

Haematuria

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Introduction

Haematuria

- Positive blood on urine dipstick
- ≥ 5 red blood cells/ microliter of urine
- Prevalence
 - Gross haematuria (macroscopic) 0.13 %
 - Microscopic- 1.5%
 - Haematuria + proteinuria 0.06%



Haematuria in children

- Differs from adults in:
 - Etiology
 - Symptoms and signs
 - Management
- Most important difference: in children most likely to be a non surgical problem

Red urine

- Red urine without red blood cells
 - Called heme-positive urine
 - False positive test

Causes of heme positive urine

- Haemoglobinuria
- Myoglobinuria
- Food
- Drugs e.g Rifampicin

Causes of false negative test

- High urine concentrations of ascorbic acid
- Formalin in urine (As a preservative)

Haematuria

Macroscopic haematuria

- Symptomatic with dysuria, loin pain or renal colic
- Asymptomatic
- With or without proteinuria

Haematuria

Microscopic haematuria

- Detected during screening
- Or when the child presents with intercurrent illnesses
- With or without proteinuria

Consultation

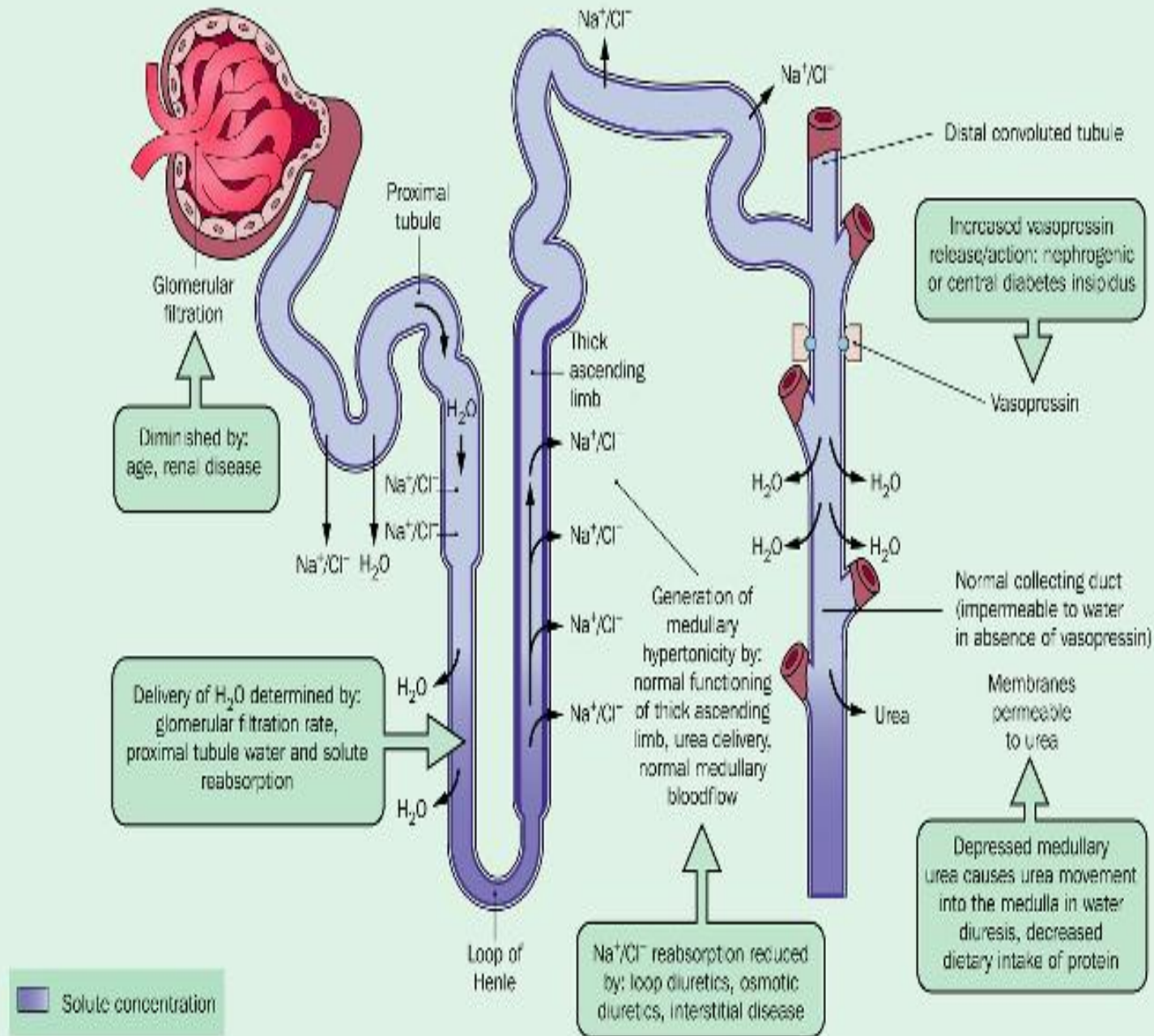
- My 4 year old girl has blood in the urine. What next?

History

- It is useful to determine the level of haematuria
 - Upper vs lower urinary tract

Haematuria

- Upper urinary tract sources of haematuria
 - Glomerulus
 - Tubules
 - Interstitium



Diminished by:
age, renal disease

Delivery of H₂O determined by:
glomerular filtration rate,
proximal tubule water and solute
reabsorption

Na⁺/Cl⁻ reabsorption reduced
by: loop diuretics, osmotic
diuretics, interstitial disease

Increased vasopressin
release/action: nephrogenic
or central diabetes insipidus

Depressed medullary
urea causes urea movement
into the medulla in water
diuresis, decreased
dietary intake of protein

Haematuria

- Haematuria from the glomeruli
 - Brown, cola coloured or burgundy
 - Associated with proteinuria
 - Microscopy findings of red cell casts and dysmorphic RBC
- Haematuria originating within the tubules
 - Presence of leucocytes
 - Epithelial cell casts

Haematuria

- Lower urinary tract sources of haematuria
 - Pelvocalyceal system
 - Ureter
 - Bladder
 - Urethra

Haematuria

- Haematuria from the lower urinary tract
 - Gross haematuria, blood clots
 - Terminal haematuria
 - Microscopy findings of normal red cell morphology
 - Minimal proteinuria

Kidney

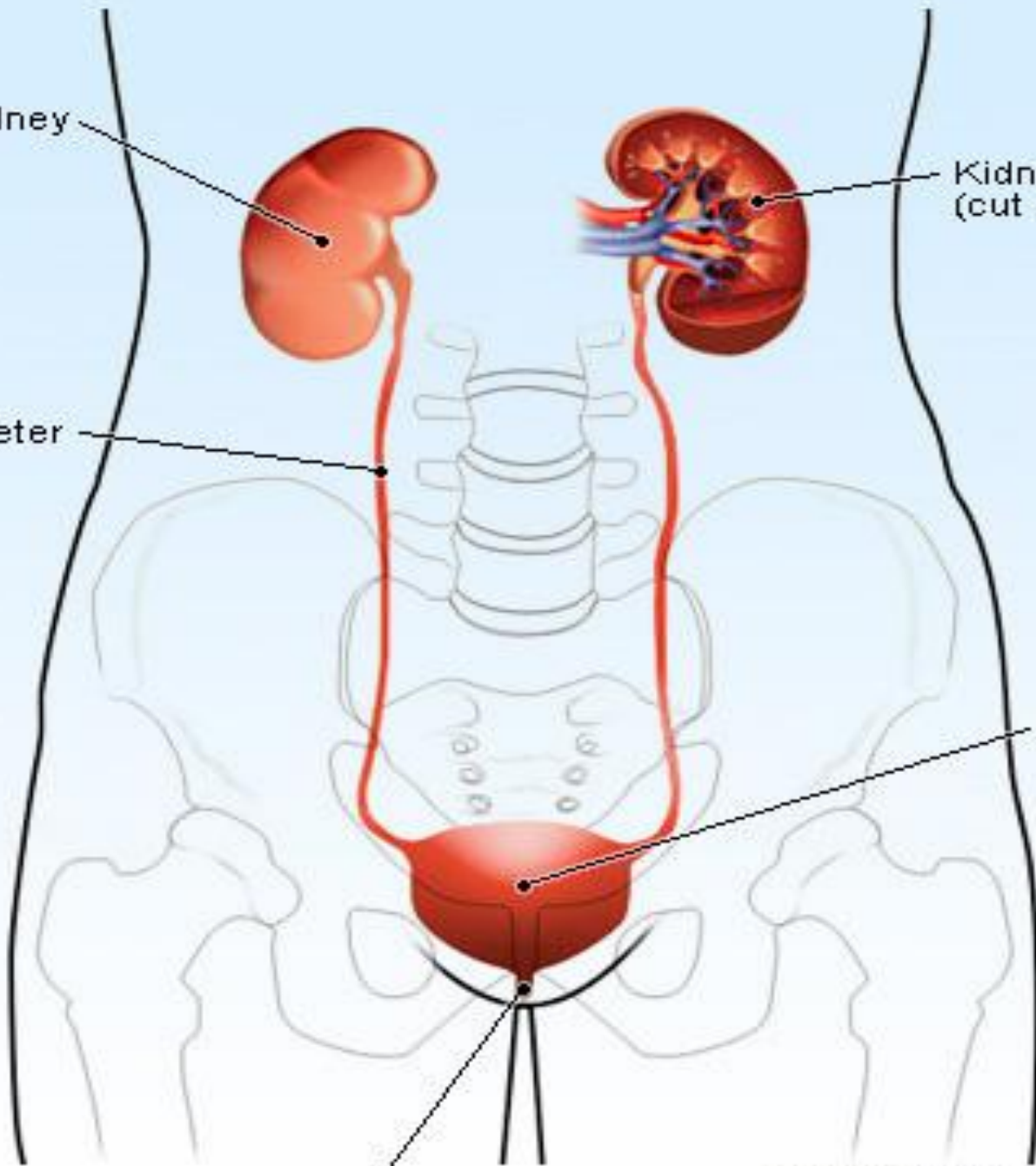
Kidney
(cut open)

Ureter

Bladder

Urethra

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History

- Is the bloody urine at the beginning/end of the stream?
- Is it bright red? (more likely to be a local cause of haematuria)
- Is it tea or cola coloured? (Glomerular cause)
- Family history of renal disease, or deafness or bleeding disorder? (Familial cause)
- Recurrent haematuria?
- Fever, dysuria, frequency, vomiting? (Infections)
- History of renal colic ?(suggestive of calculi)

History

- The presence of oliguria/anuria
- History of body swelling, joint pains
- Recurrent respiratory tract infections
- Skin rash
- Diarrhoea
- Trauma
- Medication use

Physical examination

- Vital signs-hypertension
- Body swelling
- Signs of vasculitis- SLE
- Abdominal masses
- Skin lesions- SLE, HSP,
 - Impetigo(PSGN)



- Purpuric rash of
- Henoch Schönlein Purpura



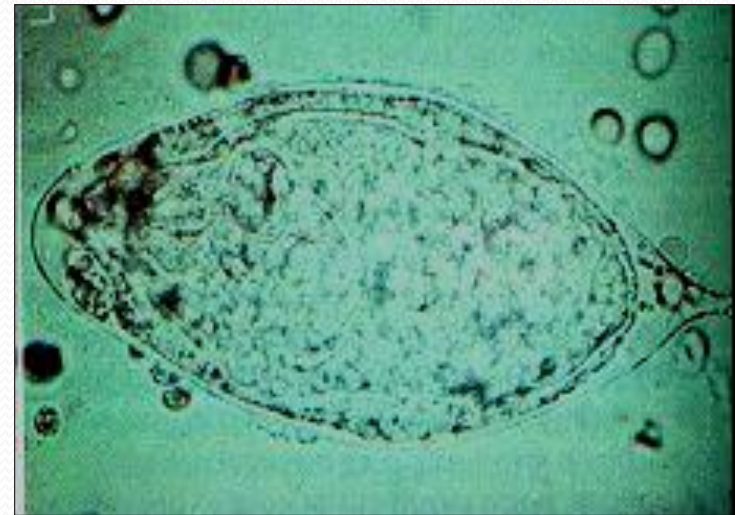
Streptococcal skin infection

Impetigo (skin sores with crusts)



Differential diagnosis of haematuria

- Glomerular causes
 - Acute Post Strep Glomerulonephritis (APSGN)
 - Henoch Schönlein Purpura (HSP)
 - Haemolytic uremic syndrome (HUS)
 - IgA nephropathy
 - Alport syndrome
- Non-glomerular causes
 - Bilharzia
 - Urinary Tract Infections (UTI)
 - Calculi
 - Tumour
 - Trauma



Differential diagnosis of haematuria

In neonates acute macroscopic haematuria

- Glomerular causes (hypoxic insult)
 - Acute tubular necrosis
- Non-glomerular causes
 - Urinary tract infection
 - Hypercalciuria
 - Morphological kidney abnormalities
 - Renal vein thrombosis



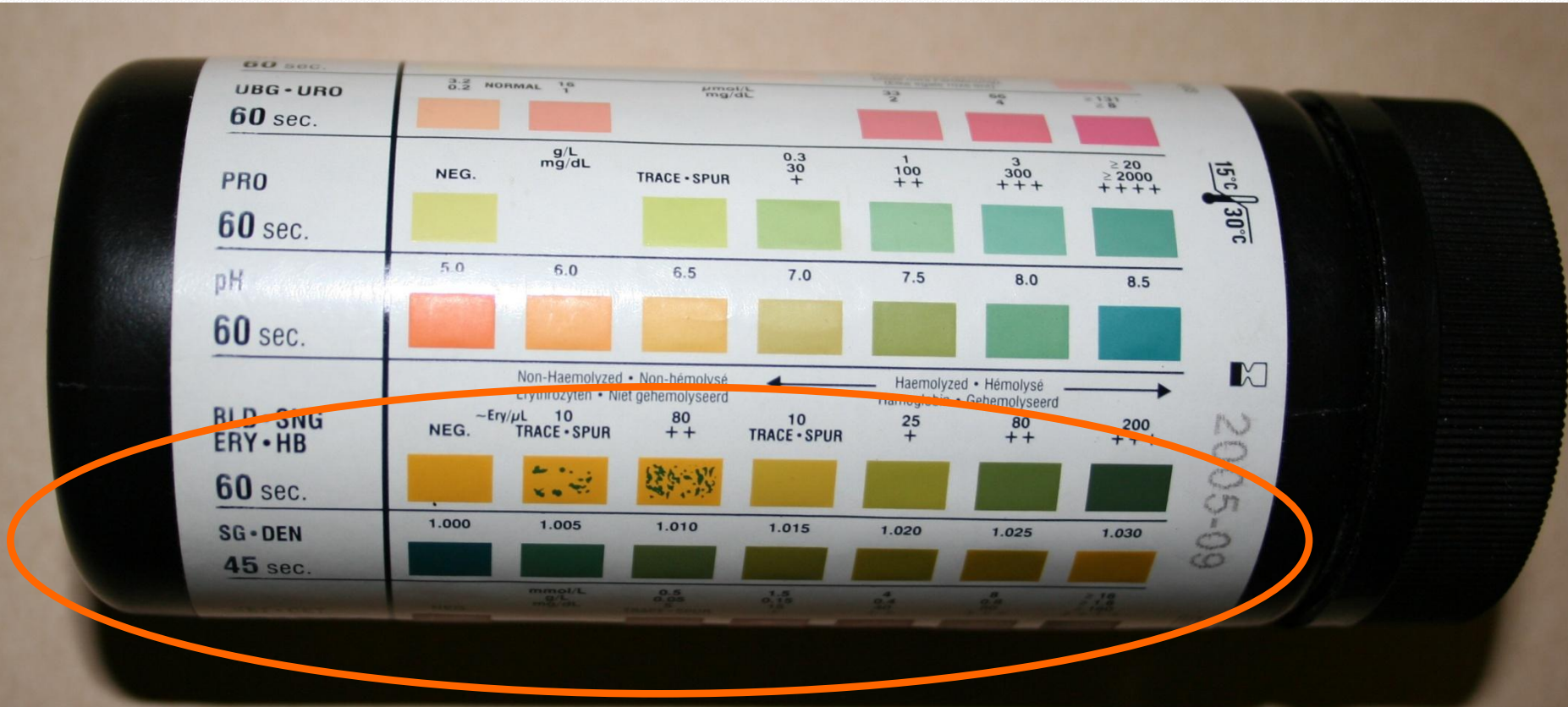
Investigations

Urine tests

- Urine dipstick
- Confirm presence of RBC's with microscopy
 - Use fresh urine sample - RBC's lyse quickly
 - In acid urine (pH < 6)
 - When U-SG < 1005
- **RBC morphology gives information of the origin of the disease**

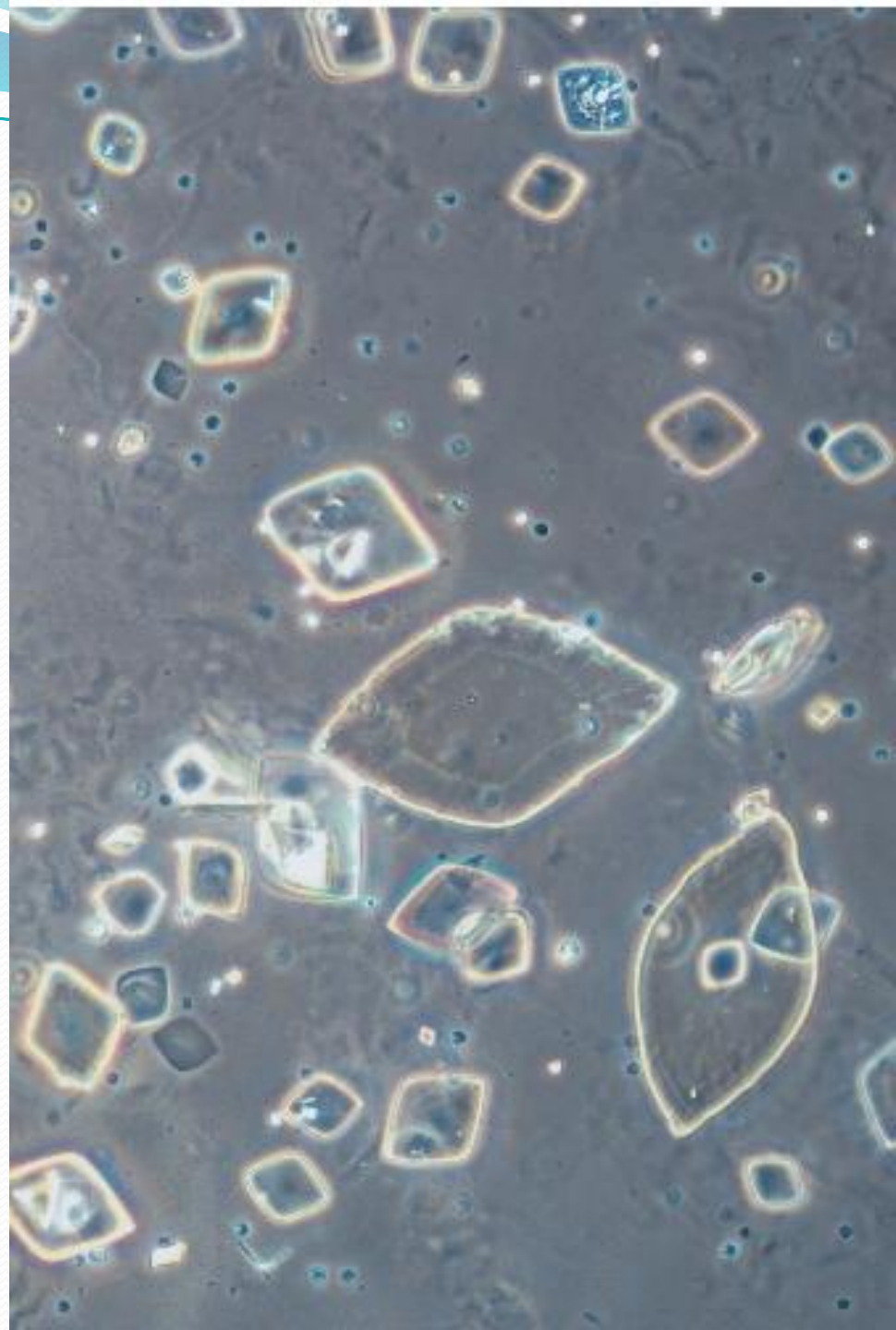


Degrees of Haematuria on dipstix



Crystals in urine

- Uric acid crystals
- Rhomboid shape



Investigations

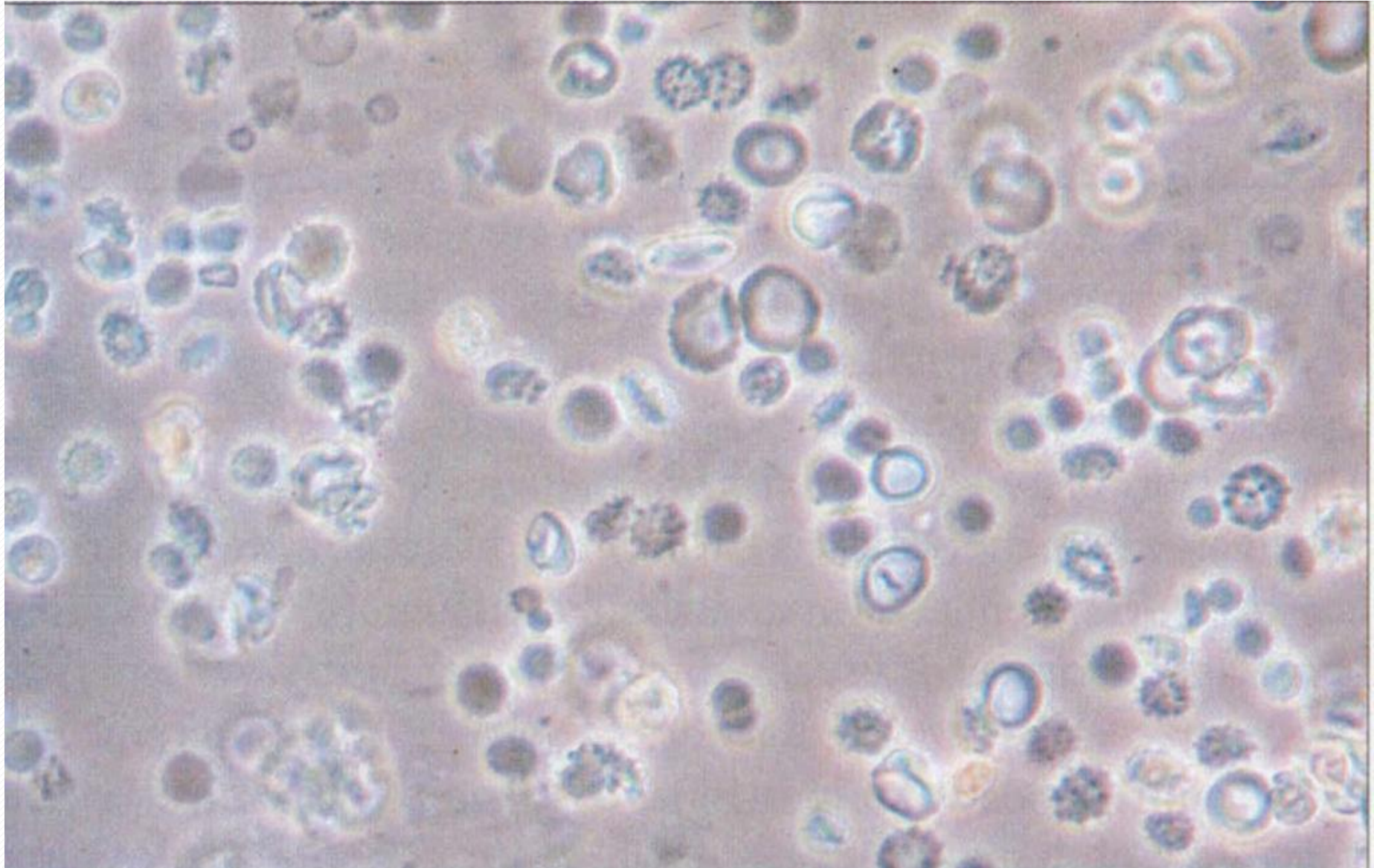
- Asymptomatic patients with isolated microscopic haematuria should not undergo further tests until at least 2 urine specimens collected over 1-2 weeks period demonstrate abnormal number of RBC

Rbc morphology - Two types of rbc's

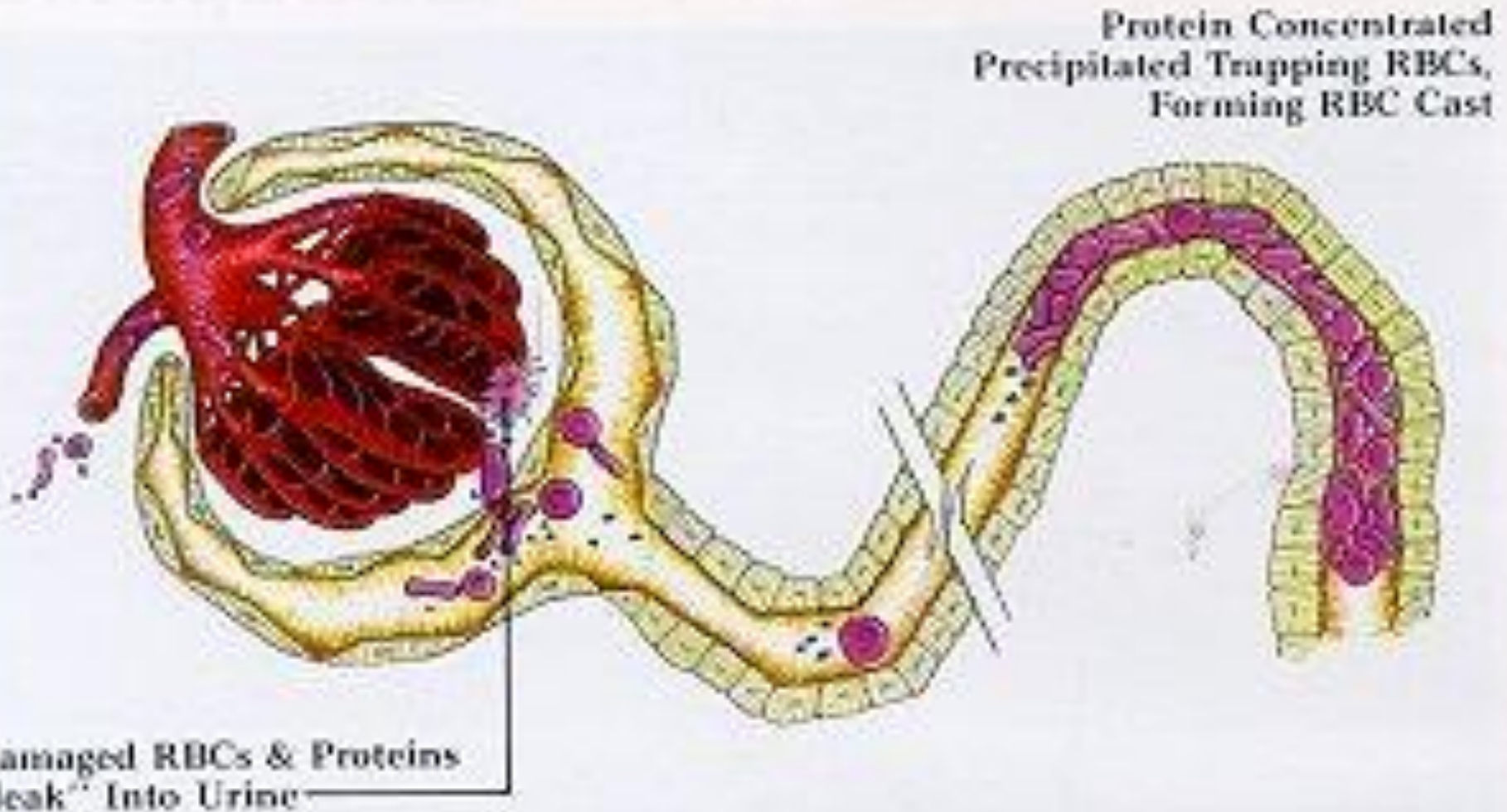
I) Dysmorphic RBC's

- Crenated (notched edges)
- Size vary
- Originate in glomerulus
- Active glomerular disease - dysmorphic rbc's & RBC casts

Dysmorphic rbc's - small, crenated (notched edges)
varying sizes & irregular shapes)



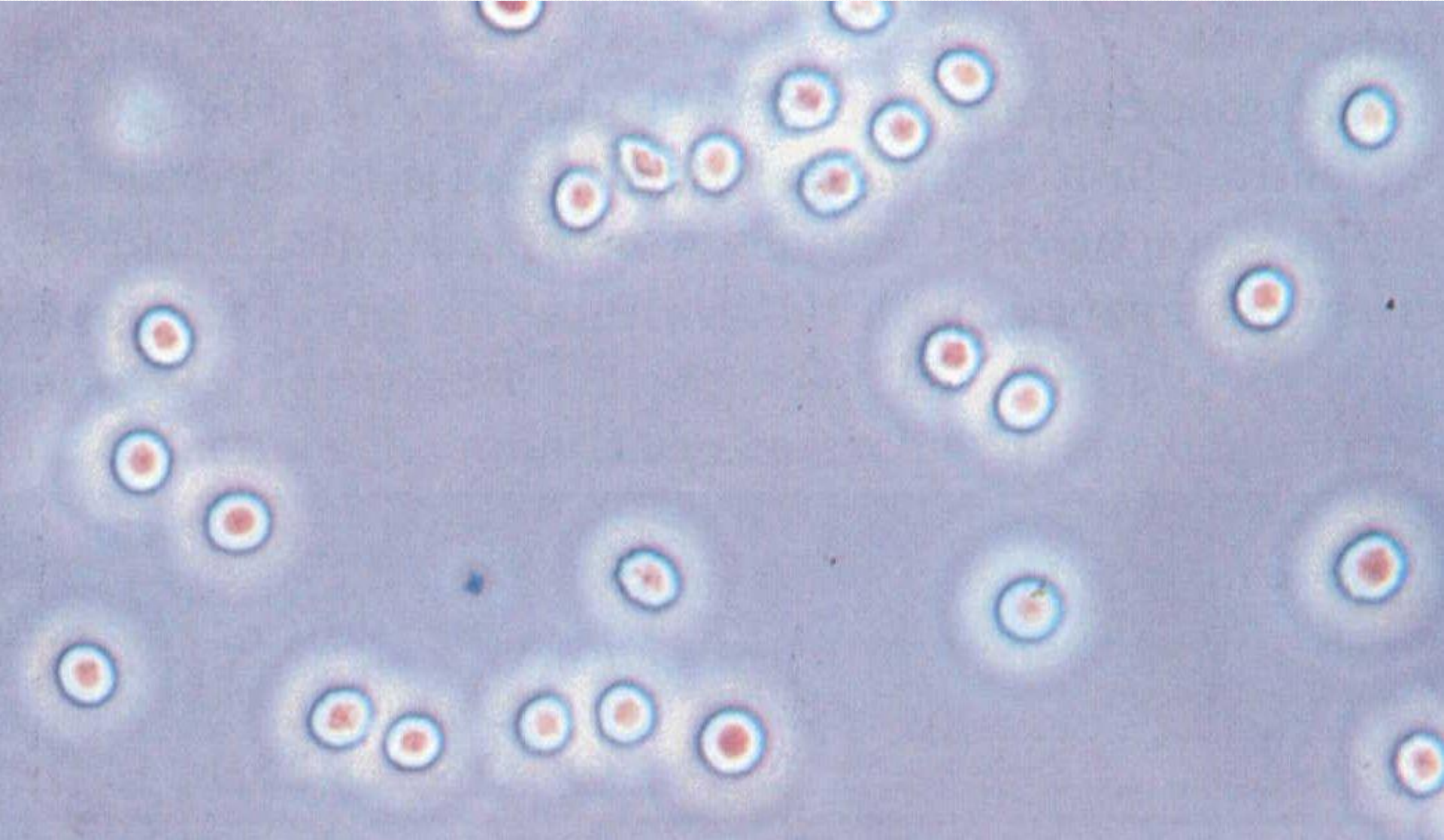
Formation of RBC cast



Rbc morphology

- II) Non glomerular (non-dysmorphic) rbc's
 - Round / biconcave smooth-walled
 - Similar size
 - Originate extraglomerular
 - UTI / hypercalciuria / stones

Non glomerular rbc's are pale, round / biconcave with smooth outline & have no nucleus



Urine tests cont

- Urine culture and sensitivity
 - To exclude infections
- Urine uric acid and creatinine ratio
- Urine calcium and creatinine ratio
- Urine protein : creatinine ratio

Investigations

Blood tests

- Biochemistry
 - Urea, creatinine and electrolytes
 - Albumin
- Haematology
 - Full blood count
 - Clotting profile(if there is history of bruising)

Investigations

Based on the clinical findings:

- Immunology

If acute glomerulonephritis is suspected

- ASO titre
- C₃, C₄
- anti-double strand DNA
- IgA

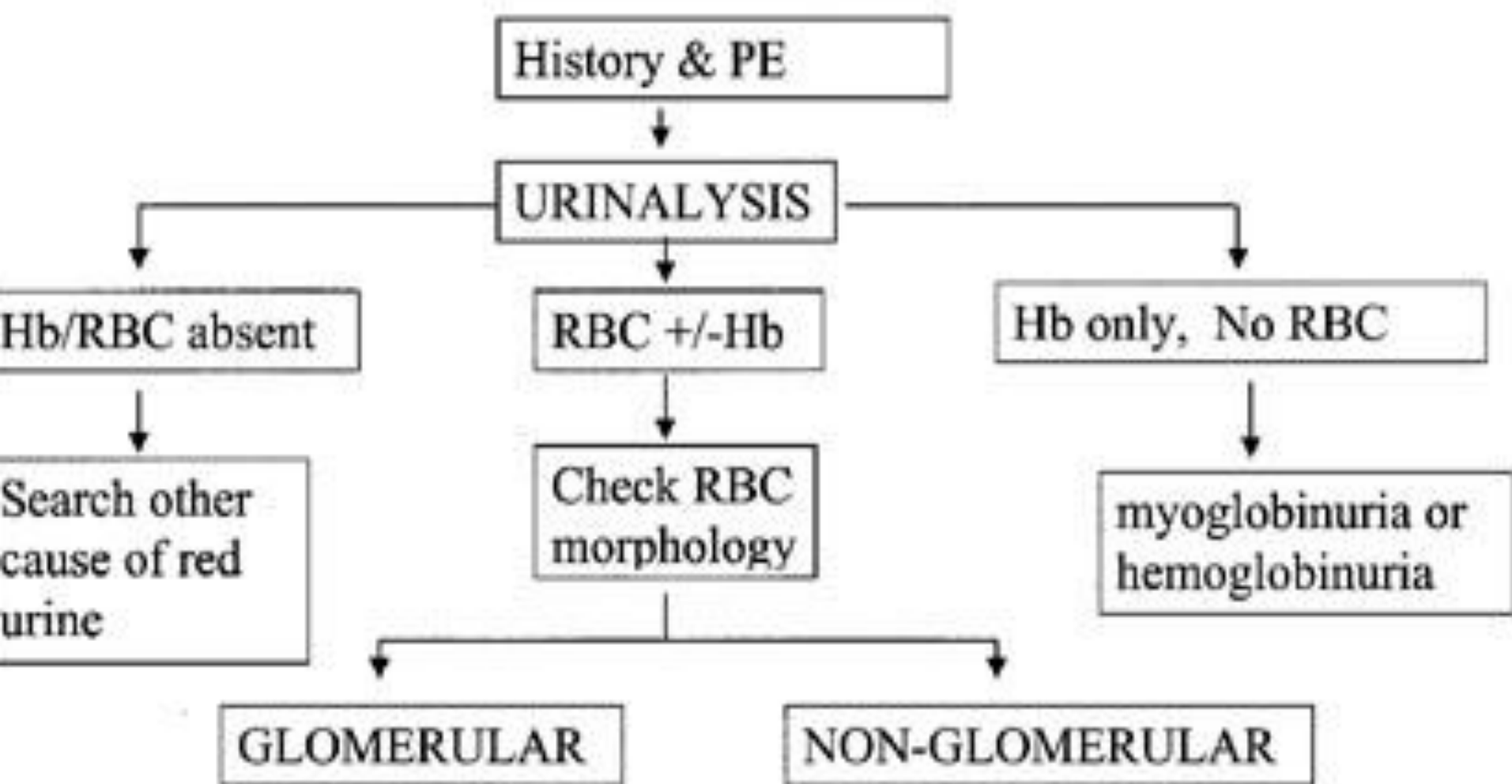
Investigations

- Imaging
 - Renal and bladder ultrasound to exclude tumors, cysts and calculi
 - Cysto-urethrogram- for bladder and urethral lesions
 - CT scan to demonstrate tumours or cysts

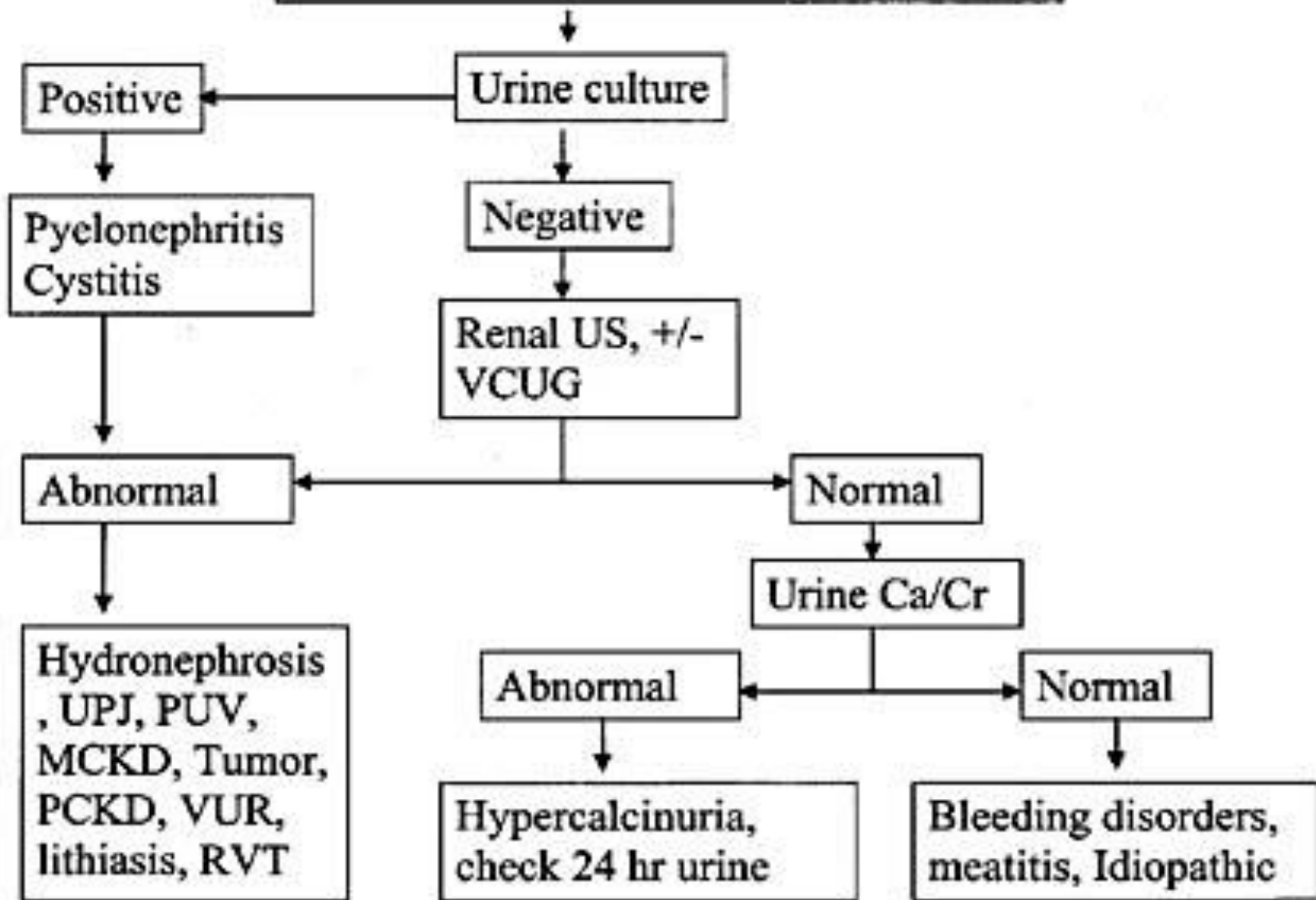
Investigations

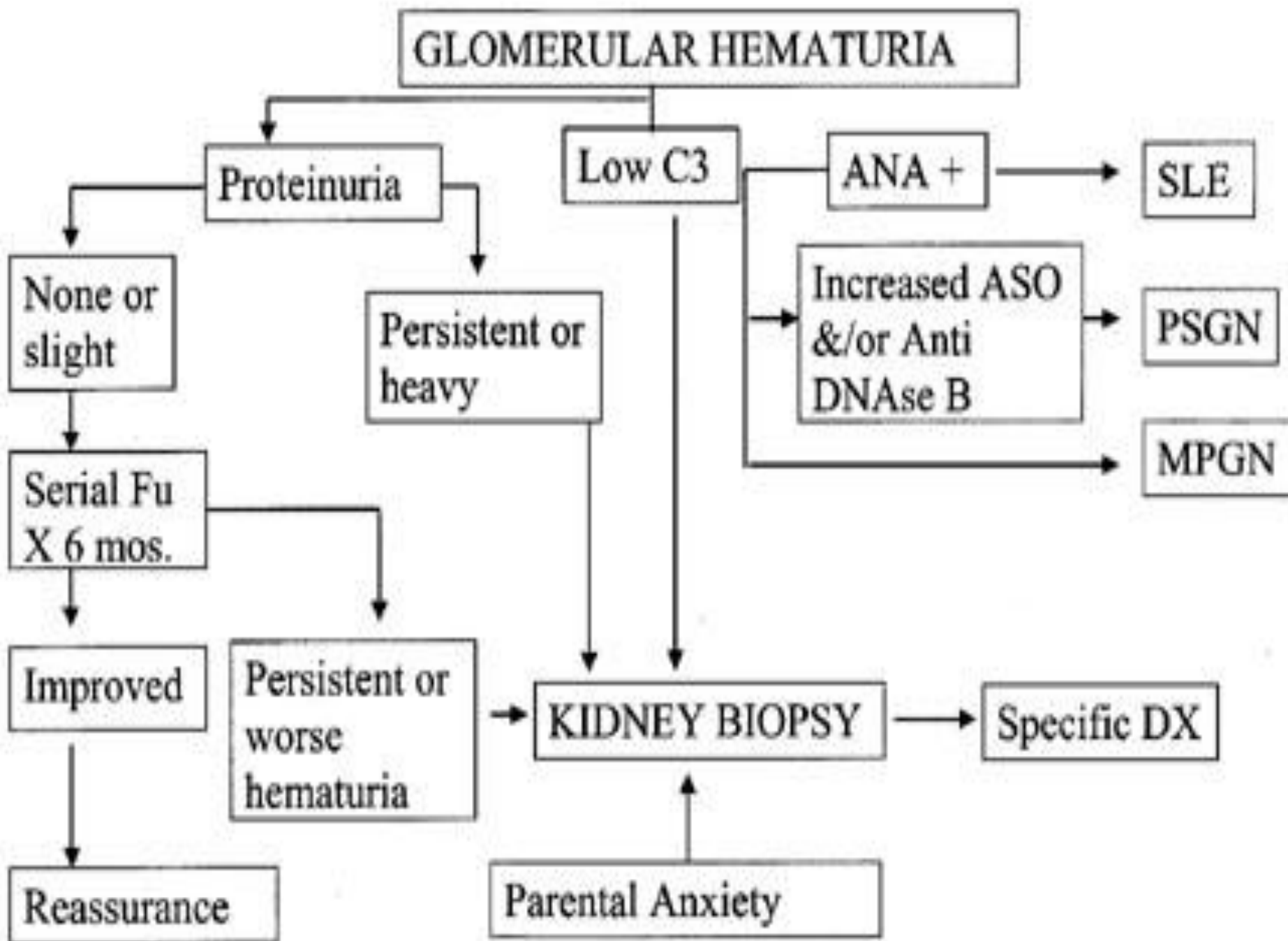
- Renal biopsy
 - If the patient has persistent/ recurrent haematuria
 - Abnormal renal function
 - Significant proteinuria
 - ↓ complement, + ANA + Anti-dsDNA
 - Family history of kidney disease

APPROACH TO HEMATURIA



NON-GLOMERULAR HEMATURIA





Acute Post-Streptococcal GN

- Acute onset of macroscopic haematuria
- Oliguria
- Oedema
- Hypertension

Pathogenesis of APSGN

- Immune complex mediated kidney disease
- Nephritogenic streptococcus infection → immune response
- Immune complexes are deposited in glomeruli

Pathogenesis of APSGN

- Activation of compliment → Inflammatory response
 - Infiltration of polymorph leucocytes
 - Swelling of endothelial cells
 - Occlusion of lumen of capillaries
 - Release of proteolytic enzymes disrupt the integrity of GBM →
 - Haematuria
 - Loss of plasma constituents into the urine

Acute Post-Streptococcal GN

- History
 - Acute onset of macroscopic haematuria
 - Recent throat or skin infection (impetigo)
 - ↓ urine output
 - Swelling (periorbital)
 - Headache / convulsions
- Clinical Examination
 - Oedema
 - Hypertension
 - Volume over load



Streptococcal skin infection

Impetigo (skin sores with crusts)



APSGN

- Special investigations
 - Urine dipstick: haematuria (\pm proteinuria)
 - Red cells with granular and red cell casts
 - Positive streptococcus serology
 - Anti Strep-DNase B titre
 - ASO titre
 - Decreased S-Complement C₃ level

Differential diagnosis of APSGN

- Henoch Schönlein Purpura (HSP)
- IgA glomerulonephritis (Berger's Disease)
- SLE
- Other infections e.g. Hepatitis B, HIV GN
- Alport Syndrome
- Other causes of macroscopic haematuria



References

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