RENAL TUMORS

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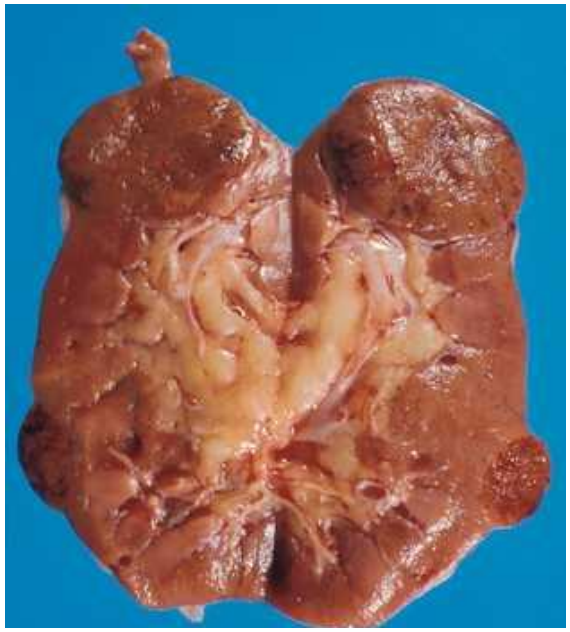
BENIGN

- cortical (papillary) adenoma
- fibroma
- angiomyolipoma
- oncocytoma

MALIGNANT

- renal cell carcioma (RCC)
- Wilm’s tumor

Cortical (papillary) adenoma

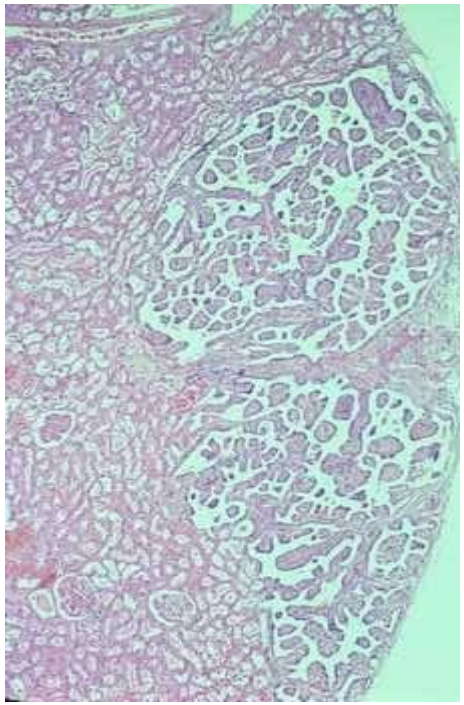


Cortical adenoma in the upper pole of the kidney. Note its well circumscription.

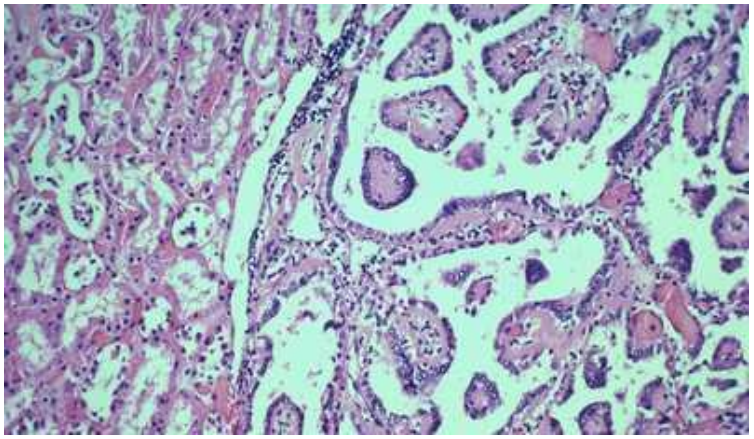
A smaller adenoma is also present in the lower pole

- small well-defined tumors,
- asymptomatic
- are found commonly at autopsy in people over 40 years, the vast majority of whom are males.
- They form pale yellow to gray subcapsular, cortical masses usually less than 2 cm in diameter.

Cortical (papillary) adenoma



Cortical adenoma showing branching papillary fronds projecting into cystic spaces.



- Adenomas less than 3 cm in diameter rarely metastasize
- larger tumors metastasize at a frequency that appears to be a linear function of their diameter.
- There are no histologic criteria to distinguish a small carcinoma from an adenoma.
- Currently, the separation is based predominantly on the size of the lesion: tumors less than 3 cm are called adenoma and larger ones are called carcinoma.

Renal oncocytoma

- Benign, unifocal renal tumor that averages 5-7 cm in diameter
- the presence of malignant elements has been reported
- more common in women
- unknown etiology
- found incidentally
- the tumors are well circumscribed and the cut surface has a uniform mahogany-brown color without foci of hemorrhage or necrosis
- large oncocytomas commonly show a prominent stellate scar, which gives them a distinct gross appearance

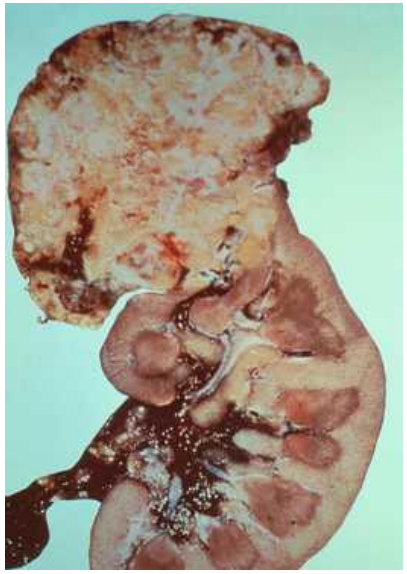
Angiomyolipoma

- benign lesions characterized by the presence of:

  mature adipose tissue, **smooth muscle** and **thick-walled blood vess**els

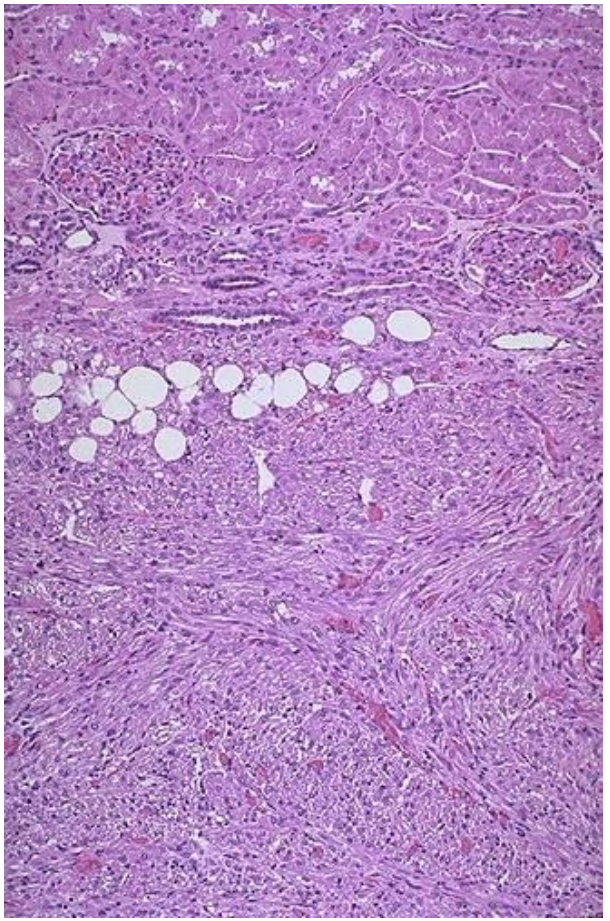
- the true nature of these lesions is uncertain, but they are usually regarded as hamartomas
- about 33% of patients with angiomyolipoma have tuberous sclerosis - when renal angiomyolipomas are bilateral, patients have an 80 to 90 percent chance of having tuberous sclerosis.
- more than 80% of tuberous sclerosis patients have angiomyolipoma
- typically, the lesions are asymptomatic but may present with flank pain, mass, hematuria
- grossly, the tumors are typically multifocal, bilateral and small in patients with tuberous sclerosis, and single, unilateral and large in those without. They are well circumscribed but not encapsulated and have varied appearances depending on the proportions of the constituent elements. In 25% of cases the tumors may be confused with malignancy because of extension outside the renal capsule.

Angiomyolipoma



the irregular margins and capsular penetration wrongly suggest malignancy.

low power microscopic appearance:
the tumor has a strip of adipose tissue (the "lipoma" part) that then blends in with interlacing bundles of smooth muscle (the "myo" component) in which are scattered vascular spaces (the "angio" component).



Renal cell carcinoma (RCC)

- 85% of all malignant tumors arising in kidneys
- most common: 60-70 years
- risk factors:
  - smoking
  - obesity
  - HT
  - asbestos, petroleum products, heavy metals
  - CKD and acquired cystic disease
  - inborn predisposition (multifocal and bilateral tumors):
    - hereditary clear cell Ca
    - hereditary papillary Ca
    - von Hippel-Lindau syndrome

Renal cell carcinoma (RCC)

SYMPTOMS:

•the classic triad of back pain, abdominal mass and hematuria is actually seen in only about 10% of patients and indicates advanced disease

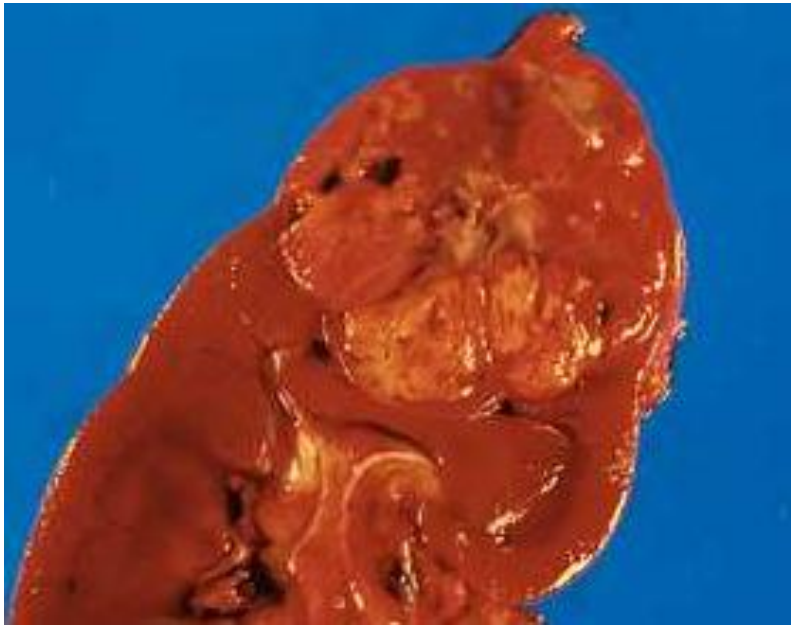
•hematuria is the single most common symptom and leads to secondary anemia.

- about a third of patients present with distant metastases (lungs and bones). Rarely, patients may have a solitary metastasis with long-term survival or even regression of the distant disease after resection of the primary tumor.

•**Paraneoplastic syndromes**: RCC is frequently associated with various systemic symptoms from organs not directly involved with tumor:

– erythrocytosis or polycythemia (from erythropoietin production),
– hypercalcemia (due to secretion of parathormone-like substance),
– hypertension
– feminization or masculinization
– Cushing's syndrome
– leukemoid reactions

Renal cell carcinoma (RCC)



Renal cell carcinoma in the upper pole of a bisected kidney.

Note its well circumscription and yellowish color

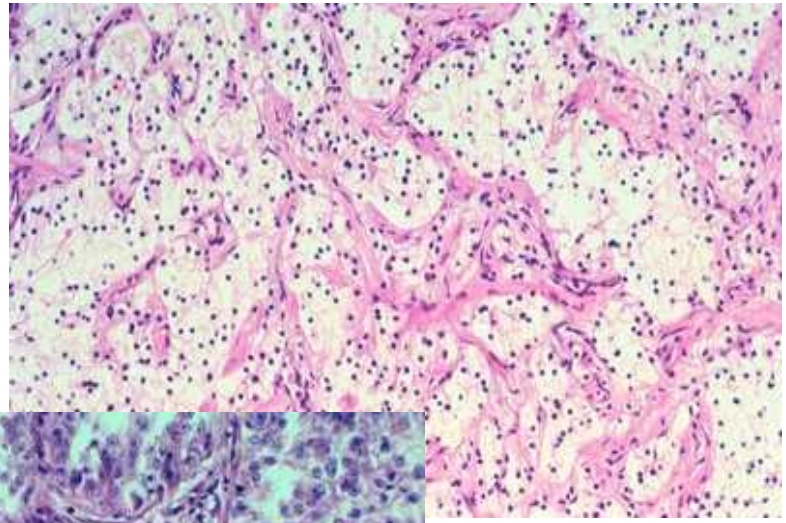
Renal cell carcinoma (RCC)

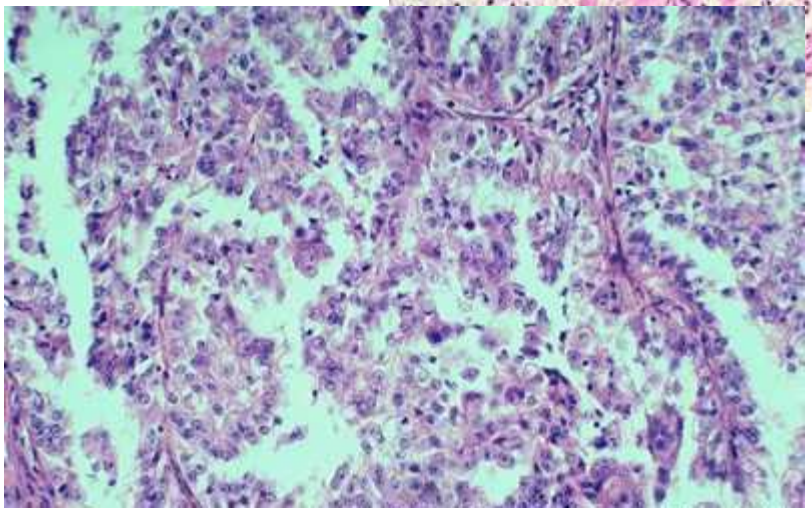
Gross morphology:

- yellowish tumor with hemorrhagic, necrotic cystic areas
- may grow into the renal vein

Microscopically:

- clear cell Ca (70-80%)
- papillary Ca (10-15%)
- chromophobe renal Ca (5%)
- sarcomatoid Ca





Nephroblastoma (Wilms tumor)

- **the most common renal malignancy in children and the fourth most common childhood cancer**
- almost all cases are diagnosed before 10 years of age, and two-thirds before 5 years of age
- peak incidence between 2 and 5 years of age
- 5-10% of WT involve both kidneys, 12% have multifocal loci within a single kidney
- WT may occur as a part of a multiple malformation syndrome including
  - WAGR,
  - Denys-Drash,
  - Beckwith-Wiedemann syndromes
- WT is associated with mutations of a number of genes including WT1, p53, FWT1, and FWT2 genes, and mutations at the 11p15.5 loci.
- The diagnosis of WT is made by histologic confirmation, either at the time of surgical excision or by biopsy.

- WAGR - **W**T, **A**niridia, **G**enitourinary malformations in affected 46XY males, and mental **R**etardation.

This is associated with deletion of the Wilm's tumor-associated gene, WT1, located on the short arm of chromosome 11 (11p13).

- Denys-Drash syndrome - WT, nephropathy and ambiguous genitalia in affected males.

DDS is due to mutation of both alleles of the WT1 gene that renders it inactive.

- Beckwith-Wiedman syndrome - WT, organomegaly and body overgrowth (either as gigantism or hemihypertrophy).

This is associated with loss of the maternal allele of a locus on 11p15 called WT2, germline duplication of paternal WT2 allele or inheritance of two paternal WT2 alleles and none from the mother.

Nephroblastoma (Wilm's Tumor)

Clinical features

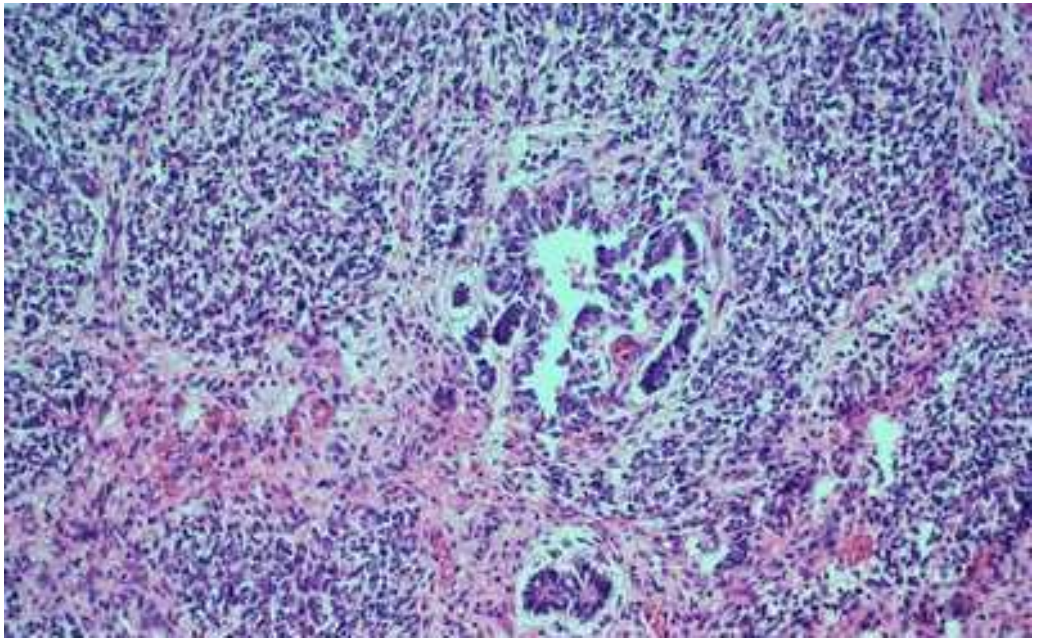
- the most common presentation is detection of an abdominal mass or swelling without other signs or symptoms
- symptoms or signs that may be present include abdominal pain (30%), hematuria (12-25%), and hypertension (25%).

PROGNOSIS:

good outcome with early diagnosis (currently 90% long term survival)

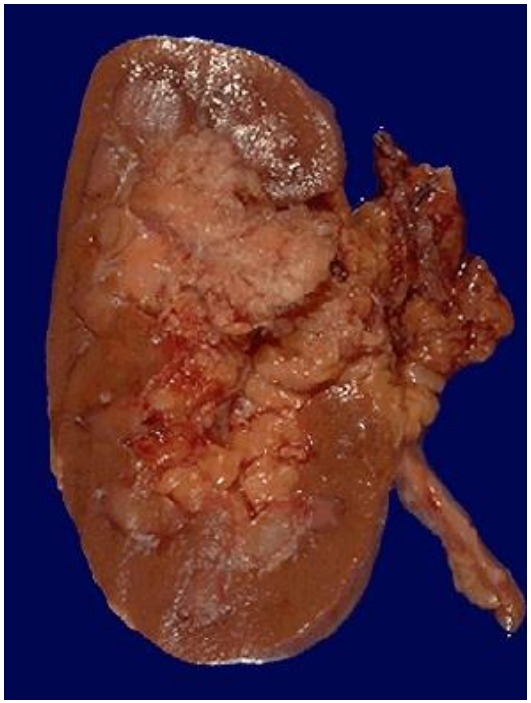
Nephroblastoma (Wilms tumor)

- Precursor lesions in the form of multiple or diffuse foci of nephrogenic rests or blastema within otherwise normal renal parenchyma (nephroblastomatosis).
- The classic microscopic picture of WT is triphasic with epithelial elements in the form of abortive tubules or glomeruli, spindle-shaped stromal cells and small, round blue blastema in various proportions. This represents attempts to recapitulate the stages of development of the kidney. Occasional tumors contain only two or one of the elements.



Classic triphasic pattern of WT with tubules, spindle-shaped stromal cells and small, round, blue blastema cells.

Renal pelvis Ca



- Transitional and squamous Ca
- 5-10% of renal neoplasms
- May cause the obstruction of pelvis and calyces and produce hydronephrosis.
- hematuria is a frequent presenting symptom

Renal cysts

Cystic diseases, comprising:

- developmental,
- hereditary
- acquired disorders

Renal cysts: classification

1. multicystic renal dysplasia
2. polycystic kidney disease
   - autosomal-dominant polycystic disease
   - autosomal-recessive polycystic disease
3. medullary cystic disease
   - medullary sponge kidney
   - nephronophtisis
4. acquired (dialysis-associated) cystic disease
5. localized (simple) renal cysts
6. renal cysts in hereditary syndromes (tuberous sclerosis)

Simple renal cysts

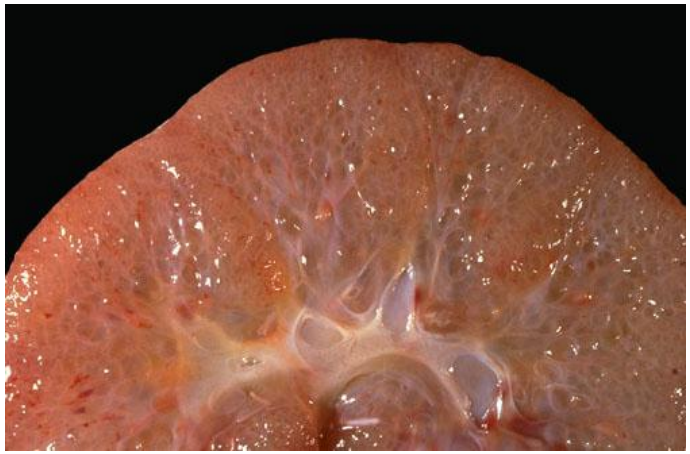
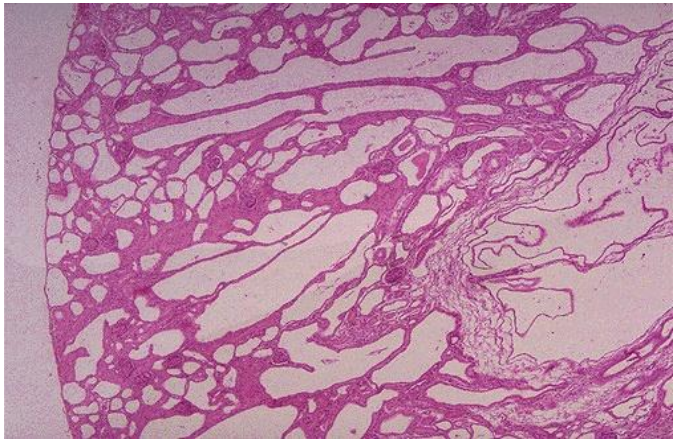
- the most common renal masses, accounting for approximately 65-70% of cases
- most often in patients >50 years of age and are more common in men than women
- may be solitary, or multiple and bilateral
- typically asymptomatic

- the clinical significance of simple renal cysts is not completely clear. Most nephrologists have believed simple renal cysts to be of little significance. However, in a study cited above of 1948 healthy potential kidney donors, after adjusting for age and sex, cysts ≥5 mm were associated with higher albumin excretion, hypertension, and hyperfiltration

Autosomal recessive polycystic kidney disease (ARPKD)

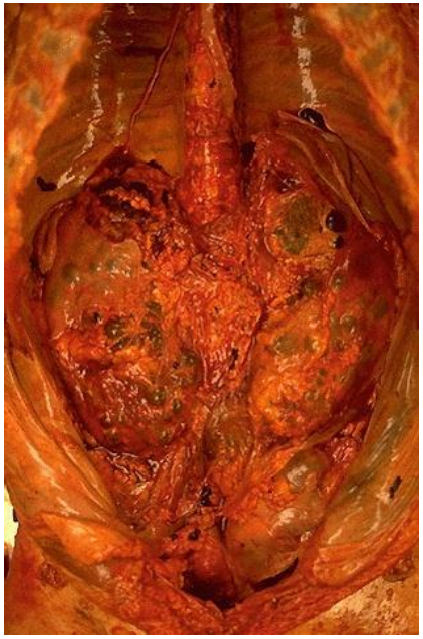
- cystic dilations of the renal collecting ducts and congenital hepatic fibrosis.
- depending on the time of presentation and presence of associated hepatic lesions
  - perinatal
  - neonatal
  - infantile
  - juvenile
- The estimated reported incidence of ARPKD is 1:10,000 to 1:40,000, although this may be an underestimation as severely affected neonates may die without a diagnosis, and young adults with mild disease may not be diagnosed.
- ARPKD is caused by mutations in the PKD1 gene that encodes for fibrocystin (also referred to as polyductin), which localizes to the primary cilia in the cortical and medullary collecting ducts and the thick ascending limb of the kidney, and the epithelial cells of the hepatic bile duct.
- The renal pathologic findings of ARPKD include enlargement of the kidneys by cystic dilatations (microcysts) of the collecting tubules, and hepatic findings of portal fibrosis with disruption of the ductal plate with hyperplastic, ectatic biliary ducts, and normal liver parenchyma.
- Progressive renal failure occurs in most patients.

Autosomal recessive polycystic kidney disease (ARPKD)

- Kidneys are enlarged, and have a smooth external appearance
- The cysts are relatively small, but uniformly distributed throughout the parenchyma, and there is no distinguishable cortex or medulla.
- Dilated elongated channels are present at right angles to the cortical surface

Autosomal dominant Polycystic Kidney Disease (DPKD)



These markedly enlarged kidneys are seen in the retroperitoneum of an adult with dominant polycystic kidney disease (DPKD).

- the most common genetic cause of chronic kidney disease
- ADPKD is the underlying cause of kidney disease in ±5% of patients who initiate dialysis in the US
- this condition is inherited in an autosomal dominant pattern,
- main characteristics:
    - large multicystic kidneys,
    - liver cysts,
    - berry aneurysm

- main clinical features:
    - hematuria
    - flank pain
    - UTI
    - renal stones
    - Hypertension

- this disease rarely manifests itself before middle age,
- progressive renal failure progresses as the cysts become larger and the functioning renal tissue smaller in volume.

Autosomal dominant Polycystic Kidney Disease (DPKD)

Polycystic kidney disease (PKD) is inherited as an autosomal dominant or recessive trait.

Autosomal dominant PKD (ADPKD) is caused by mutations of either PKD1 (gene product: polycystin 1) or PKD2 (gene product: polycystin 2) genes.

PKD1 mutations are more common and cause more severe disease than PKD2 mutations.

Autosomal dominant Polycystic Kidney Disease (ADPKD)

mutations to polycystin 1,2

altered mechanosensation by tubular cilia and altered Ca influx

altered tubular epithelial growth and differentiation

cysts formation

Autosomal dominant Polycystic Kidney Disease (ADPKD)

The cut surface of a markedly enlarged kidney from an adult with dominant polycystic kidney disease (ADPKD) shows very large cysts that can be filled with clear fluid or filled with recent or organizing hemorrhage

Grossly, ADPKD results in very large kidneys

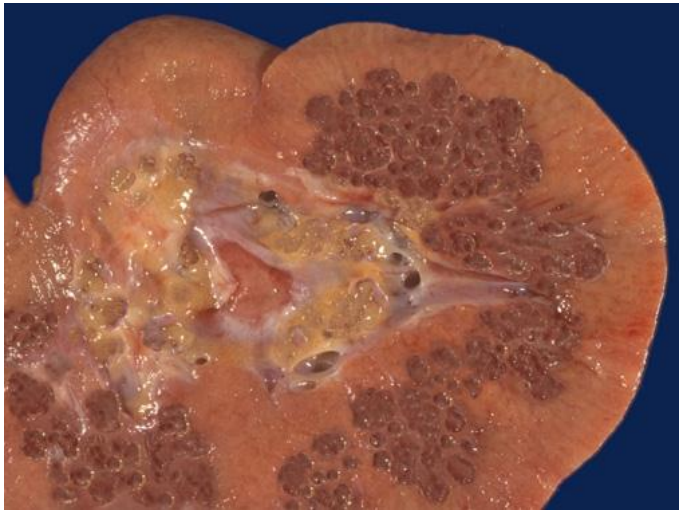
The affected kidneys are just a mass of large fluid-filled cysts.

With dominant polycystic kidney disease (DPKD), other organs may be involved with polycystic change, including liver (and less commonly pancreas).

Medullary sponge kidney (MSK)

- Medullary sponge kidney is a congenital disorder characterized by malformation of the **terminal collecting ducts in the pericalyceal region of the renal pyramids**.
- This collecting duct dilatation is associated with the formation of **medullary cysts** that are often diffuse but do not involve the cortex.
- Medullary sponge kidney is usually asymptomatic.
- The diagnosis is commonly made as an incidental finding during an imaging test performed for a different indication.
- Although considered benign, the associated complications of medullary sponge kidney (eg, nephrolithiasis and urinary tract infections) may rarely lead to chronic kidney disease and even renal failure

Medullary sponge kidney (MSK)



There are **0.1 to 0.5 cm cysts** involving the inner medullary and papillary regions in this kidney.
The cortex appears normal.

- Medullary sponge kidney (MSK) is a congenital condition that most often occurs sporadically.
- The true prevalence of medullary sponge kidney is likely less than one percent in the population
- It is often bilateral, but incidental and found only on radiologic imaging studies, with an incidence of 0.5 to 1% in adults.
- Most common complications are:
  - Nephrolithiasis (develop in 60% of cases)
  - UTI
  - hematuria
- Renal failure is unlikely to occur, but may result from severe pyelonephritis.

Acquired cystic disease of the kidney in adults

- Chronic renal failure (particularly in patients on maintenance hemodialysis or peritoneal dialysis) is frequently associated with the development of multiple and bilateral renal cysts, which are usually <0.5 cm in diameter, but can be as large as 2 to 3 cm.
- A diagnosis requires involvement of both kidneys, with four or more cysts being present.
- Acquired cystic disease can be easily distinguished from autosomal dominant polycystic kidney disease (ADPKD) as the kidneys are small to normal in size, as opposed to the extremely large kidneys found in all ADPKD individuals with renal insufficiency.
- Often, acquired cystic disease can be detected prior to end-stage renal disease (ESRD)
- The incidence of acquired cystic disease increases progressively with duration of dialysis.
- Renal cell carcinoma — The incidence in renal cell carcinoma (RCC) is increased in patients with acquired cystic disease