

Renal system

clinical introduction for Third year

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OUTLINE:

- Give an introduction for renal system through clinically oriented cases.
- Briefly discuss urinalysis ,hematuria and proteinuria.

Case 1:

- 23 yrs old male , previously healthy, c/o Rt loin pain of 2 days duration and noticed blood in the urine.

what is your next step?

- You sent for him a urinalysis and it showed:
nill protein, nill sugar, RBCs 10-20, WBCs 4-5.

what is next ?

(?case of kidney stones)

Case 2:

- 66 yrs. old male ,previously healthy, c/o Rt loin pain of 2 days duration and noticed blood in the urine.

what is your next step?

- You sent for him a urinalysis and it showed :
nil protein, nil sugar, 10-20 RBCs , WBCs 4-5.

what is your next step?

(?case of Renal cell carcinoma)

Case 3:

- 30 yrs old male previously healthy, he noticed blood in the urine.

your next step was to send a urinalysis for him.

- Urinalysis showed:

+2 protein , nil sugar , 10-20 RBCs, 4-5 WBCs.

now what is next?

(?case of Glomerulonephritis)

Case 4:

- 30 yrs old male previously healthy, c/o sudden sever Lt loin pain ,then noticed blood in the urine.

Urinalysis:+3 protein , nil sugar , 10-20 RBCs,
4-5 WBCs)

What is next?(?Lt renal vein thrombosis)

Case 5:

- 30 yrs. old male ,previously healthy , had diarrhea and treated with metronidazole noticed blood in the urine.

urinalysis showed : protein nil, sugar nil , RBCs 1-2 , WBCs 1-2 .

What is next?(Drug related red urine)

Case 6

- 70 yrs. old male presented to the clinic with painless attacks of bloody urine and urgency with feeling of hotness.

his urinalysis showed no sugar ,+1 protein, 10-15 RBCs, and 20-25 WBCs.

(? UTI)

Case 7 :

- 70 yrs. old male presented to the clinic with painless attacks of bloody urine, and history of passing clots.

His urinalysis showed numerous RBCs, 8-10 WBCs and numerous epithelial and transitional cells.

(?transitional cell carcinoma of bladder)

Case 8:

- 70 yrs old male presented to the clinic with painless attacks of bloody urine, and history of passing clots.

His urinalysis showed numerous RBCs, 8-10 WBCs.

you noticed that his body was covered with some dark red-black areas that he can't remember any trauma at these sites.

(?low platelets, meds like warfarin)

Case 9 :

- 13 yrs old female came to the clinic with back pain which radiates to the groin and attacks of hematuria.

her urinalysis showed only 8-10 RBCs.

(?menses related)

Case 10 :

- 30 yr old lady came to the clinic with history of generalized pain, arthralgia and skin rash. She noticed also bloody urine sometimes and new onset swelling in the ankles.

her urinalysis showed nil sugar, +3 protein and 10-15 RBCs with casts.

(?SLE and lupus nephritis)

Case 11 :

- 70 yr old lady, came to the clinic with history of generalized pain, arthralgia and skin rash.

She noticed also bloody urine sometimes and new onset bloody cough.

her urinalysis showed nil sugar, +1 protein and 10-15 RBCs with casts.

(?vasculitis)

Case 12 :

- 70 yr old lady, came to the clinic with history of generalized fatigue, polyuria and numbness in the tips of her fingers .

She noticed bloody urine sometimes and new onset ankle swelling.

her urinalysis showed +3 sugar, +2 protein and 5-8 RBCs with no casts.

(?Diabetic nephropathy)

Normal Urine

Dipstick:(visual or automated)

- Blood negative
- Ketones negative
- Glucose negative
- Protein negative or trace
- pH 5.0 to 8.0

Microscopy

- Cells: Rare red cells (<< 1/hpf); squamous cells
- Casts Hyaline
- Crystals Calcium oxalate

Abnormal urine

Dipstick

- Blood trace to large
- Protein 0.3 g/L to 20 g/L
- Glucose, ketones

Microscopy

- Cells: red, white, yeast
- Casts – granular, rbc, wbc, hemegranular, lipid
- Crystals: urate, cysteine, triple phosphate, drugs
- Other: oval fat bodies, lipid droplets, debris (ATN)

Preparation for Microscopy

Typical: Obtain fresh urine

Spin 10-12 ml in centrifuge for 1-3 minutes

Discard supernatant

Shake residue – pour or pipette drop on slide –

Always cover with coverslip

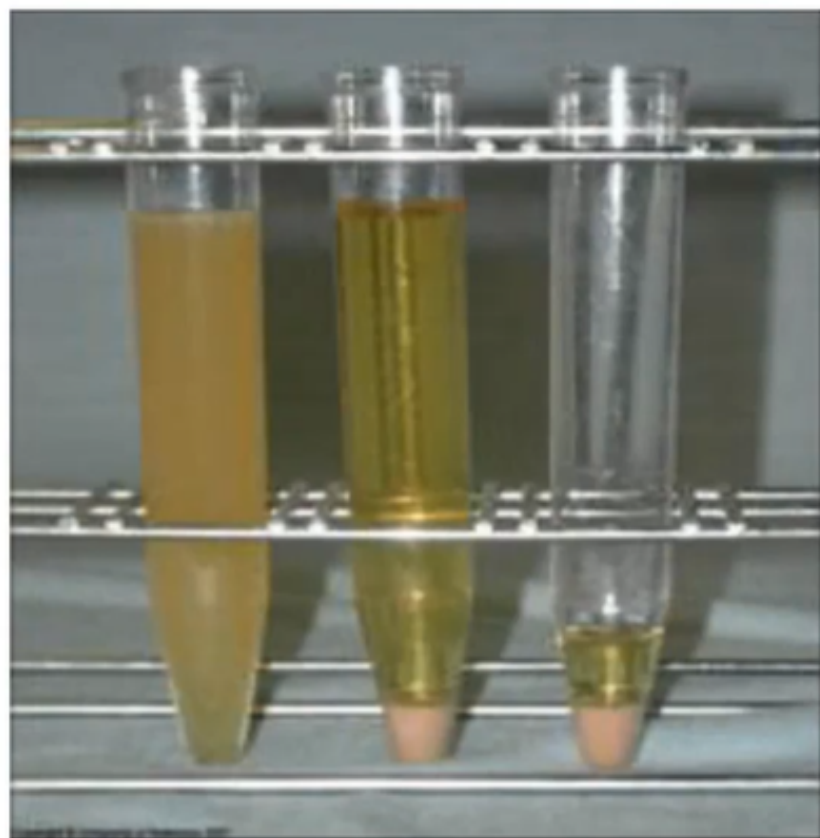
Examine on low then high power to identify cells and casts



Urine Dipstick

Normal and abnormal

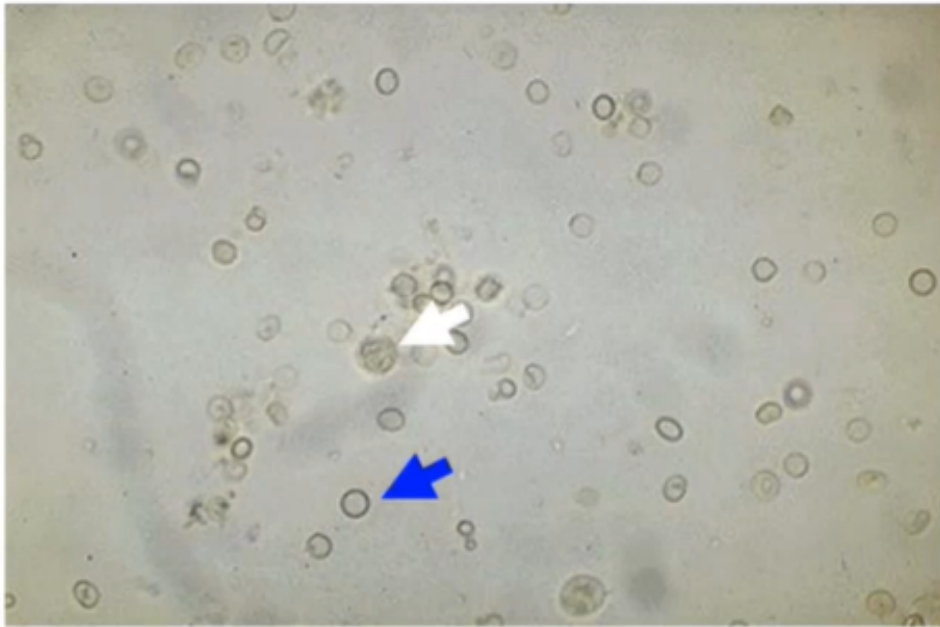




Preparation for Microscopy (2)

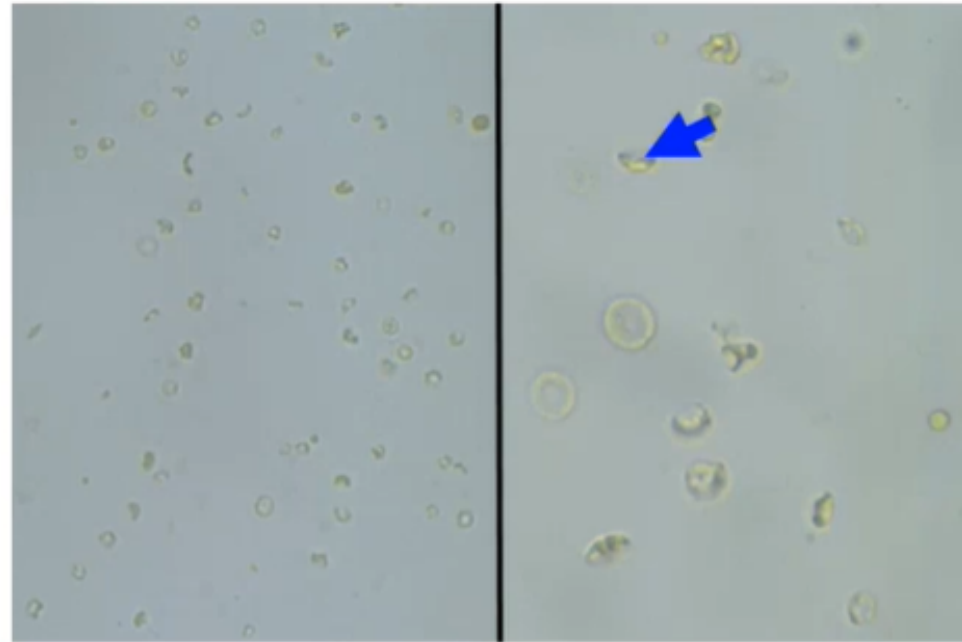
- If urine grossly bloody, or heavily sedimented:
- Examine Unspun and spun
- Spun sediment may be so thick that it is impossible to identify casts

Cells



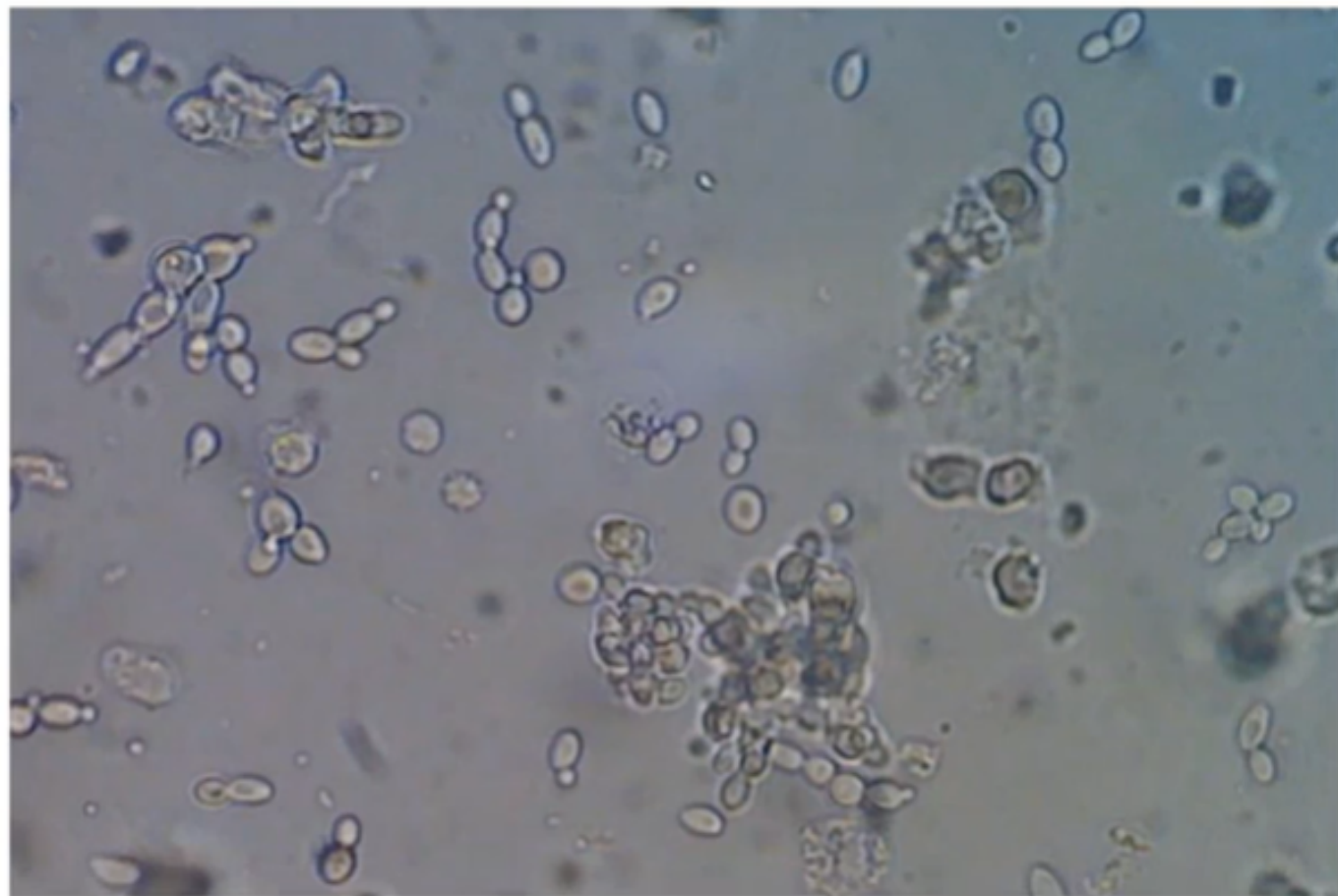
RBC – small, distinct cell membrane, clear cytoplasm

WBC – larger, less distinct cell membrane, granular cytoplasm



Dysmorphic red cells – typical of glomerular disease

Cells: yeast



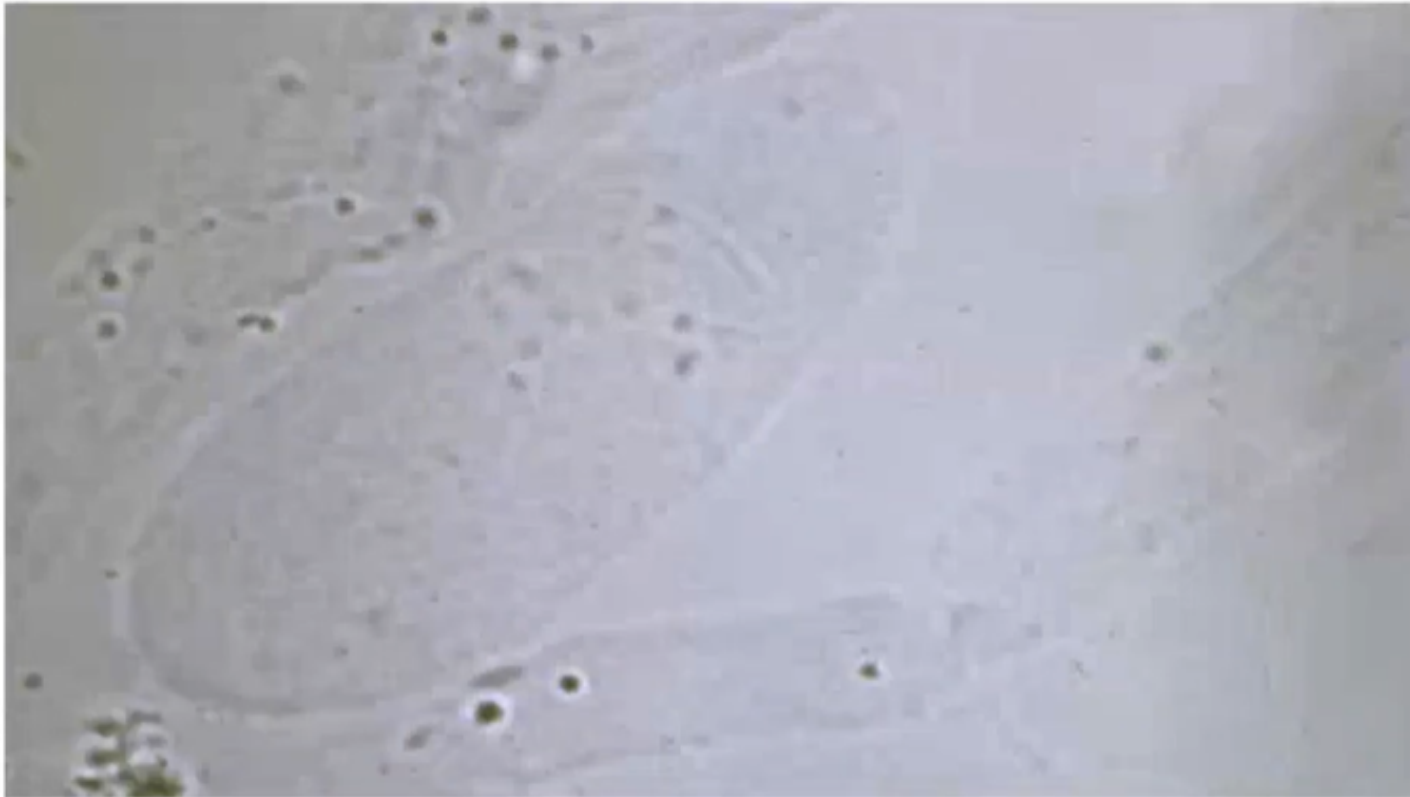
Budding yeast: note they are similar in size to rbc but often in chains – dipstick blood may be negative

Squamous cells



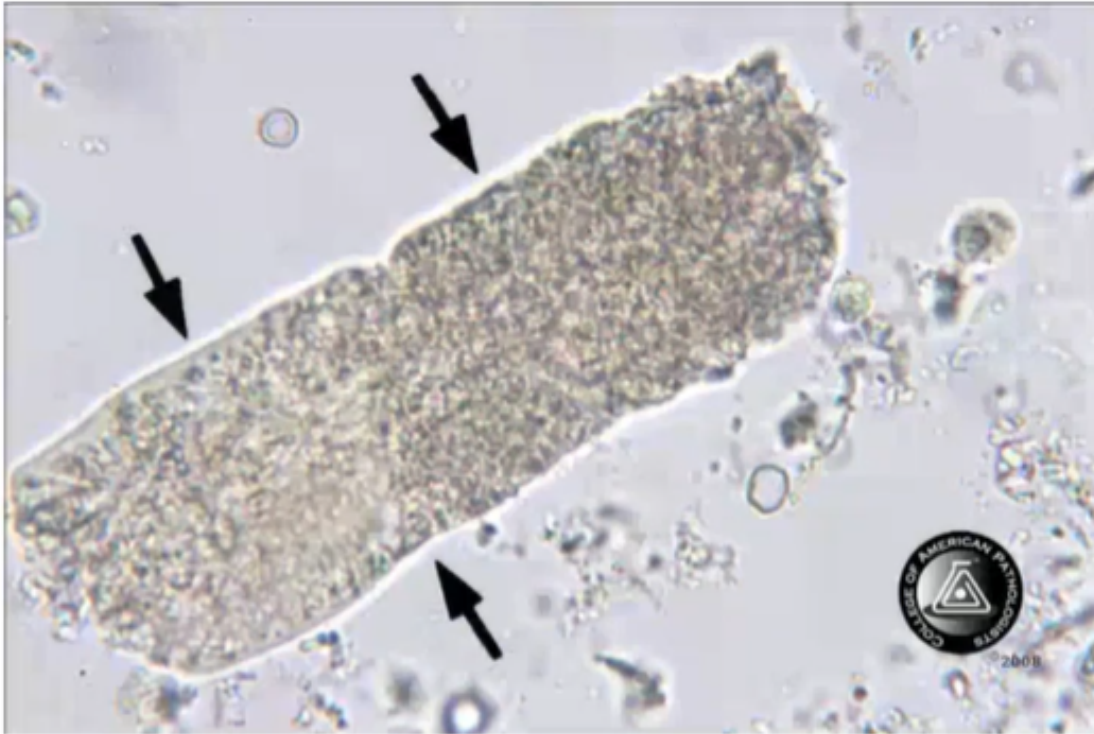
Large, polygonal
cells from
uroepithelium

Acellular Casts: Hyaline cast



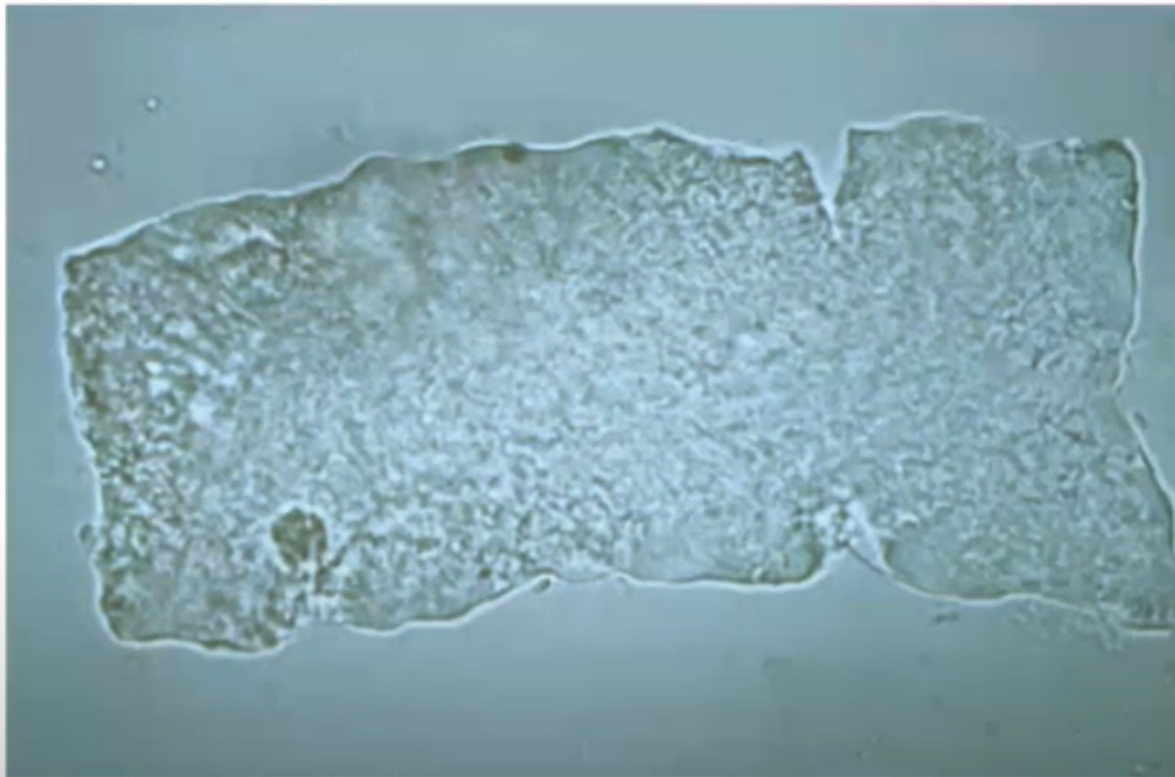
Hyaline cast: no significance; common in highly concentrated urine: probably Tamm-Horsfall protein

Acellular Cast: Granular



Granular cast: abnormal but non-specific

Acellular Cast: waxy

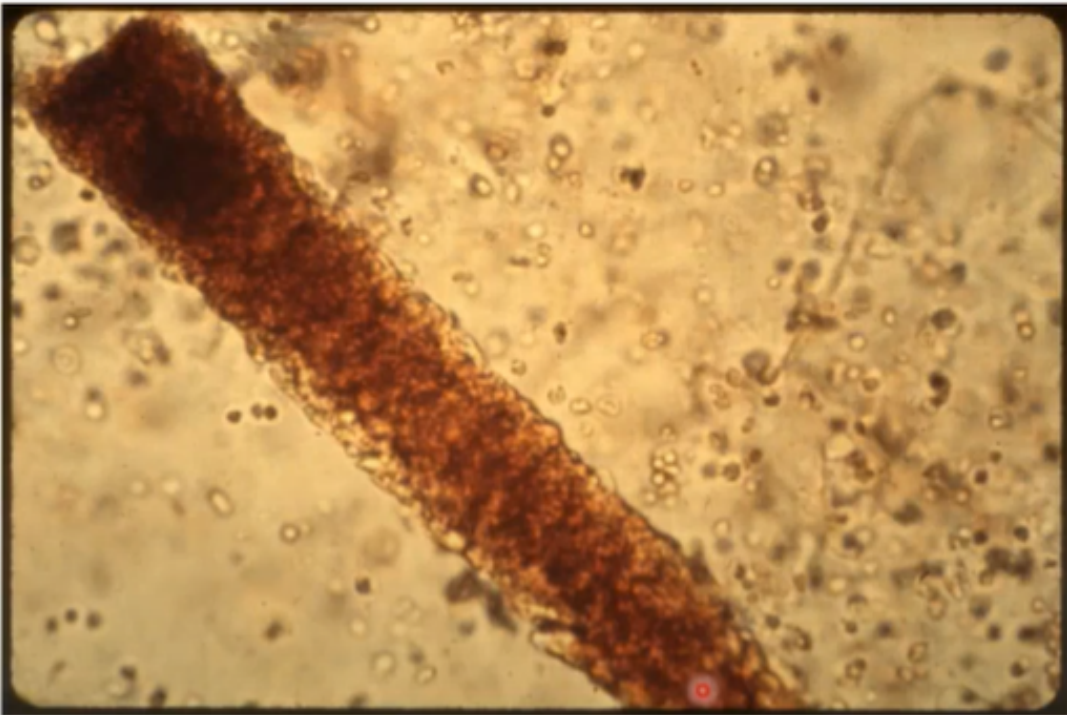


Broad "waxy" cast – said to be typical of advanced CKD

21:42 / 37:08



Acellular Cast: Heme Granular Cast

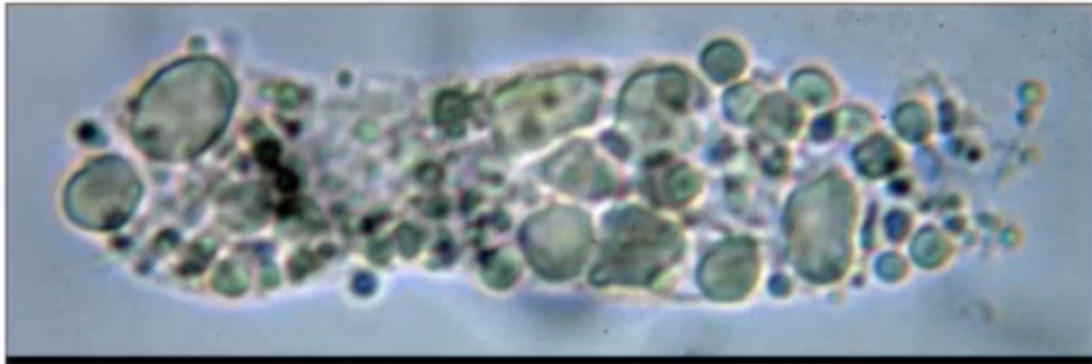


Heme-pigmented granular cast.

1. ATN (most common)
2. Proliferative or necrotizing GN (same significance as RBC cast in this setting)

With ATN look for tubular cells and debris

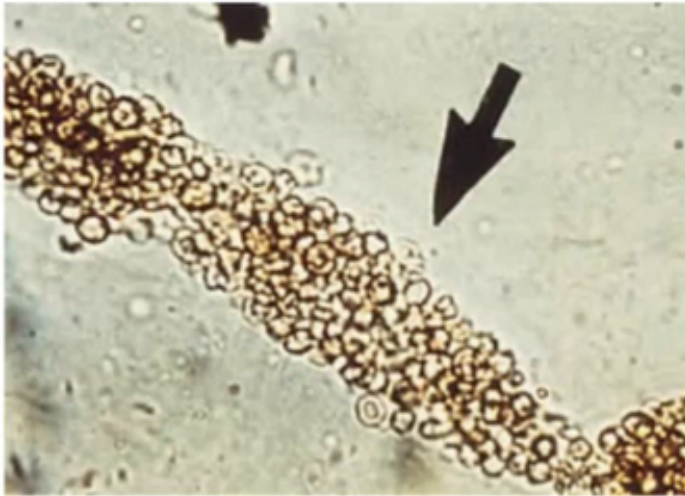
Acellular Casts: Lipid Cast



Lipid cast: seen in nephrotic syndrome;
dipstick protein ≥ 3 g/L

Note variable size of droplets of lipid

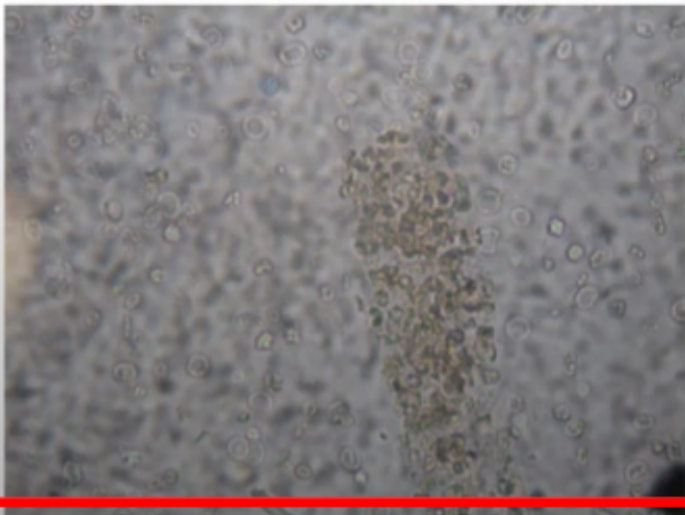
Cellular Cast: RBC



Distinct red cells seen within cast. Dip must be positive for blood.

Not numerous.

Seen in proliferative or necrotizing GN: PSGN, proliferative lupus, IgAN, ANCA vasculitis etc.



Cellular Cast: WBC casts



Seen in:

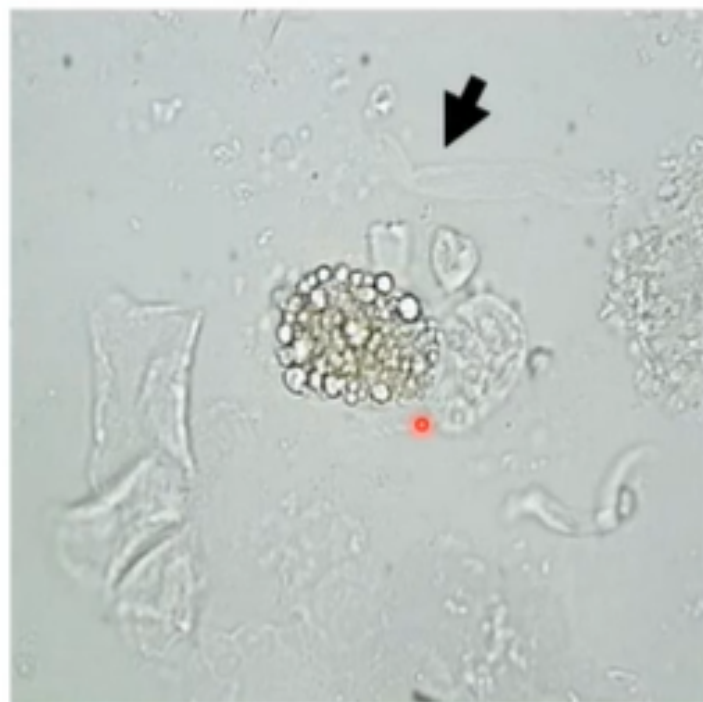
Pyelonephritis

Allergic interstitial
nephritis

Granulomatous
interstitial nephritis

Rarely proliferative GN

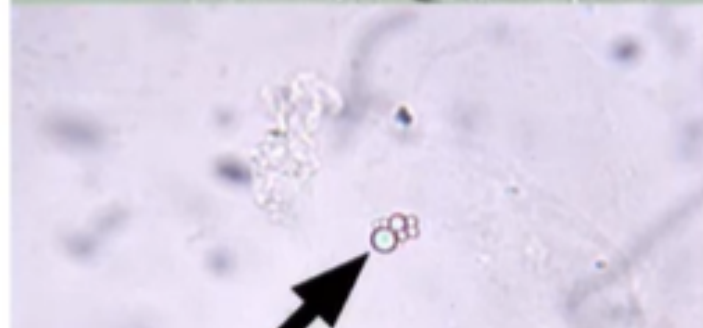
Other: Oval Fat Body, Lipid droplets



Oval, round or cast-shaped dark object with small "bubbles" within

Likely droplets of lipoprotein

Typical of nephrotic range proteinuria

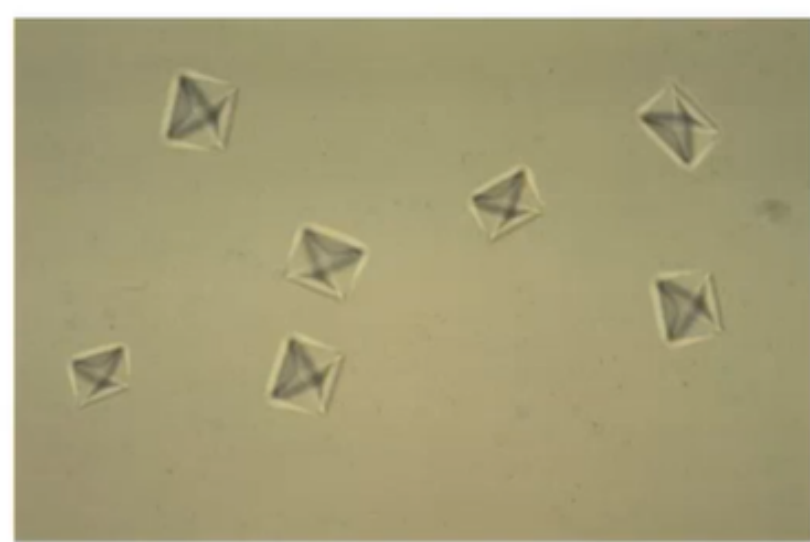


Other: bacteria



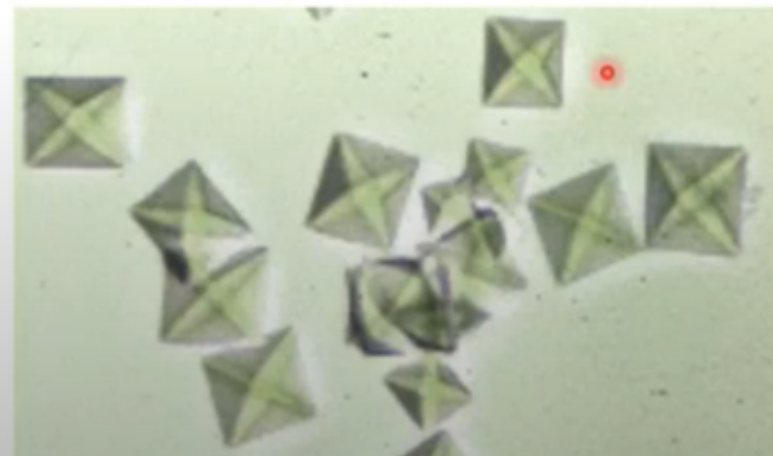
Always abnormal. If associated with white cells, suggests UTI. Look for movement of bacteria!

Crystals: Calcium oxalate

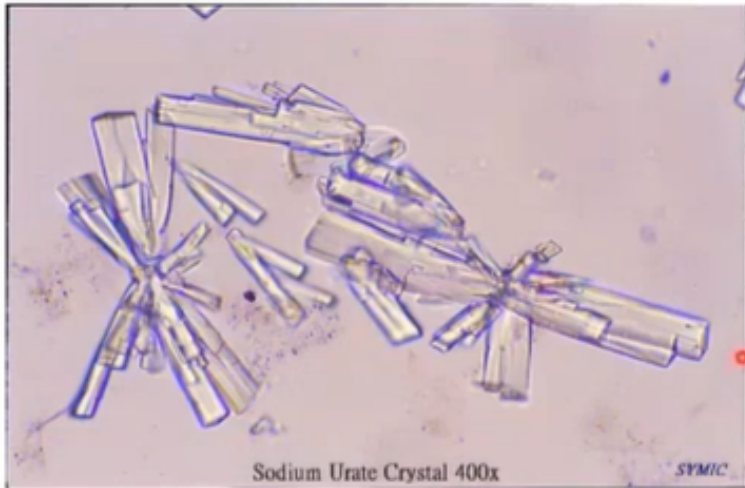


Seen in normal urine, rarely pathological

Look for them in suspected ethylene glycol poisoning.



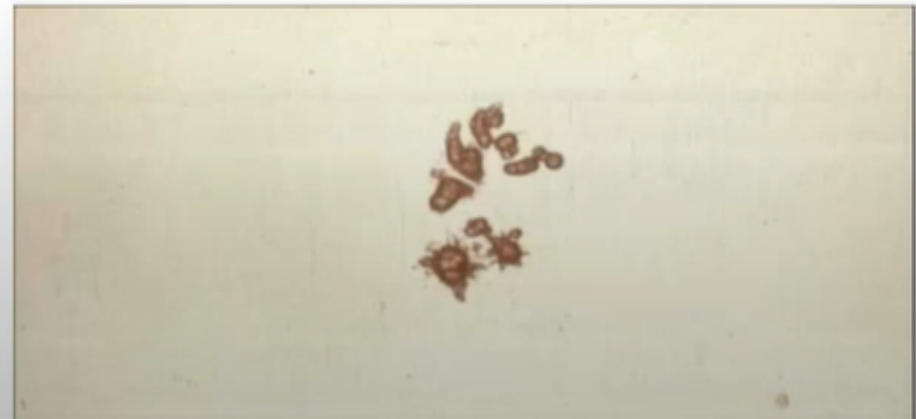
Crystals: uric acid



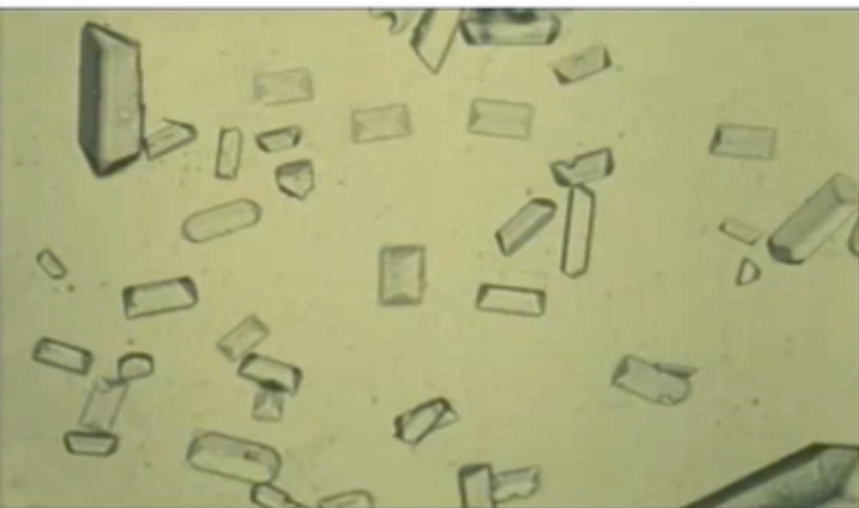
Sodium urate

Uric acid

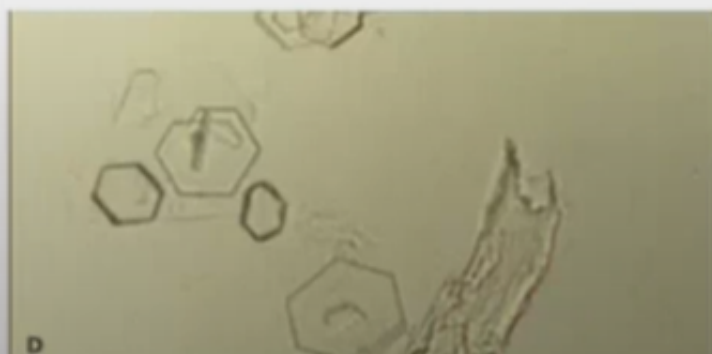
Ammonium biurate



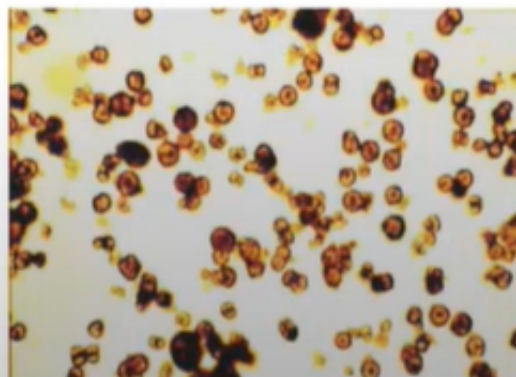
Abnormal Crystals



Triple phosphate: seen with chronic UTI (coffin lid)



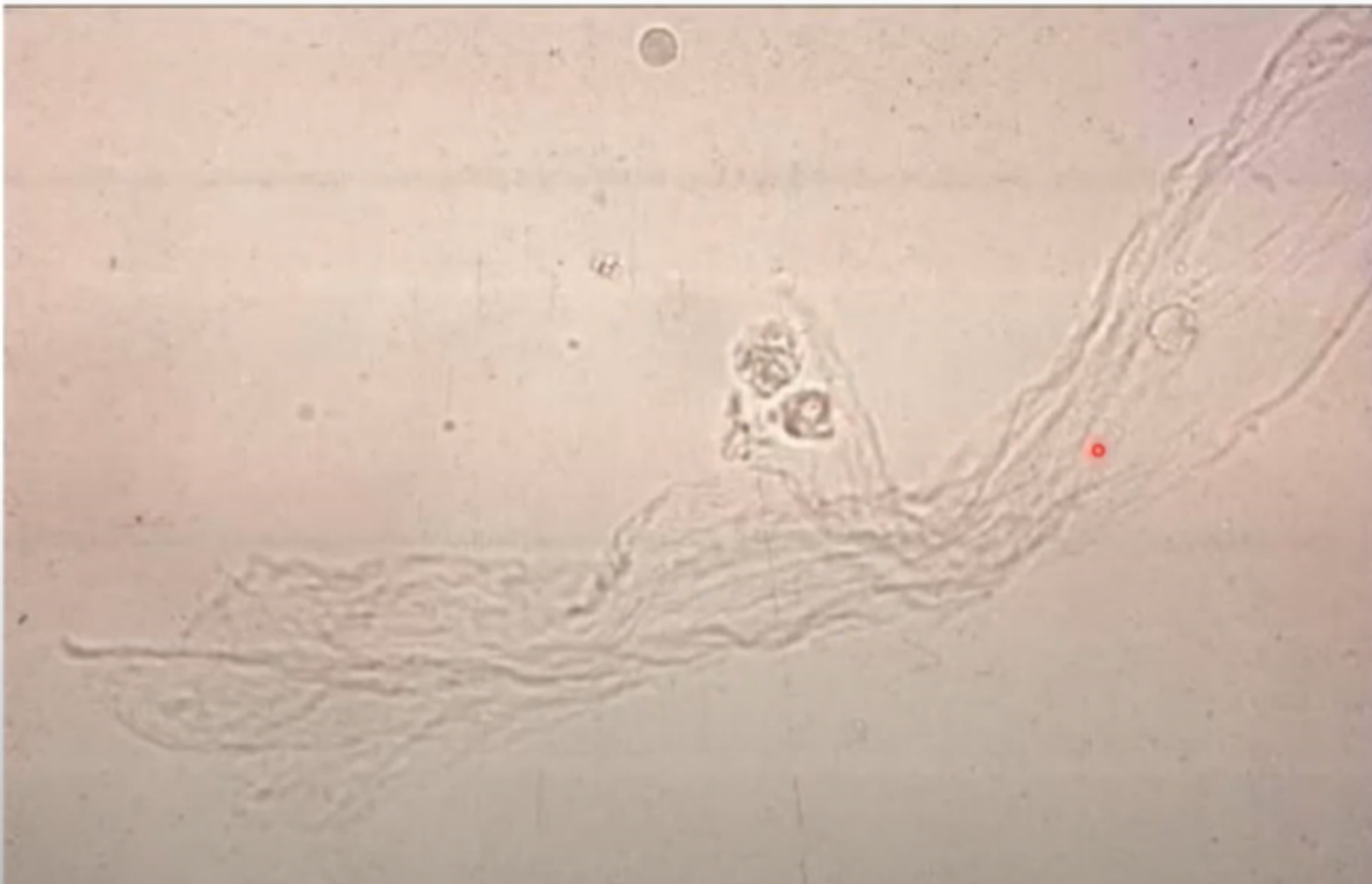
Cysteine: rare – AR genetic disorder of children, teens; cause of stones



2,8-DI-HYDROXYADENINE (BF)

2,8-dihydroxyadeninuria: extremely rare

Other



Mucous

Urinalysis in Decision Making

Most useful in:

- Hematuria: red cell casts and/or clearly dysmorphic rbc's defines glomerular cause
- AKI: finding of blood, protein, debris and HG casts defines ATN