Renal stone

Kidney Stones

DEFINITION

- Nephrolithiasis refers to renal stone disease
- urolithiasis refers to the presence of stones in the urinary system.
- Stones, or calculi are formed in the urinary tract from the kidney to bladder by the crystallization of substances excreted in the urine

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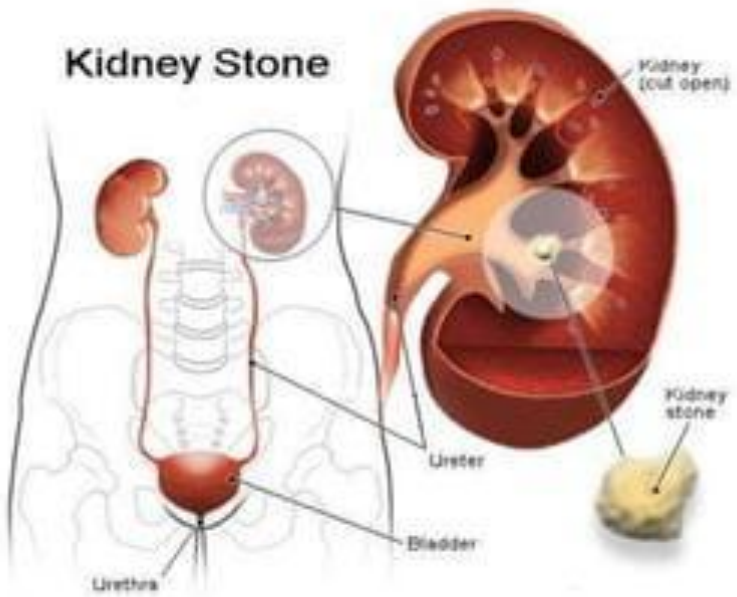
ETIOLOGY

- METABOLIC
- LIFESTYLE
- GENETIC FACTORS
- DRUGS
- OTHERS

Kidney Stone Formation

- Causes:
  - Highly concentrated urine, urine stasis
  - Imbalance of pH in urine
    - Acidic: Uric and Cystine Stones
    - Alkaline: Calcium Stones
  - Gout
  - Hyperparathyroidism
  - UTI
  - Medications
    - Lasix, Topamax, Crixivan



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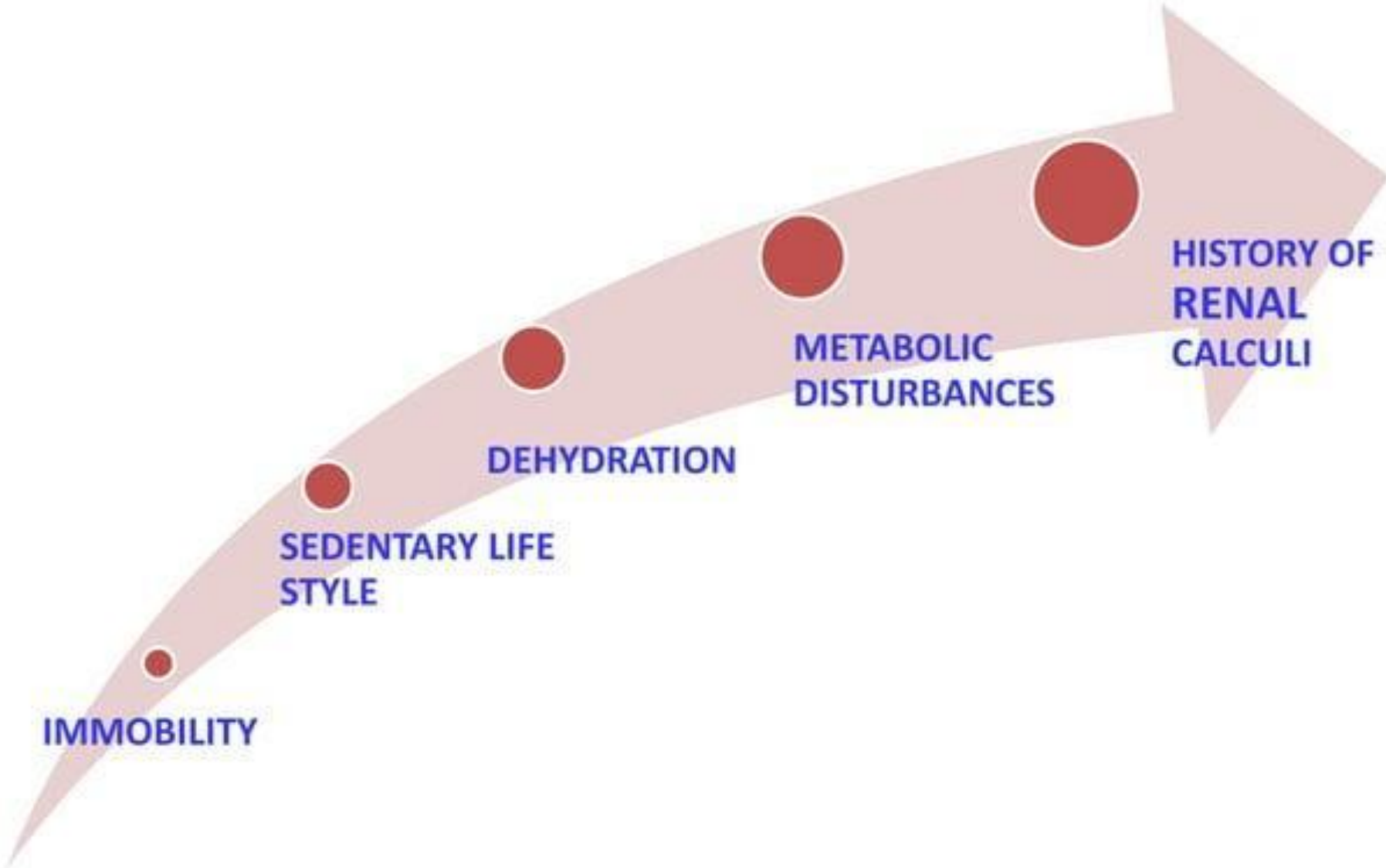
RISK FACTORS



PATHOPHYSIOLOGY

Slow urine flow

↓

supersaturation of urine

↓

with the particular element

↓

crystallized

↓

stone

PATHOPHYSIOLOGY

2

- Damage to the lining of the urinary tract

PATHOPHYSIOLOGY

Decreased inhibitor substances

supersaturation and crystalline aggregation

Types of S

- **Calcium Oxalate**
  - Most common
- **Calcium Phosphate**
- **Struvite-** mag+ammo+ca phos
  - More common in woman than men.
  - Commonly a result of UTI.
- **Uric Acid**
  - Caused by high protein diet and gout.
- **Cystine**
  - Fairly uncommon; generally linked to a hereditary disorder.

Calcium stone

Imbalance

↓

supersaturation &

inhibitors of urine

↓

Crystal

↓

stone

Mixed stone (struvite)

UTI

↓

Urea splitting organism (proteus)

↓

Urease

↓

Production of stones

Uric acid stone

Acidic urine

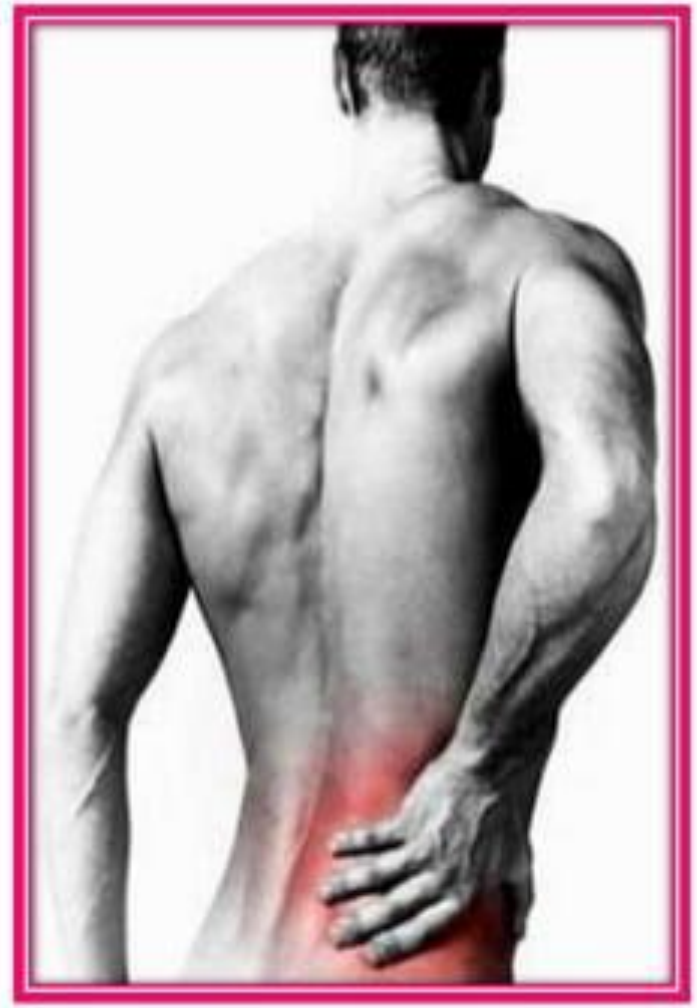
↓ Solubility of uric acid

Ppt of uric acid crystals

Uric acid stone

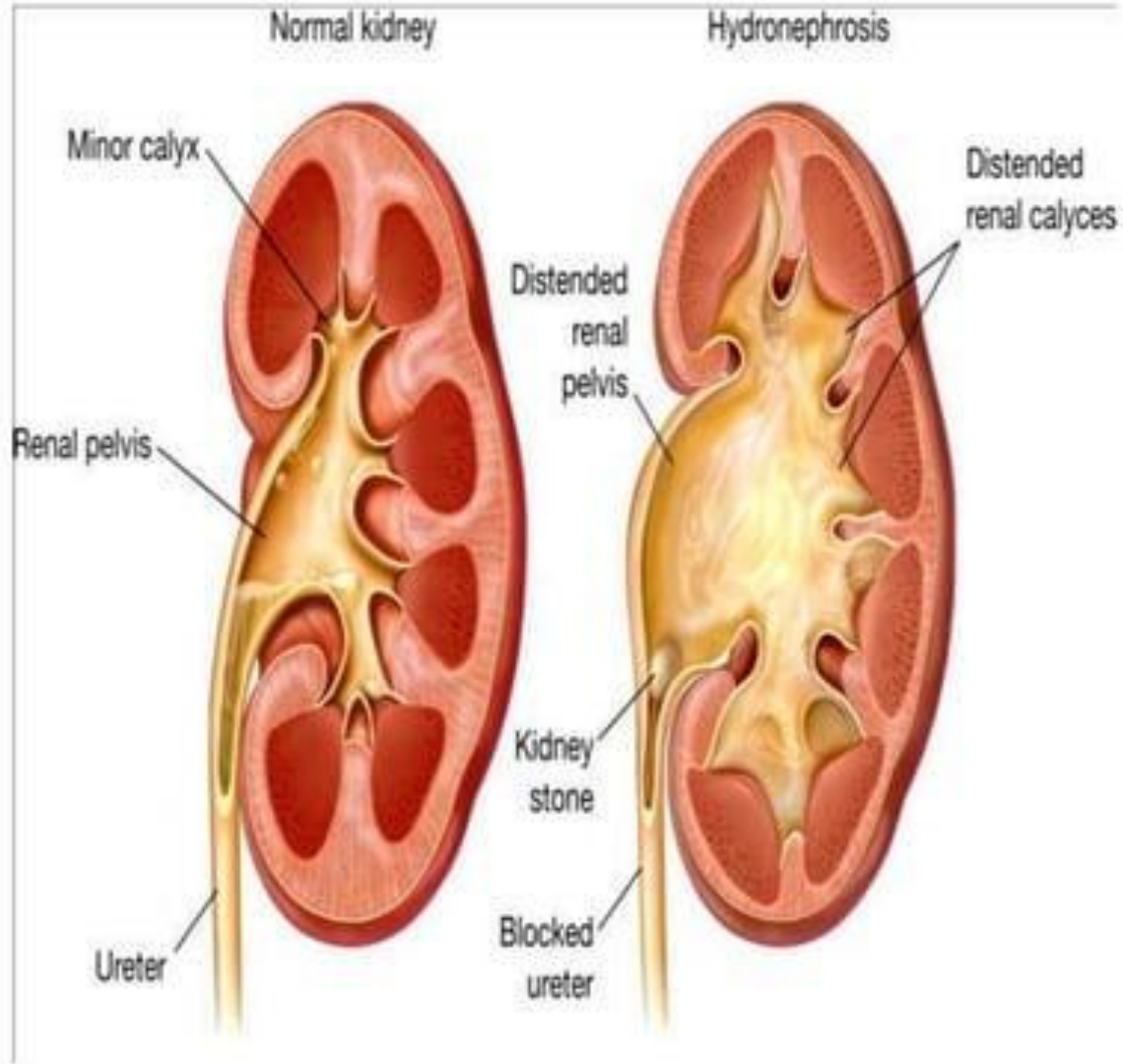
CLINICAL MANIFESTSTIONS

- Severe abdominal or flank pain
- Frequency and dysuria
- Oliguria and anuria in obstruction



CLINICAL MANIFESTSTIONS

- Hematuria
- Renal colic
- Nausea
- hydronephrosis

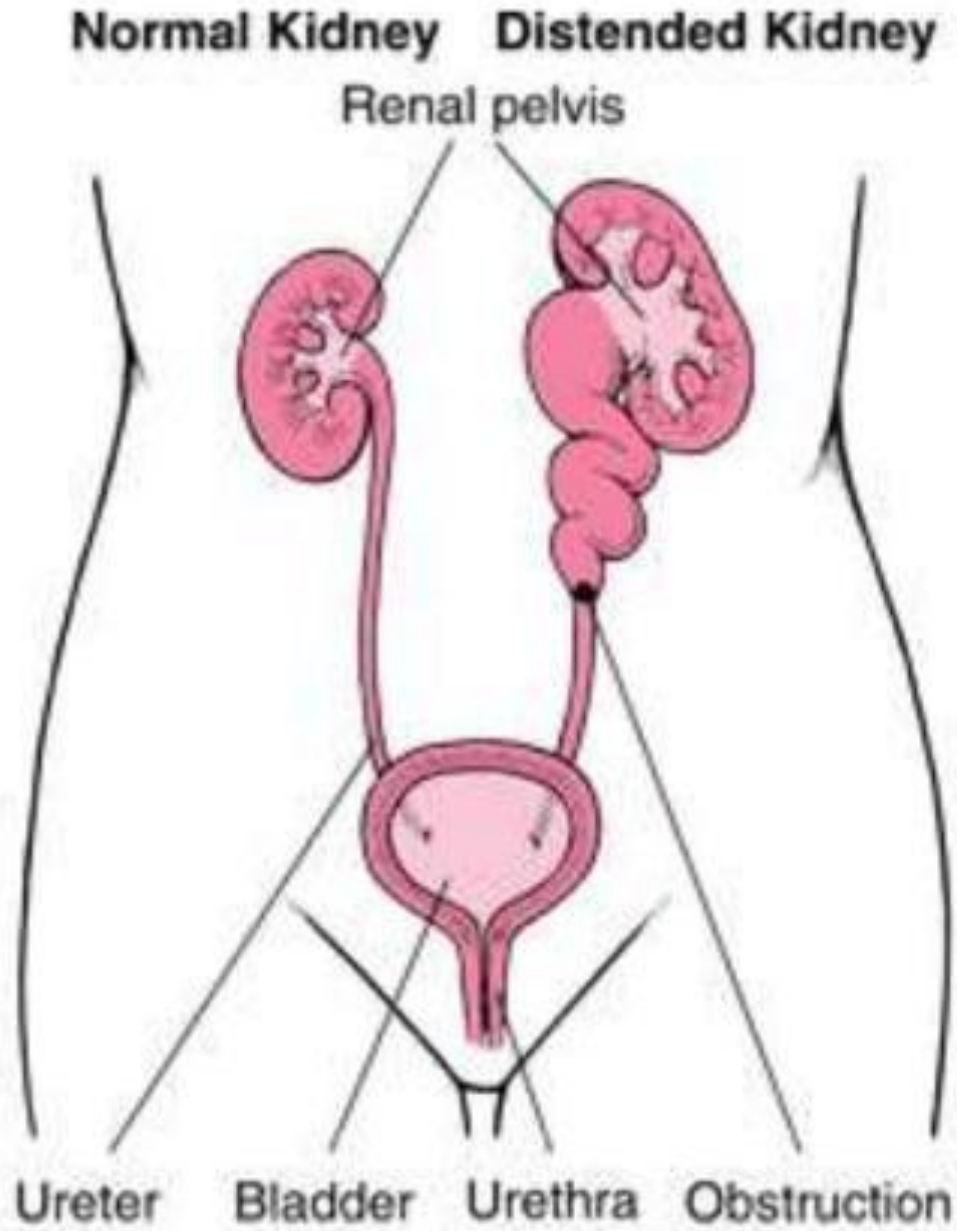


Hydronephrosis

Definition

- Hydronephrosis is the aseptic dilatation of the renal pelvis or calyces.
- It may be associated with obstruction but may be present in the absence of obstruction.

- There is accompanied destruction of kidney parenchyma.

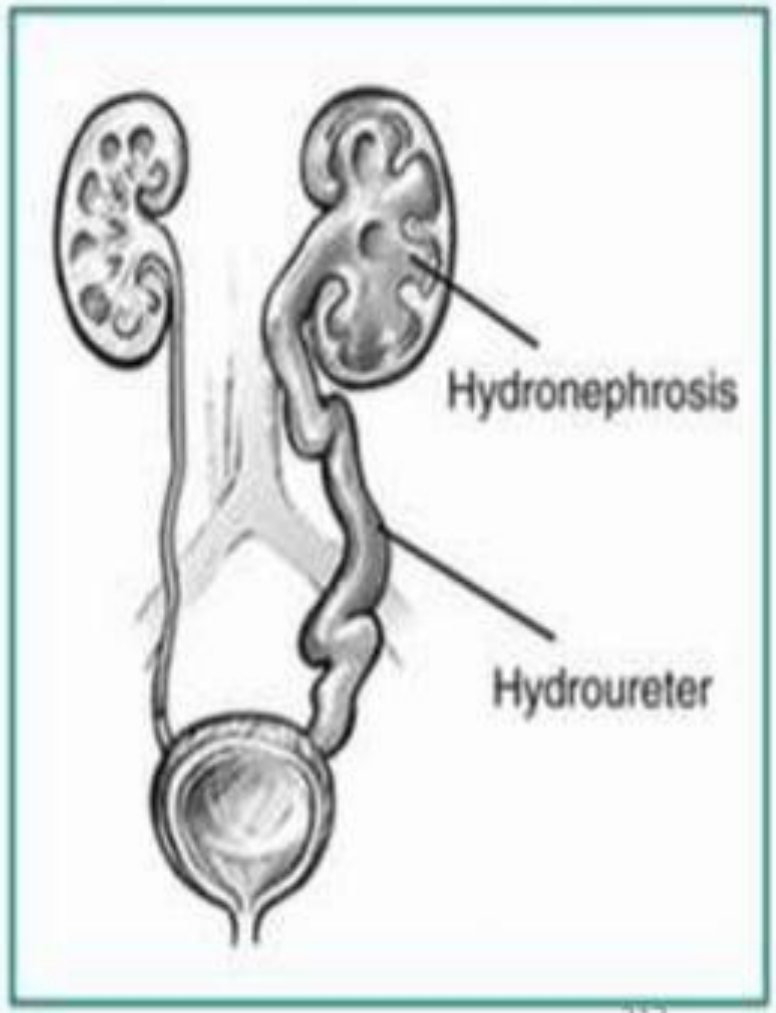

Normal Kidney
Distended Kidney
Renal pelvis
Ureter
Bladder
Urethra
Obstruction

Etiology

- It can be Unilateral or bilateral.
- Unilateral maybe extramural, intramural or Intraluminal
- Bilateral causes are either congenital or acquired

Unilateral hydronephrosis

- By some form of ureteric obstruction, with the ureter above the obstruction being dilated.



<u>Causes</u>

A. Extramural obstruction
B. Intramural (in the walls)
C. Intraluminal

PATHOPHYSIOLOGY

Due to the etiological factors

↓

Obstruction of the urine flow

↓

Fluid backs up into the kidney

↓

Causing dilatation of renal pelvis

↓

Results in barotraumas/pressure trauma

PATHOPHYSIOLOGY

Higher pressure causes irreversible destruction of the nephrones

↓

Hypertrophy of the kidneys as a consequence of increased workload

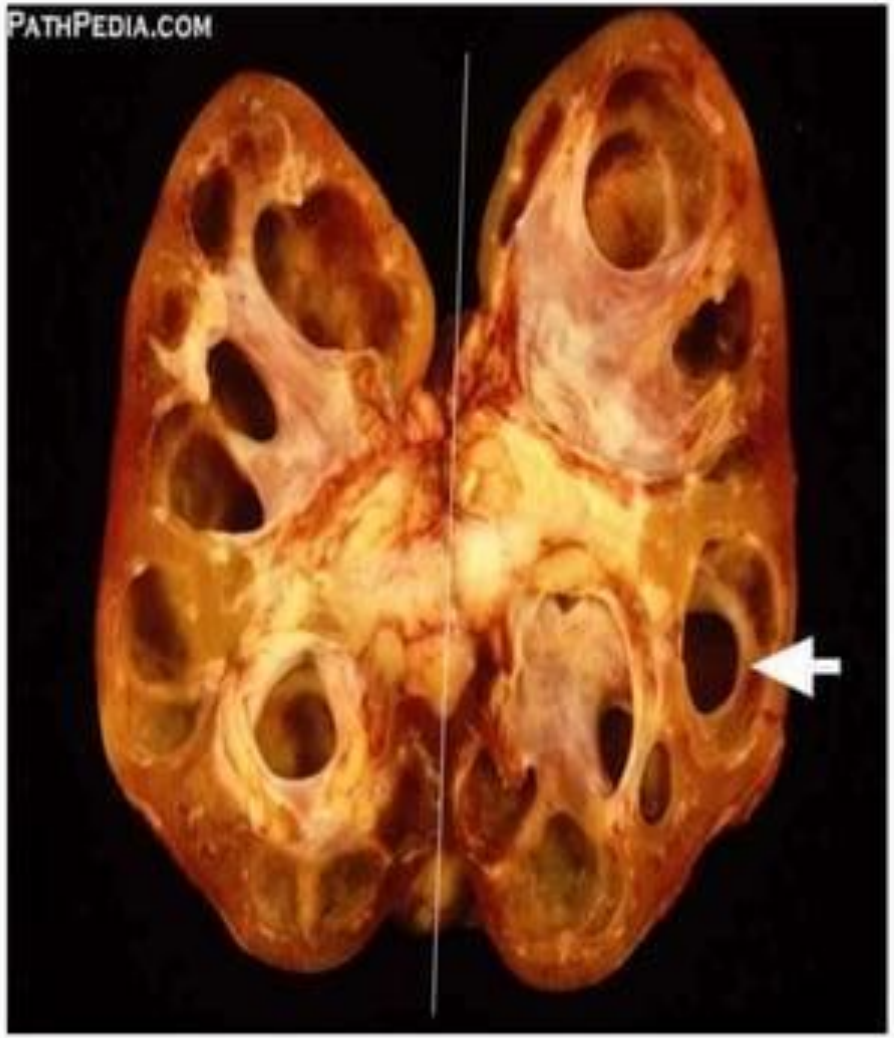
↓

Hydronephrosis

↓

Renal failure

Gross



- Moderate to marked enlargement of kidney.
- Extra renal hydronephrosis
- Intra renal hydronephrosis

Microscopy

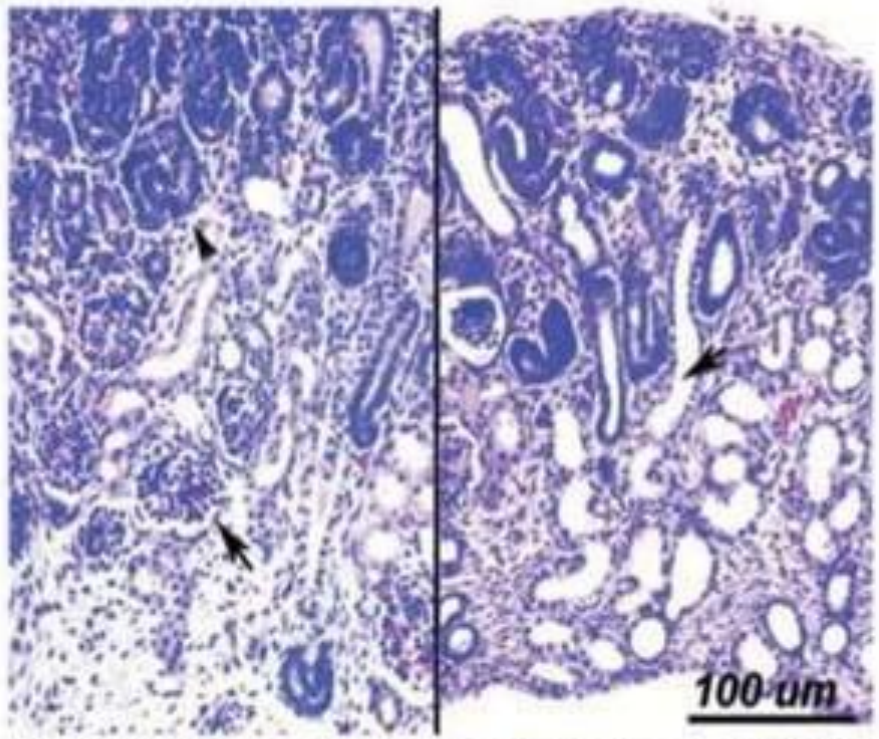


***Figure 4** – Microscopic comparison between a normal kidney from the control group (left) with hydronephrotic kidney from the hydronephrosis group (right). Note mature (arrows) and immature (arrowheads) glomeruli in the control group. In the hydronephrosis group, we can see medullar and cortical atrophy and cystic tubular dilation (arrow), (HE, X200).*

- Atrophy of tubules and glomeruli
- Thickened sac
- Chronic inflammatory cell infiltrate
- Interstitial fibrosis.

TUMOURS OF THE KIDNEY

TUMOURS OF THE KIDNEY

- **Benign**
  - **.. Cortical adenoma,**
  - **.. Renal fibroma**
  - **.. Angiomyolipoma**
  - **.. Oncocytoma**
- **Malignant**
  - **.. Renal cell carcinoma,**
  - **.. Wilms tumour**

RENAL CELL CARCINOMA

Adenocarcinoma of kidney,
Hypernephroma

Renal cell carcinoma

- 1 to 3% of visceral cancers,
- 85% of renal cancers in adults
- 6^{th} and 7^{th} decades of life,
- M : F = 2 to 3 : 1
- Histogenesis – Tubular epithelium

Renal cell carcinoma - Epidemiology

RISK FACTORS:

- Tobacco smokers
- Obesity - (women)
- Hypertension
- Estrogen therapy
- Exposure to asbestos, heavy metals, petroleum products
- CRF, acquired cystic diseases.
- Tuberous sclerosis
- Mostly sporadic

RENAL CELL CARCINOMA

HISTOLOGIC TYPES

Clear cell RCC .

Papillary RCC .

Chromophobe RCC .

Collecting duct RCC .

Unclassified RCC .

Clinical features of RCC

Three classic diagnostic features of renal cell carcinoma

Hematuria (50%), costovertebral pain, mass

- Asymptomatic/incidental finding
- Constitutional symptoms (fever, malaise, weakness, and weight loss)
- Present with metastasis (lungs and bones)
- Paraneoplastic syndromes

RENAL CELL CARCINOMA (RCC)

- **Grossly:** Mainly polar, spherical yellow variegated tumor with hemorrhagic, necrotic & cystic areas. May extend into renal vein.

- **Microscopically:**
  - Clear cell carcinoma: (70-80%)
  - Papillary carcinoma: (10-15%)
  - Chromophobe renal carcinoma (5%)
  - Sarcomatoid carcinoma

Clear Cell
Renal Cell Carcinoma

Total nephrectomy

(gross)

(Most common renal tumor in adults)

WILMS TUMOUR

(Nephroblastoma)

Wilms Tumor

- 1 in every 10,000 children in the United States
- most common primary renal tumor of childhood
- peak incidence for Wilms tumor is between 2 and 5 years of age
- 5% to 10% of Wilms tumors involve both kidneys

Wilms Tumor

Clinical

- Tumor has tendency to easily metastasize
- major complaint is associated with large size of the tumor - readily palpable mass
- Good outcome with early diagnosis.

Urinary bladder tumors

- Exophytic papilloma
- Inverted papilloma
- Papillary urothelial neoplasms of low malignant potential
- Low grade and high grade papillary urothelial cancers
- Carcinoma in situ (CIS, or flat non-invasive urothelial carcinoma)
- Mixed carcinoma
- Adenocarcinoma
- Small-cell carcinoma
- Sarcomas

Pathology

- Most Common Type is Transitional Cell Carcinoma 93%

Papillary

Benign

Malignant

Flat

Dyspalsia

Cis

Invasive Cancer

Pathology

- Squamous Cell Carcinoma
- Adenocarcinoma
- Small Cell Cancer
- Rhabdomyosarcoma
- Lymphoma
- Melanoma
- Secondaries frm other sites
- Primary UB Pheochromocytoma

TYPES OF BLADDER TUMORS

Non-invasive

Papilloma
Papillary carcinoma

Invasive

Invasive
Papillary carcinoma

In situ

Flat (sessile)
non-invasive carcinoma

Invasive

Flat (sessile)
invasive carcinoma