Diseases of Urinary System

(Part 4)

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Pathology of urinary tract diseases

Urinary outflow obstruction and Diseases of urinary bladder

Pathology of urinary tract diseases

Intended Learning Objectives

By the end of this lecture; you should:

- Identify types, etiology and complications of renal calculi.
- Define hydronephrosis and enumerate its causes and complications
- Define cystitis and mention its predisposing factors, etiology and effects

Pathology of urinary tract diseases

Renal calculi

Pathology of urinary tract diseases

Renal calculi

Etiology/predisposing factors:

Occur due to precipitation of inorganic crystals of the urine ***due to***:

1. ***Increase urine concentration:*** hot weather or decrease water intake
2. ***Increased inorganic crystals***:
   a. ↑ calcium: hyperparathyroidism
   b. Excess urate as in gout
   c. Excess oxalate as in excess intake in diet (tomato, mango)
   d. Excess cystine as familial cystinurea
3. ***Urine stasis***: predispose to infection and help precipitation of inorganic crystals
4. ***Urinary tract infection:***
   - Provide a nucleus for stone formation
   - Change pH of urine: alkaline pH predispose to phosphate stone while acidic pH predispose to oxalate stone

Pathology of urinary tract diseases

Renal calculi

Types of renal stones:

	Oxalate	Urate	Phosphate
Type	Primary	Primary	Secondary to infection
Site	Renal calyces, renal pelvis and urinary bladder		
Size	Small	Usually small, may be large	Usually large (stage horn)
Number	Multiple	Single or multiple	Usually single
Color	Black	Yellow/brown	Chalky white
Surface	Spiky	Smooth	Smooth
Consistency	Hard	Hard	Friable
X ray	Radio-opaque	Radiolucent	Radio-opaque

Pathology of urinary tract diseases

Renal calculi

Types of renal stones:

Oxalate stone

Urate stone

Staghorne phosphate stone

Pathology of urinary tract diseases

Renal calculi

Effects and complications

- **M**igration → pain & obstruction.
- **O**bstruction → hydroureter & hydronephrosis or calculus anuria.
- **H**ematuria due to Injury of urinary mucosa.
- **I**nfection → cystitis → pyelonephritis, pyoureter, pyonephrosis.
- **M**etaplasia (squamous metaplasia) → squamous cell carcinoma..

Pathology of urinary tract diseases

Hydronephrosis

Pathology of urinary tract diseases

Hydronephrosis

Definition:

A chronic dilatation of renal pelvis and calyces with progressive pressure atrophy of renal cortex.

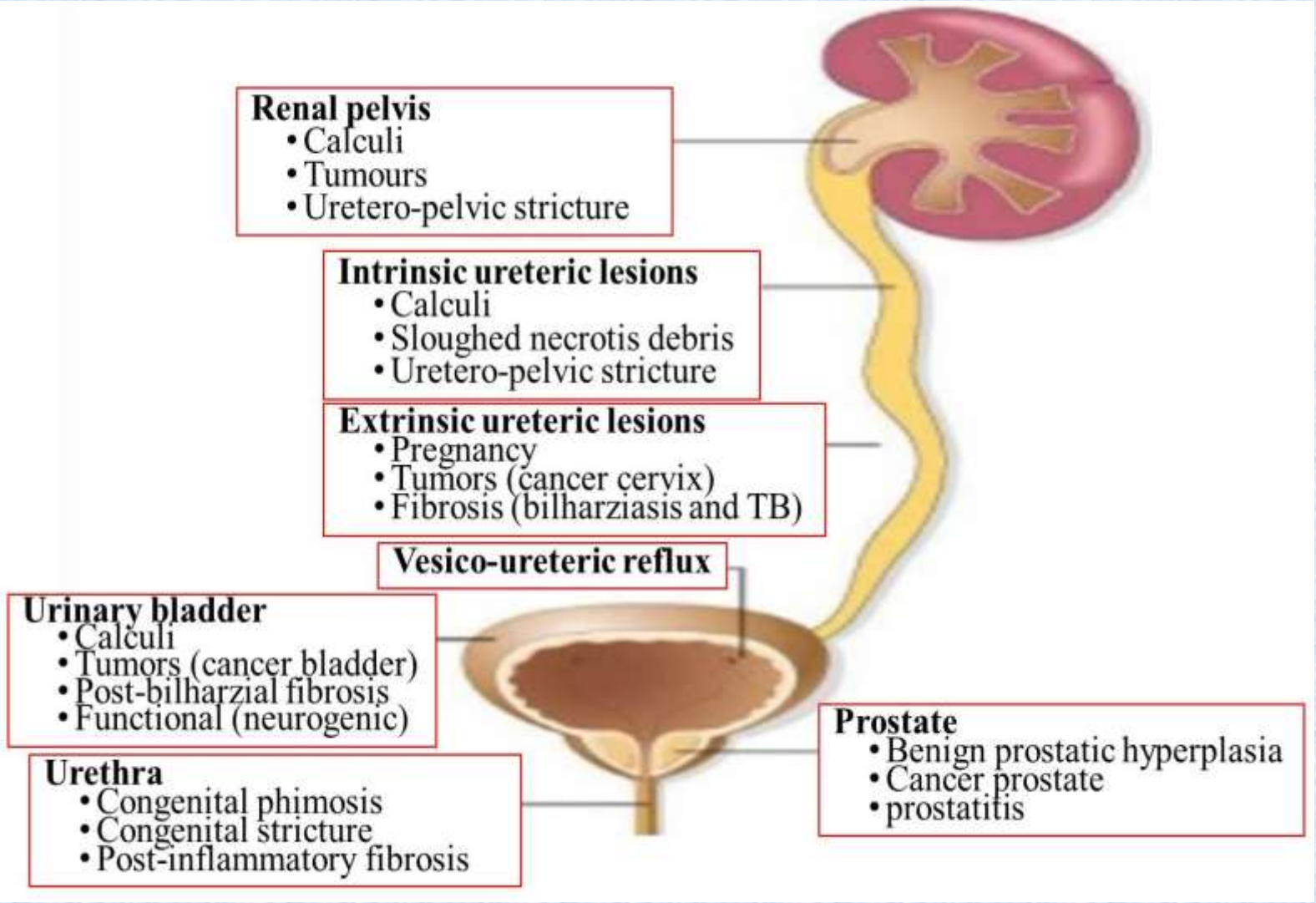
Etiology:

It occurs due to gradual, incomplete or intermittent obstruction of urinary pathway at any level of urine outflow

Pathology of urinary tract diseases

Hydronephrosis

Etiology:



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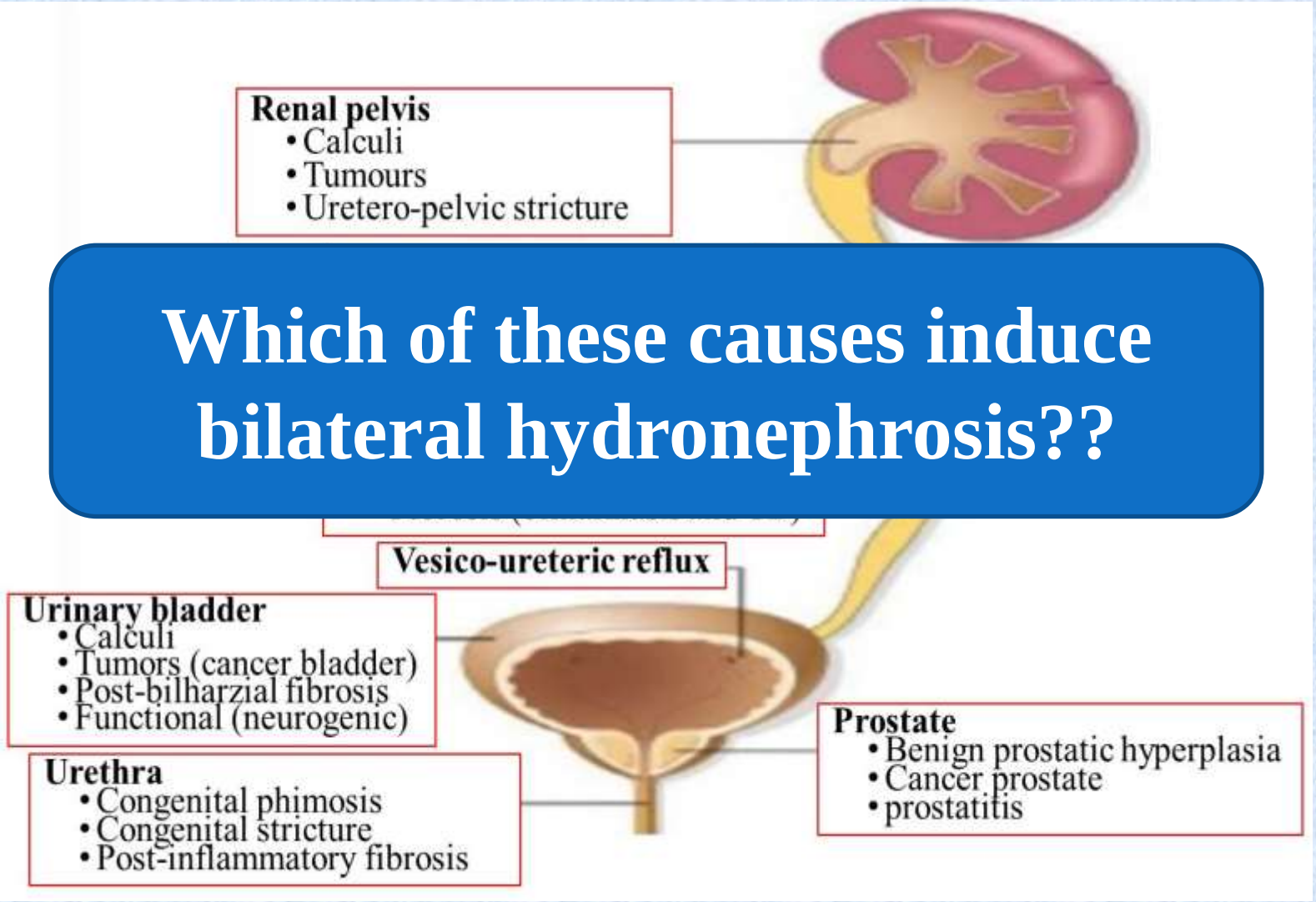
Hydronephrosis

Etiology:



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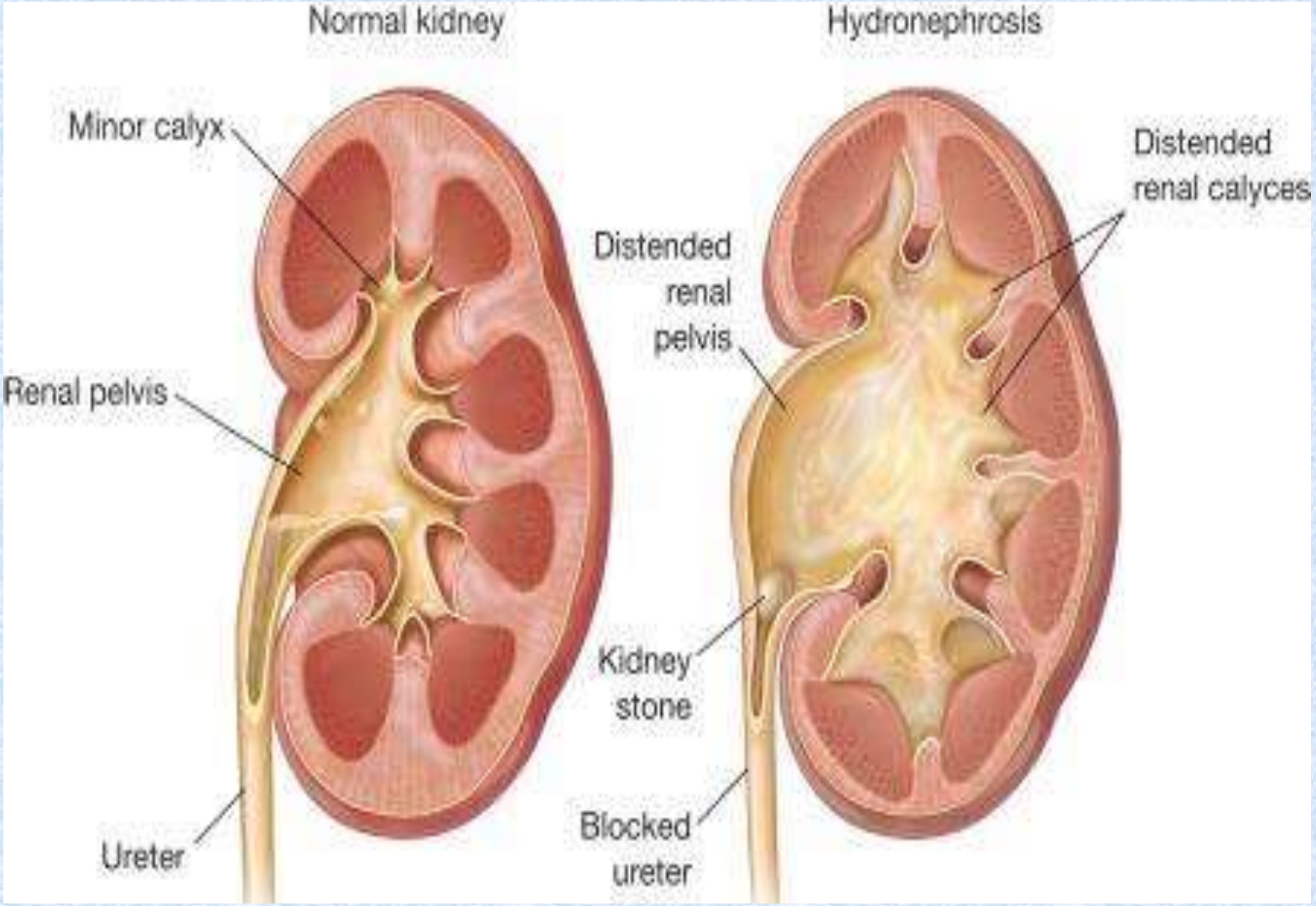
Hydronephrosis

Grossly:



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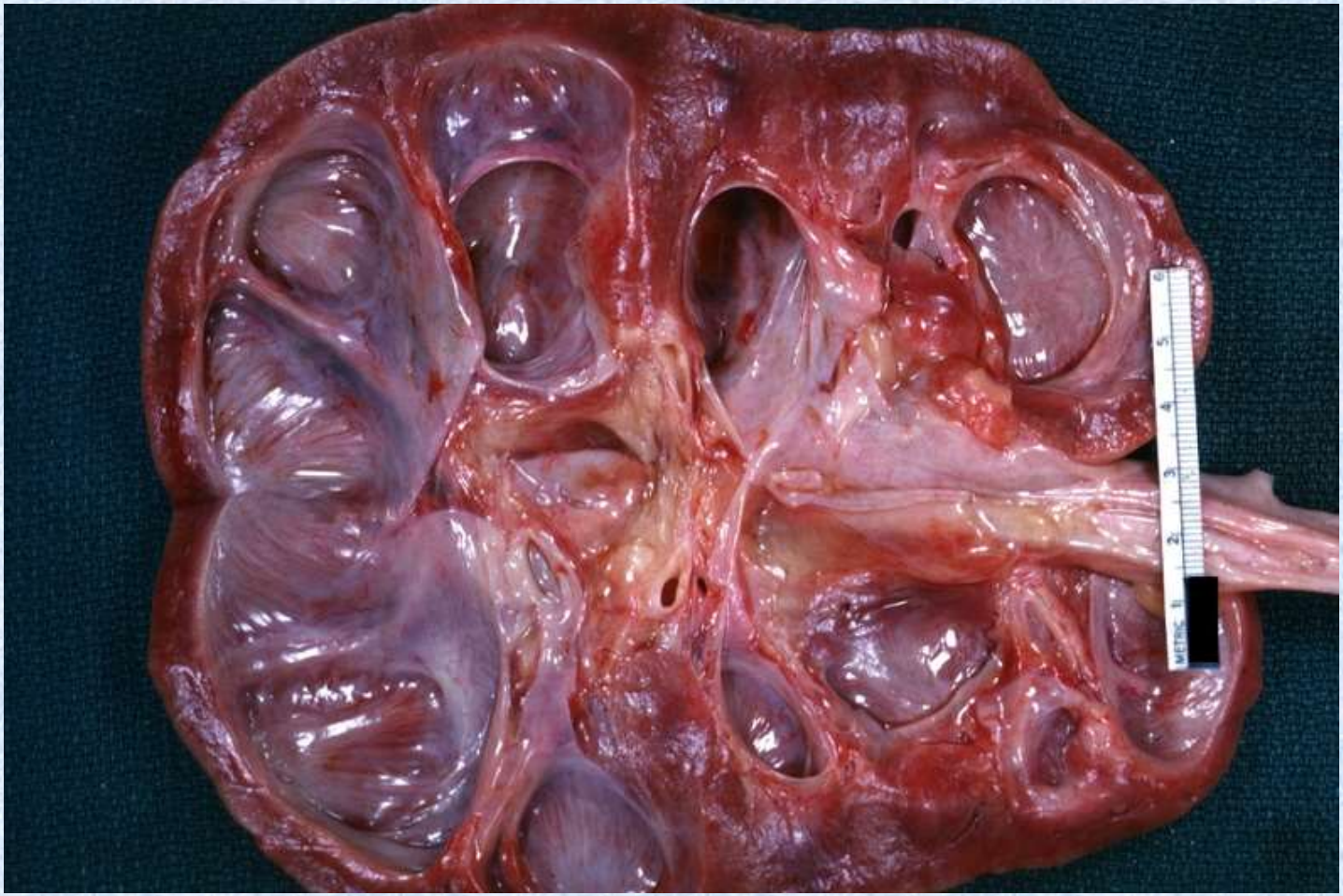
Hydronephrosis

Grossly:



Pathology of urinary tract diseases

Hydronephrosis

Grossly:

In bilateral cases; there is:

- Hypertrophy and dilatation of urinary bladder with trabeculation of the wall.
- Urinary bladder diverticula
- Bilateral hydroureter

- **MP:**

  Atrophic renal cortex with fibrosis

Pathology of urinary tract diseases

Hydronephrosis

Complications:

- Secondary infection leading to pyonephrosis
- Hypertension
- Stone formation
- Chronic renal failure (in bilateral cases)
- Urinary bladder diverticula with diverticulitis and stone formation.
- Squamous metaplasia that predispose to carcinoma.

Pathology of urinary tract diseases

Cystitis

- **Definition:**

  Inflammation of the urinary bladder wall

- **Types:**

  1. Acute cystitis
  2. Chronic cystitis:
     a. Chronic non specific cystitis
     b. Chronic specific cystitis
        - Bilharzial cystitis
        - Chronic interstitial cystitis
        - Malakoplakia (inflammation rich in histeocytes)

Pathology of urinary tract diseases

Cystitis

Non specific cystitis

- **Etiology:**

Predisposing factors:

1. Urine stasis as in enlarged prostate
2. Urinary bilharziasis: unhealthy mucosa
3. Females are more susceptible due to short urethra.
4. Decreased immunity: DM, use of steroids or immuno-suppressive drugs and AIDS
5. Urinary tract obstruction: renal calculi, tumors and stricture
6. Urinary instrumentation
7. Nearby infection as pyelonephritis, prostatitis, inflammation of uterine cervix, vagina and urethra

Pathology of urinary tract diseases

Cystitis

Non specific cystitis

- **Etiology:**

Routs of infection:

- Ascending infection through urethra
- Spread from a nearby organ as in cases of chronic cervicitis or pelvic inflammatory diseases

Causative organism

- Commonly E coli
- Other organisms: Bacillous proteus, klebsiella, staph aureus, streptococci, gonococci and others

- **Pathological features:**
  - Main two forms: **acute** and **chronic**

Pathology of urinary tract diseases

Cystitis

	Acute non specific	Chronic non specific
Clinically	-Frequency -Burning micturition -High grade fever & rigors -Hematuria and pyuria -Urine analysis: pus cells and increased RBCs	-Frequency (less compared to acute form) -Mild and microscopic hematuria -Urine analysis pus cells and RBCs
Pathology	-Congested submucosa -Infiltration by acute inflammatory cells -Hemorrhagic inflamm in severe cases	-Benign urothelial changes: hyperplasia, Brunn`s nests, cystitis cystica and squamous metaplasia - Chronic inflammatory reaction -Background of fibrosis

Pathology of urinary tract diseases

Cystitis

Non specific cystitis

- **Complications:**
  - Hematuria
  - Spread of infection; leading to uretritis and pyelonephritis
  - Hematogenous spread: bacteremia, septicemia and toxemia
  - Stone formation
  - Fibrosis of the urinary bladder in chronic cases (contracted bladder)

Pathology of urinary tract diseases

Cystitis

Bilharzial cystitis

- **Definition and incidence:**
  - It is a chronic granulomatous disease caused by schistsoma infection.
  - Very common and endemic in Egypt

- **Etiology**
  - Caused mainly by Schistsoma hematobium

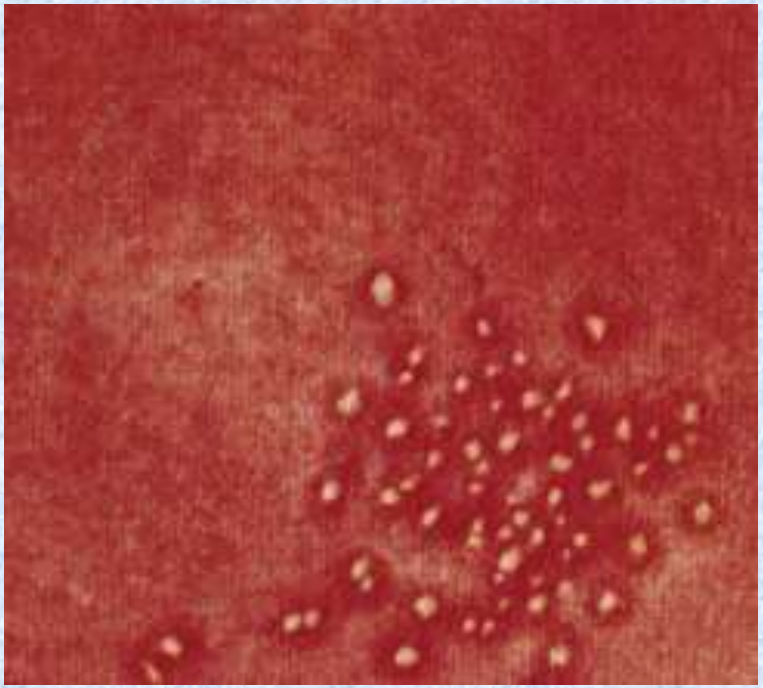
- **Sites:**
  - Urinary bladder is the main affected site
  - Ureters, renal pelvis, seminal vesicles and prostate can be also affected

Pathology of urinary tract diseases

Cystitis

Bilharzial cystitis

- **Pathological features**
  - *Grossly:*
    - Commonly affect trigone and posterior wall
    - Early lesions appears as sandy patches
    - Chronic prolonged cases: urinary bladder ulcer or polyp (single or multiple).



Sandy patches

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Cystitis

Bilharzial cystitis

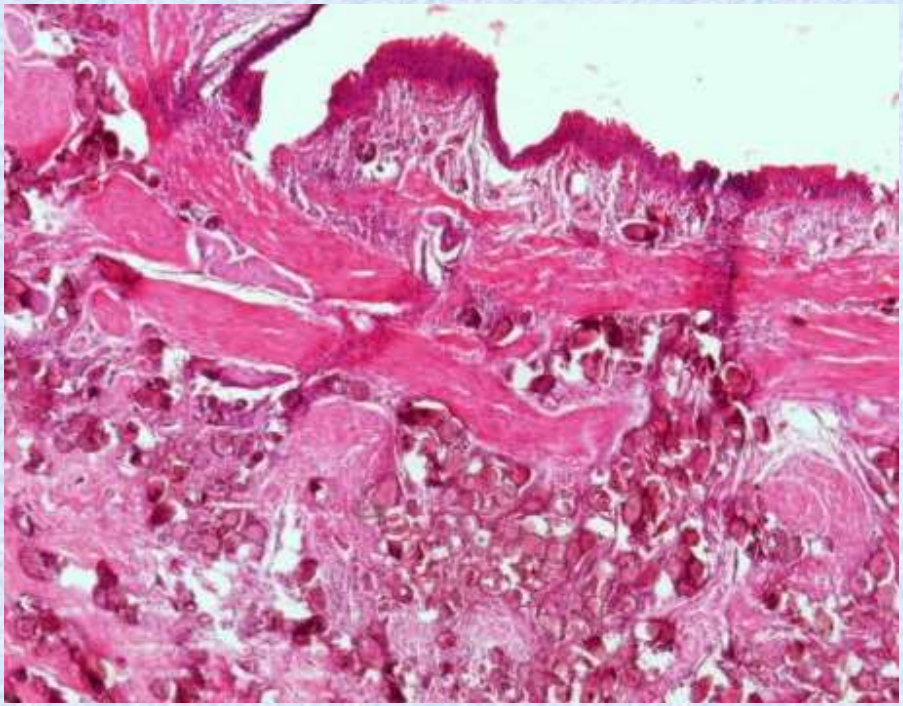
- **Pathological features**
  - *Microscopically:*
    - **Bilharzial granuloma**: - Involves mainly submucosa.
      - Fresh and calcified bilharzial ova
      - Epithelioid cells
      - Eosinophils and lymphocytes
      - Surrounded by fibrosis
    - **Benign proliferative urothelial changes:**

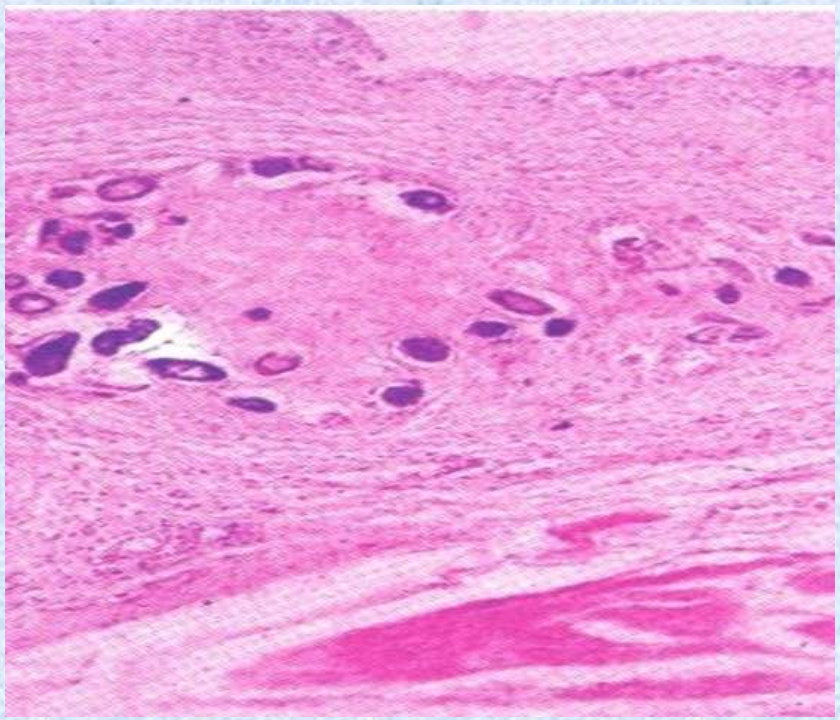
1. Epithelial hyperplasia
2. Brunn`s nests
3. Cystitic cystitica
4. Cystitis glandularis
5. Squamous metaplasia
6. Squamous dysplasia
7. Urothelial dysplasia

Pathology of urinary tract diseases

Cystitis

Bilharzial cystitis

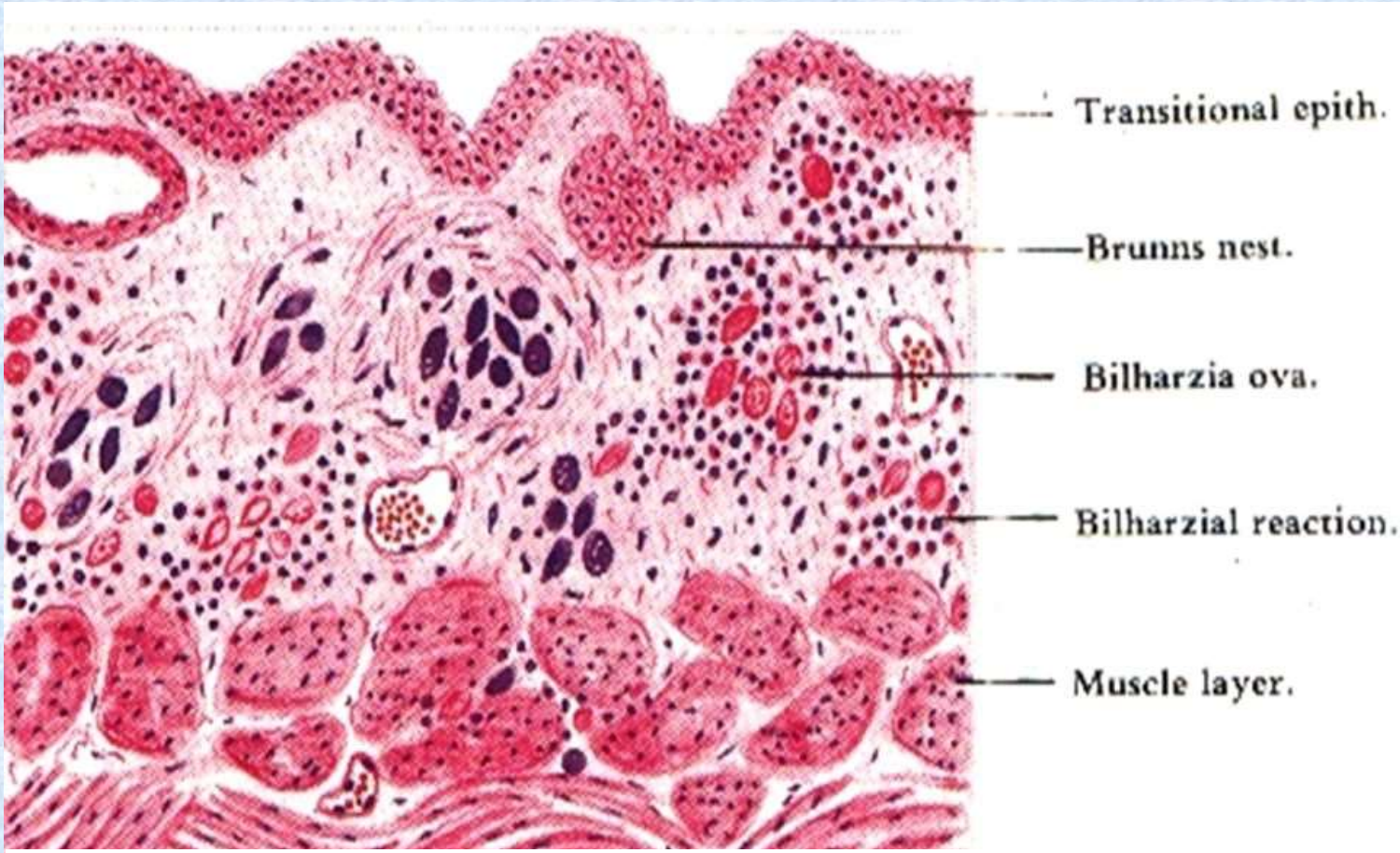




Pathology of urinary tract diseases

Cystitis

Bilharzial cystitis



Bilharzial granuloma

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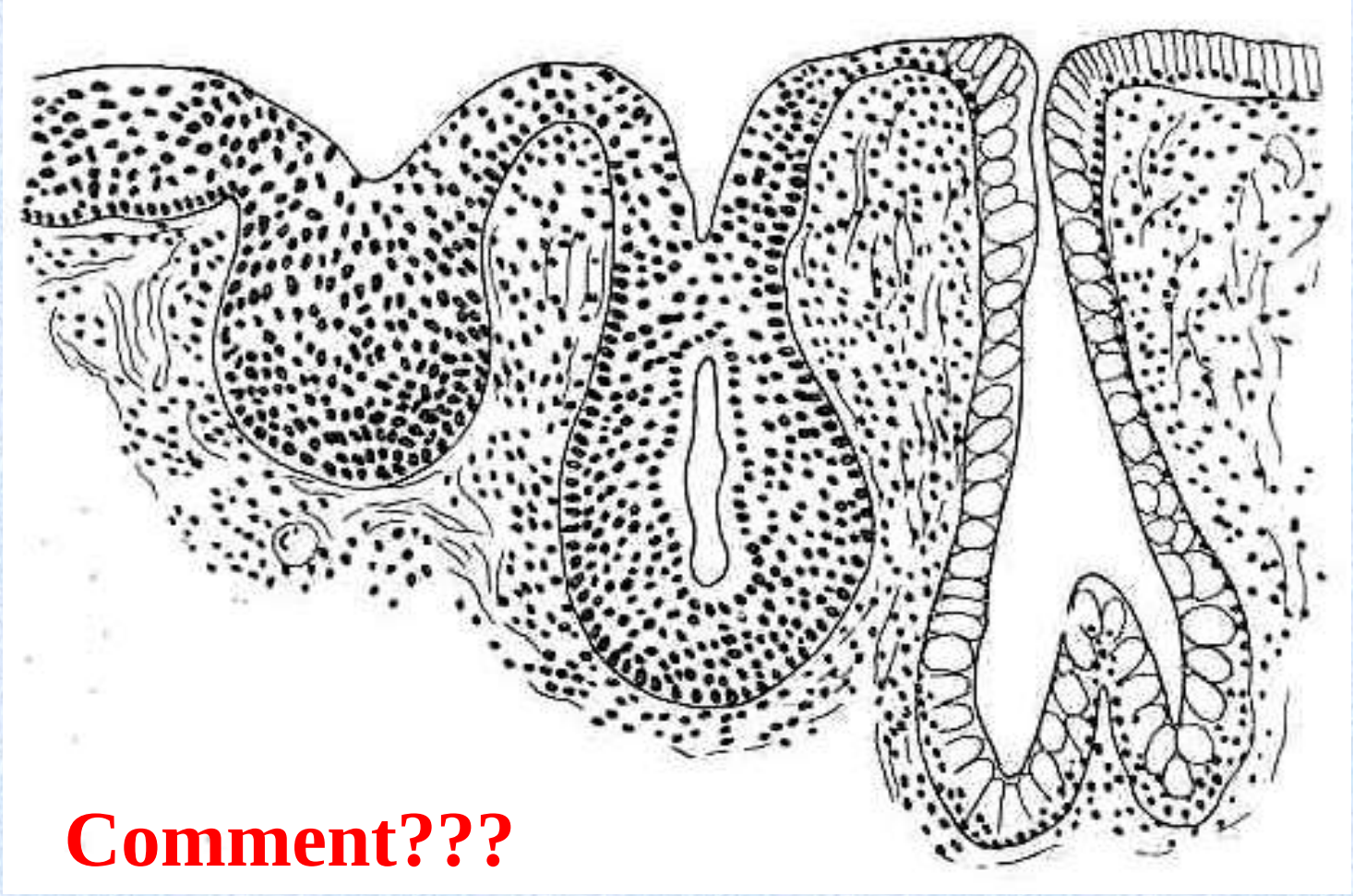
Cystitis

Bilharzial cystitis



Comment???

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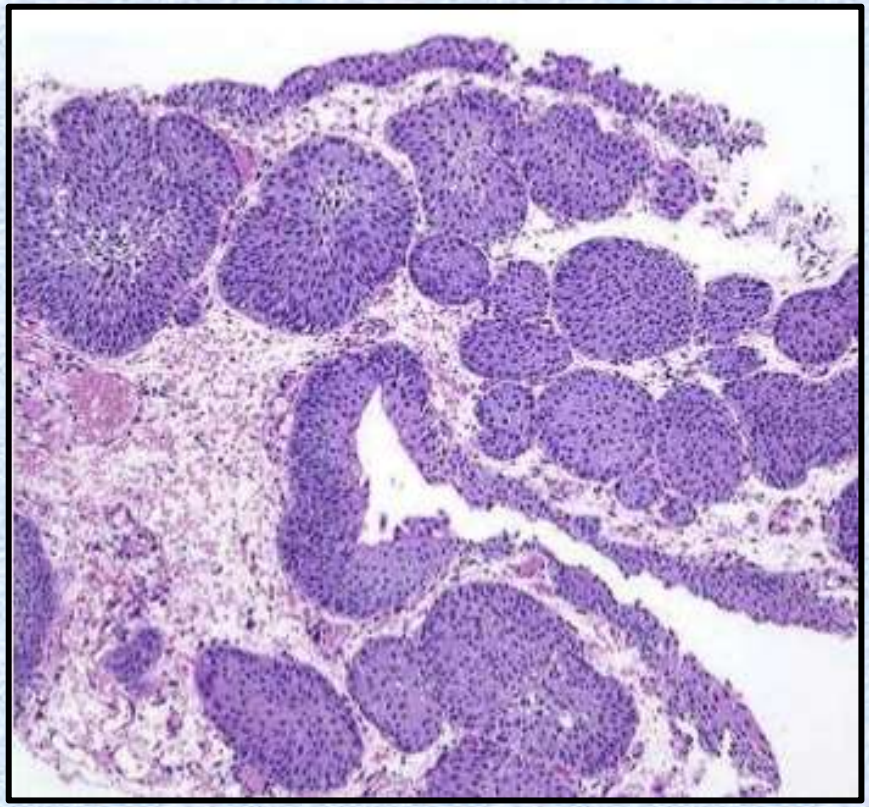
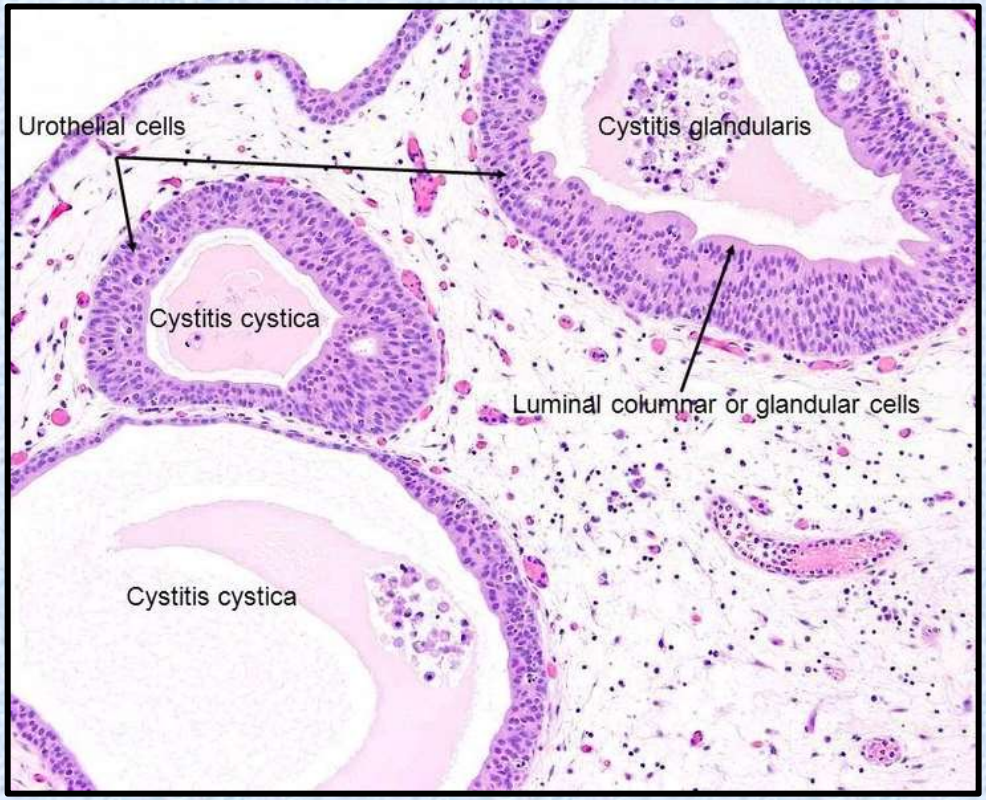
Cystitis

Bilharzial cystitis



Brunn`s nests



Cystitis cystica and glandularis

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Cystitis

Bilharzial cystitis

- **Complications**

1. Hematuria causes anemia (microcytic hypochromic)
2. Secondary bacterial infection of the bladder wall and peri-vesical tissue.
3. Ova and epithelial debris provide nuclei for phosphate stone formation
4. Fibrosis at the bladder neck causes hypertrophy of UB wall
5. Dilatation of bladder wall with bilateral hydroureter and hydronephrsosis.
6. Renal failure
7. **Predispose to cancer bladder:** Urothelial, squamous or glandular carcinomas

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Self assessment:

Which of the following in NOT true for hydronephrsis

a. Induced by gradual or incomplete obstruction of urine pathway
b. Can be caused by urinary bilharziasis
c. Usually associated with atrophy of renal cortex
d. Very commonly associated with chronic renal failure
e. Induces enlargement of the kidney and dilatation of renal calyces

Bilraziasis granuloma is NOT characterized by

a. Urinary bladder is the main site
b. Usually affect submucosa
c. Numerous fresh and calcified bilharzial ova
d. Numerous epithelioid cells and rare eosinophils
e. Associated with benign proliferative urothelial changes

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Thank you