Clinical Nephrology

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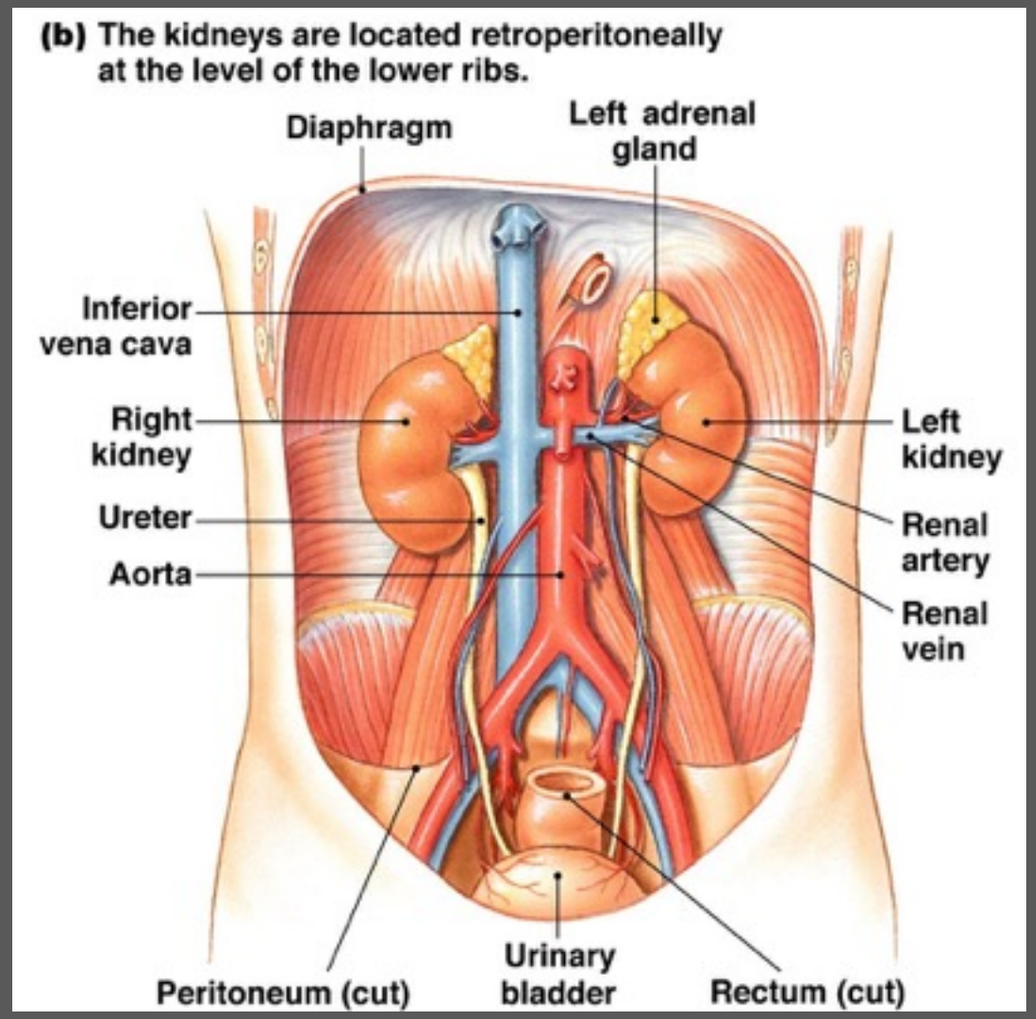
Introduction

— The kidneys are two reddish-brown, bean-shaped organs

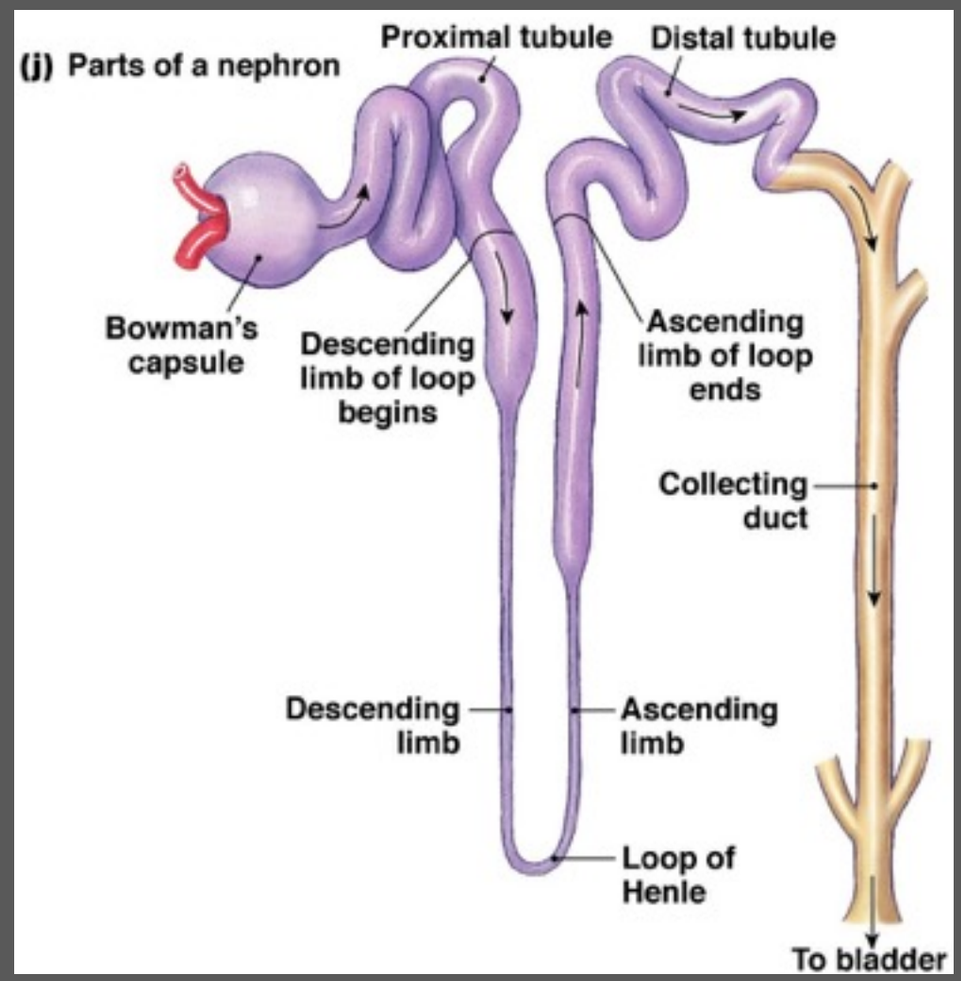
— Lie in the retroperitoneal space, level T12 to L3

— Shape: lateral surface convex; medially concave

— The range in length respectively, from approximately 6cm and 24 gms in full term infant to more than equal to 12cm and 150 gms in an adult



Nephron is the functional unit of the kidney ,each nephron consist of glomeruli and long tubules
composed one layer of epithelial cells
1 million nephron in one human kidney



Major Functions of the Kidneys

- Regulation of:
  - Body fluid osmolarity and volume (RAAS)
  - Electrolyte balance (Ca, K, PO4, Mg)
  - Bcid-base balance
  - Blood pressure

- Excretion of
  - Metabolic products
  - Foreign substances (pesticides, chemicals etc.)
  - Excess substance (water, etc)

- Secretion of
  - Erythropoitin
  -1,25-dihydroxy vitamin D_3 (vitamin D activation)
  - Renin
  - Prostaglandin

Clinical Presentation

- Renal disease may be present with specific symptoms or with no specific symptoms

- Chronic kidney disease frequently presented with abnormal routine laboratory data as increase creatinine or abnormal Urinalysis (proteinuria, hematuria or pyuria)

- Acute renal failure may manifest as abrupt onset of edema, malaise, oliguria or hematuria or can be totally asymptomatic laboratory finding (consider Pre-renal, Renal (glomerular, interstitial, tubular and vascular) and Post renal

Presenting Features of Renal Disease

1- Dysuria (burning sensation with micturition)

Urethritis and cystitis

Inflammation of vagina or penis

2- Polyuria, frequency ,nocturne (wake you up for urination at night)

Polyuria: > 3 L of urine /day

Solute diuresis , diabetes insipidus , Chronic renal failure

3- Oliguria (decrease urine output)

< 300ml of urine/day

hypotension

intrinsic renal disease

urinary tract obstruction

4- Hematuria

Blood in the urine, arise anywhere in renal tract

5- Proteinuria (frothy urine)

protein in the urine, secondary to glomeruli disease or tubular disease

6- Renal pain

dull constant in the loin

associated with renal obstruction, acute pyelonephritis, acute nephritis syndrome, polycystic kidney, renal infarction

7- ureteric colic

severe loin pain, waxes and wanes, a/w fever , vomiting, radiated to abdomen, groin, upper thigh

renal calculus, clots

8- Volume : Edema, hypertension

9- Uremia (decrease appetite, nausea, vomiting, generalized weakness, sleep disturbances, decrease level of consciousness, pericarditis)

10- Anemia and SOB

11- Correlate with chronic medical illness and review of systems as

DM, HTN, APKD, Rheumatological disease , malignancies and GI symptoms

12- Family Hx of renal disease

13- Drug Hx (non steroidal anti inflammatory drug (NSAIDs)

Features of common renal diseases

- Glomerulonephritis
- Interstitial nephritis
- Urinary tract infection
- Urinary tract obstruction
- Renal failure (pre renal , renal , post renal
- Polycystic kidney disease

case No 1

- 25 year old man with no significant past medical Hx , presented with acute severe left loin pain associated with (blood in his urine) gross hematuria for last few hours. has normal blood pressure.

case No 2

- 40 year old man presented with intermittent dark color urine , with no loin pain.. found to have high blood pressure 2 years ago .
- his father and his older brother were on dialysis

case No 3

- 70 year old man presented with dark color urine for last 4 month, his past medical hx significant of HTN for last 10 years and heavy smoker 20 pack year. he has history of frequency, nocturne and poor stream . no Hx of pain

Case 4

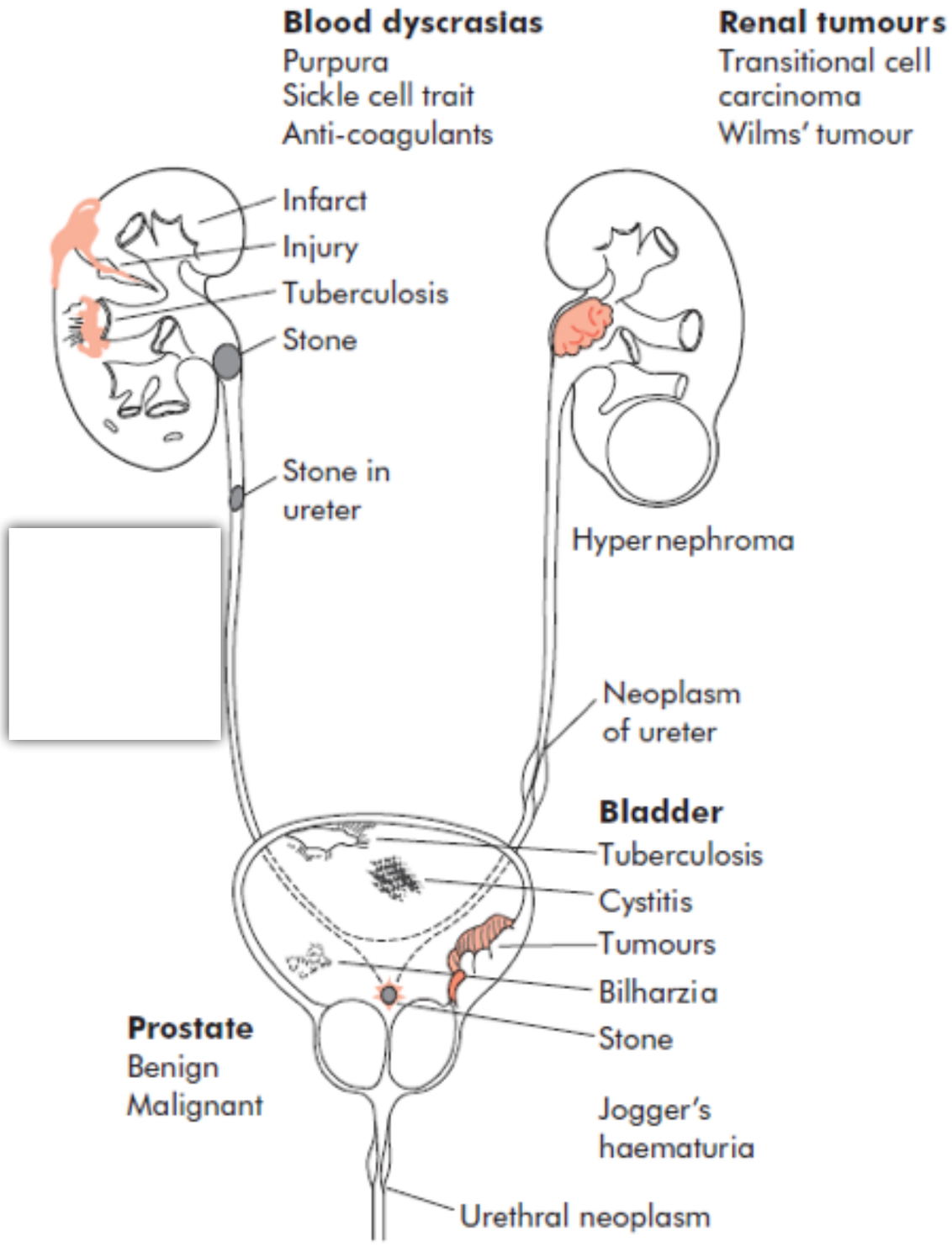
- 26 year old man, noticed dark urine after his heavy weight lifting workout. associated with severe muscle pain.. he noticed also decrease in his urine amount

- What is the cause of dark red urine in each patient?

Differential Diagnosis of red urine

- Hematuria
- Hemoglobinuria/myoglobinuria
- Anthrocyanin in beets and blackberries
- Chronic lead and mercury poisoning
- Phenolphthalein (in bowel evacuants)
- Phenothiazines (e.g., Compazine)
- Rifampin

Causes of
Normal RBCs shape in urine microscopy



Hematuria

- Painful or painless
- Gross (visible to the naked eye) or microscopic
- Initial (only at the start of the stream)
- Terminal (only at the end of the stream)
- Total
- intermittent or persistent
- Glomerular or non- glomerular (essential)

Glomerular hematuria

Disorder
IgA nephropathy (Berger's disease)
Mesangioproliferative GN
Focal segmental proliferative GN
Familial nephritis (e.g., Alport's syndrome)
Membranous GN
Mesangiocapillary GN
Focal segmental sclerosis
Unclassifiable
Systemic lupus erythematosus
Postinfectious GN
Subacute bacterial endocarditis

Case No 5

- 24 year old female presented with generalized edema and periorbital edema. she has hx of joint pain, malar rash and mouth ulcers
- Urine analysis showed +3 protein . 1-2 RBCs
- 24 hour urine collection showed 4g / day protienuria

Case No 6

- 20 year-old woman with no significant past medical history who came to clinic for a physical for college football. Hx of frequent NSIADs use for her period. with no other physical complaints. Vital signs, BP within normal . Physical exams within normal . Urine Analysis : +ve for WBCs casts, +1 protein and +2 RBCs, +ve glucose
- 24 hour urine collection showed 500mg / day proteinuria

Case No 7

- 70 year old man, presented with lower limb edema, back pain and generalized weakness.
- found to have anaemia, high ESR (erythrocytes sedimentation rate) and urine analysis +RBCs , negative for Protein..
- 24 hour urine showed 2grams proteinuria

- What is the cause of Proteinuria in each case ?

causes of proteinuria

TYPE	PATHOPHYSIOLOGIC FEATURES	CAUSES
Glomerular	**Increased glomerular capillary permeability to proteins**	**Primary or secondary glomerulopathy**
Tubular	**Decreased tubular resorbtion of proteins in glomerular filterate**	**Tubular or interstitial disease caused by drugs, hypertensive glomerulosclerosis**
Overflow	**Increased production of low molecular weight proteins**	**Monoclonal gammopahy, leukemia**

Causes Of Proteinuria

- **Primary glomerulonephropathy**
  - Minimal change disease
  - Idiopathic membranous glomerulonephritis
  - Focal segmental glomerulonephritis
  - Membranoproliferative glomerulonephritis
  - IgA nephropathy
- **Secondary glomerulonephropathy**
  - Diabetes mellitus
  - Collagen vascular disorders (e.g., lupus nephritis)
  - Amyloidosis
  - Preeclampsia
  - Infection (e.g., HIV, hepatitis B and C, poststreptococcal illness, syphilis, malaria and endocarditis)
  - Gastrointestinal and lung cancers
  - Lymphoma, chronic renal transplant rejection
- **Glomerulonephropathy associated with the following drugs:**
  - Heroin
  - NSAIDs
  - Gold components
  - Penicillamine
  - Lithium
  - Heavy Metal

Causes Of Proteinuria

- Tubular
  - Hypertensive nephrosclerosis
  - Tubulointerstitial disease due to
    - Uric acid nephropathy
    - Acute hypersenstivity
    - Interstitial nephritis
    - Fanconi syndrome
    - Heavy metals & Drugs
    - Sickle cell disease
- Overflow
  - Hemoglobinuria
  - Myoglobinuria
  - Multiple myeloma
  - Amyloidosis

Case No 8

- 19 year old man, presented to nephrology clinic with high blood pressure reached 160/100. negative family Hx of HTN. negative review of symptoms.

- found to have low k level and normal kidney Function with normal renal doppler US

Case No 9

- 50 year old man presented with high blood pressure reading 140-160 / 90-100
- negative review of symptoms and normal kidney function, normal secondary work up

- what is the most likely cause of HTN in both cases ?

Aetiology of Hypertension

- Primary – 90-95% of cases – also termed “essential” of “idiopathic”
- Secondary – about 5% of cases
  - Renal or renovascular disease
  - Endocrine disease
    - Phaeochomocytoma
    - Cushings syndrome
    - Conn’s syndrome
    - Acromegaly and hypothyroidism
  - Coarctation of the aorta
  - Iatrogenic
    - Hormonal / oral contraceptive
    - NSAIDs

Case No 10

- 65 year old man , presented with decrease Urine output for the last 2 days, he reported difficulty in urination, with frequency , hesitancy and poor stream.
- diagnosed to have benign prostate hypertrophy and he stopped his medications for last 4 months.
- His Creatinine : 6.5mg/dl (high)

Case No 11

- 50 year old women, presented with vomiting, diarrhea and fever for the last 3 days looks like she had food poisoning.
- at presentation she was hypotensive and dry.
- Her Creatinine: 4.5mg/dl (high)

Case No 12

- 60 year old man, obese with bilateral knew pain, and he is using regularly diclofenac sodium , presented with feeling unwell and mild lower limb swelling.
- found to have serum creatinine 4.5 mg/dl (high)

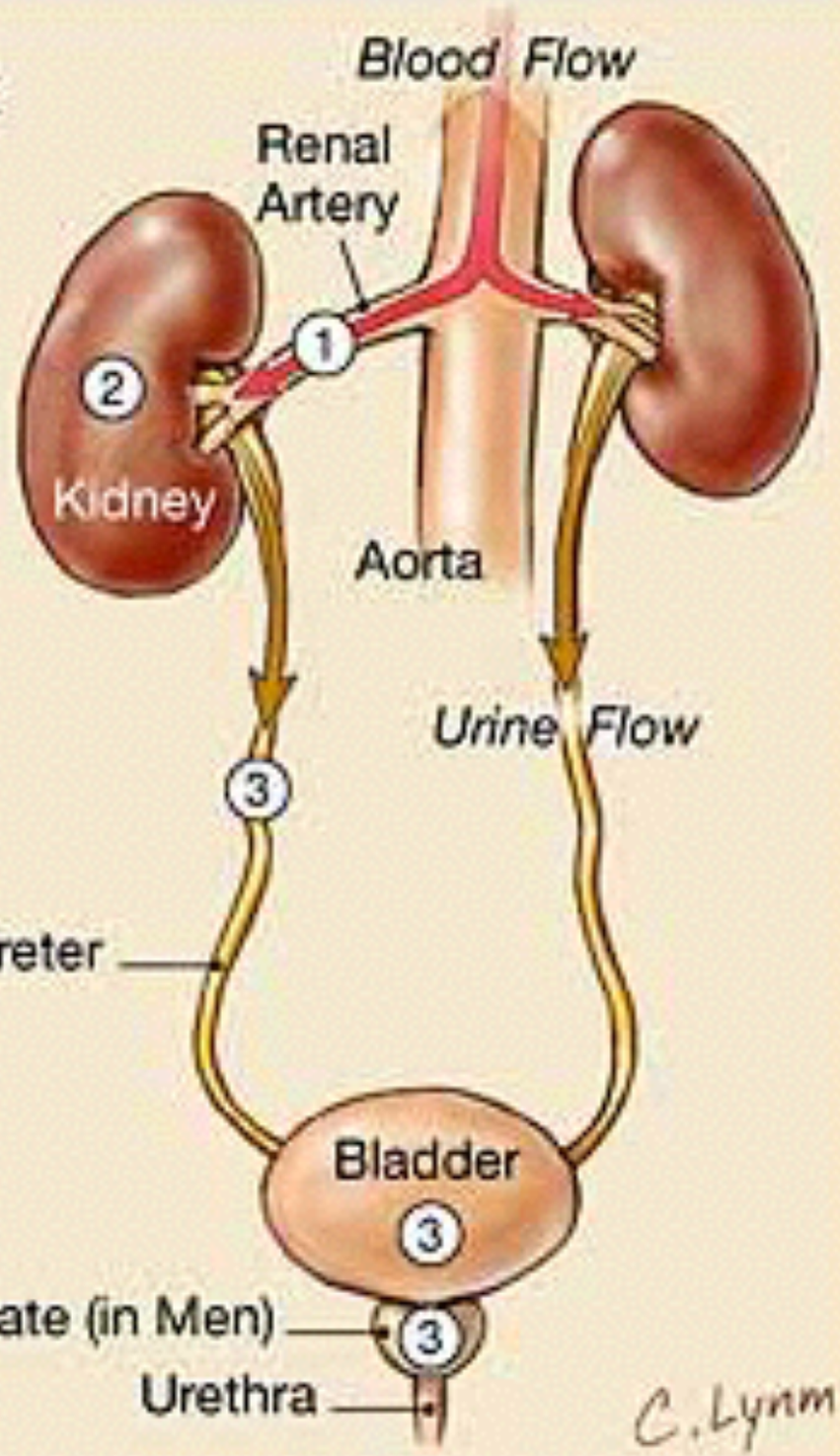
- What is the most likely cause of Acute renal failure ?

CAUSES OF ACUTE RENAL FAILURE

① Prerenal
Sudden and severe drop in blood pressure (shock) or interruption of blood flow to the kidneys from severe injury or illness

② Intrarenal
Direct damage to the kidneys by inflammation, toxins, drugs, infection, or reduced blood supply

③ Postrenal
Sudden obstruction of urine flow due to enlarged prostate, kidney stones, bladder tumor, or injury



Causes of AKI

Pre renal

Decrease in effective
.blood volume
Arterial occlusion
Or
.stenosis
Homodynamic
.Form

Intrinsic renal

Vascular
.Vasculitis
Malignant hypertension

Acute Glomerulo nephritis

Acute Interstitial nephritis

Acute Tubular necrosis

.Ischemic

.Nephrotoxic

Exogenous
Antibiotic
Radio contrast
cisplatin

Endogenous
Intra tubular pigment
.Intra tubular protein
.Intra tubular crystal

Post renal

Obstruction Of Collecting System
Or
Extra renal drainage

Case No 13

- 60 year old man with HTN, DM, for last 30 years his baseline Creatinine 2.5mg/dl (eGFR, MDRD 28 ml/min/1.75m2
- His renal us was small bilaterally with no renal artery stenosis
- his urine analysis +1 P and negative for RBCs

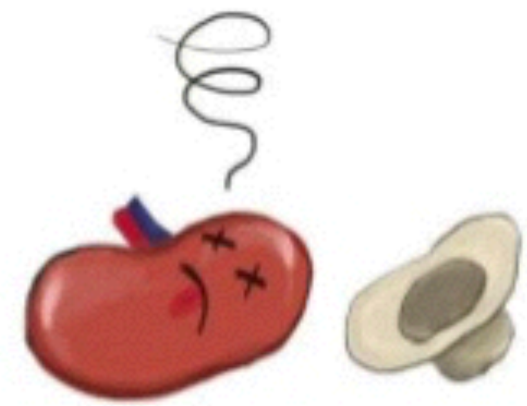
What is the definition of CKD?

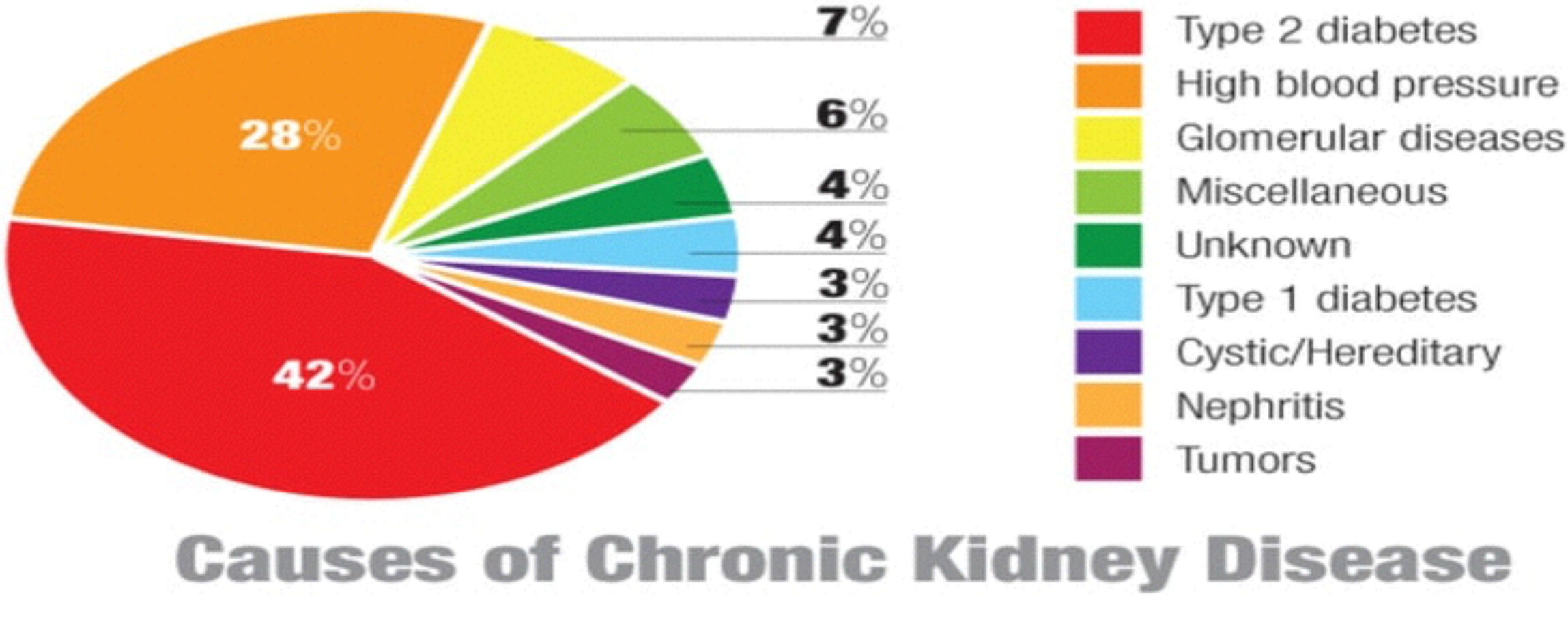
Abnormal

Kidney **structure** or Kidney **function**

for **> 3 months**

with implications for health.




28%
7%
6%
4%
4%
3%
3%
3%
42%
Type 2 diabetes
High blood pressure
Glomerular diseases
Miscellaneous
Unknown
Type 1 diabetes
Cystic/Hereditary
Nephritis
Tumors
Causes of Chronic Kidney Disease

Thank you

Thank you