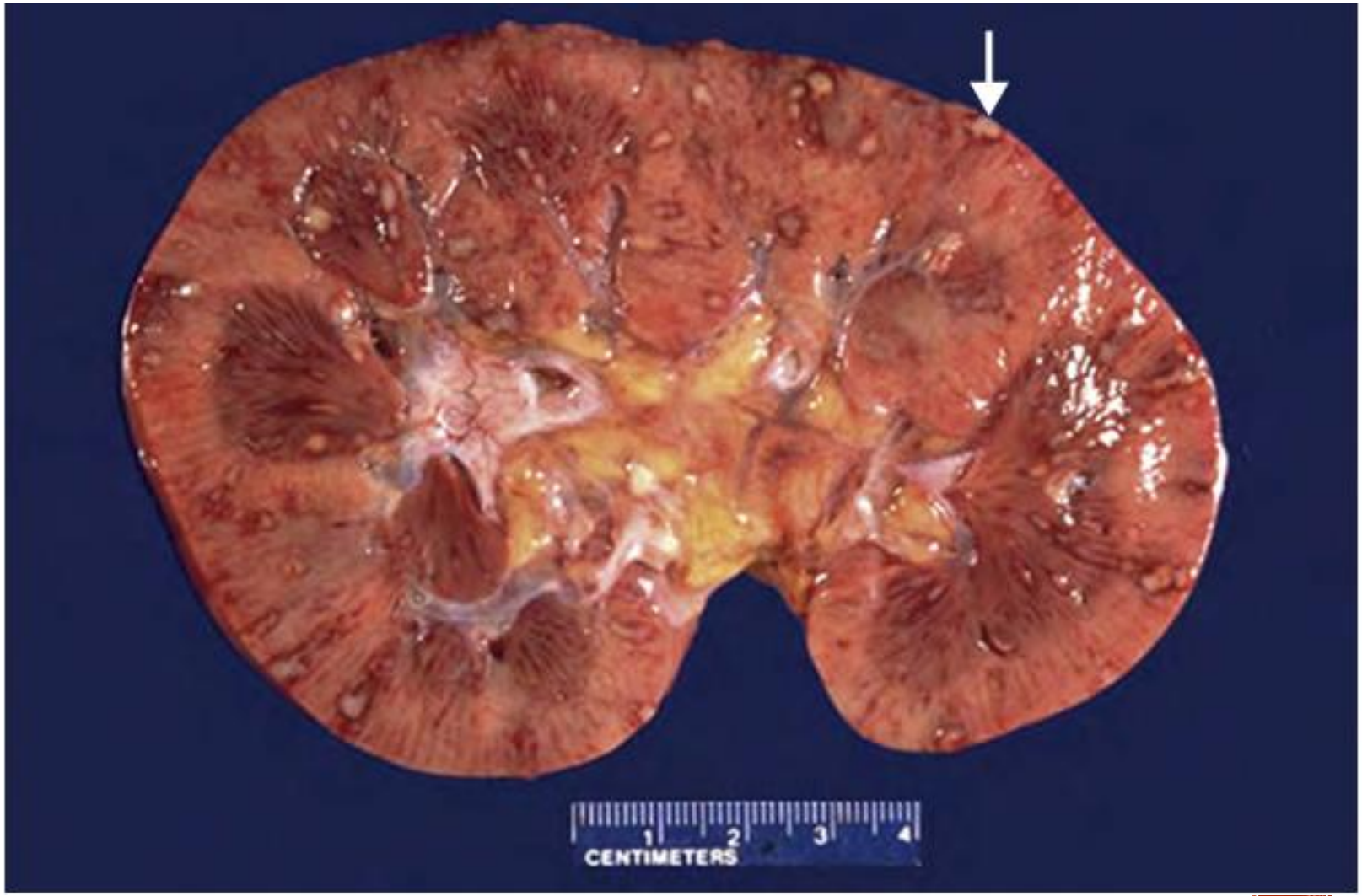
Dr. Manar Rizik Al-Sayyed, M.D, Jordanian board



TUBULOINTERSTITIAL DISEASES

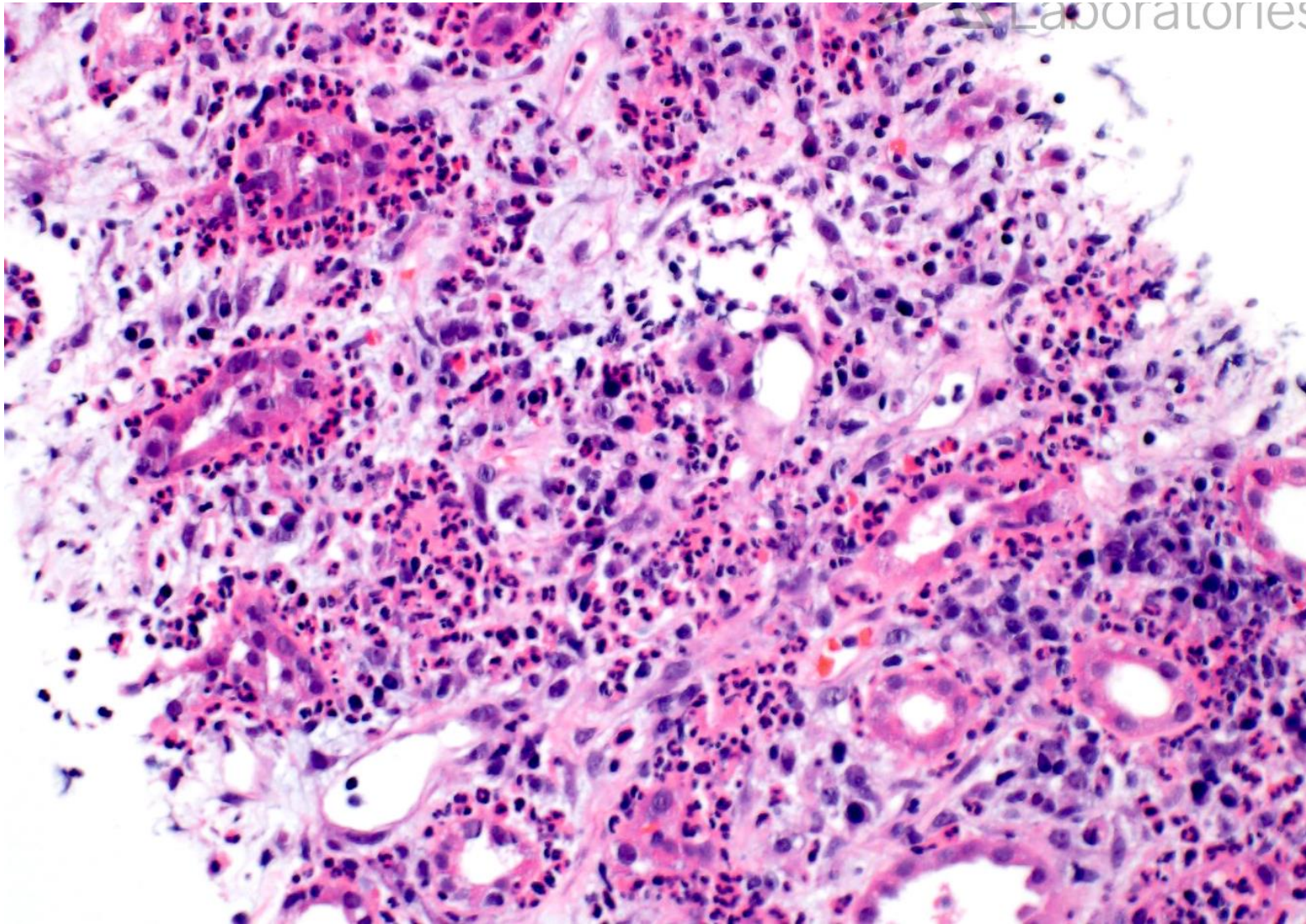
ACUTE PYELONEPHRITIS, GROSS

- The cut surface of this swollen kidney reveals many small yellowish microabscesses involving cortex and medulla.



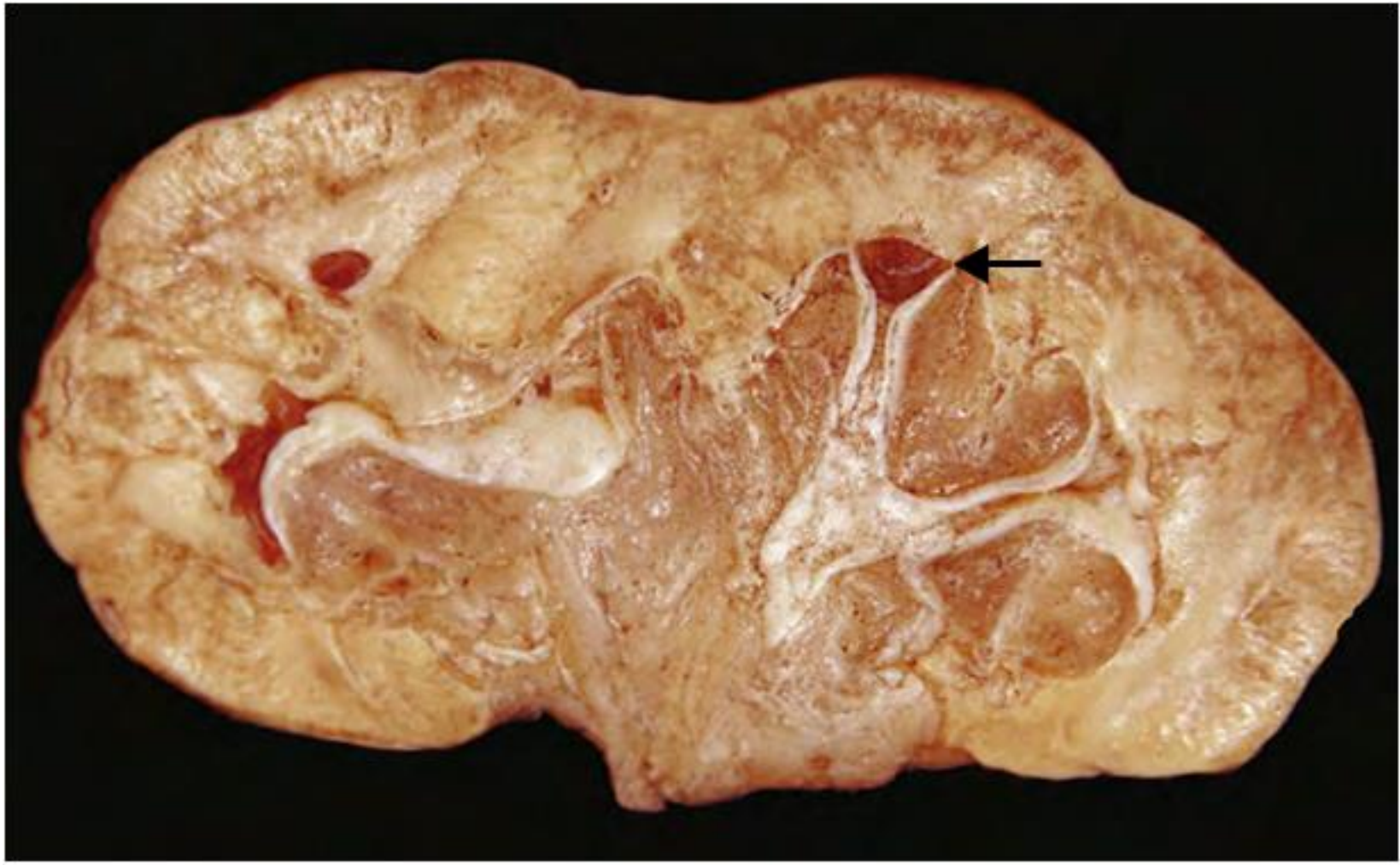
ACUTE PYELONEPHRITIS, MICROSCOPIC

- An extensive infiltrate of **neutrophils** is present in collecting tubules and interstitial tissue.

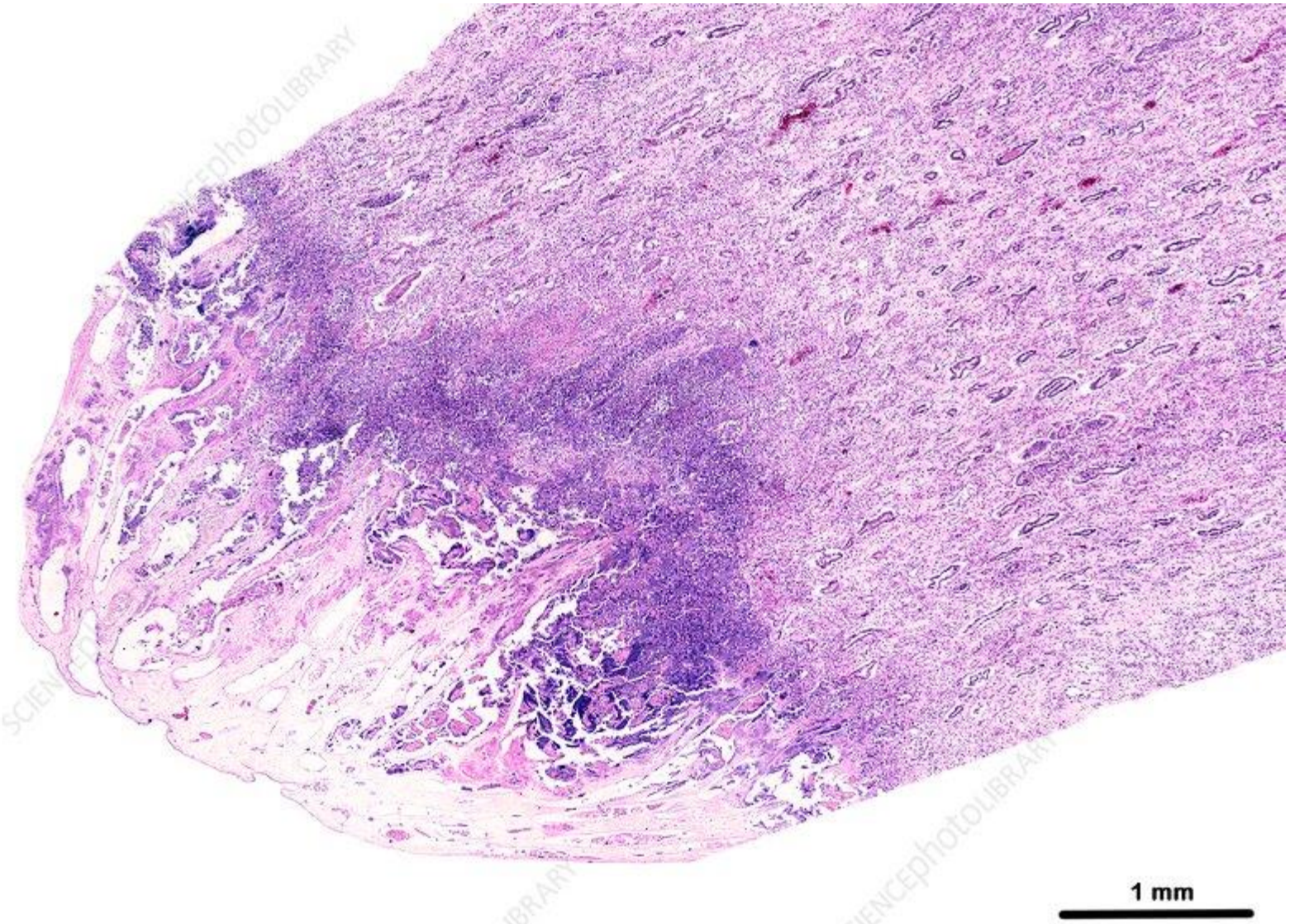


PAPILLARY NECROSIS, GROSS

- This is an uncommon but severe complication of acute pyelonephritis, particularly in patients with diabetes mellitus or urinary tract obstruction.
- These red areas involving some renal papillae are areas of papillary necrosis, a form of focal **coagulative necrosis**.

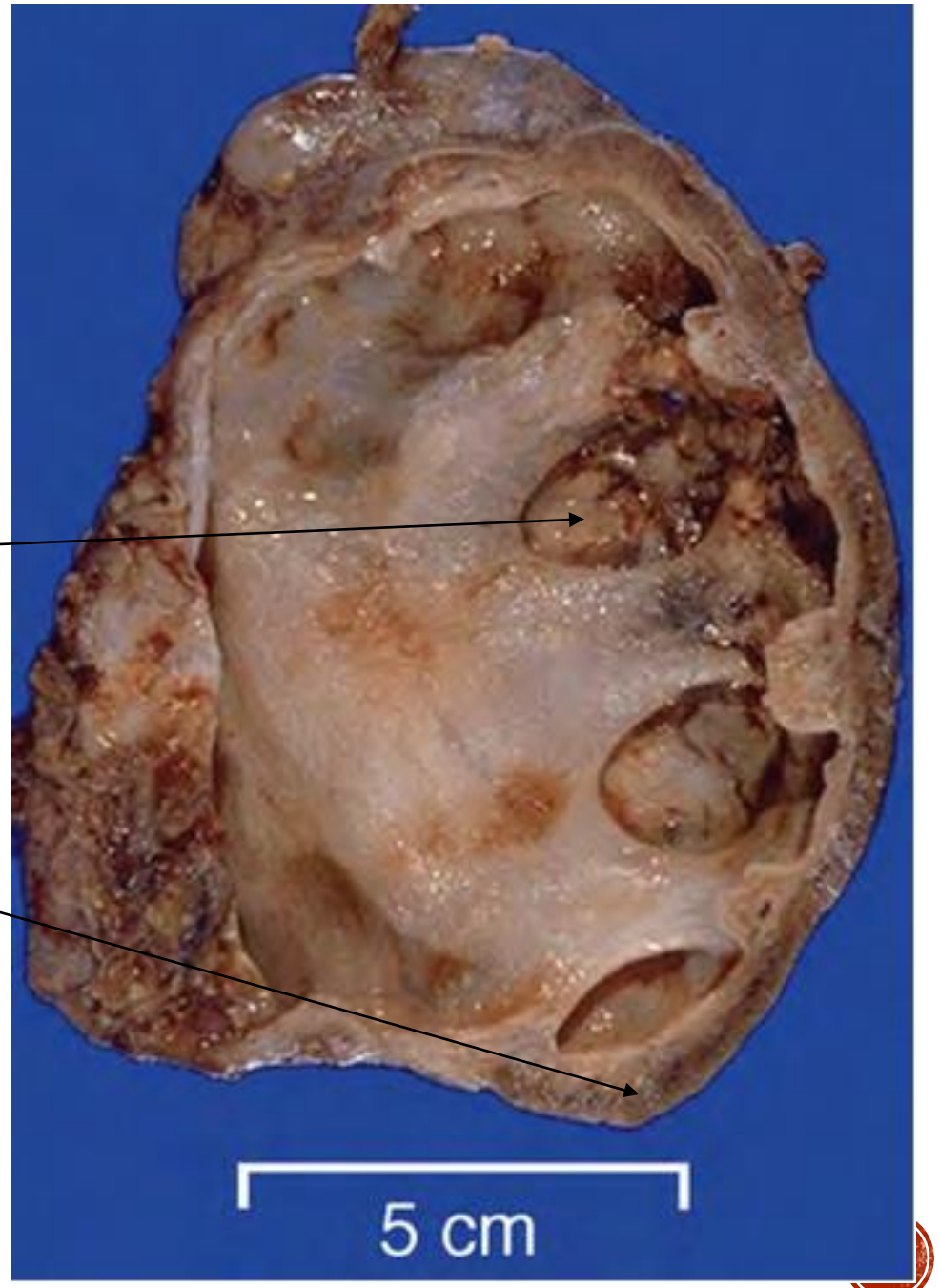


PAPILLARY NECROSIS, MICROSCOPIC



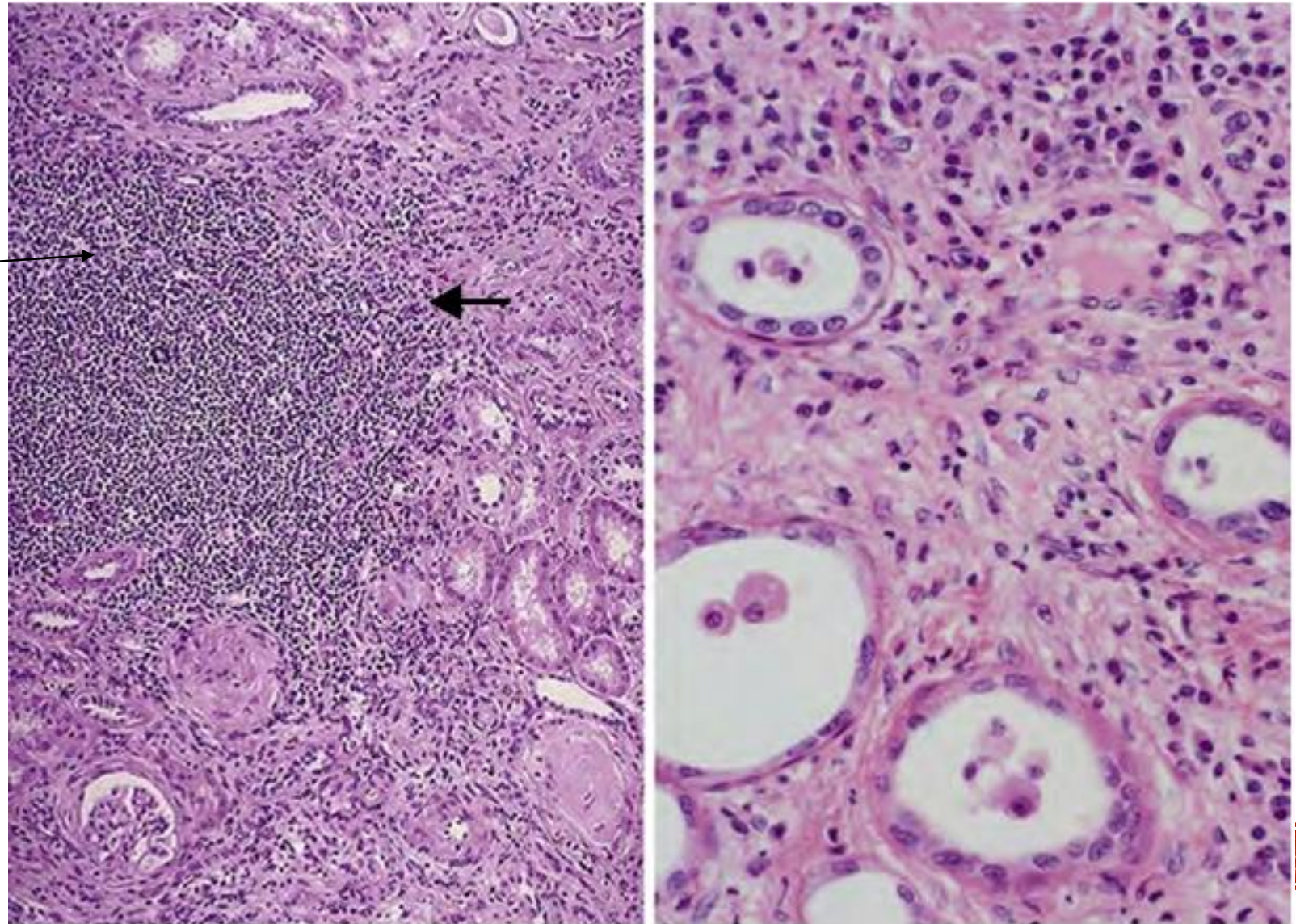
CHRONIC PYELONEPHRITIS, GROSS

- This kidney has advanced chronic pyelonephritis from reflux and consequent **hydronephrosis** (dilation of calyces).
- There is only a thin rim of remaining renal cortex.

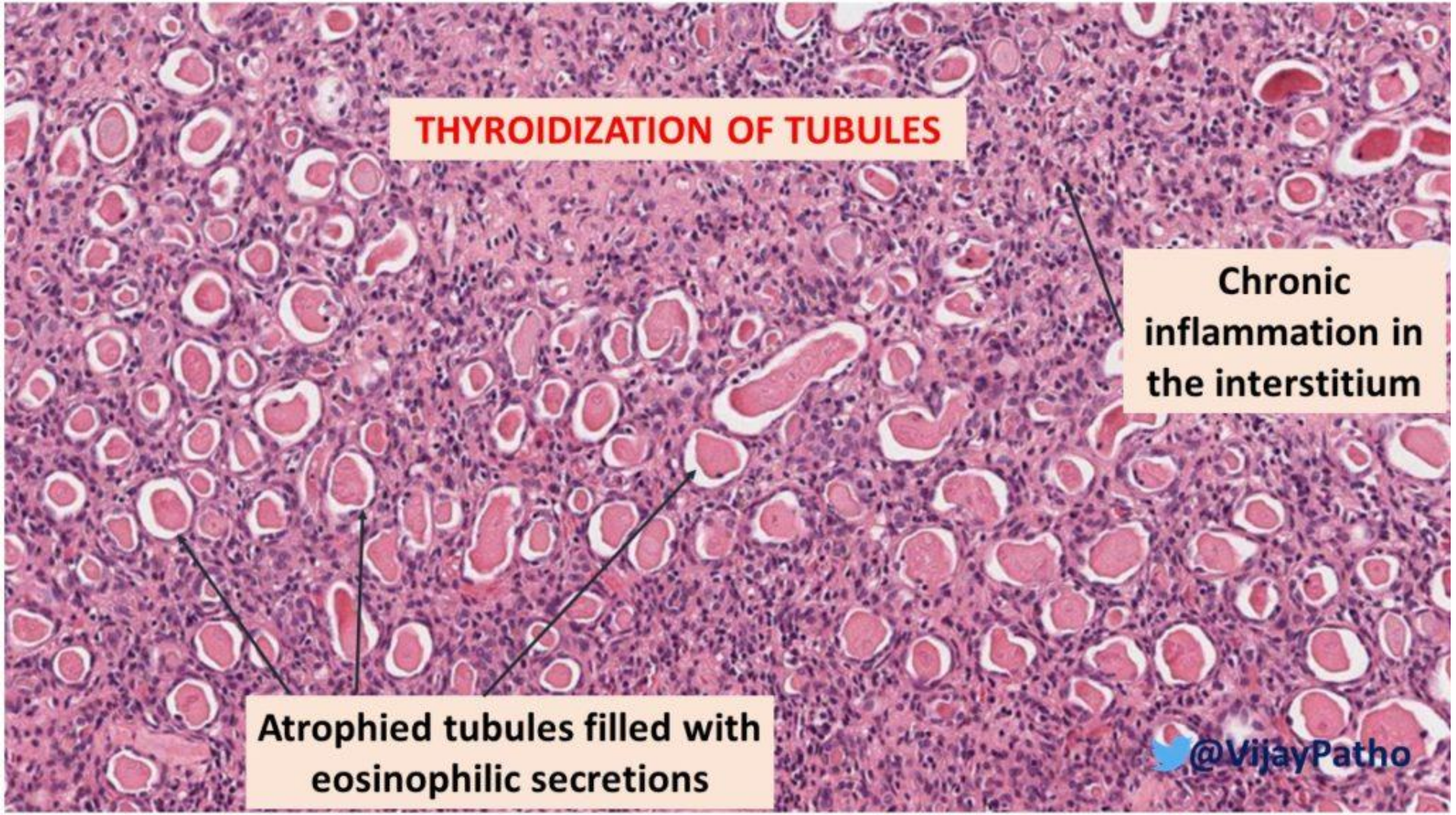


CHRONIC PYELONEPHRITIS, MICROSCOPIC

- In the left panel at low magnification is a large collection of chronic inflammatory cells.
- **Lymphocytes and plasma cells** characteristic of chronic pyelonephritis are seen at high magnification (right panel).



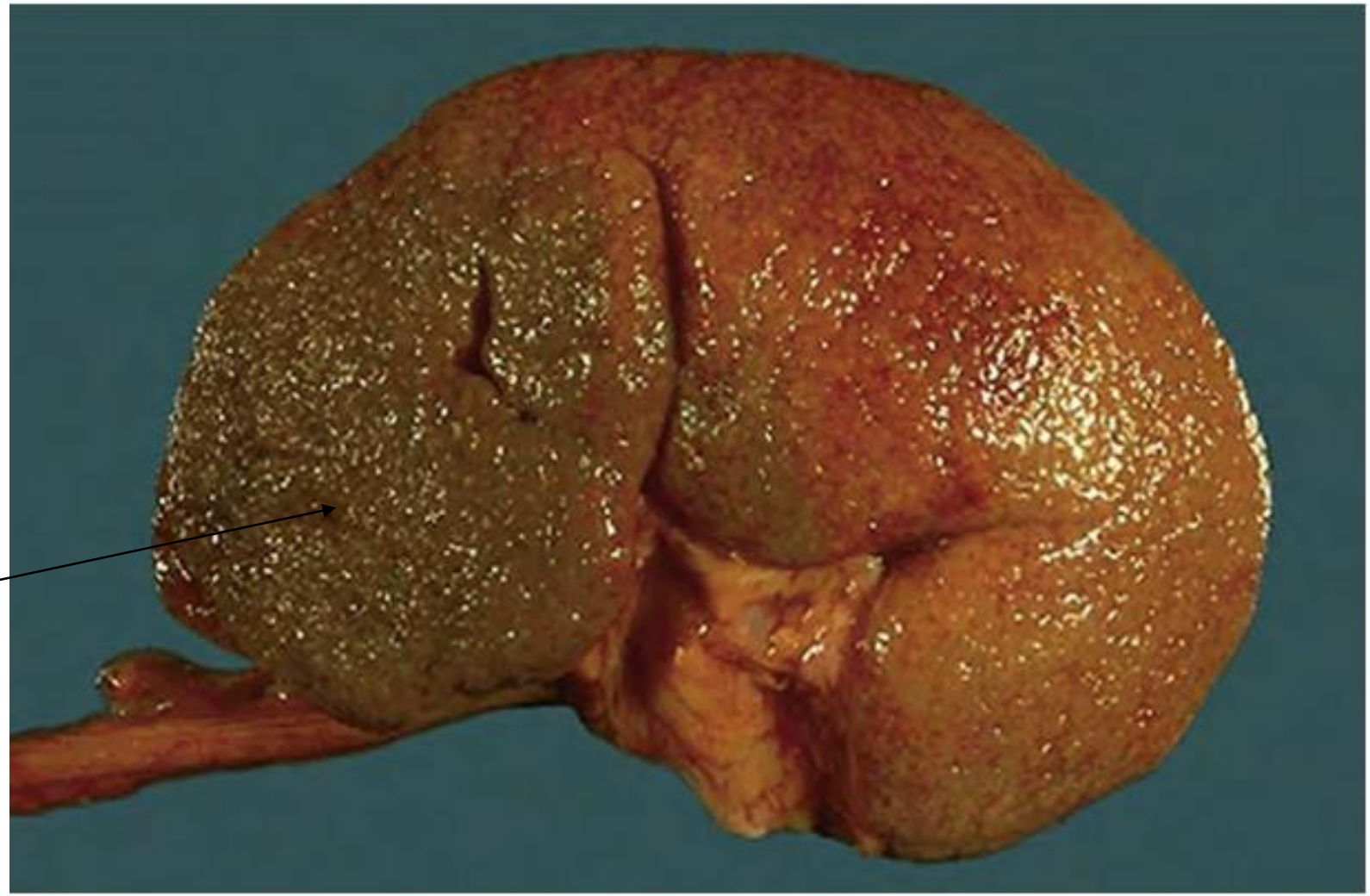
- Over time there is increasing tubular atrophy with prominent proteinaceous casts (so-called **thyroidization**) and interstitial fibrosis.



VASCULAR DISEASES

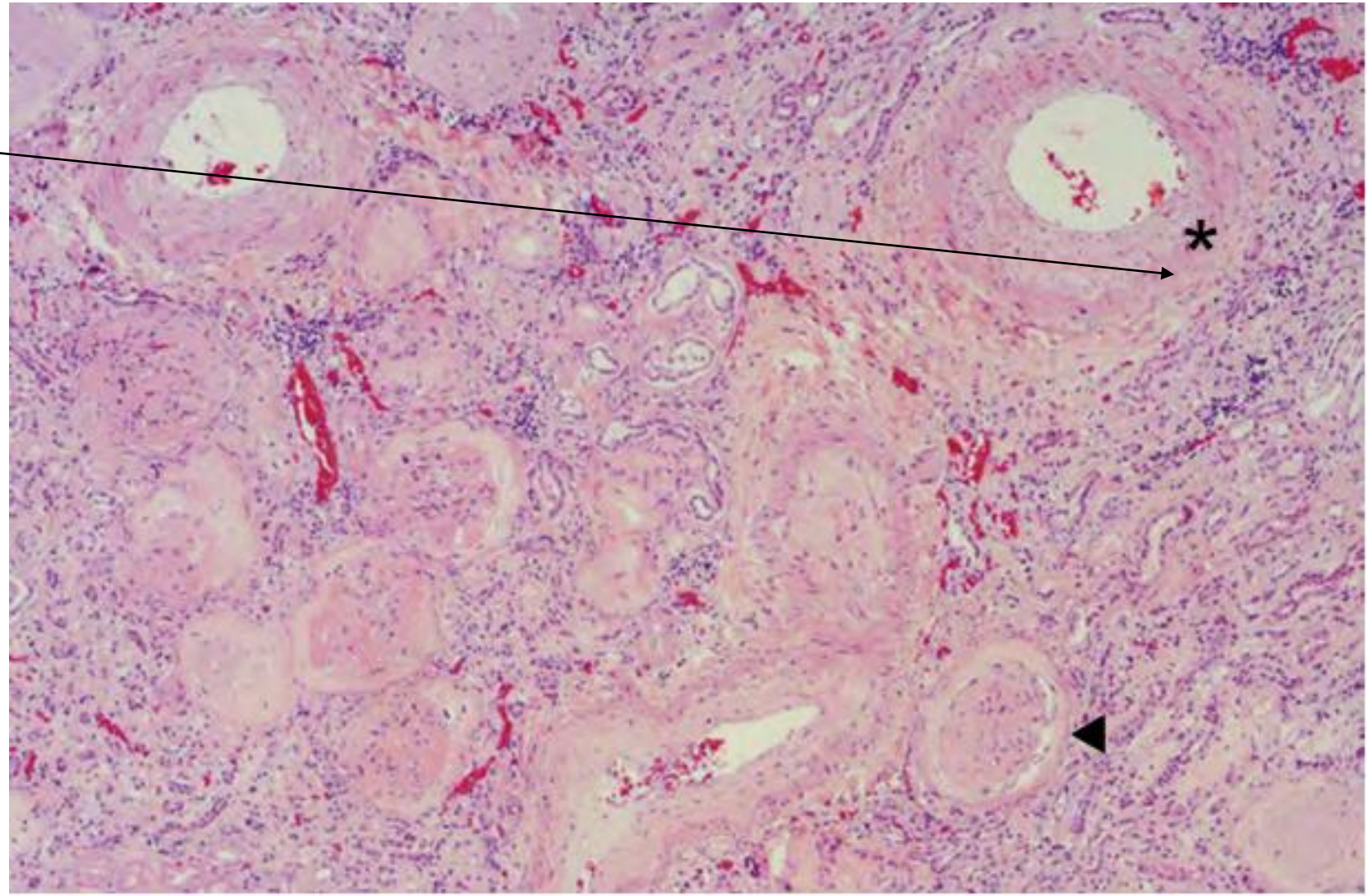
NEPHROSCLEROSIS, GROSS

- Intrinsic renal vascular disease with sclerosis and progressive luminal narrowing leads to patchy ischemic atrophy with focal loss of parenchyma that gives the kidney surfaces a characteristic **granular** appearance.



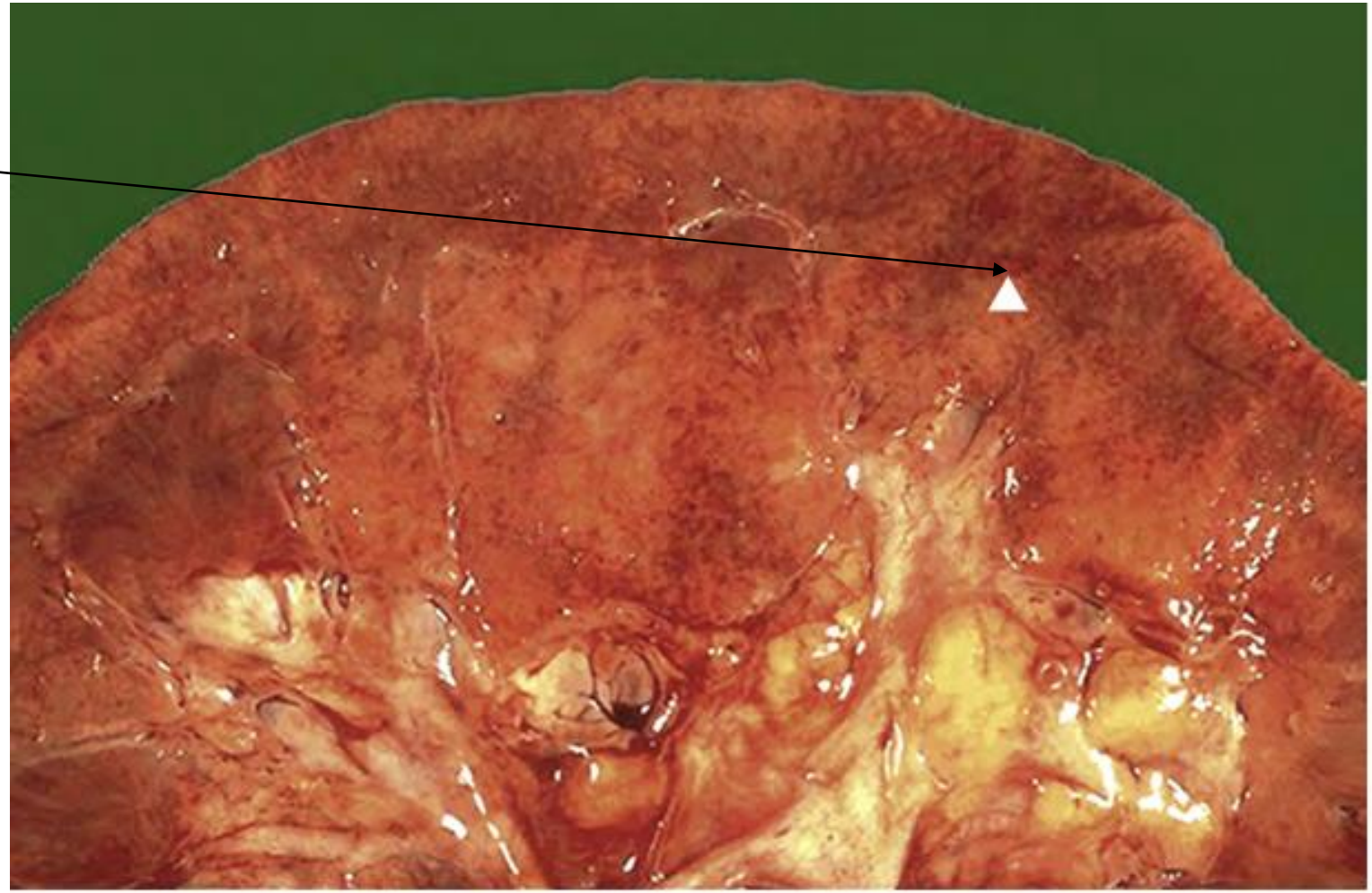
NEPHROSCLEROSIS, MICROSCOPIC

- The medial thickening of the small arteries leads to progressive luminal narrowing.
- Interstitial fibrosis, tubular atrophy and cast formation are common.
- Glomeruli are first undergo collagen deposition within the Bowman space (◄), and periglomerular fibrosis, with eventual total glomerular sclerosis.



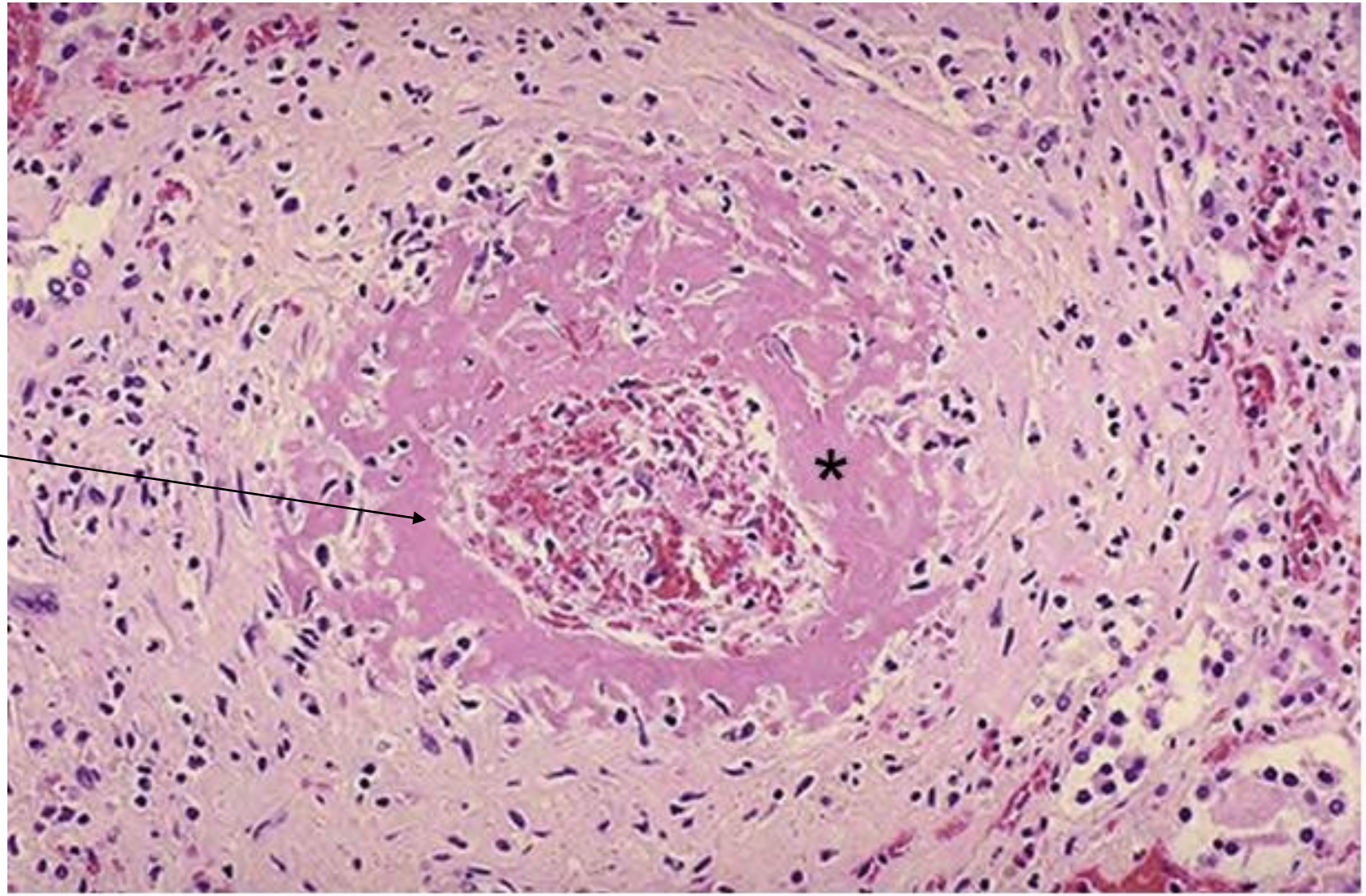
MALIGNANT NEPHROSCLEROSIS, GROSS

- This kidney has many **focal small hemorrhages** in cortex and medulla, and the corticomedullary junction is obscured.

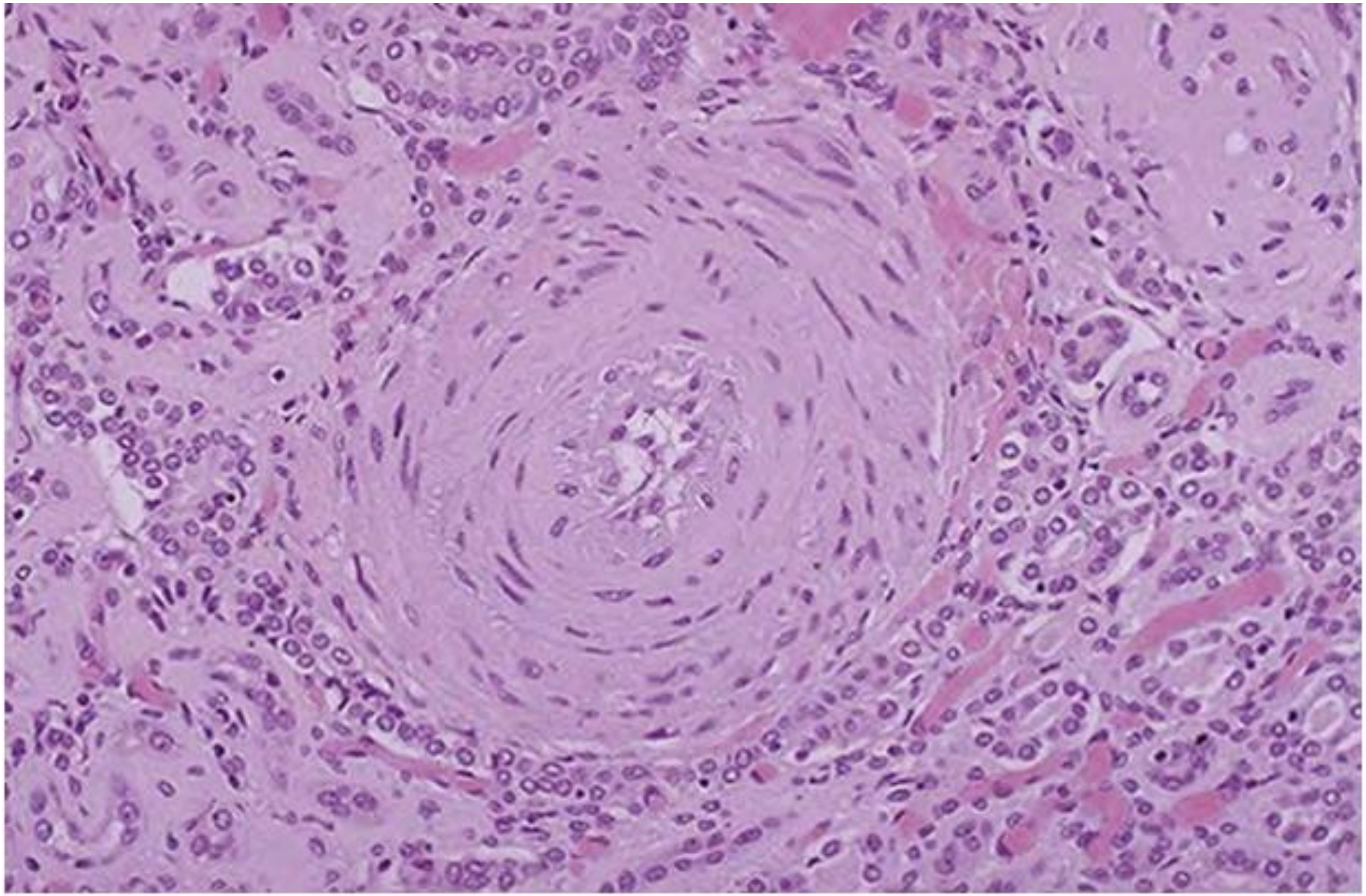


MALIGNANT NEPHROSCLEROSIS, MICROSCOPIC

- It results from endothelial injury and increased permeability to plasma proteins along with platelet activation, leading to **fibrinoid necrosis** of small arteries as shown.

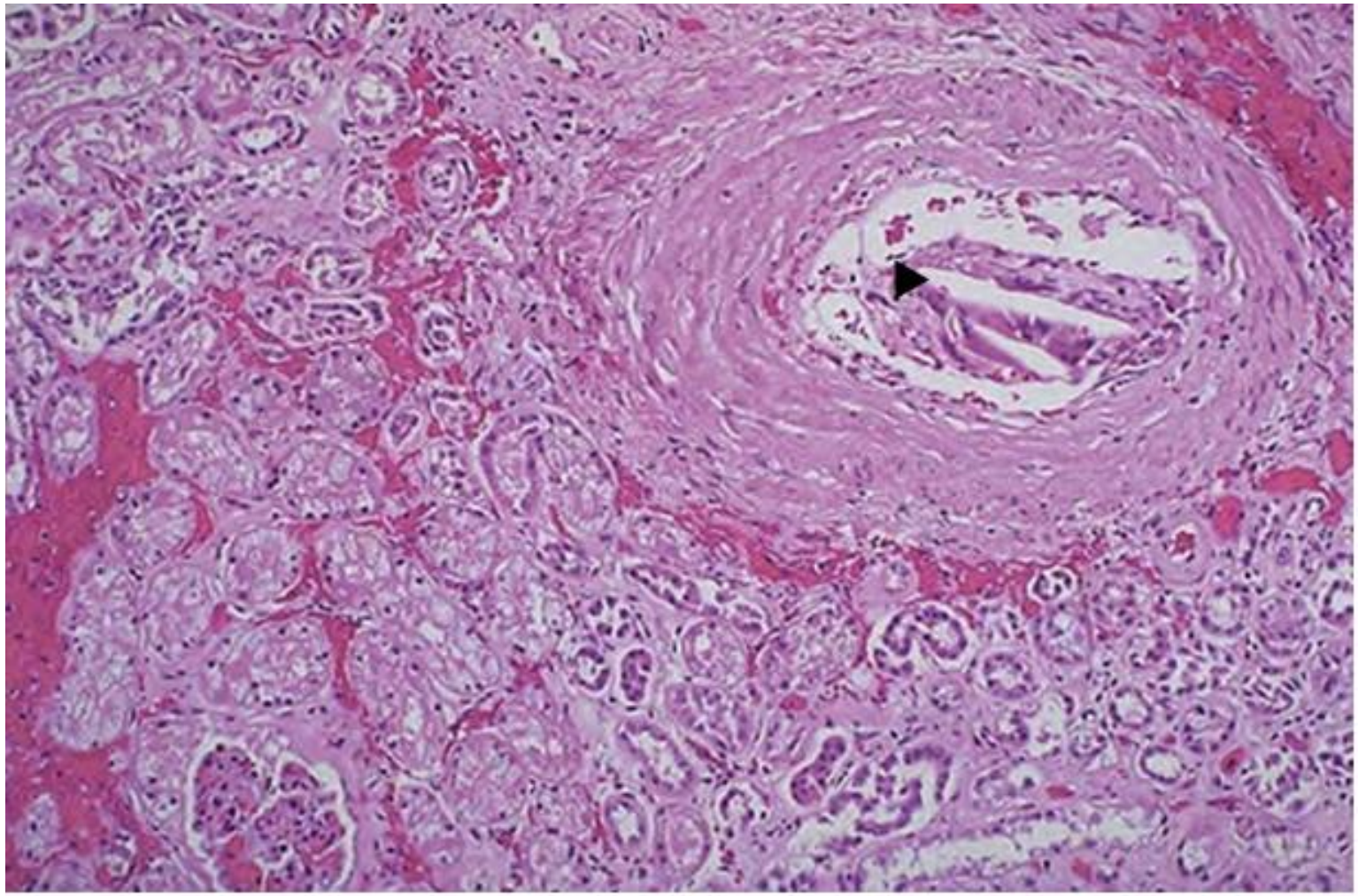


- Thickening of the arterial wall with malignant hypertension also produces a **hyperplastic arteriolitis**. The arteriole has an "onion skin" appearance from concentric layering of proliferating smooth muscle along with collagen deposition.



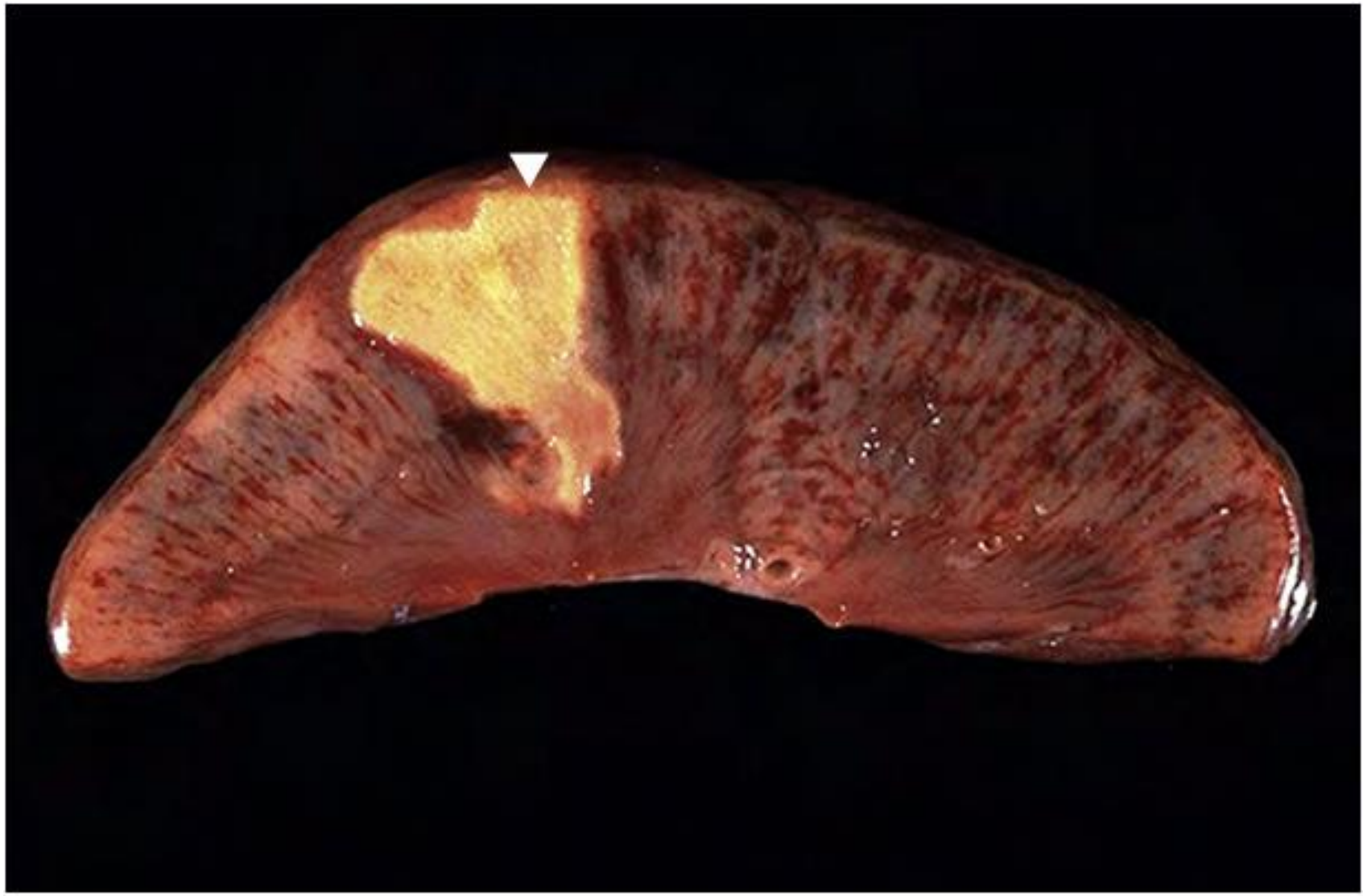
ATHEROEMBOLIC RENAL DISEASE, MICROSCOPIC

- Shown here in a renal artery branch are cholesterol clefts (▶) characteristic of such an embolus filling the lumen.



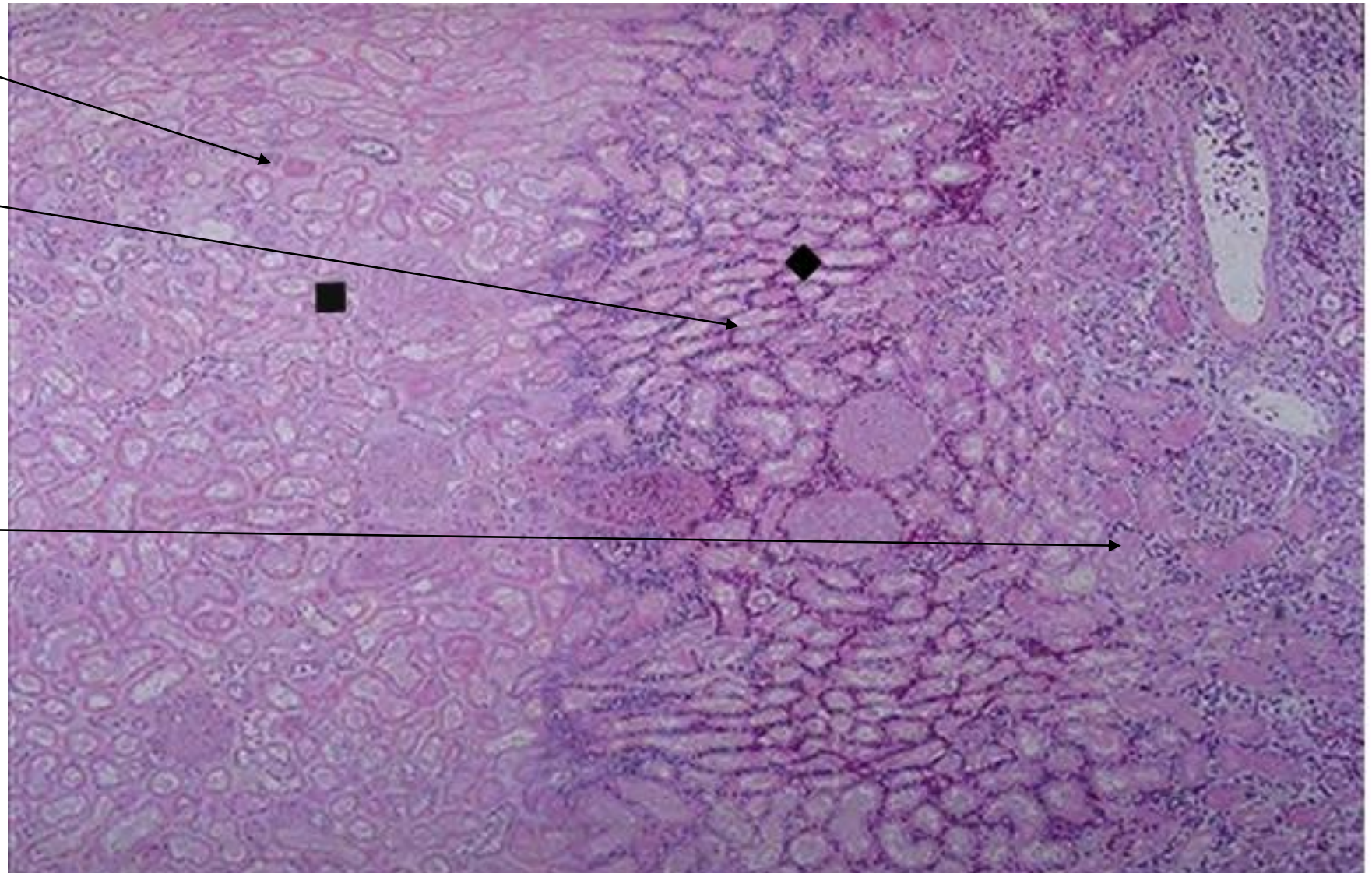
RENAL INFARCT, GROSS

- Note the wedge shape of this acute infarct, with the pale zone of **coagulative necrosis**.
- The remaining cortex is congested, as is the medulla.



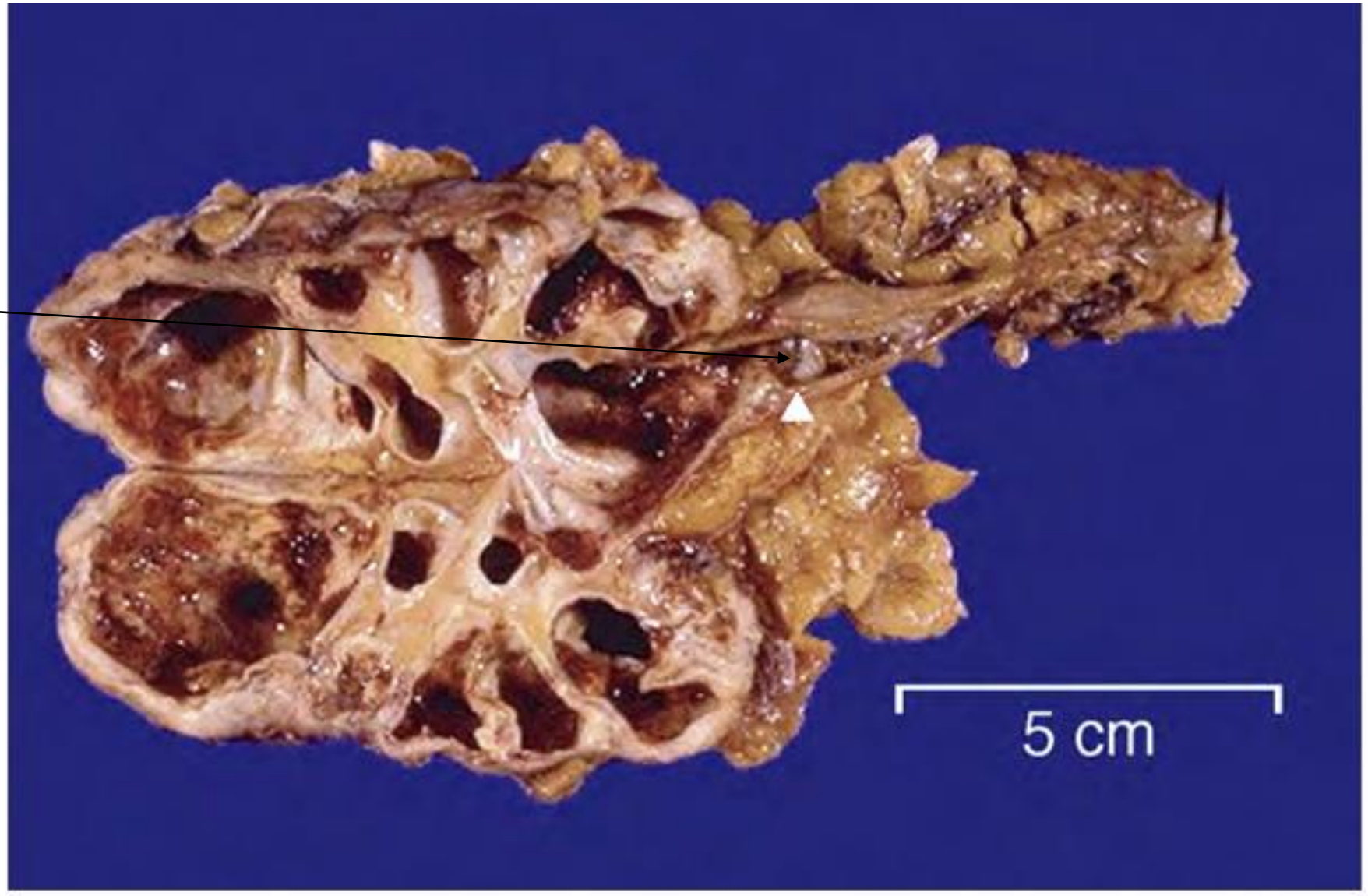
RENAL INFRACT, MICROSCOPIC

- On the right is normal kidney; to the left of that, hyperemic parenchyma is becoming necrotic;
- to the far left is pale pink infarcted kidney, in which tubules and glomeruli have undergone coagulative necrosis.

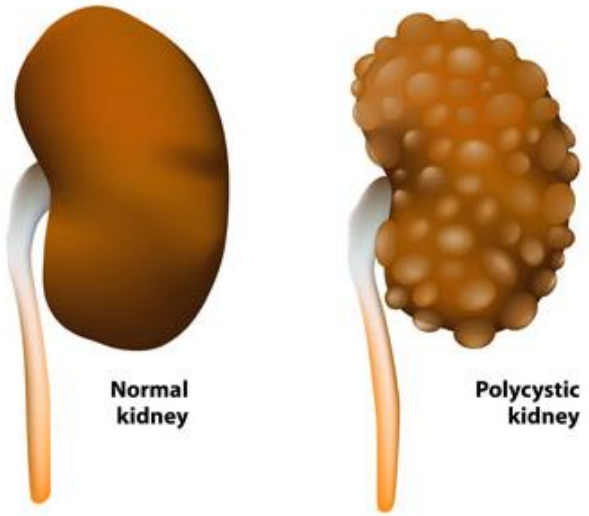


OBSTRUCTIVE UROPATHY, GROSS

- This kidney has been opened coronally to reveal hydronephrosis, and the cause is a **calculus** at the ureteropelvic junction.
- This kidney shows a marked degree of hydronephrosis with nearly complete loss of cortex.

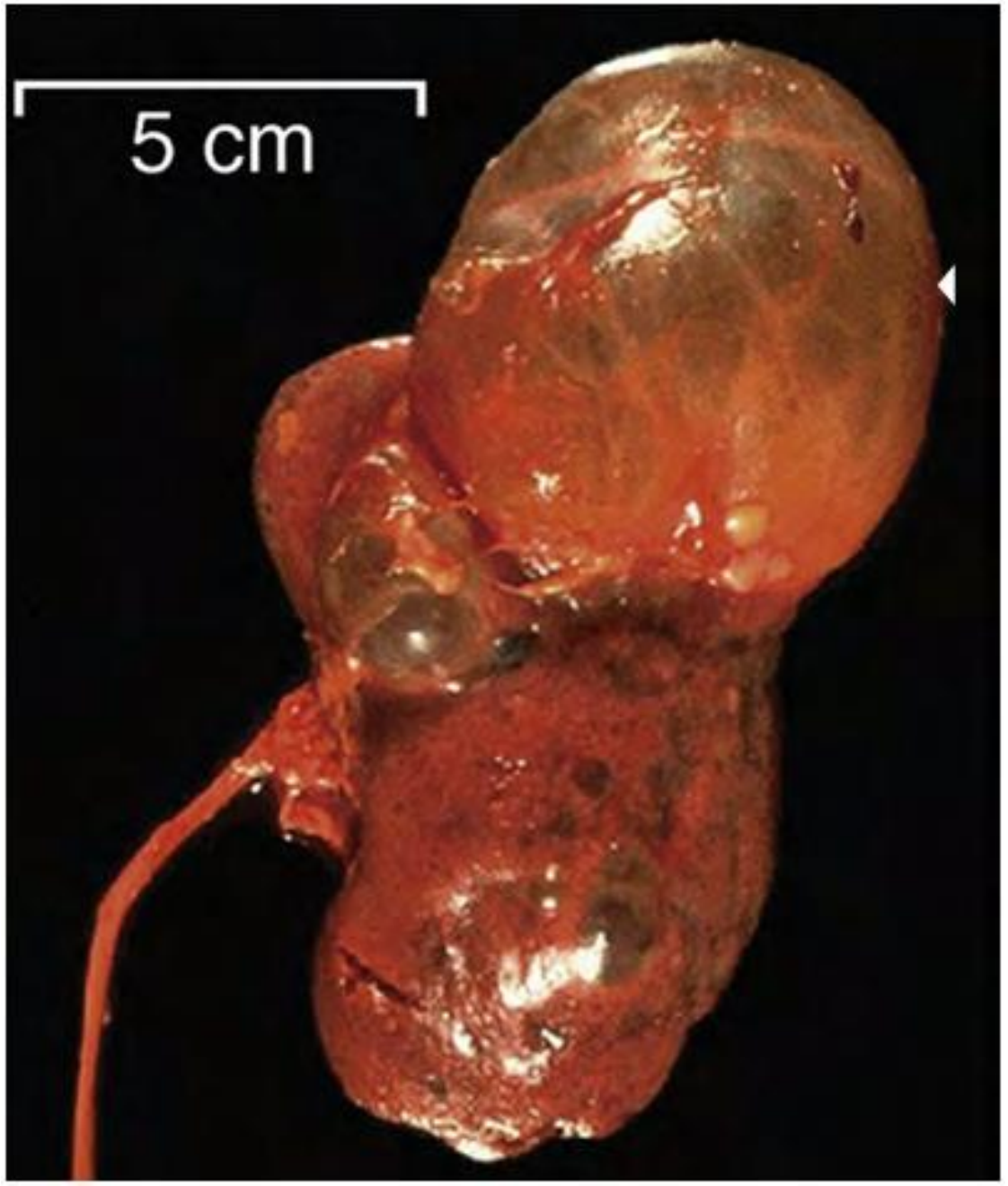


CYSTIC DISEASES



SIMPLE RENAL CYST, GROSS

- Note the large simple cyst of the right upper pole (◄).
- Other smaller cysts are also scattered within the renal cortex in the left panel.
- Simple renal cysts are a common incidental finding in adults.

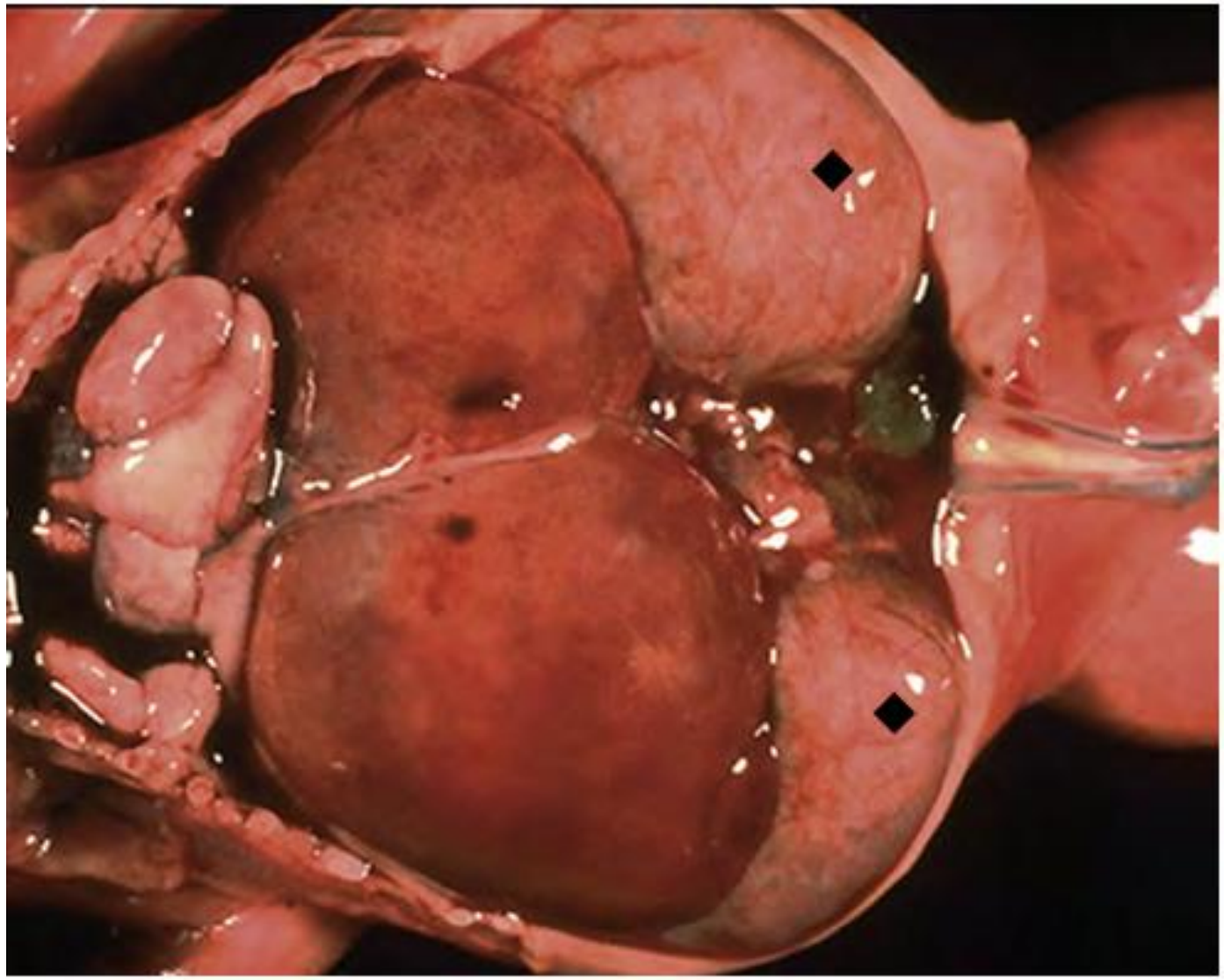


AUTOSOMAL DOMINANT POLYCYSTIC KIDNEY DISEASE (ADPKD), GROSS

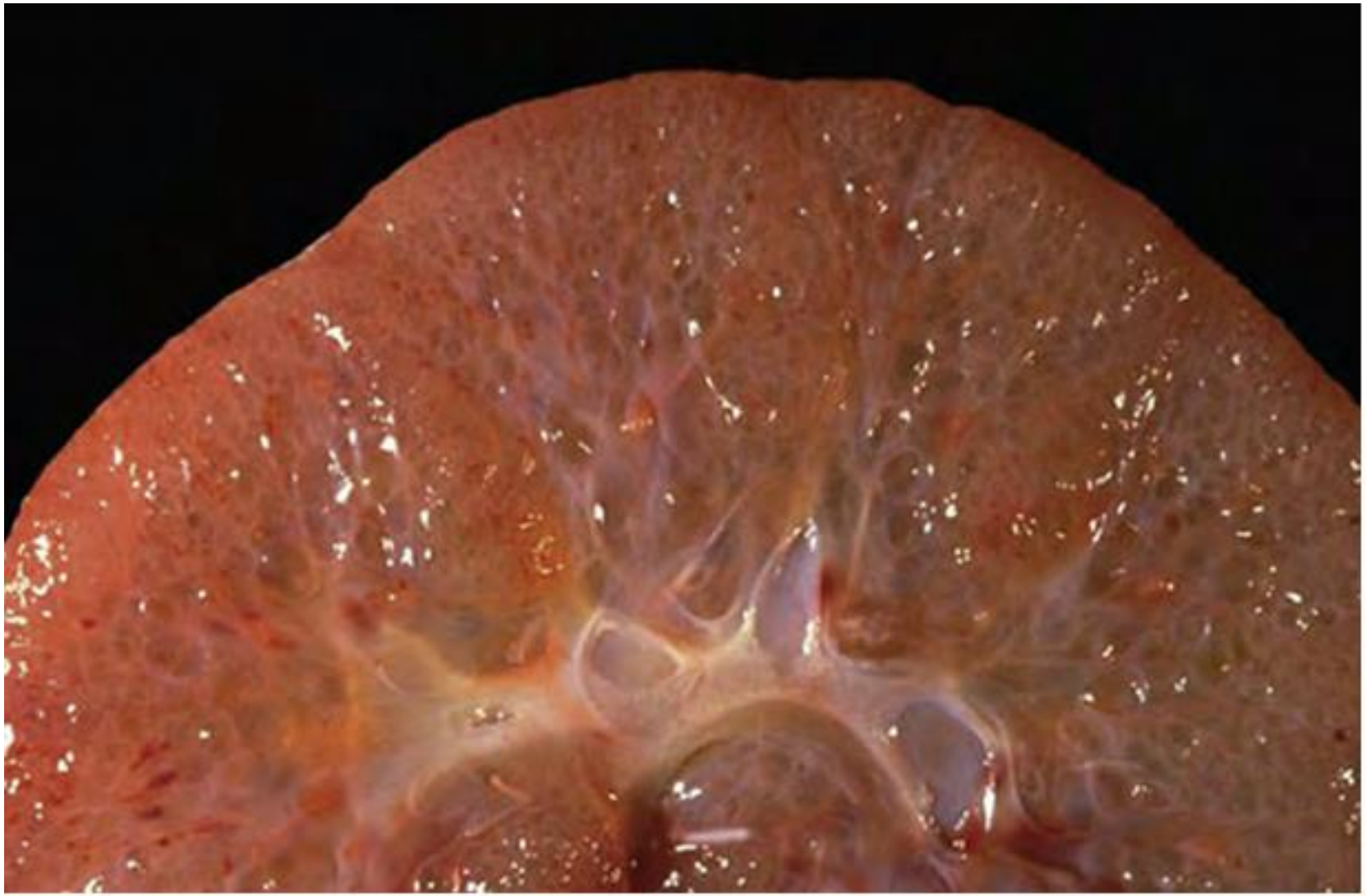
- ADPKD is a bilateral process.
- Mutations in the PKD1 gene encoding polycystin-1 account for 85% of cases, and mutations in PKD2 encoding polycystin-2 for most of the rest.
- The cysts are not typically present at birth but develop slowly over time.

AUTOSOMAL RECESSIVE POLYCYSTIC KIDNEY DISEASE (ARPKD), GROSS

- Note the bilaterally massively enlarged kidneys that nearly fill the abdomen below the liver, consistent with ARPKD in this fetus at 23 weeks gestation who died from pulmonary hypoplasia as a result of oligohydramnios.

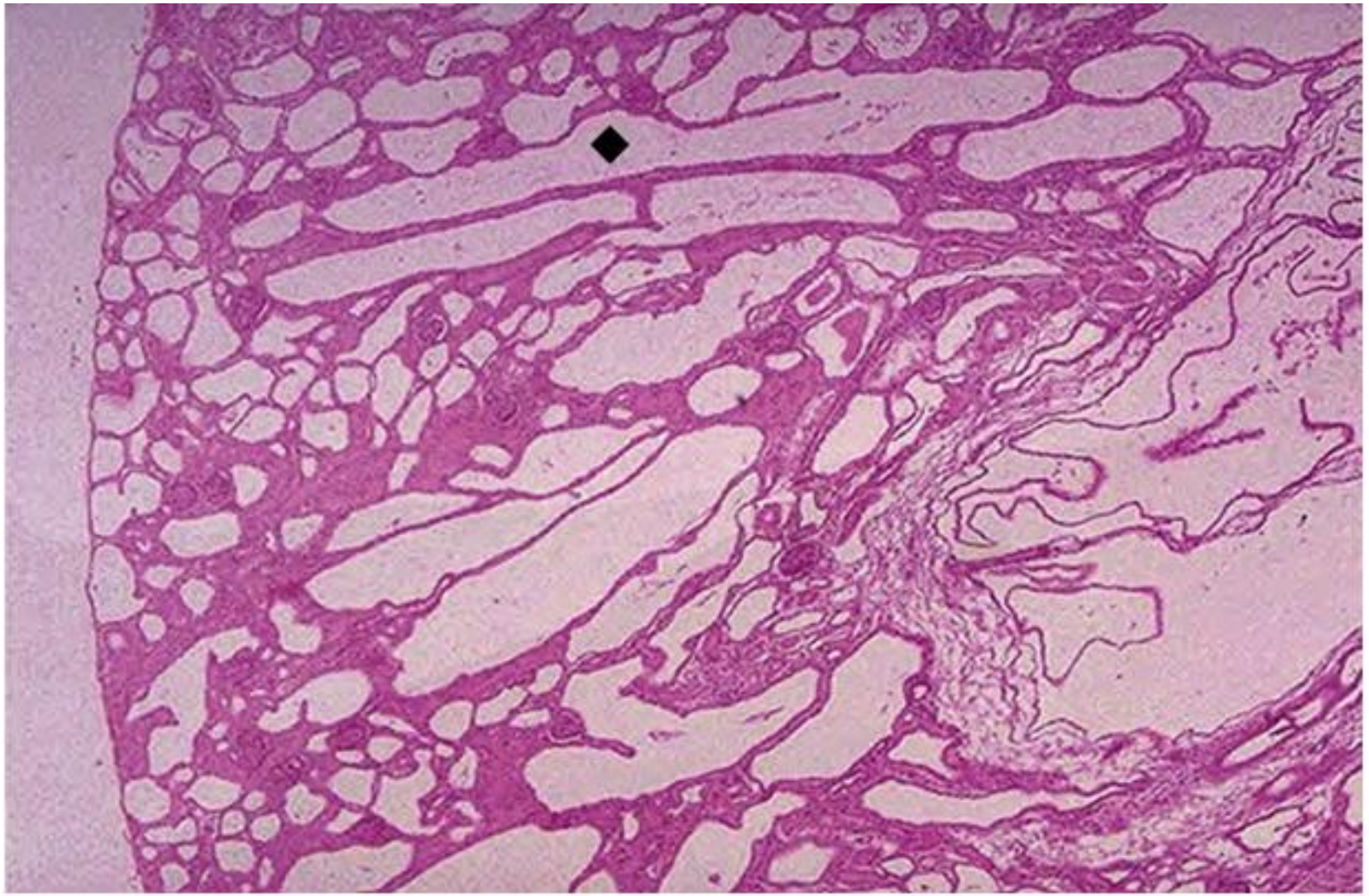


- A bilaterally and symmetrically enlarged kidney with ARPKD is shown here on cut surface.
- The **numerous glistening cysts** are small, about 1 to 2 mm in diameter, but uniformly distributed throughout the parenchyma to produce a spongy appearance, and there is no distinguishable cortex or medulla.



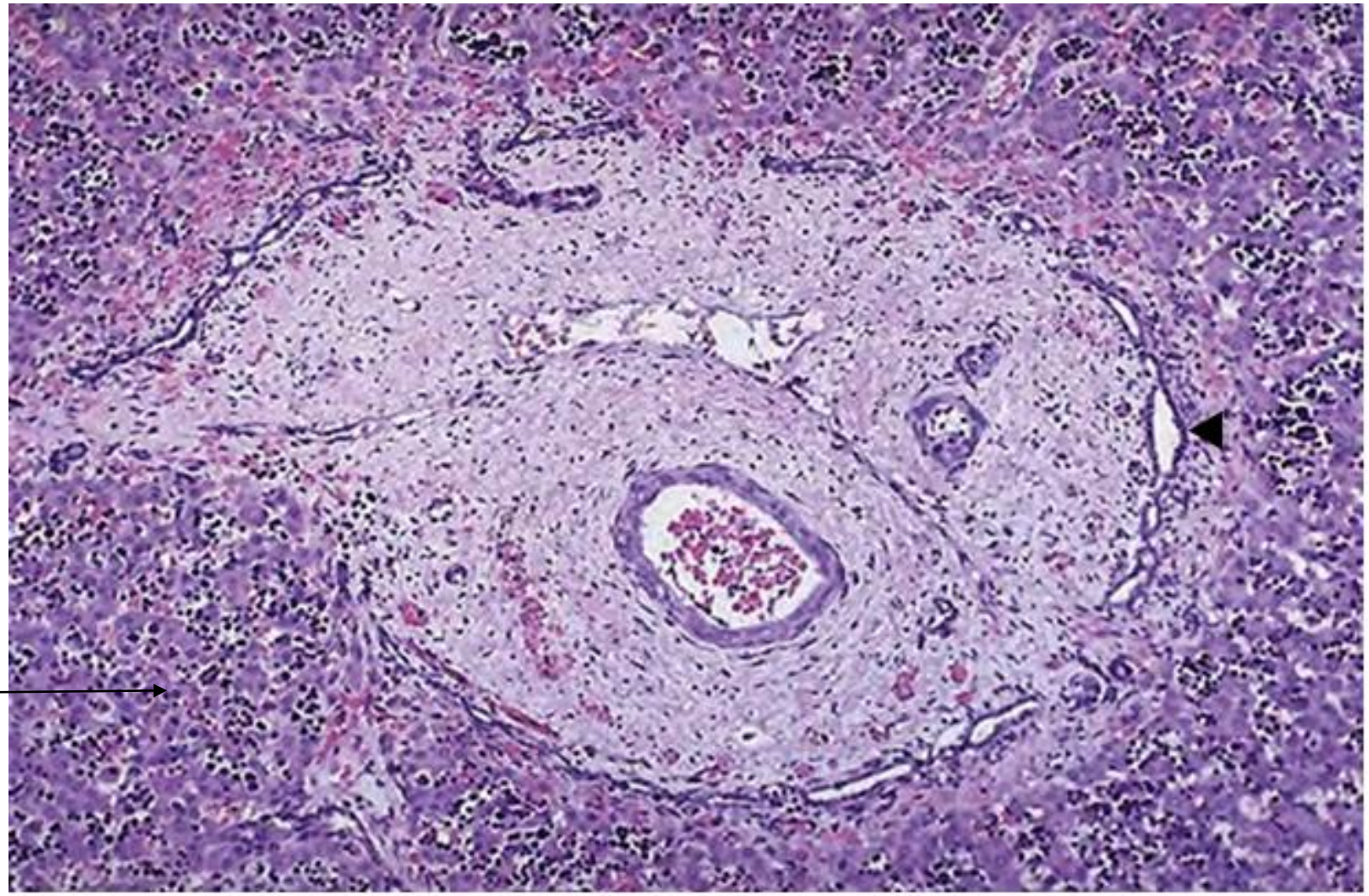
AUTOSOMAL-RECESSIVE POLYCYSTIC KIDNEY DISEASE, MICROSCOPIC

- Here are many cysts involving the collecting ducts, often elongated and radially arranged or saccular.
- A few scattered glomeruli are within the residual renal cortex. The cysts have a uniform lining of cuboidal cells.



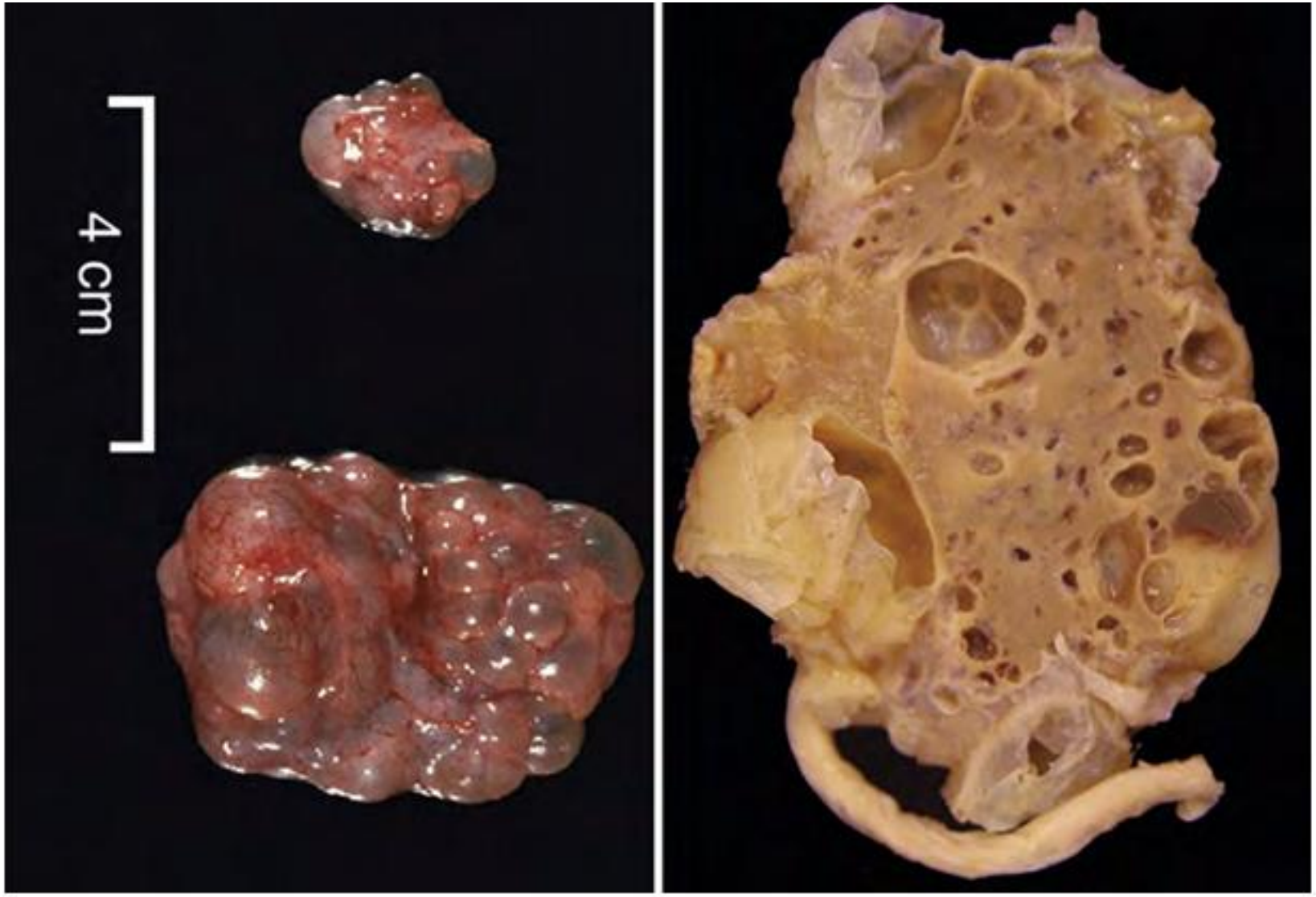
AUTOSOMAL RECESSIVE POLYCYSTIC KIDNEY DISEASE (ARPKD), LIVER, MICROSCOPIC

- Characteristic of ARPKD is the appearance in the **liver** shown here of congenital hepatic fibrosis, seen as expanded portal regions with collagenous fibrosis (◄).
- The adjacent normal hepatic parenchyma contains islands of extramedullary hematopoiesis.



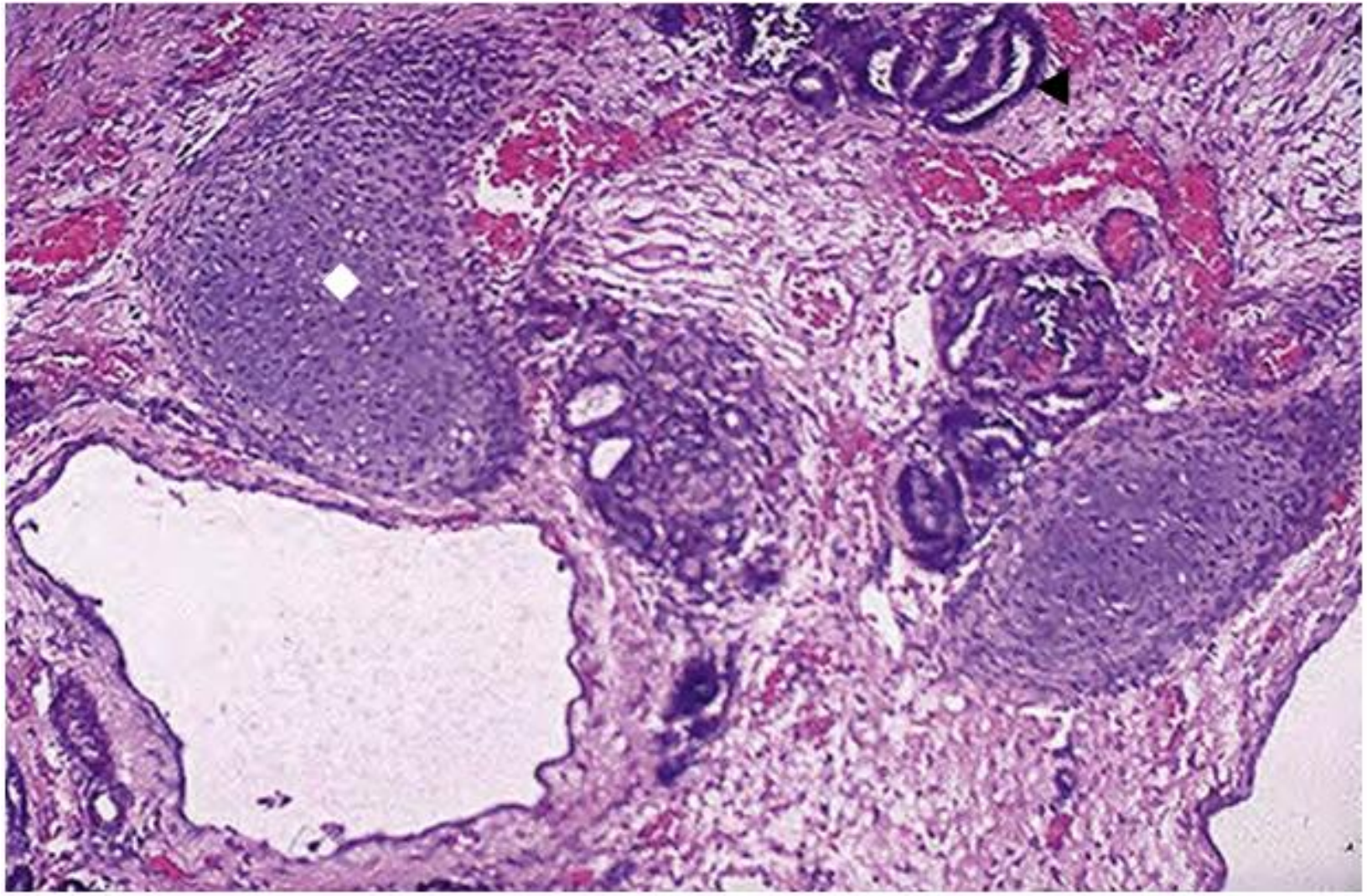
MULTICYSTIC RENAL DYSPLASIA, GROSS

- The fetal kidneys (left panel) are composed of cysts and are asymmetrical in size. The cut surface (right panel) of one kidney shows irregularly sized cysts separated by dense stroma.
- Multi-cystic renal dysplasia is more common than ARPKD, has larger cysts, and occurs **sporadically** without a defined inheritance pattern.



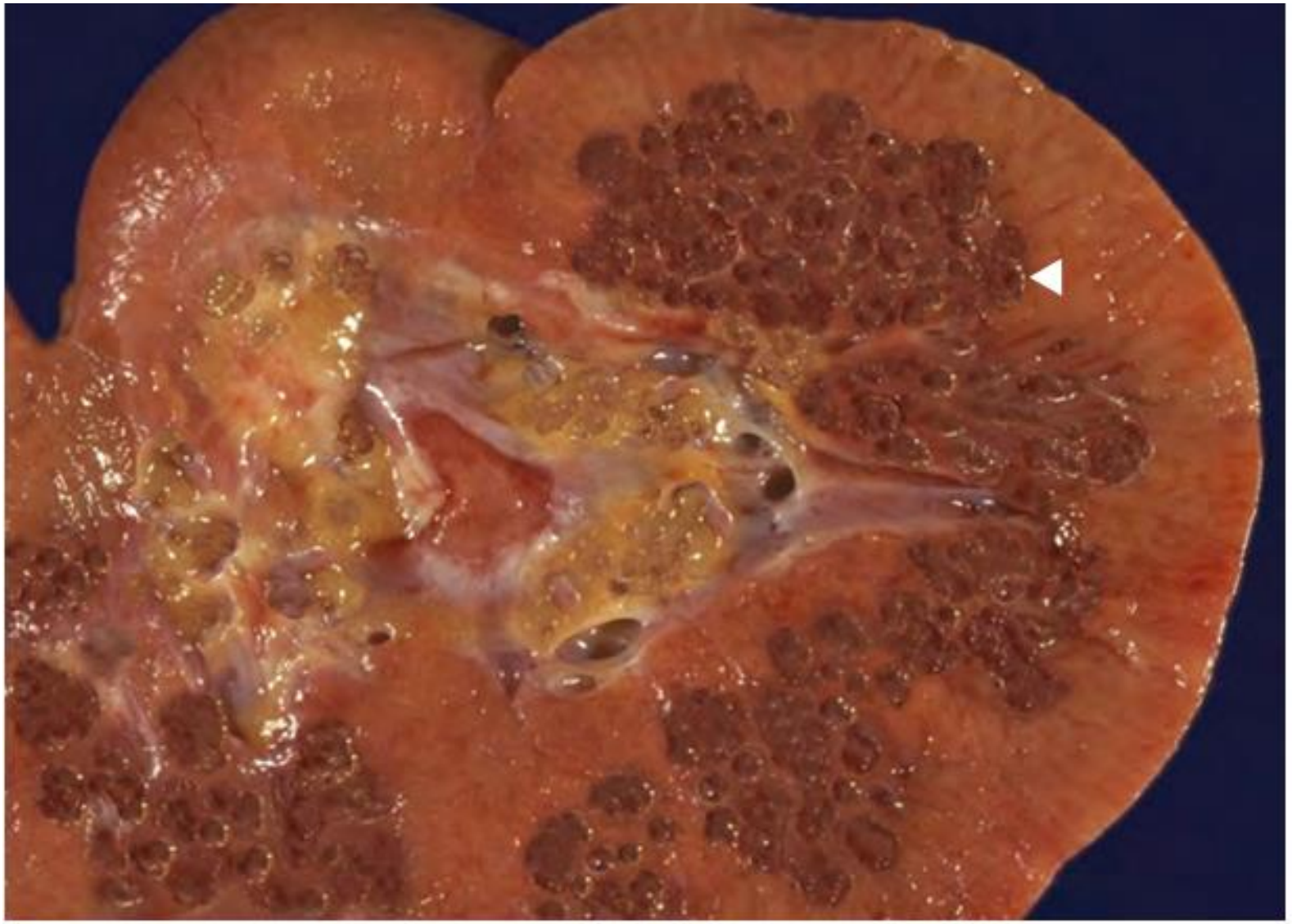
MULTICYSTIC RENAL DYSPLASIA, MICROSCOPIC

- Dysplasia in pediatric terms implies disordered organ development (not an epithelial precursor to neoplasia).
- The dysplasia is evident here in the renal parenchyma composed of **irregular vascular channels, islands of cartilage, undifferentiated mesenchyme, and scattered immature collecting ductules** (◄).



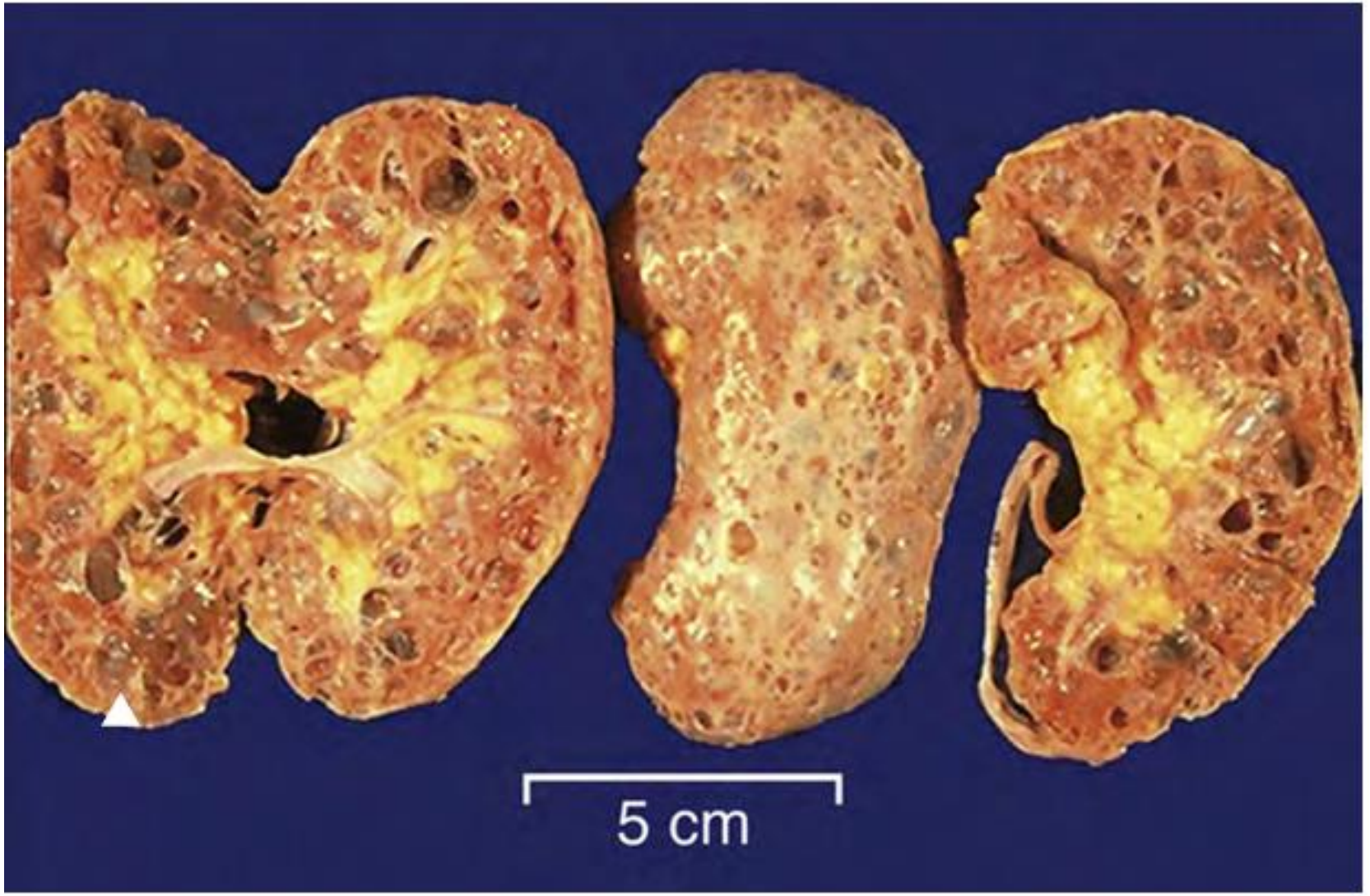
MEDULLARY SPONGE KIDNEY (MSK), GROSS

- Note the 1- to 7-mm cysts (◄) involving the medulla of this kidney that resulted from nonprogressive dilation of the distal portion of the collecting ducts and tubules in the renal papillae.
- Most cases are bilateral and are discovered incidentally.
- Renal function is usually normal because **the cortex is not involved**.

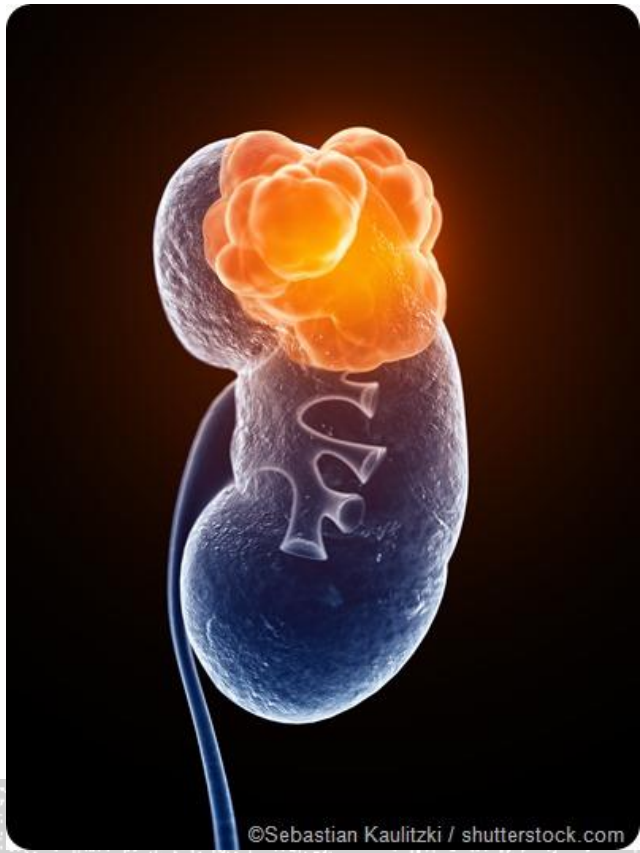


ACQUIRED RENAL CYSTIC DISEASE, GROSS

- Patients with chronic renal failure (CRF) who undergo **hemodialysis** for many years may develop multiple cortical cysts.



RENAL NEOPLASMS

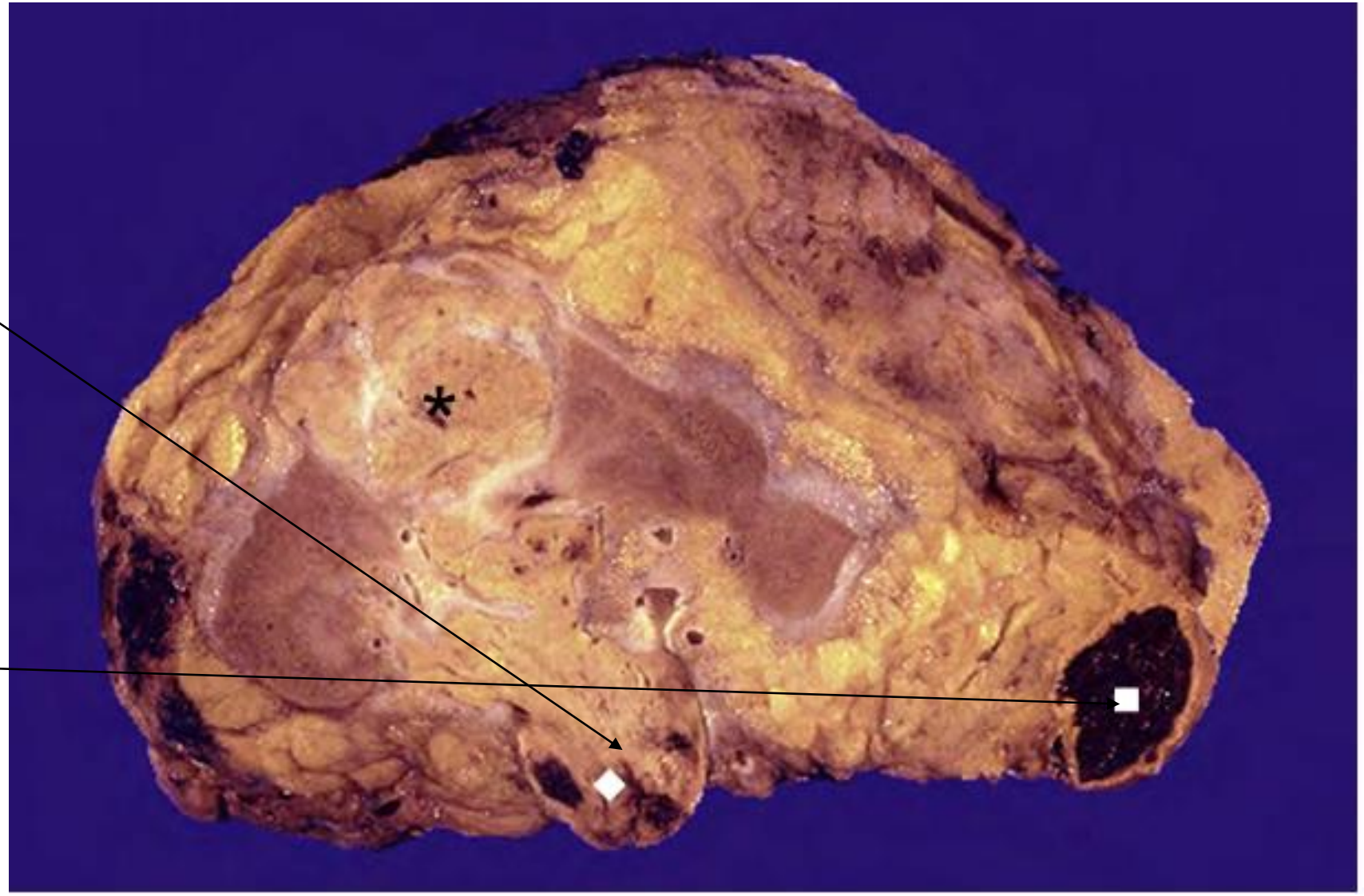


TRIGGER CASE

- A 60-year-old man presents to the clinic with cola-colored urine and flank pain. He is a **chronic smoker**. He lost 10 pounds over the past month. On physical examination, you feel a large mass in the left kidney. Lab tests show secondary polycythemia. CT scan shows solid renal mass with possible metastasis to regional lymph nodes.
- **What is the Diagnosis?**

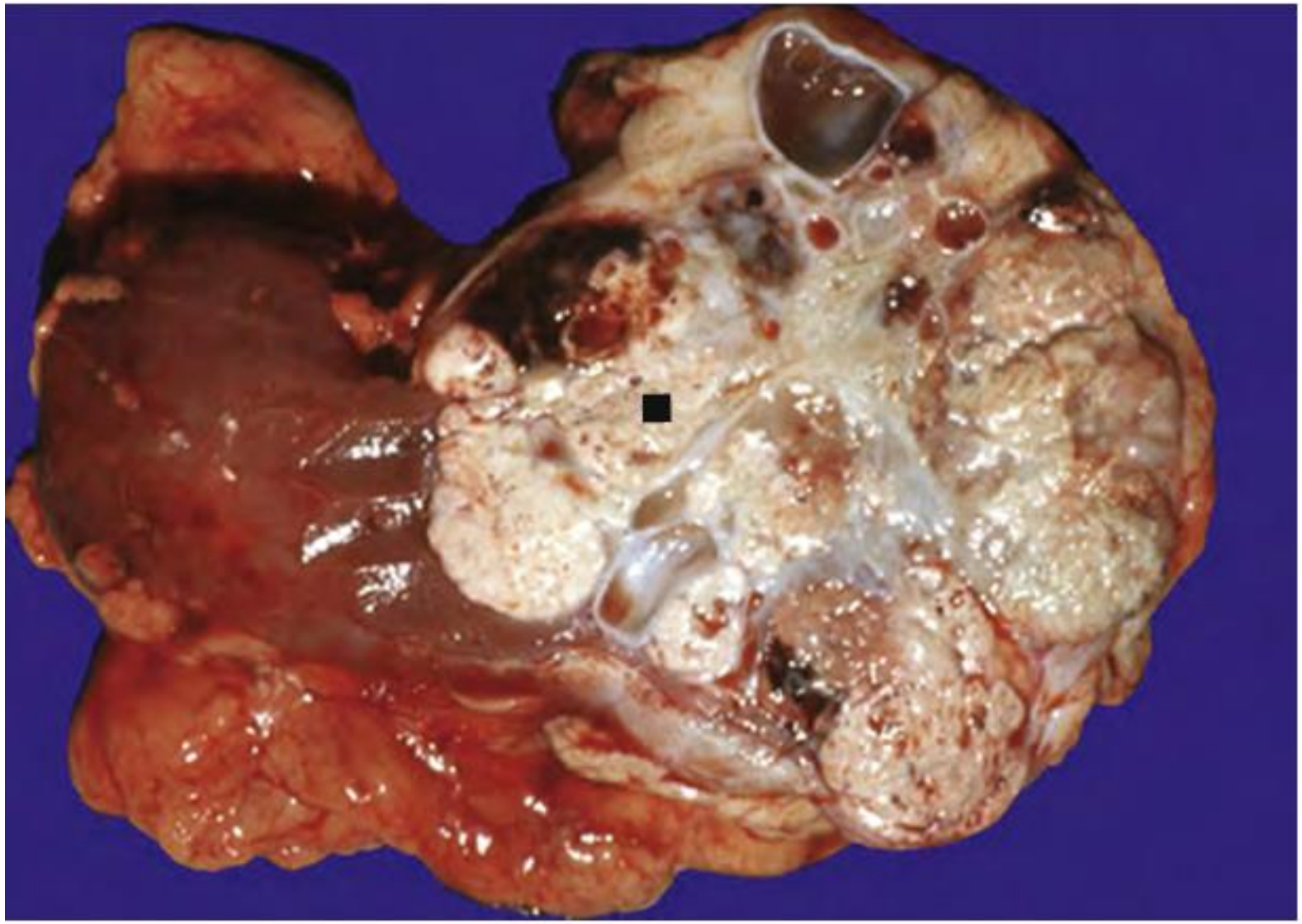
RENAL CELL CARCINOMA, GROSS

- These carcinomas have a tendency to **invade into the renal vein**, as shown in the cut surface.
- Here, the tumor (*) extended up the vena cava and occluded the adrenal vein, leading to hemorrhagic adrenal infarction.

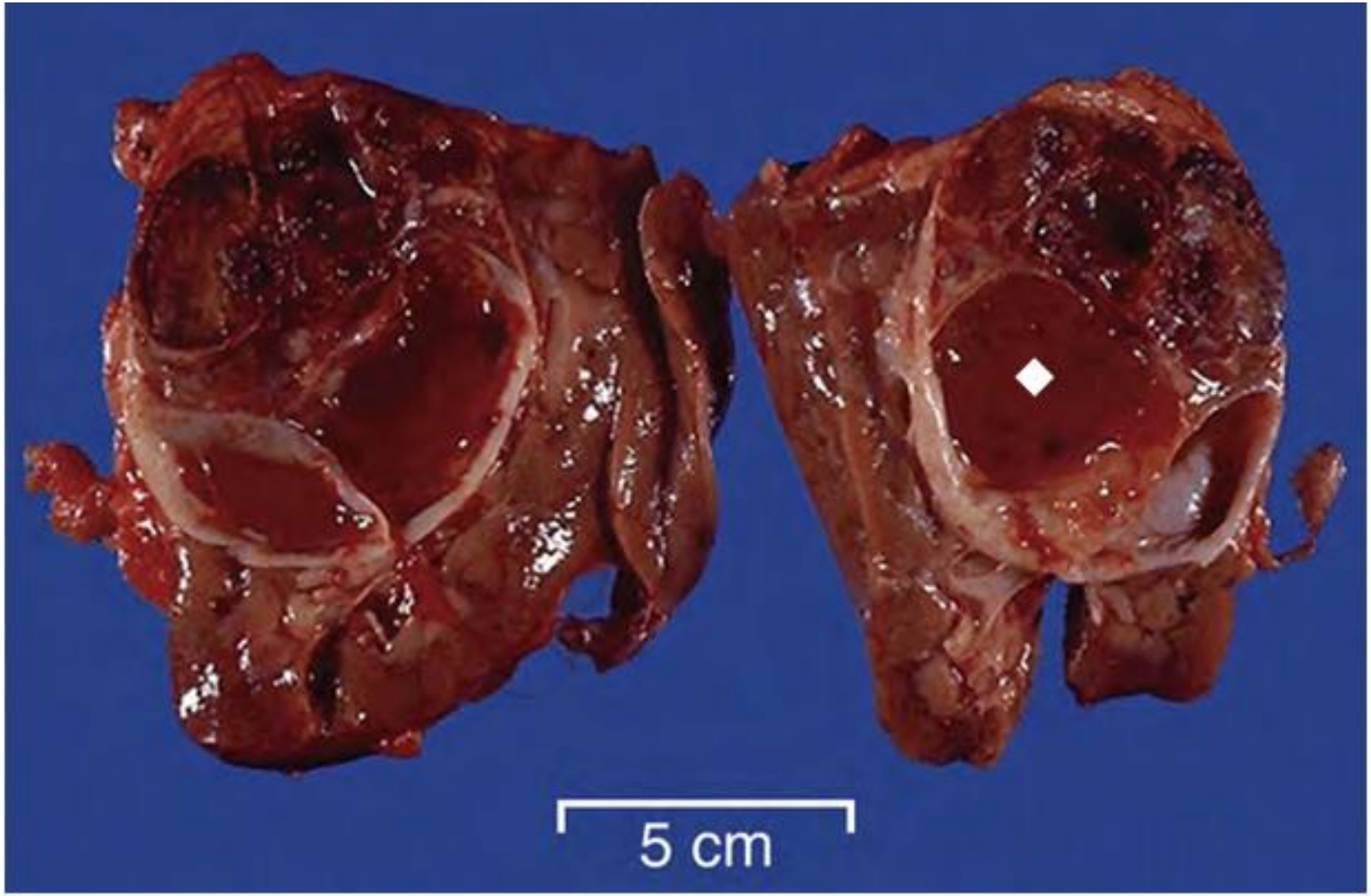


RENAL CELL CARCINOMA, GROSS

- This malignancy is arising in the lower pole of the kidney. It is large but still fairly circumscribed.
- This cut surface has a variegated appearance with white, yellowish, brown, and hemorrhagic red and cystic areas.

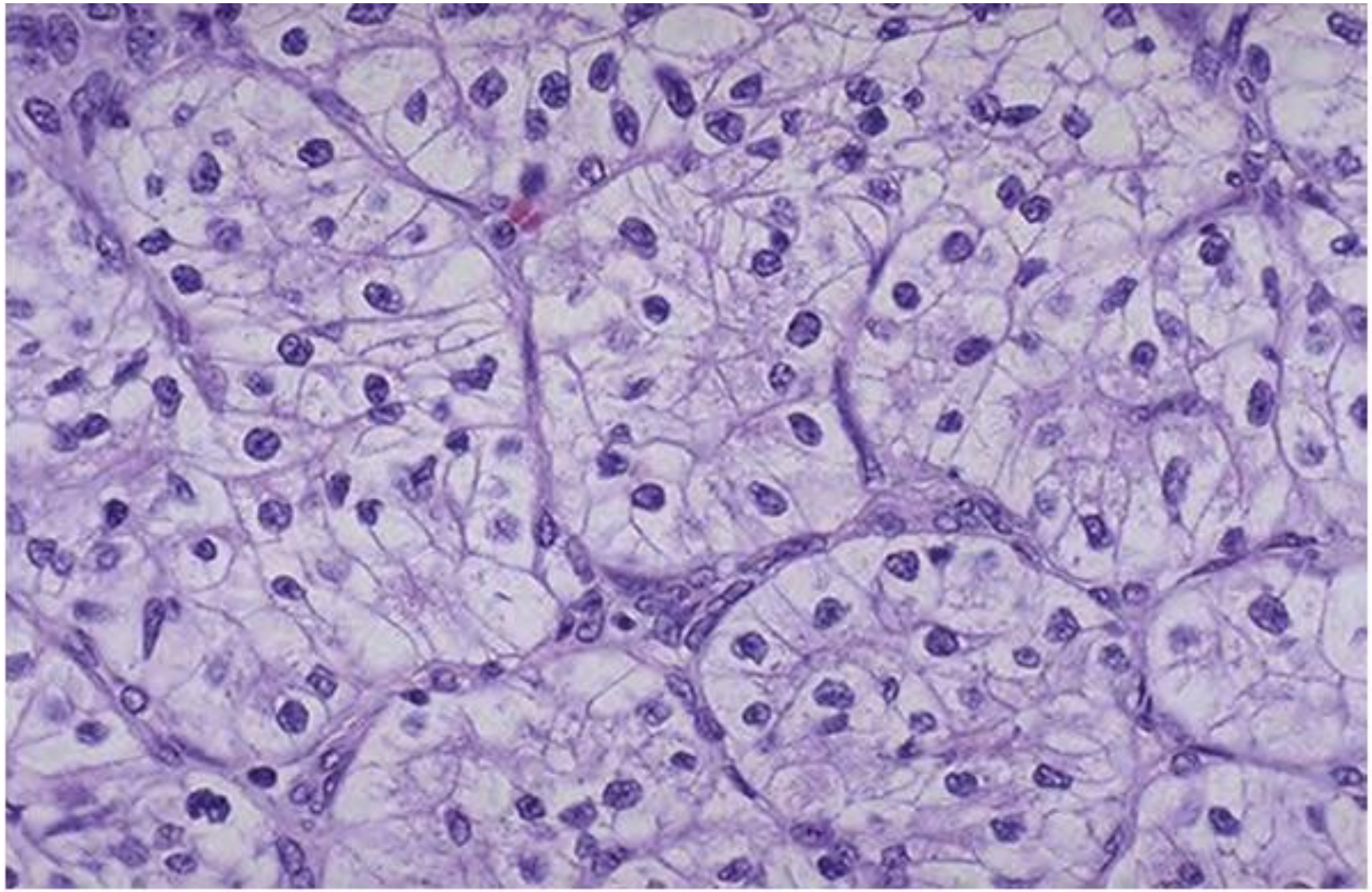


- This renal cell carcinoma on sectioning is mainly cystic with extensive hemorrhage.
- Large simple renal cysts may mimic this appearance but have a smooth, regular border.
- Renal cell carcinomas may also develop in acquired cystic disease with hemodialysis.



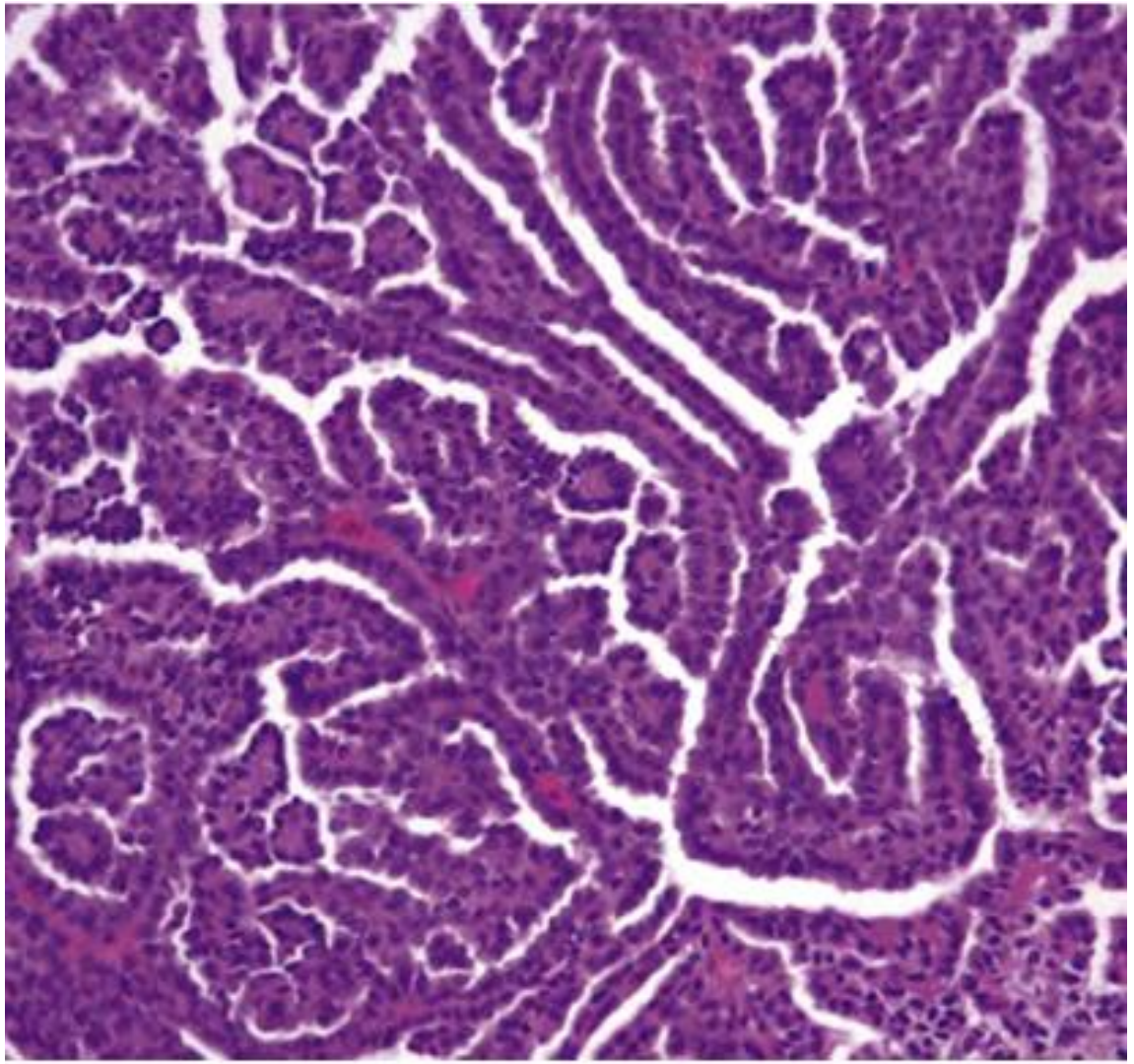
CLEAR CELL RENAL CELL CARCINOMA, MICROSCOPIC

- The neoplastic cells have abundant clear cytoplasm and are arranged in nests with intervening delicate vessels.
- It is the most common type.
- Associated with **VHL** disease and smoking.



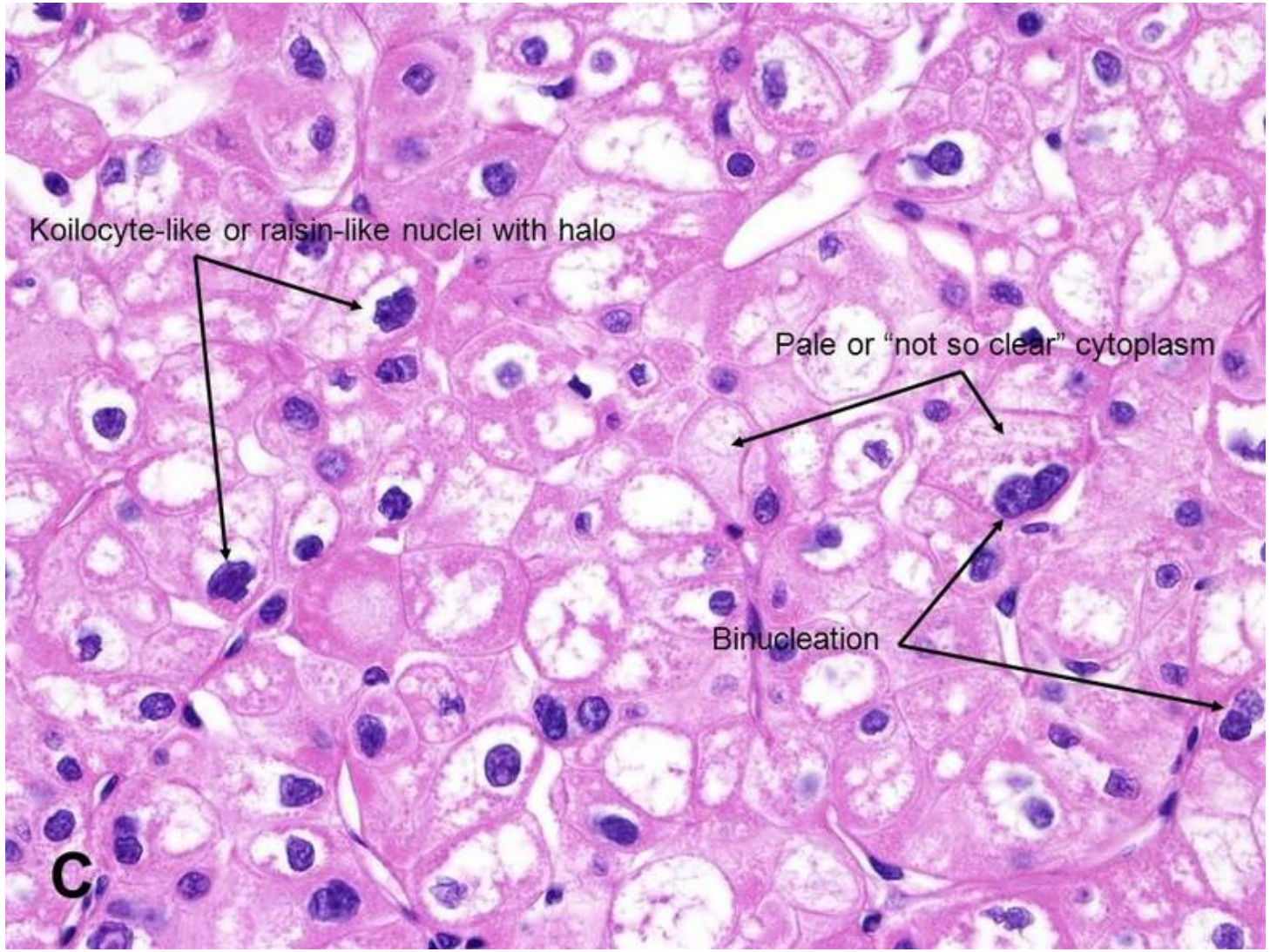
PAPILLARY RENAL CELL CARCINOMA

- The neoplastic cells have a papillary pattern as shown.
- It have MET proto-oncogene mutations and autosomal dominant inheritance.



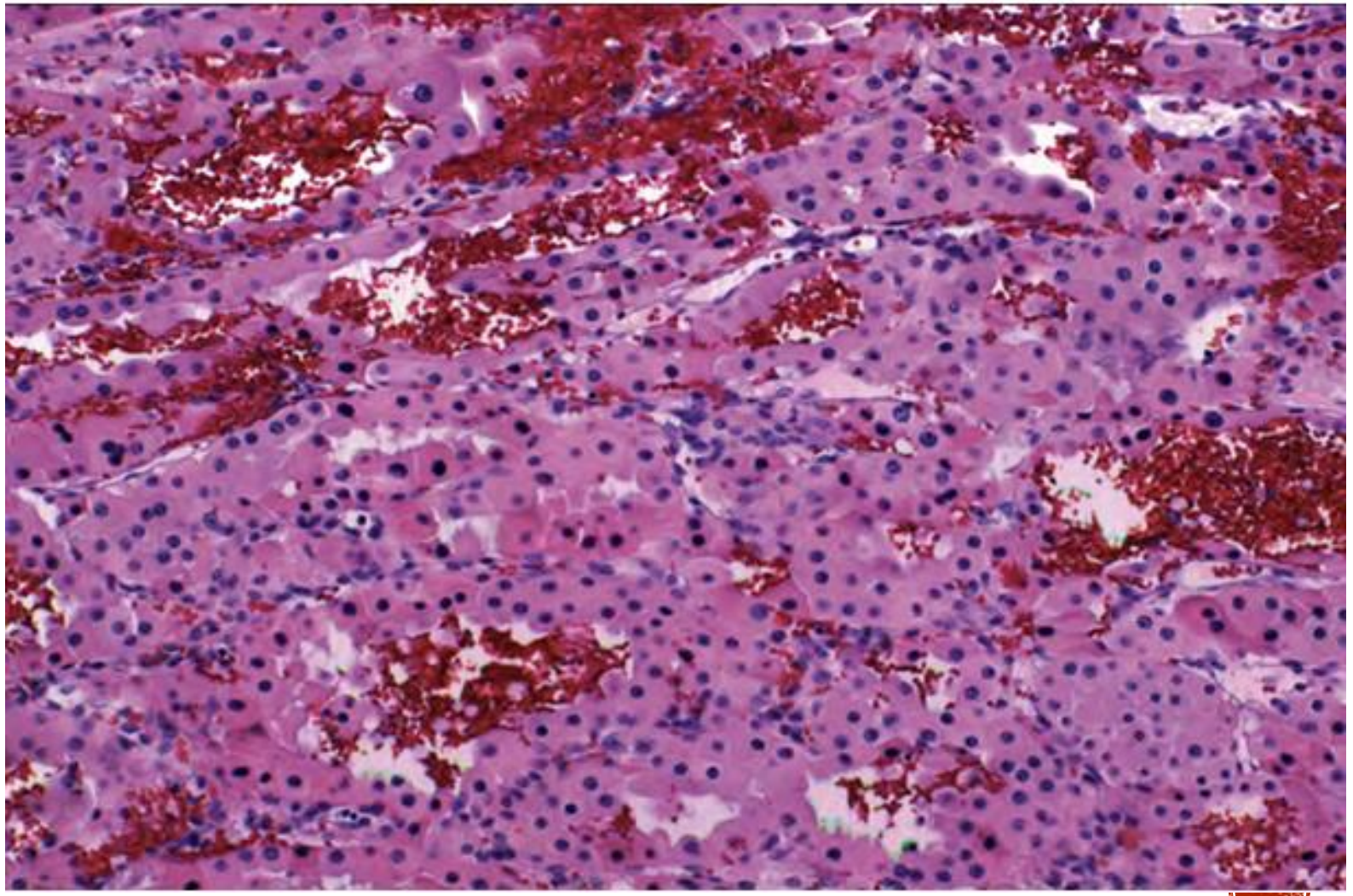
CHROMOPHOBE RENAL CELL CARCINOMA

- The neoplastic cells have abundant pink acidophilic cytoplasm with prominent cell borders.
- It resembles the **benign** renal neoplasm known as oncocytoma.



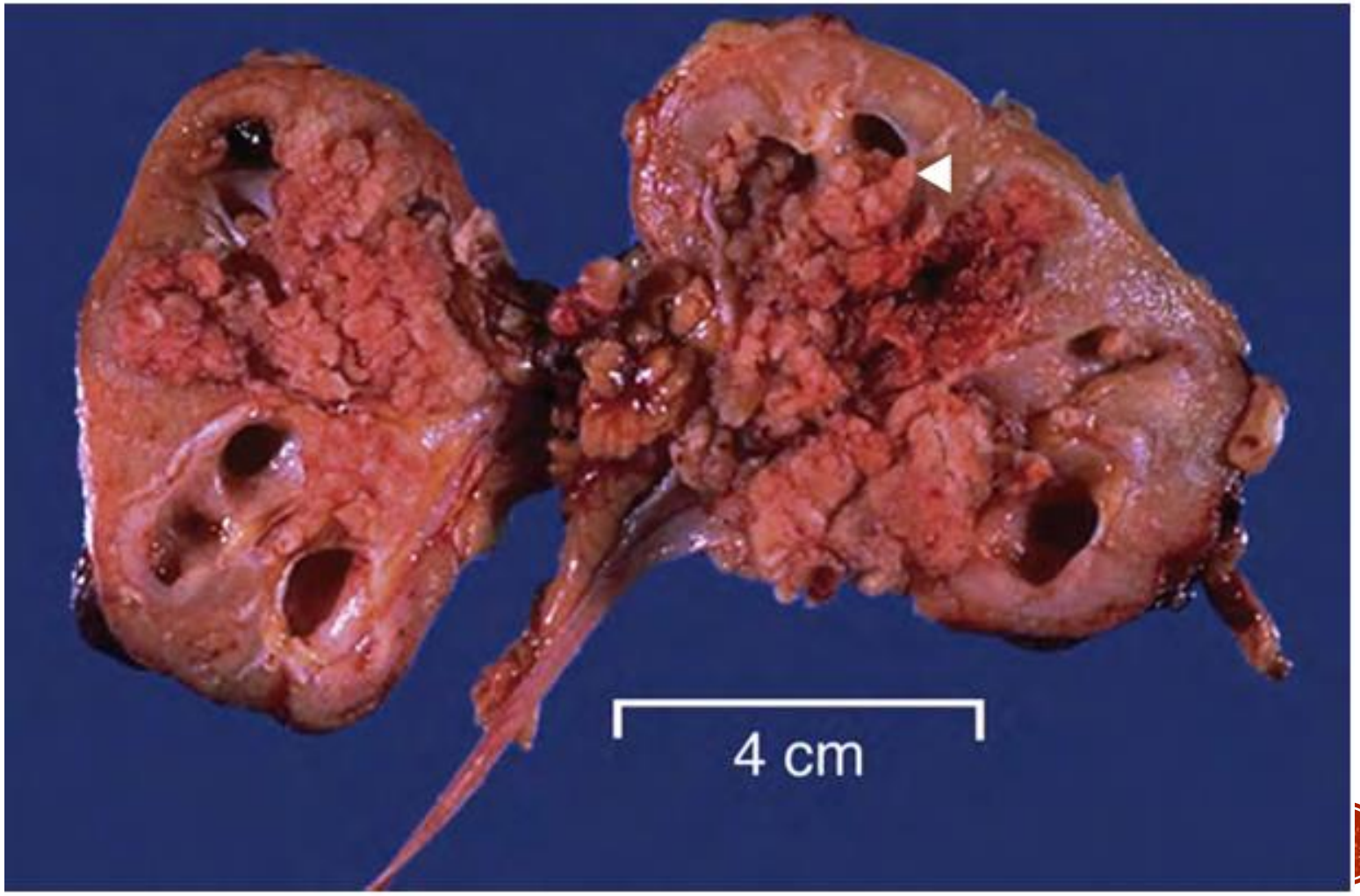
ONCOCYTOMA, MICROSCOPIC

- An oncocytoma grossly resembles a renal cell carcinoma but tends to have a **more uniform tan to brown color**.
- It is thought to arise from intercalated cells of the collecting duct.
- As shown here, the neoplastic cells are quite uniform in size, with prominent pink cytoplasm.

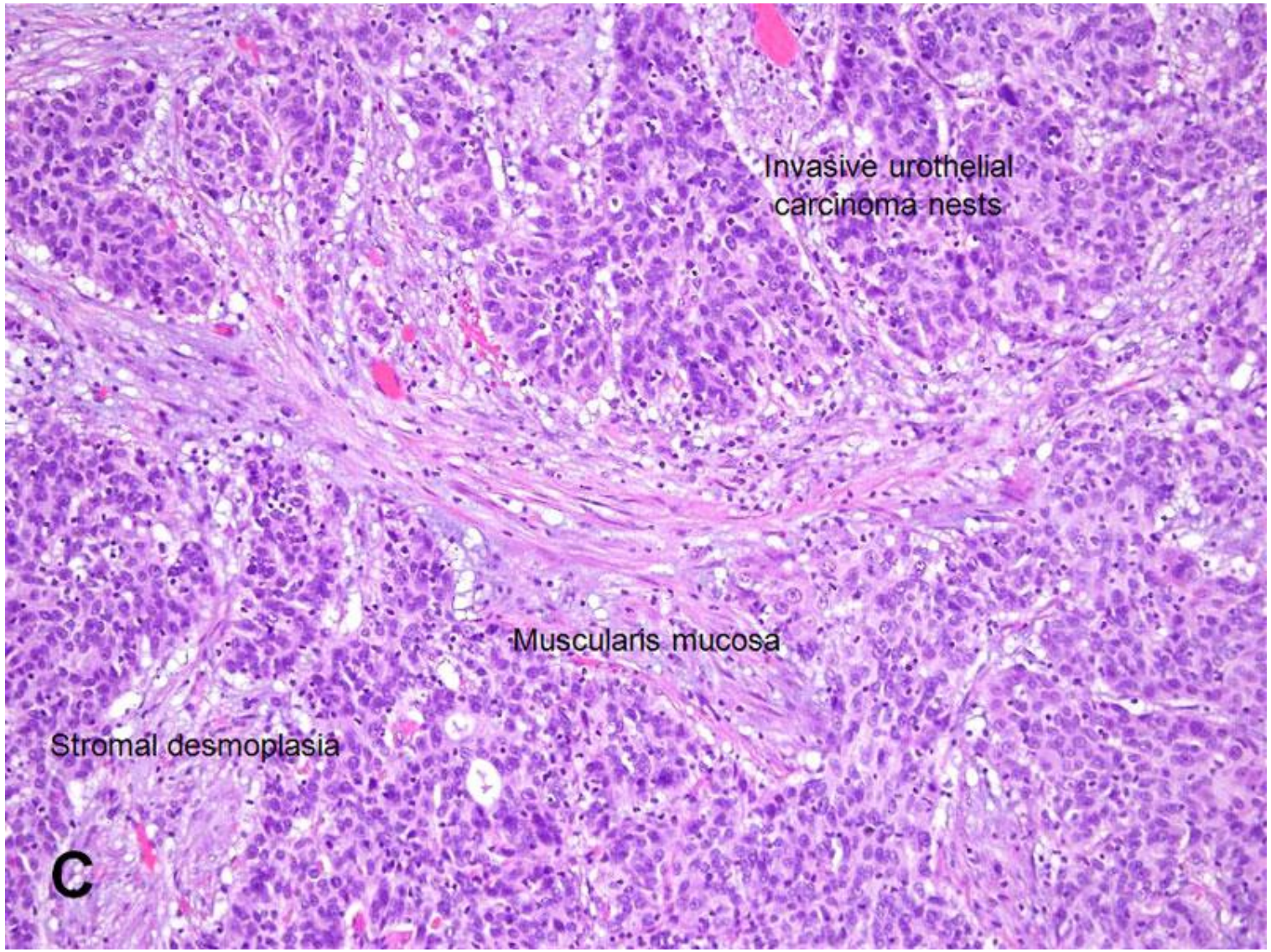


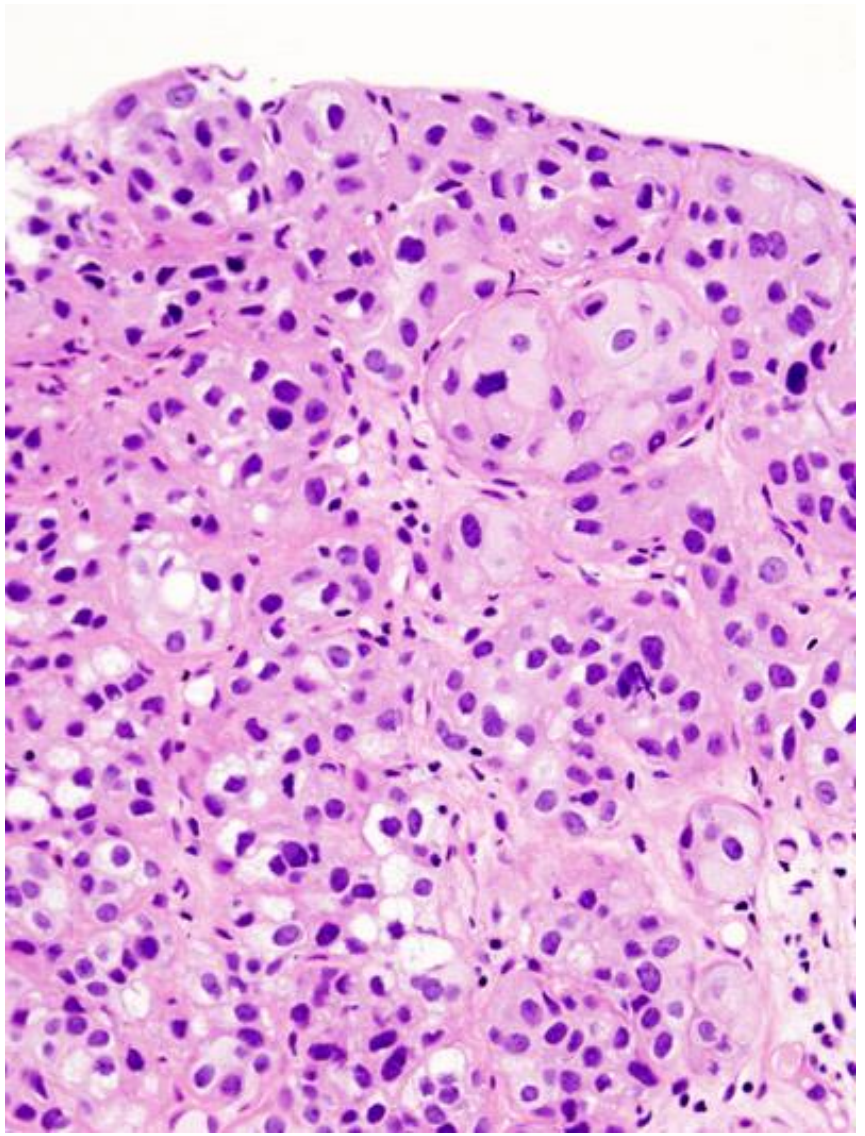
UROTHELIAL CARCINOMA (TRANSITIONAL CELL CARCINOMA), GROSS

- This sagittally sectioned kidney has a **multifocal** neoplasm arising in the urothelium of the calyceal system and invading into the renal parenchyma.



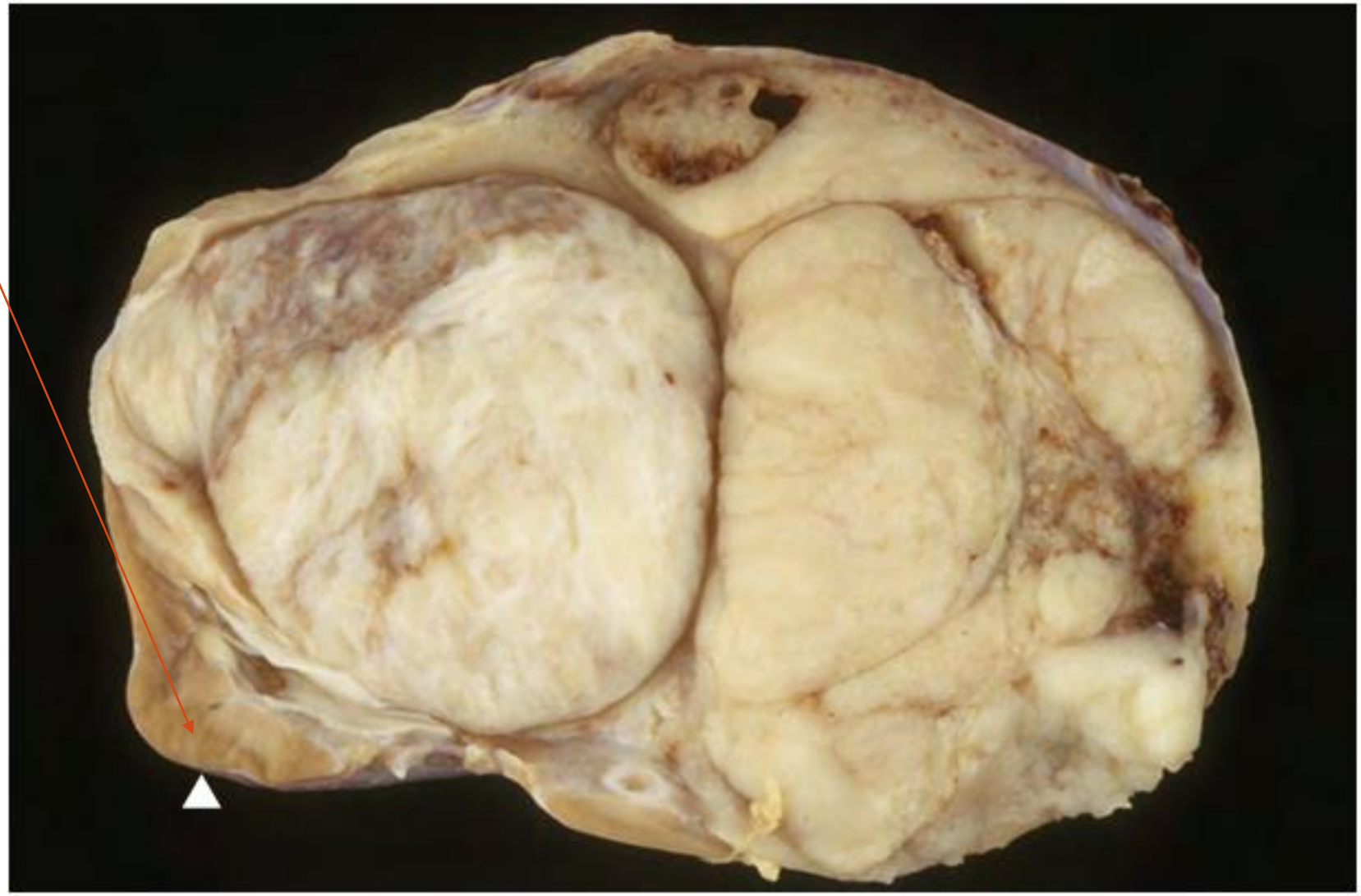
UROTHELIAL CARCINOMA, MICROSCOPIC





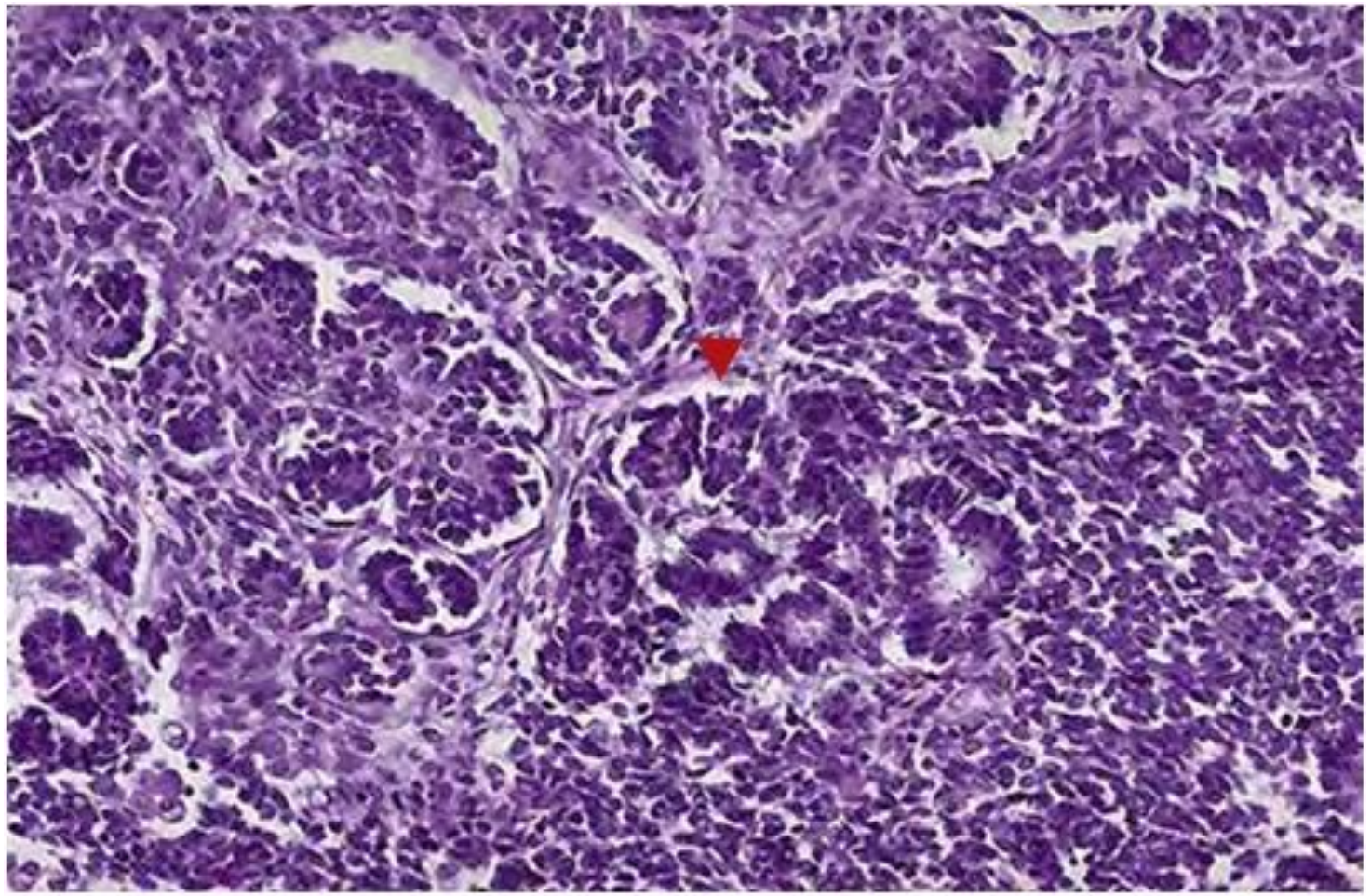
WILMS TUMOR, GROSS

- This large mass with a lobulated cut surface fills and expands the kidney of a child, with a rim of residual cortex visible at the lower left.
- The median age at diagnosis is 3 years.
- The commonest clinical presentation abdominal enlargement and pain from mass effect.
- Can be associated with congenital malformations as: WAGR syndrome, Beckwith-Wiedemann syndrome, and Denys-Drash syndrome.



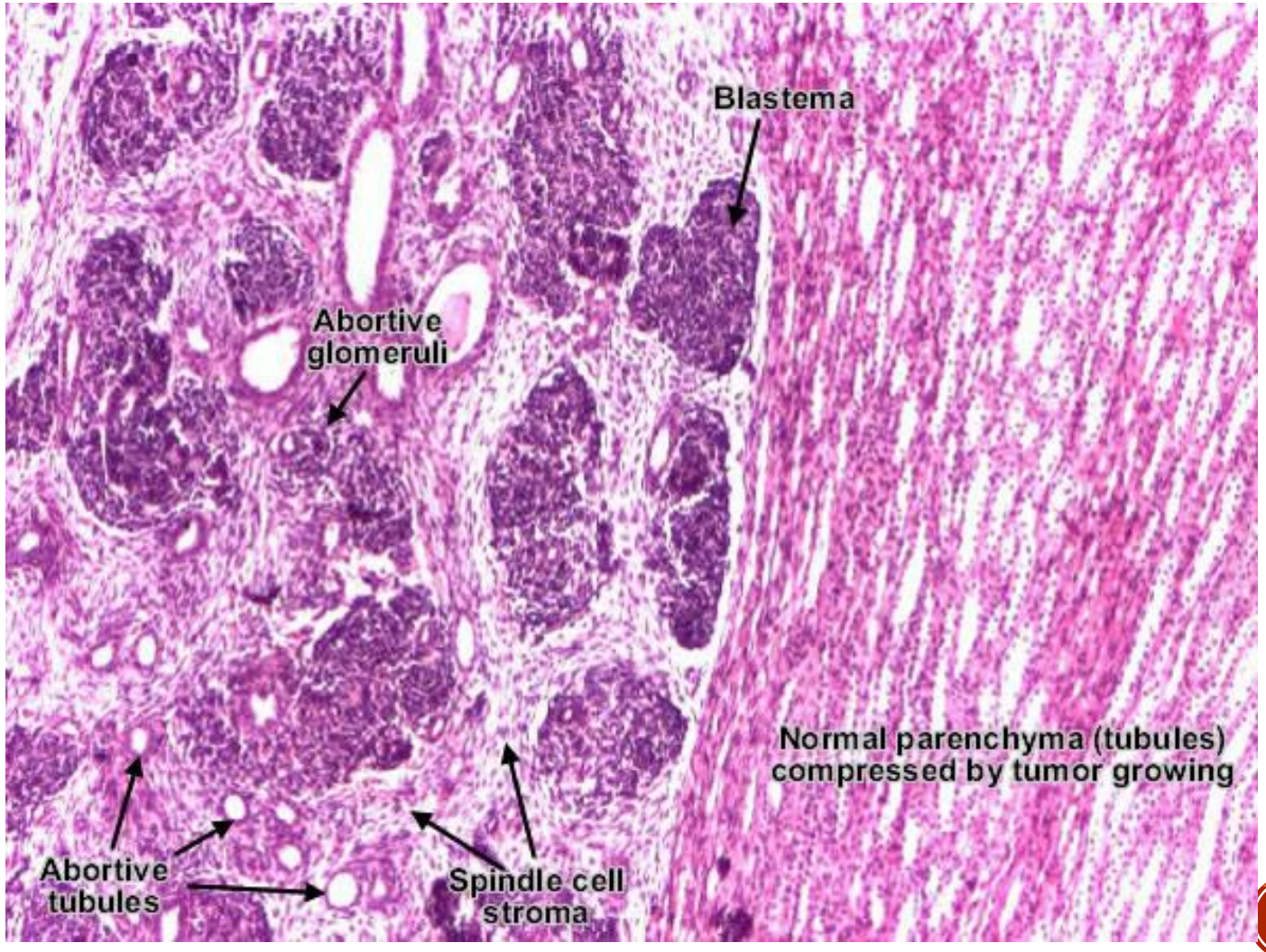
WILMS TUMOR, MICROSCOPIC

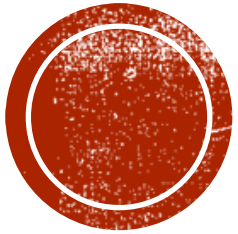
- Wilms tumor microscopically **resembles the primitive nephrogenic zone** of the developing fetal kidney, with primitive glomeruloid structures and a cellular stroma.



WILMS TUMOR MICROSCOPIC FEATURES

1. Undifferentiated blastemal component.
2. Abortive glomeruli and tubules.
3. Spindle cell stroma.





THANK YOU ☺