

# **Diseases of Urinary System**

**(Part 5)**

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# Pathology of urinary tract diseases

## **Tumors of Urinary Tract**

# Pathology of urinary tract diseases

## Intended Learning Objectives

*By the end of this lecture; you should:*

- Classify tumours of kidney, renal pelvis, ureter and urinary bladder
- Identify main features and morphology of renal cell carcinoma
- Identify presentation and morphology features of Wilm's tumor (Nephroblastoma)
- Describe epidemiology, main features and morphology of transitional and squamous cell carcinomas of UB

# Pathology of urinary tract diseases

## **Tumors of the kidney**

# Pathology of urinary tract diseases

## Tumors of the kidney

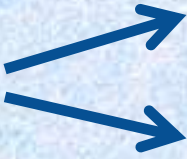
### Classification:

#### ☐ Tumors of the kidney

A. ***Benign:*** cortical adenoma, oncocytoma, angiomyolipoma and fibroma.

B.

C. ***Malignant:***

- Primary:  Renal cell carcinoma (hypernephroma)  
Wilm`s tumor (Nephroblastoma)

- Secondary: **rare** (direct infiltration from suprarenal gland).



# Pathology of urinary tract diseases

## Renal cell carcinoma

### **Definition:**

A malignant epithelial neoplasm arising from lining epithelium of renal tubules.

### **Incidence:**

- The commonest renal tumor of adults
- Usually affects middle to old age (4<sup>th</sup>-6<sup>th</sup> decade)
- Male to female ratio: about 2:1

### **Risk factors:**

#### ***Genetic:***

- Von-Hippel-Lindau syndrome (mutation of a tumor suppressor gene).
- Polycystic kidney (30 folds higher)

#### ***Acquired:***

- Renal dialysis
- Smoking

# Pathology of urinary tract diseases

## Renal cell carcinoma

### Grossly:

- Usually large polar mass (involve upper or lower pole)
- well-circumscribed
- Yellow/orange color
- Enclosed with renal capsule but may infiltrative in higher stages
- Area of hemorrhage and necrosis

### Microscopically:

Different microscopic variants had been are describes including:

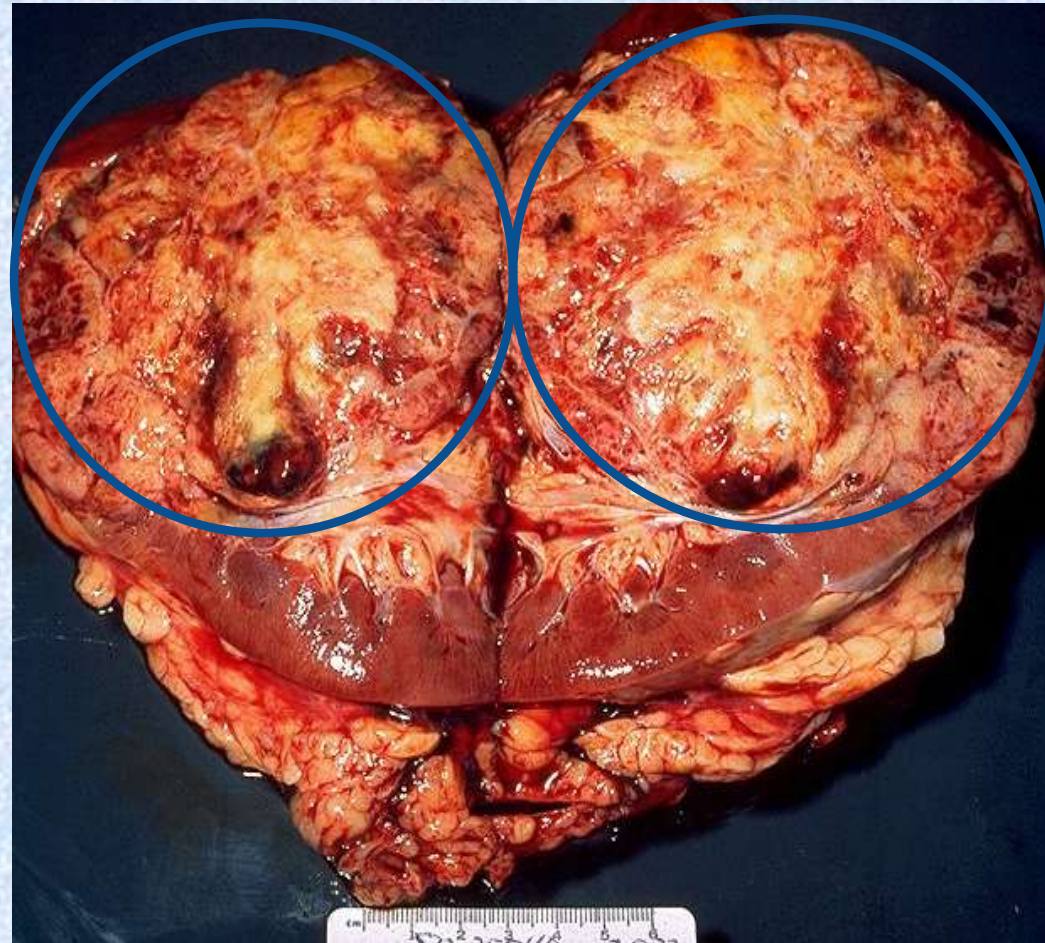
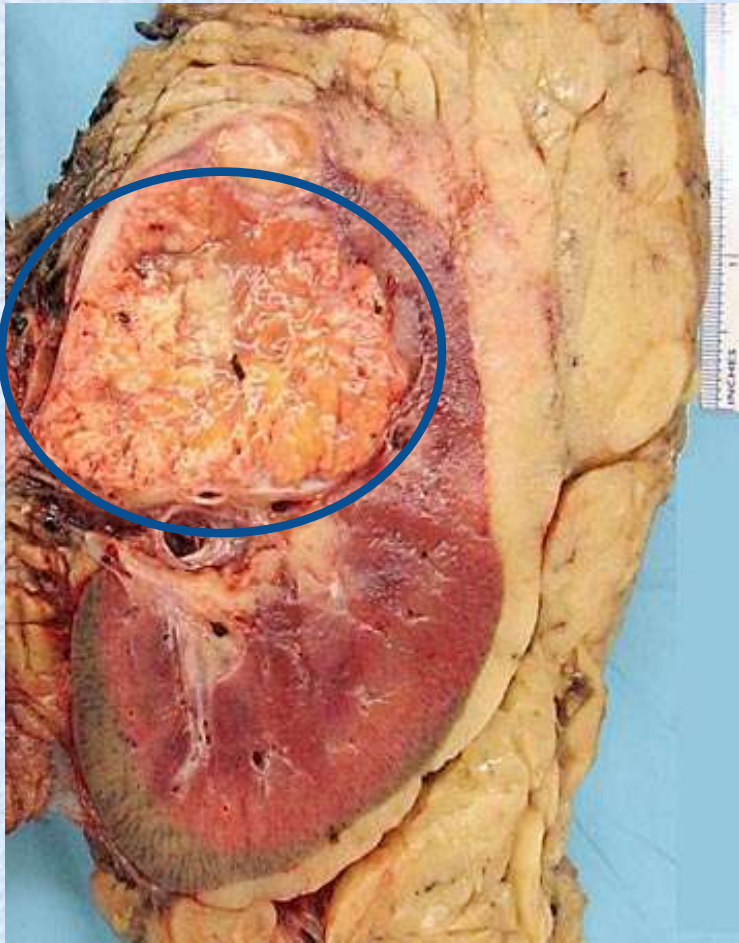
- |                       |                             |
|-----------------------|-----------------------------|
| 1. Clear cell variant | 3. Chromophobe cell variant |
| 2. Papillary variant  | 4. Sarcomatoid variant      |



# Pathology of urinary tract diseases

## Renal cell carcinoma

### Grossly



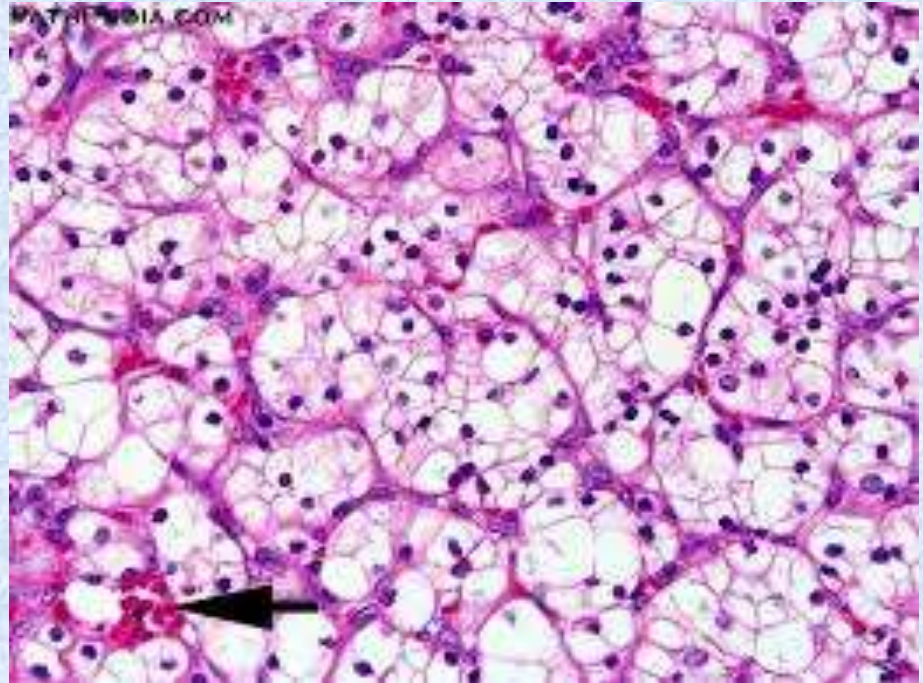
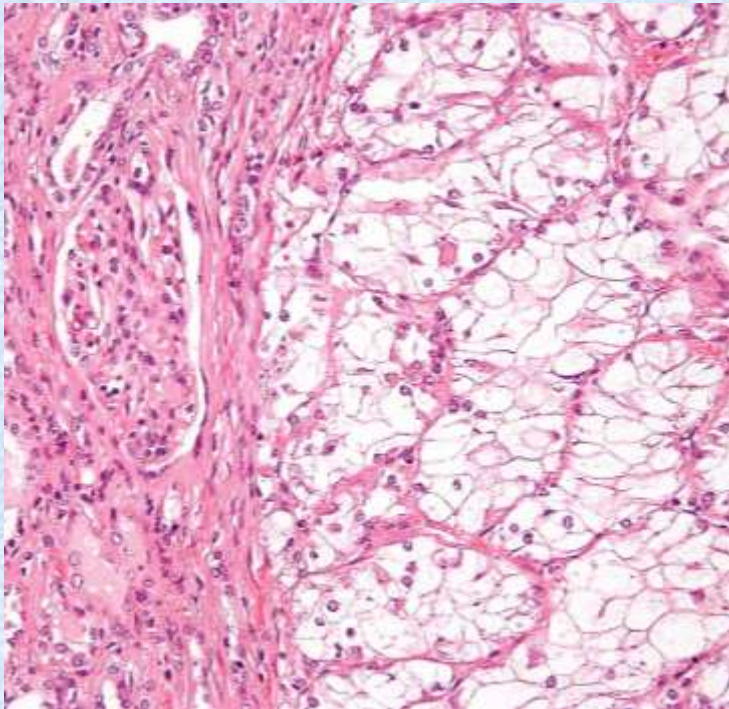


# Pathology of urinary tract diseases

## Renal cell carcinoma

### Microscopic types:

*Clear cell variant (65%):*



- Large sheets of polyhedral cells
- Cells have abundant pale cytoplasm and central pleomorphic nuclei
- Thin stroma infiltrated lymphocytes

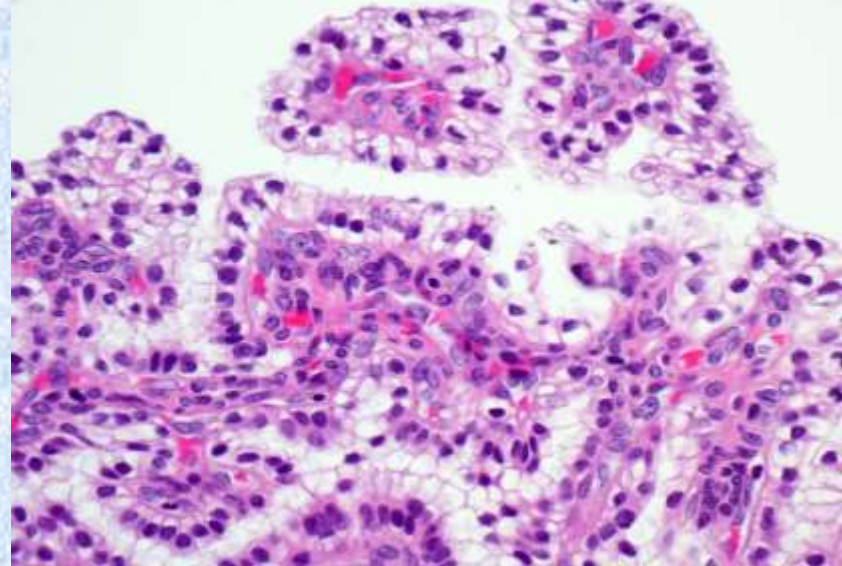
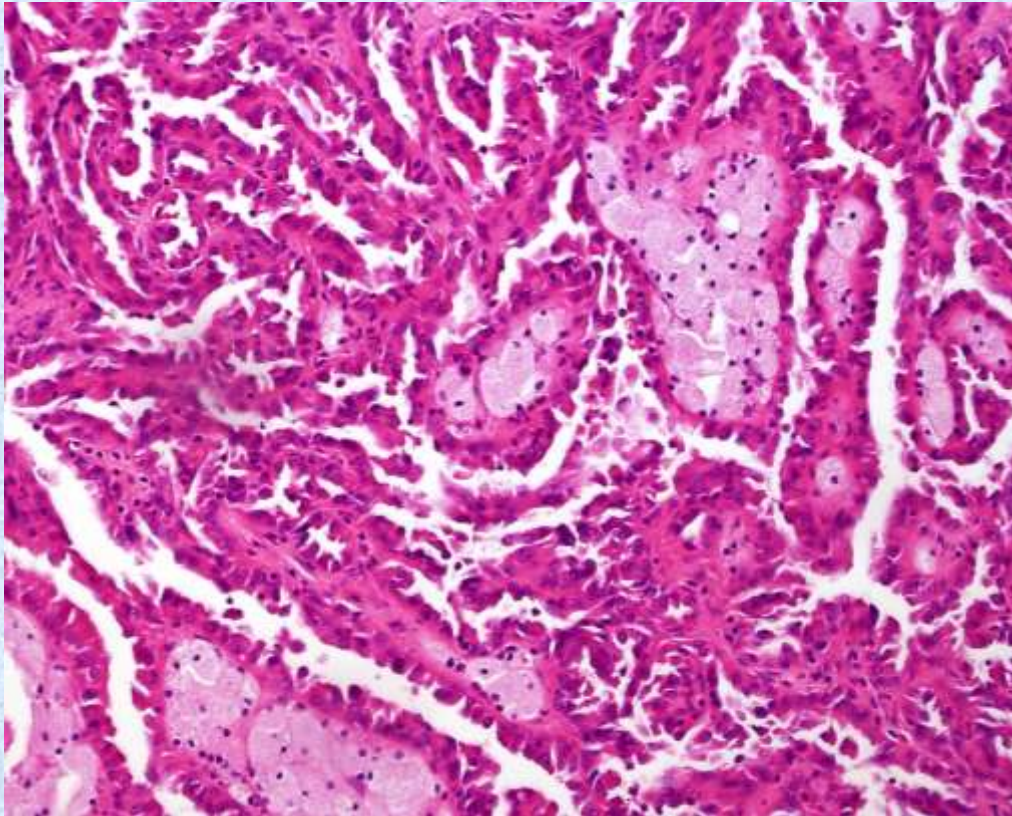


# Pathology of urinary tract diseases

## Renal cell carcinoma

### Microscopic types:

Papillary renal cell carcinoma (10-15%):



The neoplastic cells tend to form papillae

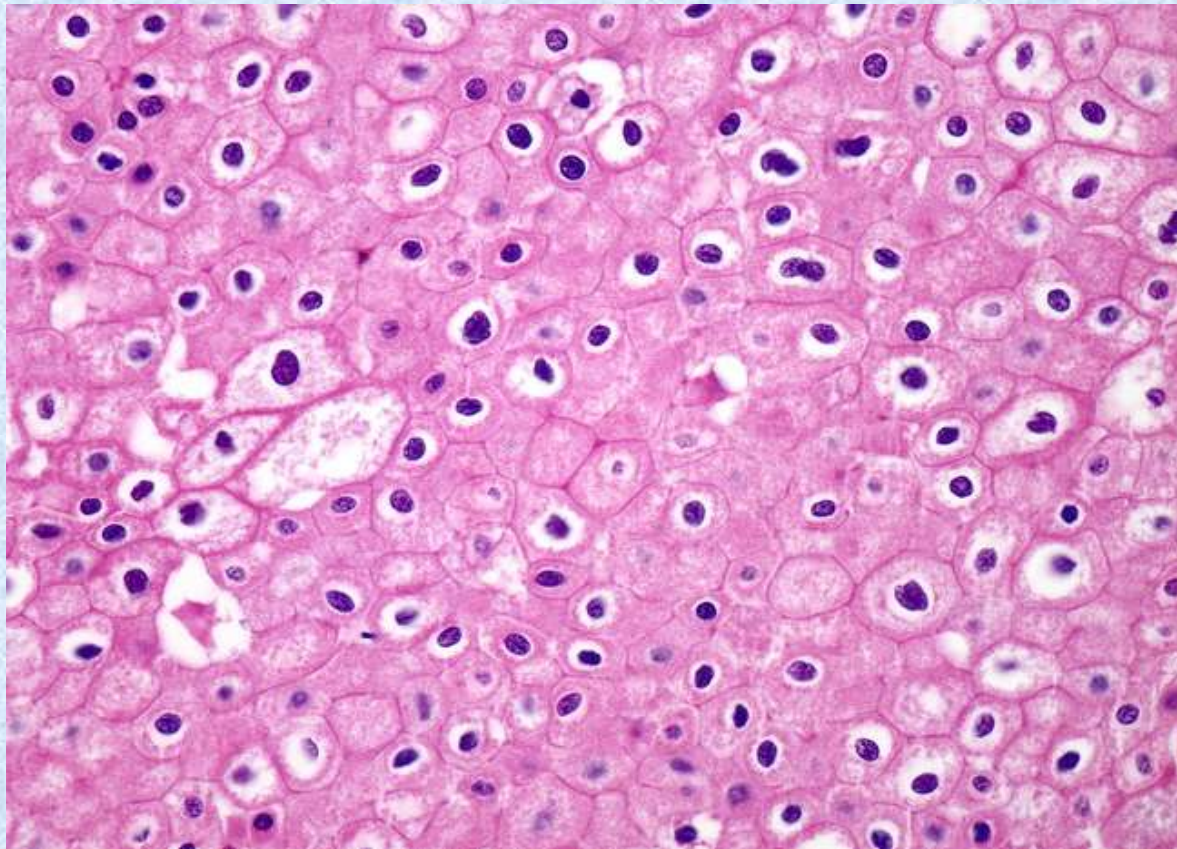


# Pathology of urinary tract diseases

## Renal cell carcinoma

### Microscopic types:

Chromophobe renal cell carcinoma (10-15%):



- The tumor cells have abundant granular eosinophilic cytoplasm
- Peri-nuclear clear halo

# Pathology of urinary tract diseases

## Renal cell carcinoma

### Clinically:

- Hematuria
- Chronic renal pain
- Renal mass
- Anemia, weight loss and fever

### Spread

**A- Direct:** to peri-renal fat, renal pelvis, renal hilum renal vessels and suprarenal gland. Involving left renal vein leads to left testicular varicocele

**B- Blood spread** (common): to lung, bone and CNS. RCC is one of **occult** tumors

**C- Lymphatic spread:** to lumbar and iliac LNs



# Pathology of urinary tract diseases

## Nephroblastoma (Wilm`s tumor)

### Incidence

- The commonest embryonic tumors (blastomas) of children
- Cell of origin: embryonic precursor cells.
- Age: most cases occur between 2-5 years.
- Usually unilateral; but could be rarely bilateral.

### Grossly

- Usually a large renal mass replacing of most renal tissue
- Fleishy bulging cut section with grayish white or pink color
- Cysts, hemorrhage and necrosis are common
- May infiltrate renal capsule and rarely involve renal hilum or renal pelvis.

# Pathology of urinary tract diseases

## Nephroblastoma (Wilm's tumor)

### Grossly



# Pathology of urinary tract diseases

## Nephroblastoma (Wilm`s tumor)

### MP

Three histological components (**triphasic**)

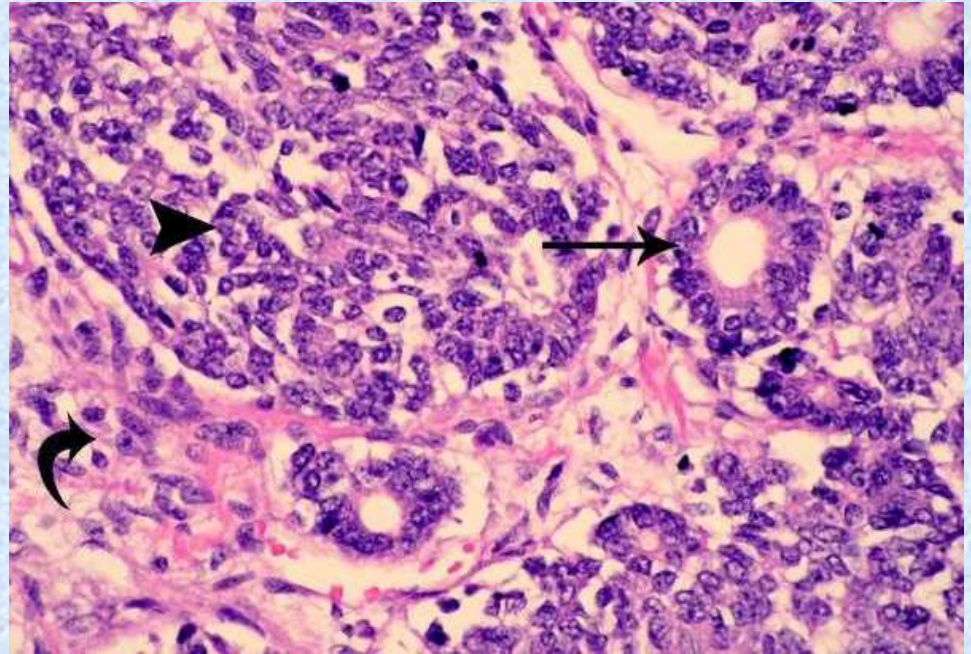
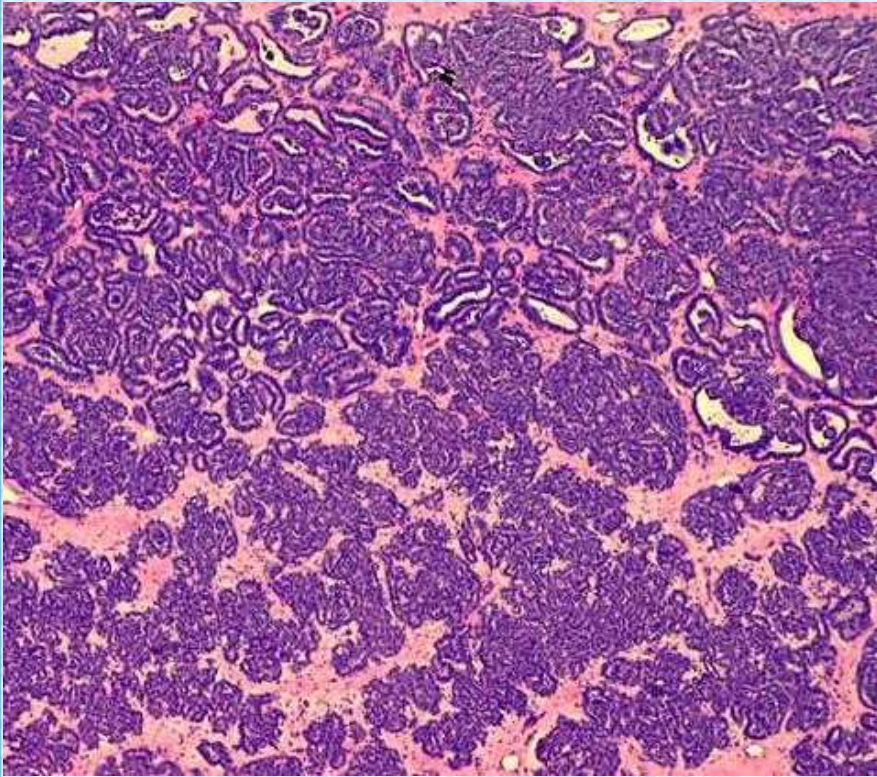
- Epithelial: malignant cells arranged in tubular structures, sheets or nests
- Mesenchymal: atypical spindle cell proliferation, muscle or cartilaginous tissue
- Blastemal/undifferentiated: cellular areas, small round or oval cells with scanty cytoplasm and hyperchromatic nuclei
- Dominance of one element may occur.



# Pathology of urinary tract diseases

## Nephroblastoma (Wilm's tumor)

MP





# Pathology of urinary tract diseases

## Nephroblastoma (Wilm`s tumor)

### Clinically:

- Renal mass (usually a large abdominal mass)
- Hematuria
- Loin pain

### Spread

**A- Direct:** to peri-renal fat or suprarenal gland less commonly to renal hilum or renal vessels.

**B- Blood spread** (common): to lung, bone and CNS.

**C- Lymphatic spread:** to iliac LNs

# Pathology of urinary tract diseases

## **Tumors of Renal Pelvis, Ureter and Urinary Bladder**

# Pathology of urinary tract diseases

## Tumors of UB, renal pelvis and ureter

### ■ Benign:

- Epithelial:
- Villous papilloma
  - Inverted papilloma

Mesenchymal: leiomyoma, fibroma and angioma

### ■ Malignant:

Primary:

- Epithelial
  - 1. Transitional cell carcinoma
  - 2. Squamous cell carcinoma
  - 3. Adenocarcinoma
- Mesenchymal: leiomyosarcoma, RMS (sarcoma botryoides)

Secondary:

- Direct from nearby tumors (prostate, cervix, rectum).
- Trans-luminal (from tumors of kidney)

# Pathology of urinary tract diseases

## Tumors of urinary bladder

### ▪ Recent classification of *epithelial* tumors of UB:

#### Urothelial tumors:

1. Flat urothelial carcinoma (in situ)
2. Non papillary (invasive) urothelial carcinoma
3. Papillary lesions
  - Transitional cell papilloma
  - Inverted papilloma
  - Low grade papillary urothelial carcinoma
  - High grade papillary urothelial carcinoma

- #### Squamous tumors:
- Squamous cell papilloma
  - Non invasive squamous cell carcinoma
  - Invasive squamous cell carcinoma

- #### Glandular tumors:
- Villous or tubular adenoma (rare)
  - Adenocarcinoma



# Pathology of urinary tract diseases

## Tumors of urinary bladder

### ▪ Risk factors:

- ❑ Urinary bilharziasis: leads to
  - Chronic irritation of the mucosa
  - Tryptophan metabolite has a carcinogenic effect
  - Squamous metaplasia and cystitis glandularis
- ❑ Aniline dyes: used in dye industries
- ❑ Chronic irritation by renal stones or chronic cystitis
- ❑ Smoking

# Pathology of urinary tract diseases

## Transitional cell carcinoma

### Definition:

A malignant epithelial neoplasm arising from urothelium

### Incidence:

- The commonest histological type
- More common in males
- Older age (over 50 years)

### Sites:

May arise from urothelial lining of

- Urinary bladder
- Ureter
- Renal pelvis
- urethra

# Pathology of urinary tract diseases

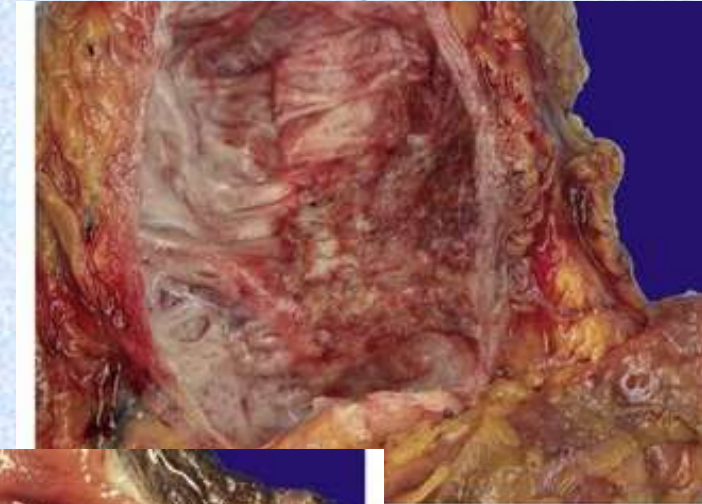
## Transitional cell carcinoma

### Pathology:

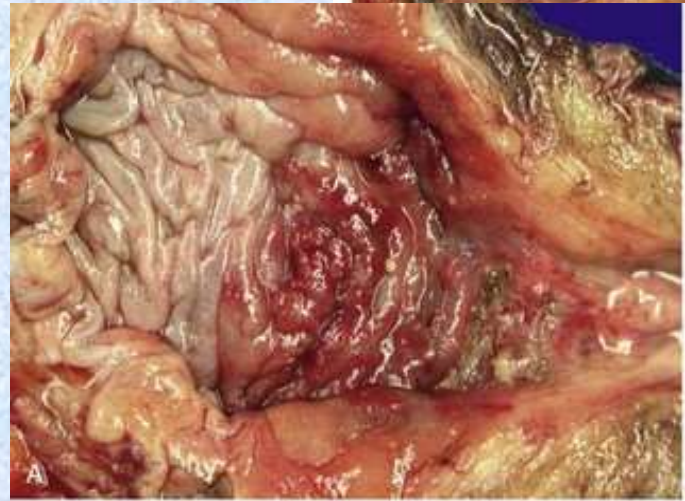
*Grossly:* 1-Early cases (flat carcinoma)



**Leukoplakic patch**



**Ulcer**



**Erosion**

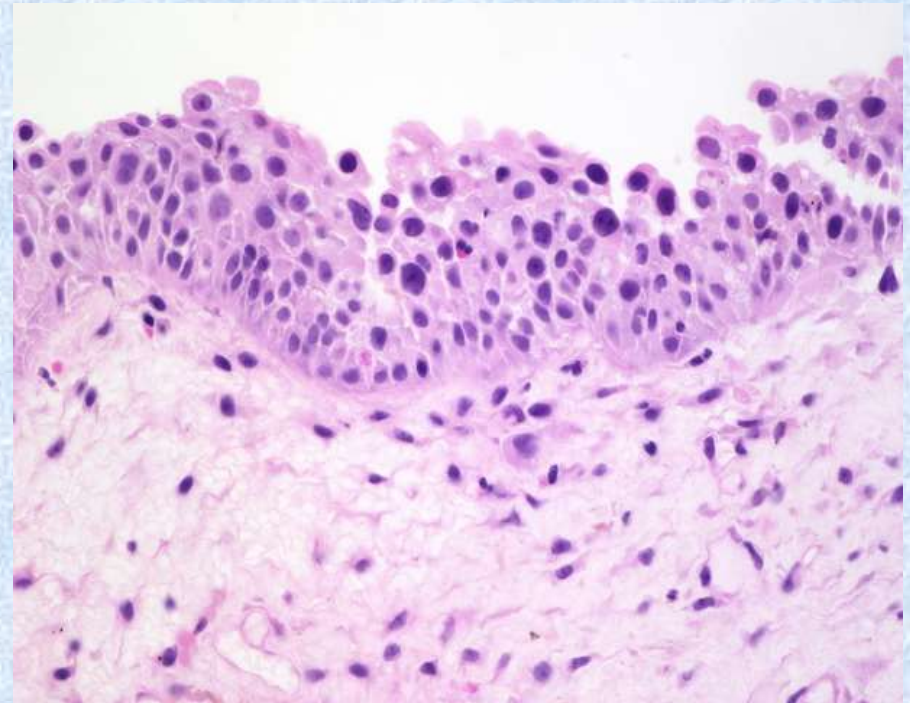
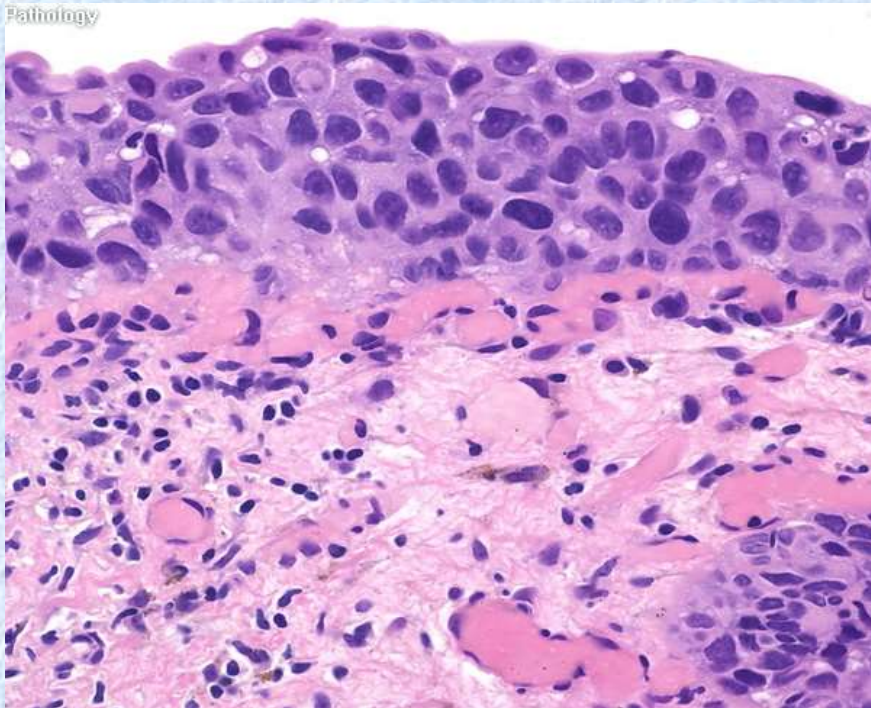


# Pathology of urinary tract diseases

## Transitional cell carcinoma

### Pathology:

**MP:** 1-Early cases (flat carcinoma)





# Pathology of urinary tract diseases

## Transitional cell carcinoma

### Pathology:

*Grossly:* 2-Papillary mass

- Large mass with finger like projections
- Usually infiltrate bladder wall



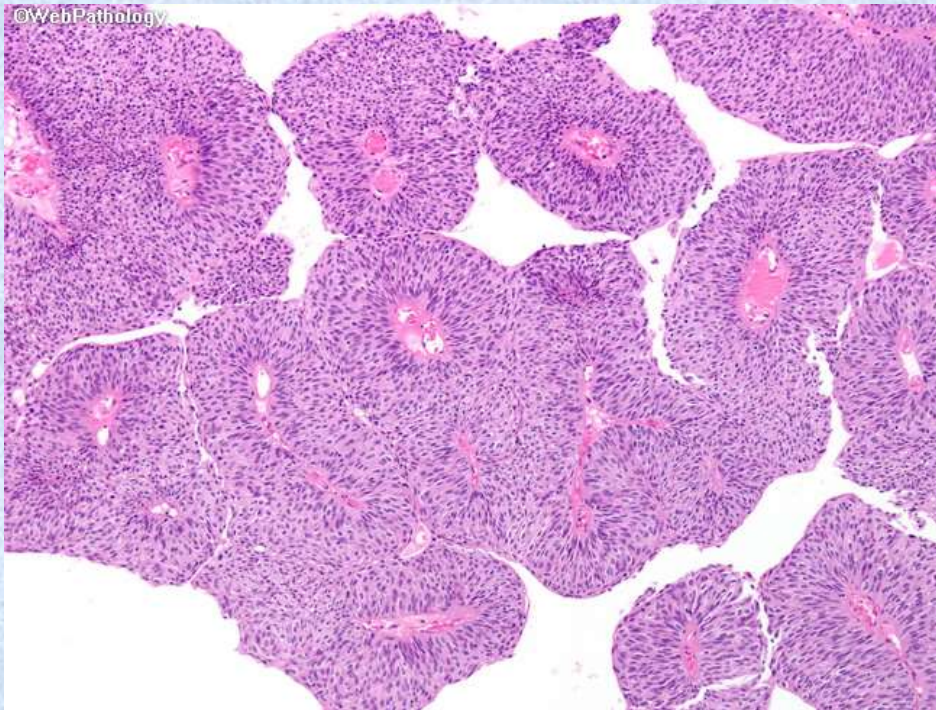
# Pathology of urinary tract diseases

## Transitional cell carcinoma

### Pathology:

**MP:** 2-Papillary mass:

- Complex branching papilla
- Thin vascular connective tissue core
- Covered with several layers of atypical cells



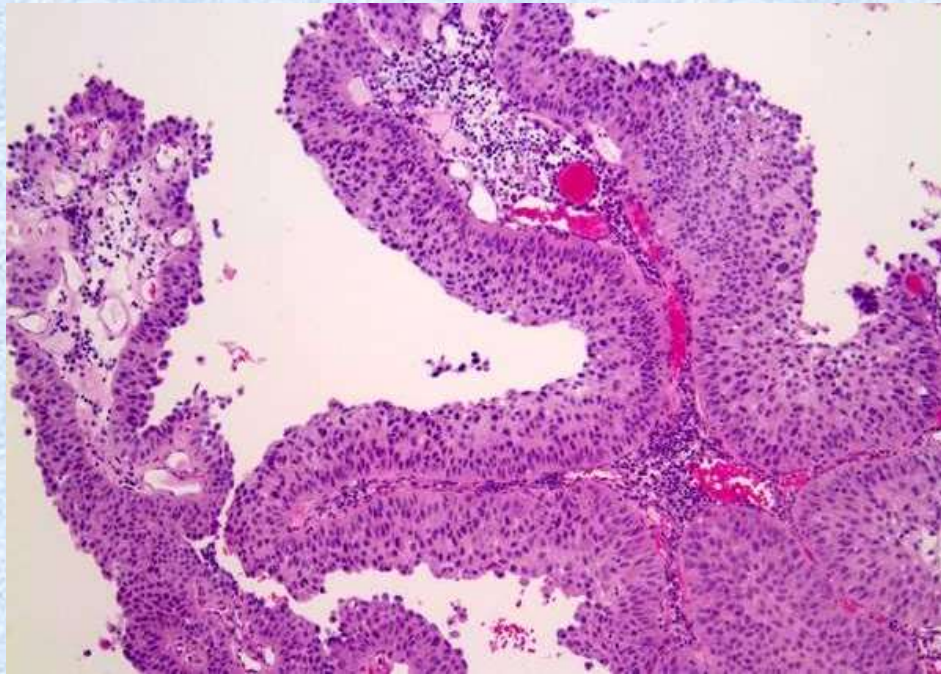


# Pathology of urinary tract diseases

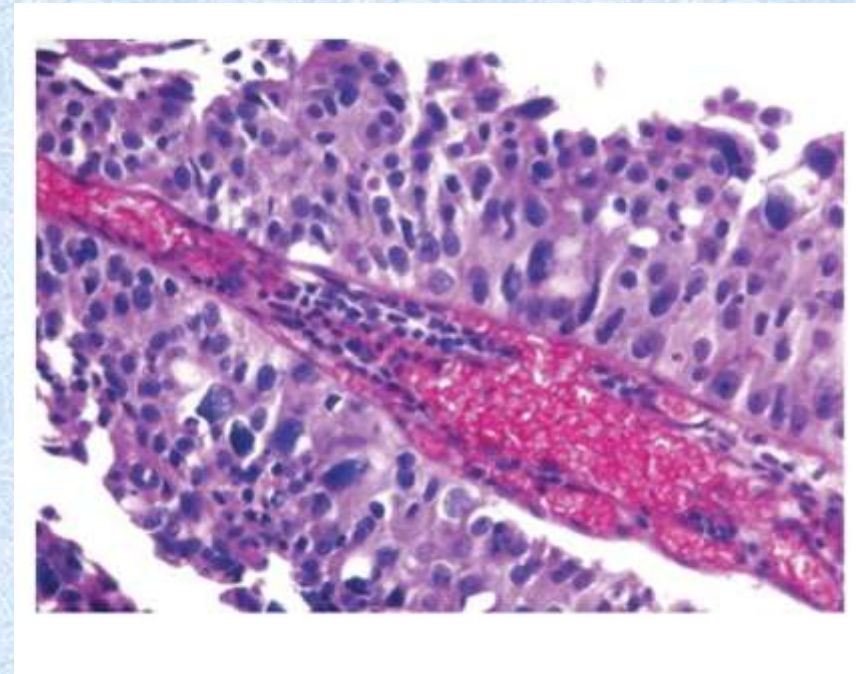
## Transitional cell carcinoma

### Pathology:

**MP:** 2-Papillary mass: complex branching papilla



Low grade



High grade

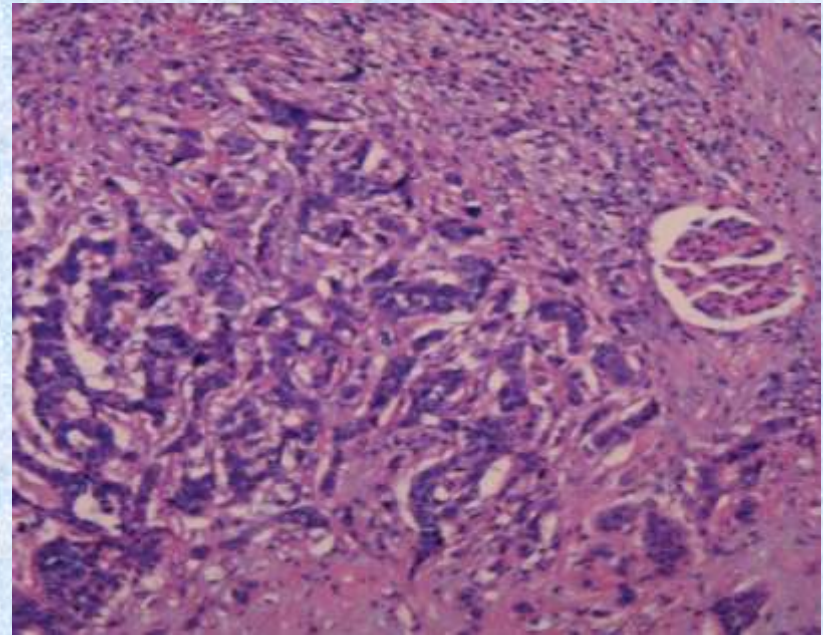
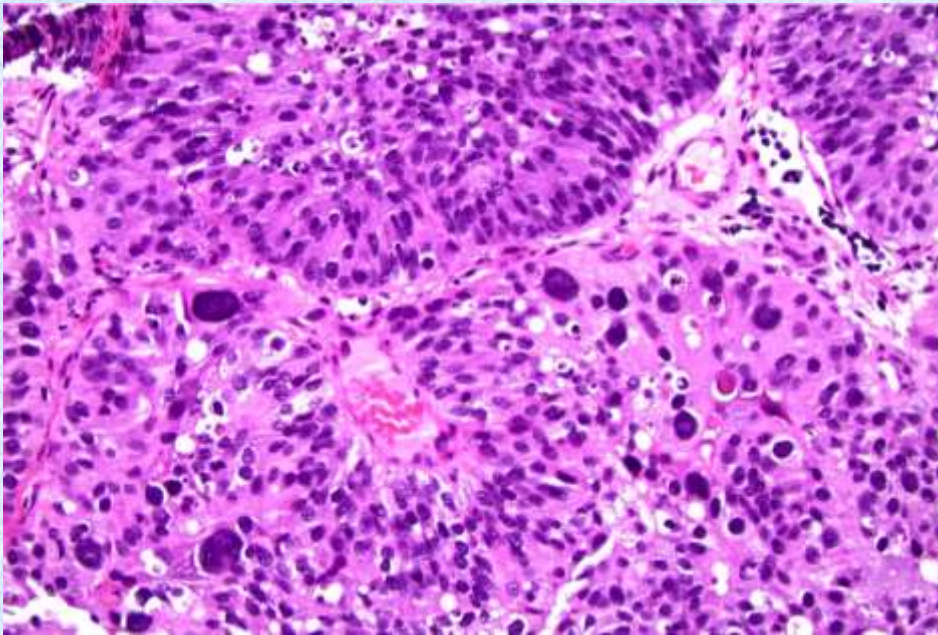


# Pathology of urinary tract diseases

## Transitional cell carcinoma

### Pathology:

**MP:** 3-Invasive urothelial carcinoma: malignant cells infiltrate submucosa forming nests, sheets and cords





# Pathology of urinary tract diseases

## Squamous cell carcinoma

### **Definition:**

A malignant epithelial neoplasm arising after squamous metaplasia of urothelium

### **Incidence:**

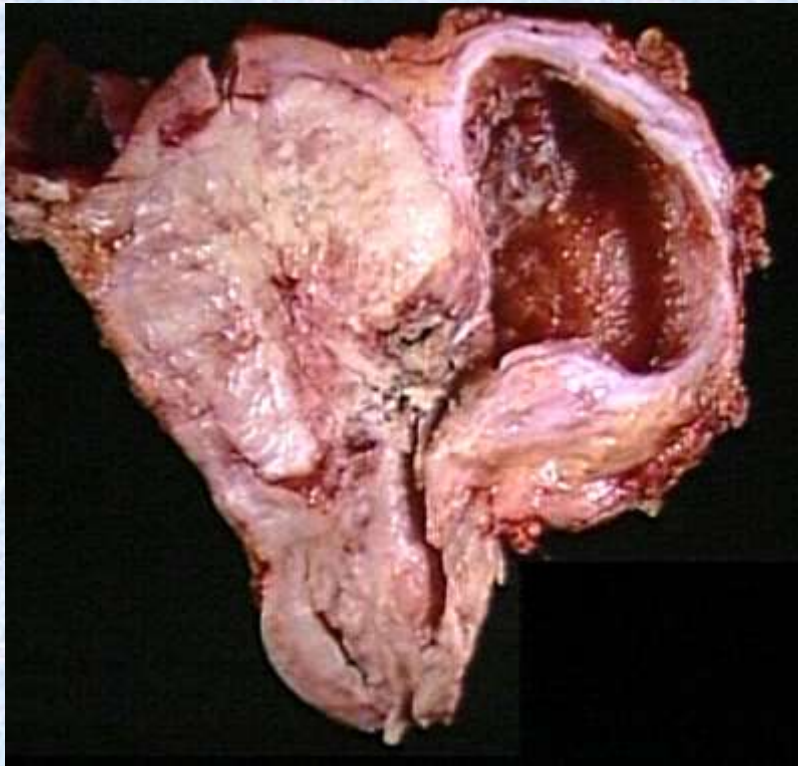
- Worldwide; it is much less common than urothelial carcinoma
- In Egypt is common due to high prevalence of bilharziasis
- More common in males
- Usually affect young adults (30-50 years)

# Pathology of urinary tract diseases

## Squamous cell carcinoma

### Pathology:

#### *Gross:*



#### Fungating mass

- Cauliflower fungating mass
- Usually infiltrates bladder wall



#### Malignant ulcer

- Raised everted edge
- indurated base
- necrotic floor



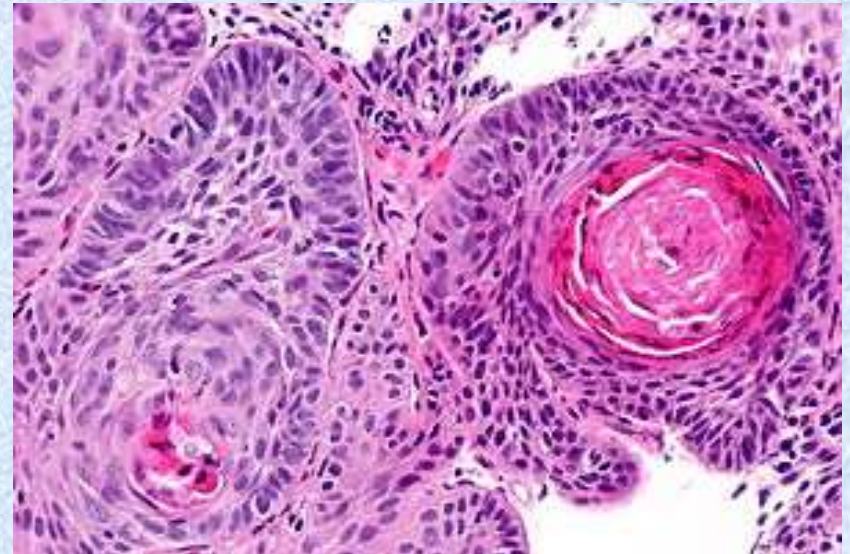
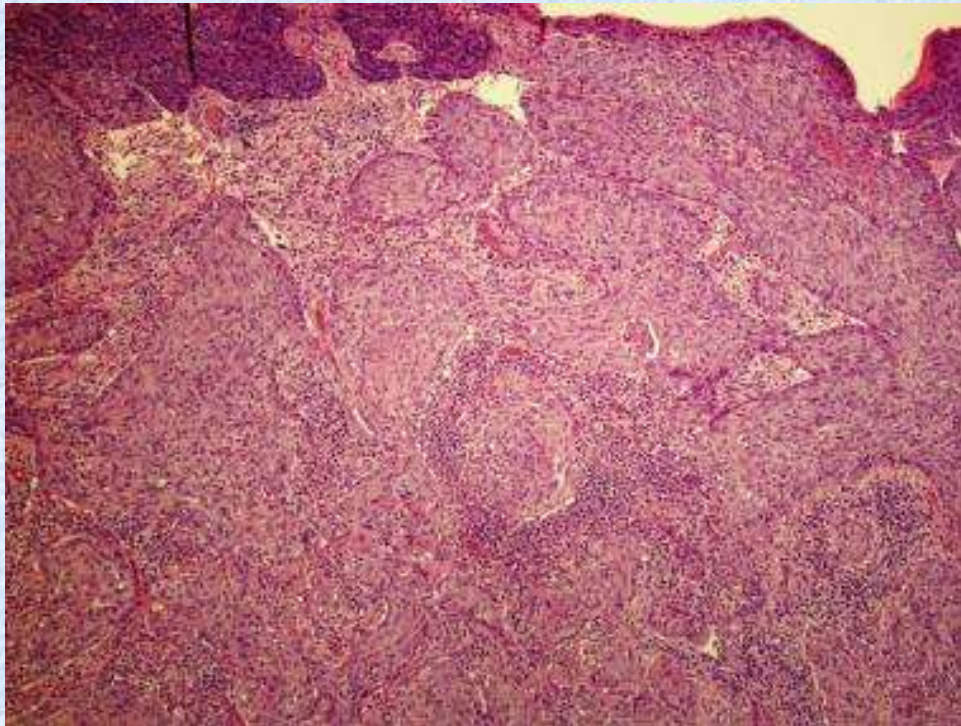
# Pathology of urinary tract diseases

## Squamous cell carcinoma

### Pathology:

*MP:*

- Malignant cells form large sheets and nests
- Central keratinization, keratin pearl and cell nest formation
- Infiltrates submucosa and muscle wall





# Pathology of urinary tract diseases

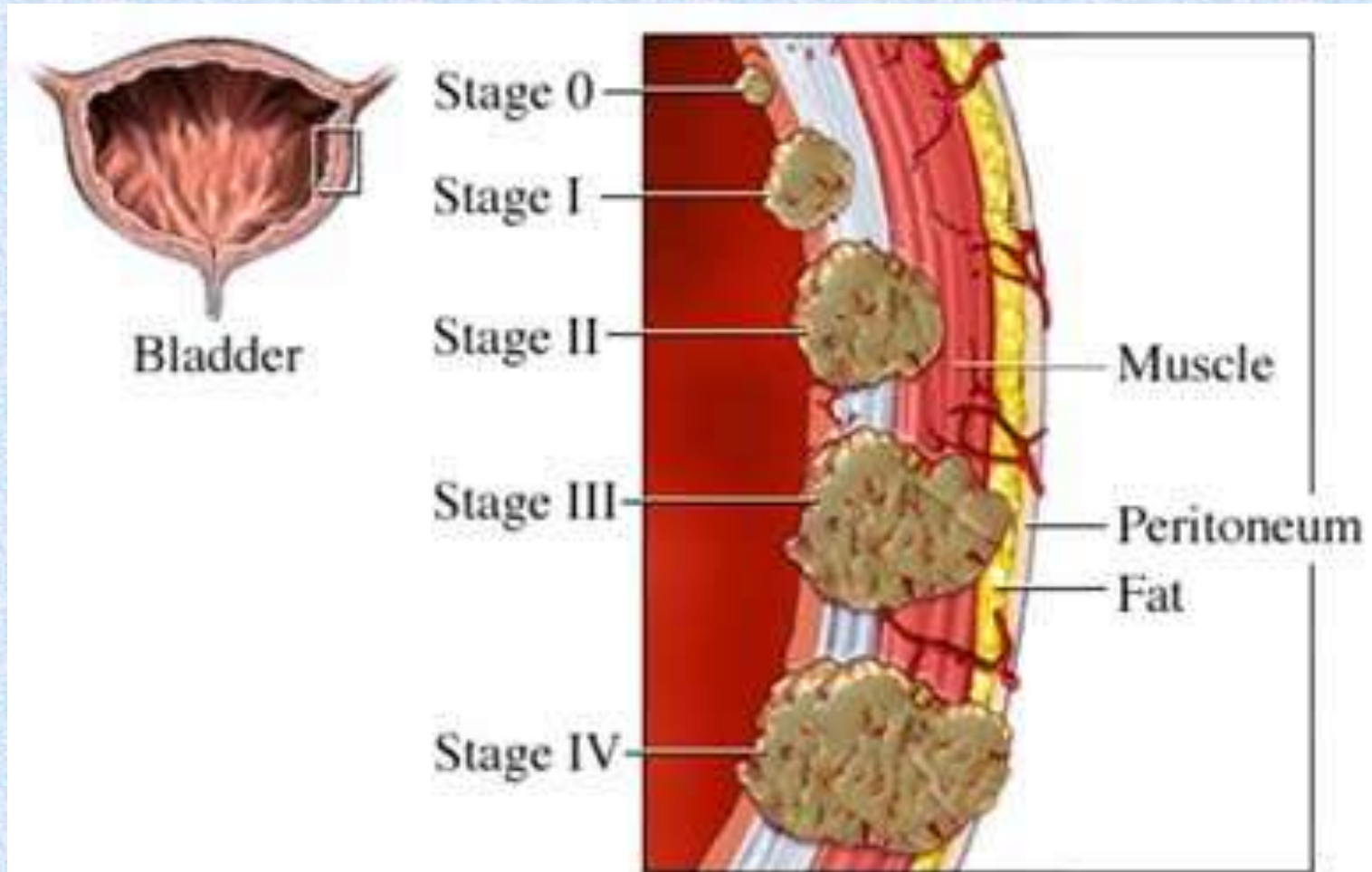
## Spread of cancer bladder

1. ***Direct:*** to nearby structures as ureters, urethra, prostate, seminal vesicles, cervix and vagina
2. ***Lymphatic:*** internal iliac and para-aortic LNs
3. ***Hematogenous:*** lung, liver, bone and CNS

# Pathology of urinary tract diseases

## Tumors of urinary bladder

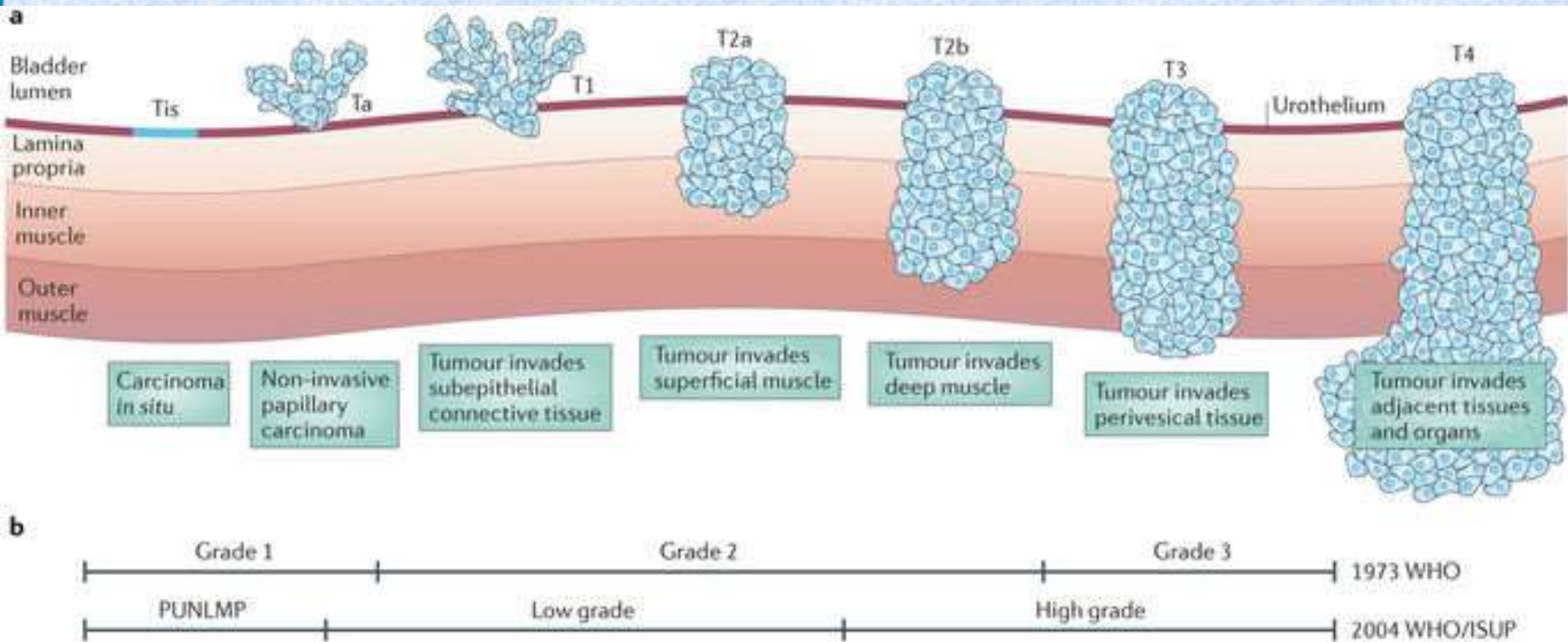
### ▪ Pathological staging of cancer bladder



# Pathology of urinary tract diseases

## Tumors of urinary bladder

### ■ Pathological staging of cancer bladder





# Pathology of urinary tract diseases

## Bilharzial and non bilharzial cancer bladder

	Bilharzial	Non bilharzial
<b>Age</b>	30-50yrs	Older than 50yrs
<b>Etiology and Predisposing factors</b>	<ul style="list-style-type: none"><li>-Bilharziasis: leads to leukoplakia, cystitis glandularis, squamous metaplasia and dysplasia</li><li>-Chronic cystitis by E coli with liberation of nitrates</li><li>-Stones</li></ul>	<ul style="list-style-type: none"><li>-Villous papilloma</li><li>-Aniline dyes</li><li>-Stones</li><li>-Smoking</li><li>-Chronic cystitis including bilharziasis</li></ul>
<b>Grossly</b>	<ul style="list-style-type: none"><li>-Fungating mass (non-papillary)</li><li>-Malignant ulcer</li><li>-Infiltrative mass</li></ul>	<ul style="list-style-type: none"><li>-Usually papillary mass.</li><li>-Less commonly fungating, ulcerative or infiltrative mass</li></ul>

# Pathology of urinary tract diseases

## Bilharzial and non bilharzial cancer bladder

	Bilharzial	Non bilharzial
<b>MP:</b>	<ul style="list-style-type: none"><li>-Sq. CC</li><li>-TCC (non papillary or papillary)</li><li>-Adenocarcinoma (rare)</li></ul>	<ul style="list-style-type: none"><li>- TCC<ul style="list-style-type: none"><li>•Papillary</li><li>•Non papillary (invasive)</li></ul></li><li>- Adenocarcinoma (rare)</li></ul>
<b>Spread:</b> <i>-Direct</i> <i>-Lymphatic</i> <i>-Blood</i>	<ul style="list-style-type: none"><li>-Common</li><li>-Rare</li><li>-Rare</li></ul>	<ul style="list-style-type: none"><li>-Common</li><li>-Relatively more common</li><li>-Relatively more common</li></ul>
<i>-Chemotherapy</i>	-Chemo-resistant	-Commonly chemo-sensitive
<i>-Radiotherapy</i>	-Radio-resistant	-Commonly radiosensitive
<i>-Prognosis</i>	-Worse	-Relatively better

# Pathology of urinary tract diseases

## Hematuria

**Definition:** passage of blood with urine

**Etiology:**

1. Urinary bilharziasis
2. Inflammatory : cystitis, pyelonephritis, glomerulonephritis
3. Renal stones
4. Urinary bladder and renal tumors
5. Polycystic kidney
6. Prostatic causes: Benign prostatic hyperplasia
7. Circulatory disease: Renal congestion and renal infarction.
8. General causes: leukemia, purpura, hemophilia.....etc



# Pathology of urinary tract diseases

## Self assessment:

**Which of the following is considered as a triphasic tumor?**

- a. Hypernephroma.
- b. Nephroblastoma.
- c. Transitional cell carcinoma.
- d. Squamous cell carcinoma.
- e. Adenocarcinoma.

**Which of the following has complex papillary appearance on microscopic examination?**

- a. Hypernephroma.
- b. Nephroblastoma.
- c. Transitional cell carcinoma.
- d. Squamous cell carcinoma.
- e. Adenocarcinoma.

# Pathology of urinary tract diseases

*Thank you*