

	Pneumonia	Pleural effusion	Pneumothorax
Trachea position	CENTRAL	<u>CIL</u> Tracheal SHIFT	+ + +
Percussion - note	DULL	STONY DULL	Hyper-resonant
Air entry	NORMAL*	distant breath sound	Absent Air entry
Breath sounds	Bronchial Breathing		⊖ breath sounds

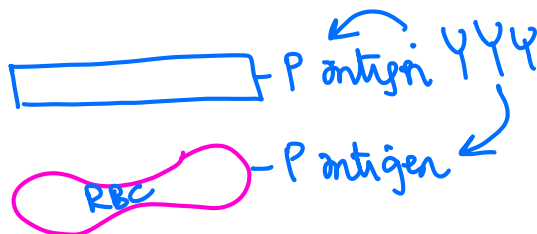
- MCC of pneumonia in AIDS patient is Pneumococcus*
- MCC of Tension Pneumothorax is Baro trauma > penetrating trauma
faulty VENTILATOR settings!
- Best site for insertion of wide bore needle in

-Tension pneumothorax in adults= 5 ICS Ant To NAL
2 ICS Lat To MCL

-Tension pneumothorax in children= 2 ICS lat To MCL

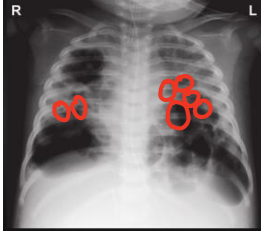

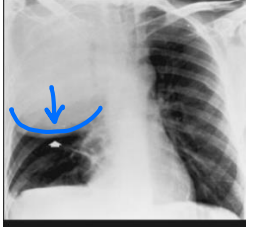
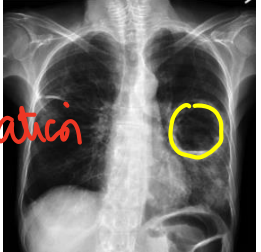

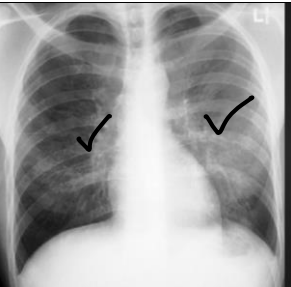
- Legionella pneumophila is associated with SIADH: *Na ↓*
 = * CONFUSION, DIS ORIENTATION: SpO₂: 98%
 pO₂: 95 mm Hg
- Legionella can present as both typical and atypical pneumonia
 * URINE for legionella antigen
- Atypical pneumonia with evidence of hemolysis, Low Hb and black urine is mycoplasma pneumoniae
LDH ↑
Hemoglobinuria
Donath Landsteiner Ab!

SELECTIVE MEDIA: BUFFERED YEAST CHARCOAL Extract



AIHA: Postviral cold
Hemoglobinuria

Organism specific pointers in pneumonia

<p>Legionella pneumonia</p>	<p>Best test: urine legionella antigen</p> <p>Selective culture media BYCE</p> <p>* SIADH: Na ↓</p> <p>DOC Azithromycin</p> <p>1°: Repeated hand wash: chlorhexidine</p> <p>SSI: lead surgeon, scrub nurse: S. AUREUS ⊕</p> <p>Tactical Mupirocin</p>	
<p>S. Aureus Nosocomial pneumonia</p>		<p>- ≥ 48 HOURS of admission</p> <p>- Pneumatocele(s)</p> <p>- lung Abscess</p> <p>- Air Fluid level in CXR</p> 
<p>Klebsiella Pneumoniae Alcoholic with Red currant jelly sputum</p>		<p>CAP = pneumococcus</p> <p>alcoholic, CAP = klebsiella pneumoniae</p> <p>Bulging fissure sign: CXR</p> <p><u>FREIDLANDER'S Pneumonia</u></p> <p>lung abscess +/-</p> <p>gag reflex ↓</p>
<p>* Anaerobic lung abscess</p> <p>MICROAspiration of saliva</p>		<p>20yr: HOLI: ALCOHOL + DRUGS cough reflex ↓</p> <p>sleeping 2 days</p> <p>> 2days: FEVER HG + PURULENT Bronchorrhoe</p> <p>CXR: Cavity ⊕</p>
<p>P. Jiroveci</p> <p>Gomori Methamine stain</p> <p>CRUSHED Pink Pong ball appearance</p>	 	<p>P. JIROVECI</p> <p>HIV +</p> <p>* CD4 < 200</p> <p>* CXR: INFILTRATES BL</p> <p>* Sputum stain ⊖ GMS</p>

PD, AD, HEAD INJURY, STROKE | CVA
drug OVERDOSE = alcohol + drugs

⇒ Aspiration pneumonia

ANAEROBIC +

Ping Pong ball

BAL + STEROIDS

Rx: TMP-SMX

1°: TMP-SMX

Sulpha allergy = PENTAMIDINE

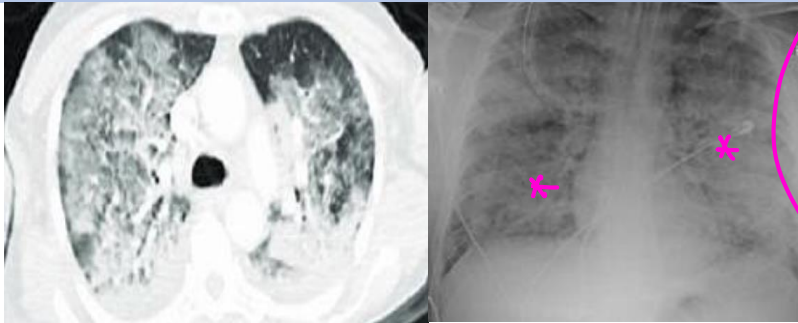
* MC organism ⇒ Git: ANAEROBIC (BACTEROIDES)

↓

Vitamin K

ARDS

death



COVID-19: SARS-CoV-2
 SARS
 H1N1 = swine flu
 H5N1 = bird flu

MCC PNEUMONIA > SEPSIS

- MCC direct cause PNEUMONIA
- MC indirect cause SEPSIS

- * Pancreatitis (Acute)
- * TRALI: < 6 HR of Tx
 ↓ : FFP > BT
 1°: avoid multiparous donor
- * Mendelson: Aspiration of Stomach Contents
- * Toxic gas inhalation: MIC

Diagnostic criteria

1. $\text{paO}_2 / \text{FiO}_2 \text{ ratio} = < 300$
 Echo ↓
2. LA pressure is normal / Absence of LA hypertension
 NON-CARDIOGENIC PULM EDEMA
3. CXR shows Bilateral infiltrates
4. < 7 days of lung injury / of insult

BERLIN CRITERIA

RX:

Low volume ventilation = Low tidal volume and high PEEP

* $\text{TV} = 12 \text{ ml/kg}$

* $4-6 \text{ ml/kg} = \text{low volume Tidal}$

PEEP = PEAK end expiratory pressure: 1° collapse alveoli
 5cm H₂O

2. PRONE POSITION

3. COVID-19 pneumonia
 * methyl-prednisolone

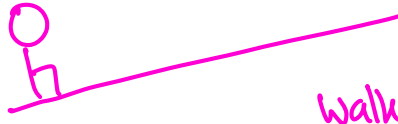
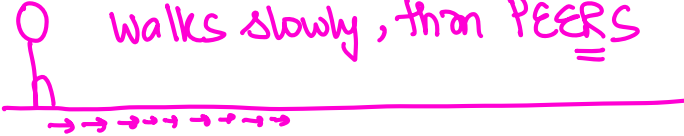
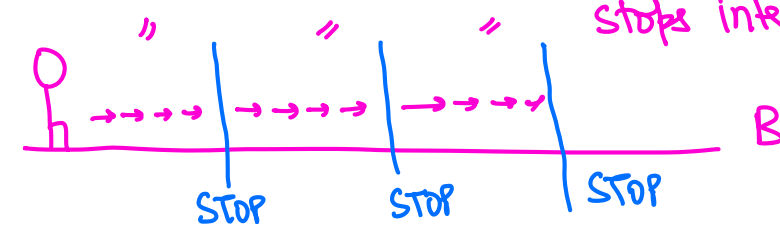
ANTHRA COALS: WOOD, COW-DUNG CAKES, COAL: fuel



COPD **SMOKER**

Modified medical research council grading of dyspnea mMRC

Grade

I	 walking on incline
II	A  walks slowly, than <u>PEERS</u> B
III	A  stops intermittently B
IV	* SOB: on daily activity: <u>change of clothes</u> * Too breathless To walk or go out of House <u>Taking bath</u> <u>washroom</u>

SOB

HF*
SOB
change of clothes
↓
NYHA
ga III

GOLD grades of COPD Timed vital capacity

I	Mild	FEV1/ FVC < 0.7 + FEV1 ≥ 80%
II	Moderate	FEV1/ FVC < 0.7 + FEV1 50-80%
III	Severe	FEV1/ FVC < 0.7 + FEV1: 30-50%
IV	Very severe	FEV1/ FVC < 0.7 + FEV1 < 30%

FEV1/ FVC < 0.7 post bronchodilator

Rx ↓
GOLD Groups

A	Low symptoms mmRC	0-1 hospitalization	Any BD	SABA or LAMA
B	High symptoms mmRC	0-1 hospitalization	LAMA + LABA	Tiotropium + Formoterol
E	Any symptoms mmRC excessive illness	>2 exacerbations or >1 hospitalization	LABA + LAMA + ICS Blood eosinophils > 300 cells/cu.mm Absolute eosinophil count	

- Clubbing is not seen in COPD FASTEST Clubbing: Lung Abscess
- Barrel chest is seen and patient sits in tripod position with hoover sign (paradoxical inward movement of chest during inspiration) AP > T diaphragm ++
- Best to measure residual volume is body plethysmography > Helium dilution Test
- Emphysema has reduced DLCO alveolar scarring
- IV hydrocortisone is used in both COPD exacerbation and severe acute asthma. Don't use oral steroids as side effects exceed the benefit.
- NIV is treatment of choice of acute exacerbation of COPD causing Type 2 respiratory failure
- best mortality reducing intervention in COPD is LTOT using low flow oxygen. Target spO2 in COPD is 88-92%.
- NIV is contraindicated in unconscious patients with CV instability

MORTALITY ↓ COPD

- O₂ concentrator + Nasal cannula @ 1L/min x 16 HOURS/day
L.T.O.T
Long TERM O₂ THERAPY
Target spO₂ = 88-92%
- ** VARENICLINE: → α₄ β₂ nicotinic Receptor, partial agonist
* NICOTINE Replacement THERAPY
✓ LOZENGEC, nasal spray, Transdermal patch
- LAMA, LABA, add ICS : AEC > 300 cells/cu.mm

MC complication of COPD = COR PULMONARE

* RUPTURE of bulle in COPD * RIF due To Non cardiogenic cause
SECONDARY Pneumothorax
POST-COVID I.L.D. PAH

① FEV₁ > 80%

Bronchial Asthma

IOC: SPIROMETRY

FEV₁ ↓
50%

Salbutamol 15min → FEV₁ ↑
65%

- Post bronchodilator FEV₁ increases by > 12% or > 200 ml air: Reversible bronchoconstriction

- DLCO is increased in asthma

- idiosyncratic asthma / intrinsic asthma presents in adult age group and has normal IgE levels and coexists with nasal polyps

*
NEUTROPHILIC +

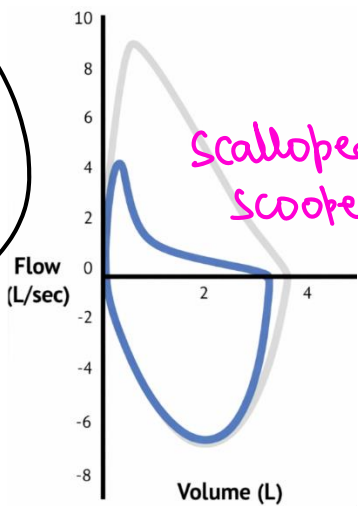
Extra mile ✓

- Fe NO measures the amount of nitric oxide in exhaled breath

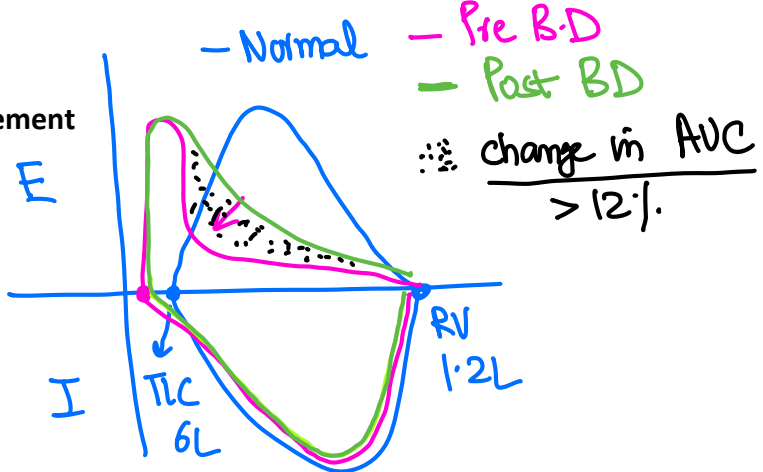
1. Non-invasive measurement of nitric oxide in exhaled breath
2. It is a non-invasive biomarker of Type-2 (eosinophilic) airway inflammation, especially in asthma.
3. Inducible nitric oxide synthase (iNOS) upregulated by IL-4/IL-13
4. Values > 50 ppb indicate Eosinophilic inflammation likely and steroid responsiveness

inhaled NO Test
Vasoreactivity Test
↓
PAH

Flow Volume CURVE



Management



* FEV₁ INCREMENT = 12% : ACOS
Asthma-COPD overlap syndrome
FEV₁ " = < 12
" " : > 12%
COPD
Asthma

LABA s/e

Palpitations
TREMORS
↑ glycaemia
SORE THROAT

<p>Step 1-2</p> <p>AOI ↑</p>	<p>Low dose ICS-LABA as needed</p>
<p>Step 3</p> <p>AOI ↑</p>	<p>MART with low dose maintenance ICS-LABA: daily</p>
<p>Step 4</p>	<p>MART with Medium dose ICS-LABA</p>
<p>Step 5</p> <p>Single CANISTER → *</p> <p>IL-5</p>	<p>Add on L.A.M.A.: Tiotropium</p> <p>Medium dose ICS - LABA - LAMA or oral STEROIDS ± [AVN Hip, CORTISOL?]</p> <p>-Refer for assessment of phenotype</p> <p>-Consider trial of high dose maintenance ICS-formoterol (risk of adrenal suppression)</p> <p>-Consider Biologicals once/monthly inj SC</p> <p>Mepolizumab: Block IL-5 itself → ↓ eosinophil survival</p> <p>* Benralizumab: Blocks IL-5 receptor → antibody-dependent cell-mediated cytotoxicity → near-complete eosinophil depletion</p> <p>ADCC</p> <p>omalizumab = anti-IgE</p>

MART = single inhaler having ICS-Formoterol inhaler for BOTH maintenance + relief

AIR = anti-inflammatory reliever

Acute asthma Exacerbation

LABA + ICS : pMDI

Rapid onset

↑

room Air

SEVERE acute Asthma

Nebulization ± salbutamol

O₂ DRIVEN nebulization

iv Hydrocortisone

⊖ PLA₂: ⊖ leukotrienes

iv Mg SO₄

Mg+ antagonist of Ca⁺⁺

Neb ± ipratropium CHLORIDE

SpO₂: 90-93%
RR < 25/min
pulse: 100-110/min
CAN Talk full sentence

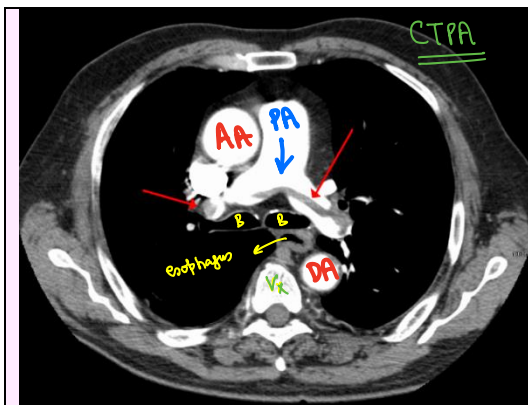
SpO₂ < 90%
RR > 25/min
PR > 110/min
Speak in words

Case Scenario

DVT → Pulm embolism

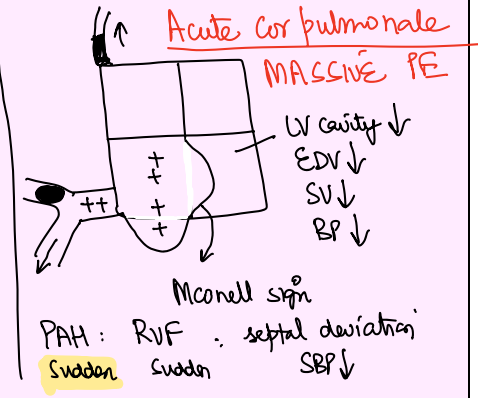
Q. 25-year-old guy has bike accident and is hospitalized for polytrauma. On day 3 he develops sudden onset respiratory distress and spO₂ is 80%. O/E Pulse is 100/min, BP = 90/60 mm hg and prominent neck veins. Diagnosis is

- a. Pulmonary embolism
- b. Fat embolism syndrome



FES

FEMUR SHAFT DRIF
 24-48 Hrs ↓
 Cytokines ⊕
 : SOB, SpO₂ < 90%
 : Unresponsive Unconscious
 axilla: petechiae
 Chest/wall
 GORD CRITERIA



First investigation/ Screening test

D-DIMER Assay

Non-invasive test to identify the cause

DOPPLER EXTREMITIES
 (soleal vein THROMBOSIS)

IOC → C.T.P.A

TOC of massive PE

BP ↓↓ : ACTEPLASE + ENOXAPARIN SC

TOC of PE/ Sub-massive PE

BP ↓/Ⓜ ENOXAPARIN SC

DVT

Parameters to be checked to identify in the question

1. Homan sign : ankle dorsiflexion → calf PAIN
2. BP Value : ↓
3. Echo findings : Mconell sign, Clot(s) in PA

* calf swelling: LIMBS ASYMETRY

HYPERCOAGULABLE state

Common errors

Q. A 60-year-old man with colorectal cancer underwent a hemicolectomy. During surgery ETCO₂ suddenly dropped from 35 mm Hg to 5 mm Hg with Hypotension. Which of the following best describes this presentation?

- a. Myocardial muscle relaxation due to anaesthetic drugs
- b. Overload of saline
- c. Pulmonary embolism
- d. Mesenteric artery bleeding

Q. 25-year-old guy has bike accident and is hospitalized for polytrauma. On day 3 he develops sudden onset respiratory distress and becomes unconscious and unresponsive. O/E Pulse is 100/min, BP= 110/70 and petechiae are noted in chest wall. Diagnosis is

- a. Pulmonary embolism
- b. Fat embolism syndrome

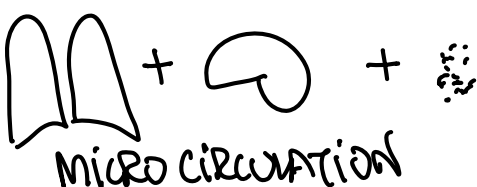
GORD CRITERIA

Major features

- Axillary or subconjunctival petechiae
- Hypoxemia PaO₂ < 60 mmHg; FIO₂ = 0.4
- Pulmonary edema
- ~~Sudden drop in Hb level > 20%~~
- Central nervous system depression disproportionate to hypoxemia

Minor features

- Tachycardia > 110/minute ✓
- Pyrexia > 38.5 ✓
11-1
- Retinal fat or petechiae
- Urinary fat globules or oligoanuria
- Sudden thrombocytopenia > 50%
- High ESR > 71 mm/hour ✓



CHPS / IHPs

- HYPONATREMIC
- HYPOKALEMIC
- HYPOCHLOREMIC
- M. ALKALOSIS
- PARADOXICAL ACIDURIA

1st To be corrected

* Na ↓

fluid of choice

NS + KCl

1st BORN / BOY, ERYTHROMYCIN
 clo PROJECTILE ⇒ 3wks
 Vomiting

ole: VISIBLE PERISTALSIS

OLIVE SHAPED lump in epigastrium

WORK: UP: IDC: USG: ⊙ DOUGHNUT / Target sign

Na ↓ (K ↓) Cl ↓ Calcium: ↓↓

pH ↑ pCO₂ ↑ HCO₃ ↑

Rx: RAMSTEDT OPERATION

M. alkalosis
 S. albumin: bound
 ↓ immed Ce⁺
Redistribution

M. Acidosis

pH ↓ pCO₂ ↓ HCO₃ ↓

K: KETOACIDOSIS = STARVATION, DM

U: URAEMIA

L: LACTIC ACIDOSIS

Pg. 132

T: TOXINS

A = SHOCK: PERFUSION ↓
 B = METFORMIN, DM

15-30ml methyl alcohol poisoning: HCOCH triadegy

alcohol dehy
formaldehyde Additional Notes Toxic To Retina
SNOW VISION

Formic acid $\text{pH} = 1$: BBB \neq : encephalopathy

Rx: FOMEPIZOLE iv + Folic acid
~~B1~~ ~~B3~~ ~~B6~~ ~~B9~~

ETHANOL NG TUBE

$\text{H}_2\text{O} + \text{CO}_2$

Contaminated cough syrup: ETHYLENE GLYCOL poisoning

inability to excrete H^+ / K^+



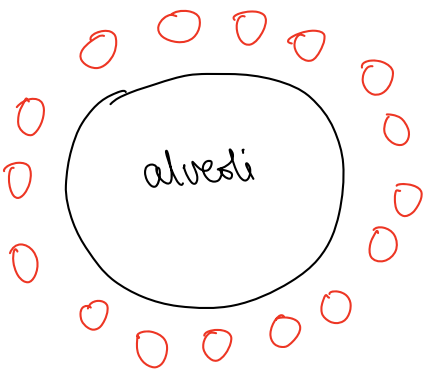
Ca oxalate
Crystal
ATN

Rx: \rightarrow iv FOMEPIZOLE

Rx: COVID-19 PNEUMONIA : MOLNUPIRAVIR *
(WHO)

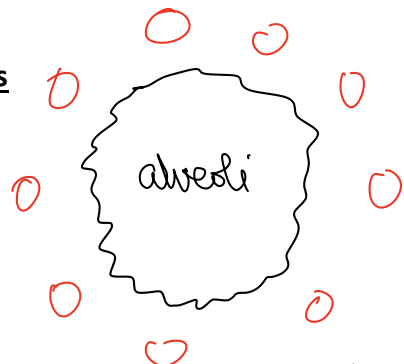
- H_1N_1 = OSELTAMAVIR
- H_5N_1 = "
- H_3N_2 = AMANTADINE
- RSV = PAXLOVID

Additional Notes



HYPERVASCULARIZATION
Surface Area ↑
DLCO ↑

e
extrinsic
= child
eosinophils, IgE ↑
STERIODS
SEVERITY ↓



Emphysema: DLCO ↓

i
intrinsic / extrinsic
adult
↓
+ neutrophils
Poor prognosis
WORSENS w age
IgE ↑, eosinophil
STERIODS

- * Acute exac^N : LABA + low dose ICS : PMDI
- * SEVERE acute asthma : Nebulization ± SABA + O₂
- * BRITTLE Asthma : EPI-PEN or epinephrine SC
- * 1^o : LABA + LD ICS
MD → LAMA / biologicals

RINSE MOUTH ± H₂O: ↓ OP candida

ICS

WORK-UP

- ** FeNO > 50 ppb
- * flow volume curve
- * Spirometry : ↑ FEV₁ > 12% increment
- * methacholine
inj challenge Test
Post-B.D

SUDDEN R.D + onset : $SpO_2 \downarrow$ SOB



Additional Notes

1. CENTRAL line INSERTION, SV \Rightarrow Pneumothorax Iatrogenic

2. NEUROSURGERY (DURAL venous sinus #) \Rightarrow VAE

3. T.H.R or T.K.R ORTHO Sx \Rightarrow P.T.E
(Femoral) (popliteal)

CANCERS, CANCER Sx
Hematological cancer

Pregnancy (LSCS), long distance air Travel
Nephrotic syn, OCP: Estrogen > 30 ug

TYPE 1 : $\downarrow pO_2$ $pCO_2 \uparrow \downarrow$

ARDS, PNEUMONIA, FES, PL. EFFUSION
HAPE / AMS, PNEUMOTHORAX

TYPE 2: $\downarrow pO_2$ $\uparrow pCO_2$

1. Acute exacerbation of COPD

2. STATUS ASTHMATICUS: SILENT chest, cyanosis
[imminent Resp failure] pulsus paradoxus

3. TENSION PNEUMOTHORAX

4. FB GLOTTIS

5. Obesity Hypoventilation syndrome / Pickwinian syn
 $pH \downarrow$ $pCO_2 \uparrow$ $HCO_3 \uparrow$ *

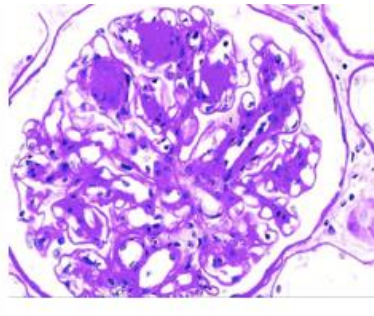
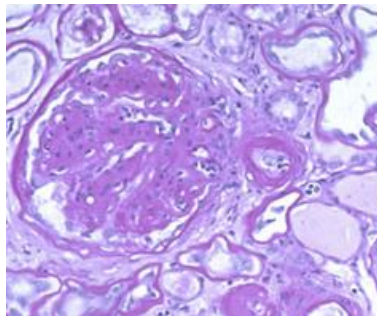
6. GBS, Hypokalemia, Amyotrophic lateral sclerosis
Cxal # spine C3,4,5

TYPE 3 : POST-OP ATELECTASIS : Rx: 1°: incentive spirometry

TYPE 4 : HYPOPERFUSION of Resp. muscle : SHOCK
Rx: I.P.P.V + Tt the shock

Nephrology and electrolytes

CKD is classified based on: • Cause (C) • GFR (G) • Albuminuria (A)			Albuminuria categories Description and range		
			A1 Normal to mildly increased <30 mg/g <3 mg/mmol	A2 Moderately increased 30-299 mg/g 3-29 mg/mmol	A3 Severely increased ≥300 mg/g ≥30 mg/mmol
G1	Normal or high	≥90	Screen 1	Screen 1	Screen 1
G2	Mildly decreased	60-89	Screen 1	Treat t 2	Treat t 2
G3a	Mildly to moderately decreased	45-59	Treat 1	Treat t 2	Treat t 3
G3b	Moderately to severely decreased	30-44	Treat 2	Treat t 3	Treat t 3
G4	Severely decreased	15-29	Treat 3	Treat t 3	Treat 4+
G5	Kidney failure	<15	Treat 4+	Treat 4+	Treat 4+



Chronic Kidney disease

-Leading cause is D. NEPHROPATHY

* -CKD with normal size kidney/ slight enlargement is seen in DM, amyloidosis

-Leading cause of death in CKD is CVD

-Target BP in CKD patients should be < 130/80 (High Renin) mm Hg

-Most life-threatening complication of CKD is HYPERTENSIVE HAEMORRHAGE

-Staging of CKD is based on eGFR and Albumin creatinine Ratio
Creatinine clearance Albumin excretion Rate

-Stage at which complications appears is grade III

-Uraemia features develop in grade V ← End stg ← "RENAL FAILURE"
Renal disease

* -Troponin I is elevated in CKD so never rely on single value in CKD patient with chest pain. Instead perform Serial troponin I

Albuminuria categories

Description and range

CKD is classified based on:			A1	A2	A3	
• Cause (C) • GFR (G) • Albuminuria (A)			Normal to mildly increased	Moderately increased	Severely increased	
			<30 mg/g <3 mg/mmol	30–299 mg/g 3–29 mg/mmol	≥300 mg/g ≥30 mg/mmol	
GFR categories (ml/min/1.73 m ²)	G1	Normal or high	≥90	Screen 1	Screen 1	Screen 1
	G2	Mildly decreased	60–89	Screen 1	Treat t 2	Treat t 2
	G3a	Mildly to moderately decreased	45–59	Treat 1	Treat t 2	Treat t 3
	G3b	Moderately to severely decreased	30–44	Treat 2	Treat t 3	Treat t 3
	G4	Severely decreased	15–29	Treat 3	Treat t 3	Treat 4+
	G5	Kidney failure	<15	Treat 4+	Treat 4+	Treat 4+



■ Low risk (if no other markers of kidney disease, no CKD)
 ■ Moderately increased risk
 ■ High risk
■ Moderately increased risk
 ■ High risk
 ■ Very high risk

A1	A2	A3
Normal to Mildly Increased	Moderately Increased (Microalbuminuria)	Severely Increased (Macroalbuminuria)
< 30 mg/g (< 3 mg/mmol)	30 - 300 mg/g (3-30 mg/mmol)	> 300 mg/g (> 30 mg/mmol)
Low Renal Risk	Moderate Risk	High Renal & CV Risk
Low Renal	Moderate Risk	High Renal & CV Risk

Mild CKD: 60 -89

Moderate CKD: 30-59

Severe CKD: 15-29

Renal failure / ESRD < 15



Q. Best to differentiate between AKI and CKD?

<ul style="list-style-type: none"> <input checked="" type="radio"/> a. Creatinine clearance and Urine albumin <input type="radio"/> b. Serum creatinine and BUN <input type="radio"/> c. Size of kidney and BUN <input type="radio"/> d. Urine output and Serum creatinine 	<p><u>S. albumin: LFT</u></p>
--	-------------------------------

G1	<p>> 90 ml/min / 1.73m²</p> <p>30</p>
G2	<p>60 - 89 ml/min / 1.73m²</p> <p>15</p>
G3A *	<p>45 - 59 ml/min / 1.73m²</p> <p>15</p>
G3B	<p>30 - 44 " "</p> <p>15</p>
G4	<p>15 - 29 " " : RRT session = 4HRS</p> <p>15</p>
G5	<p>< 15 " "</p>

→ allogenic kidney Tx
or
→ Haemodialysis
3/wk

Medical Management of CKD: **ABCDE-PK**

Metformin: eGFR < 30 ml
 insulin: 80% (calculated dose)
 SGLT2i, eGFR < 20: DPP-4 ⊖

A Keep Hb A1c < 7%

B Keep BP < 130/80: ACEi

ESRD, RF: 140/90, K⁺ = 6.8 meq/L: CCB + Prazosin

C Keep CHOLESTROL Target LDL: ATORVA (STATIN) +
 DM + CAD, Target LDL < 70 mg Ezetimibe

D vit D₃ ↓: Calcium ↓ PO₄ ↑ SAR ↑: 2° PTH ↑

Vit D₃
RDA
☺

Start first with sevelamer to decrease phosphate and then start cinacalcet

On regularly taking vitamin D and calcium, low PTH levels develop causing Adynamic bone disease

E: First replete iron levels and then start Darbepoetin

Causes of Anaemia in CKD

1. Erythropoietin deficiency
2. Iron deficiency **POOR ORAL INTAKE**
3. Hyperparathyroidism # B. marrow damage

Single dose iv or oral iron

P PO₄ ↑

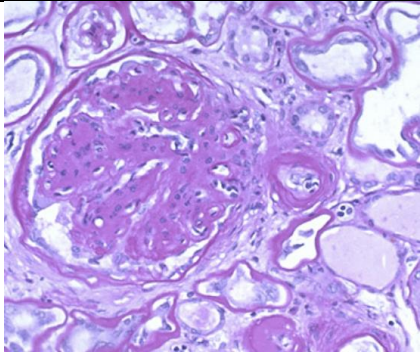
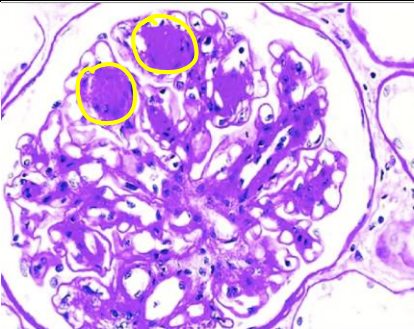
SEVELAMER
 Lanthanum carbonate
 Calcium - acetate

K K ↑

PATIROMER
 Sodium Zirconate
 S.P.S sod-poly chlore sulphonate

* diuretic: Metazalone: Pedal edeme +
 in CKD

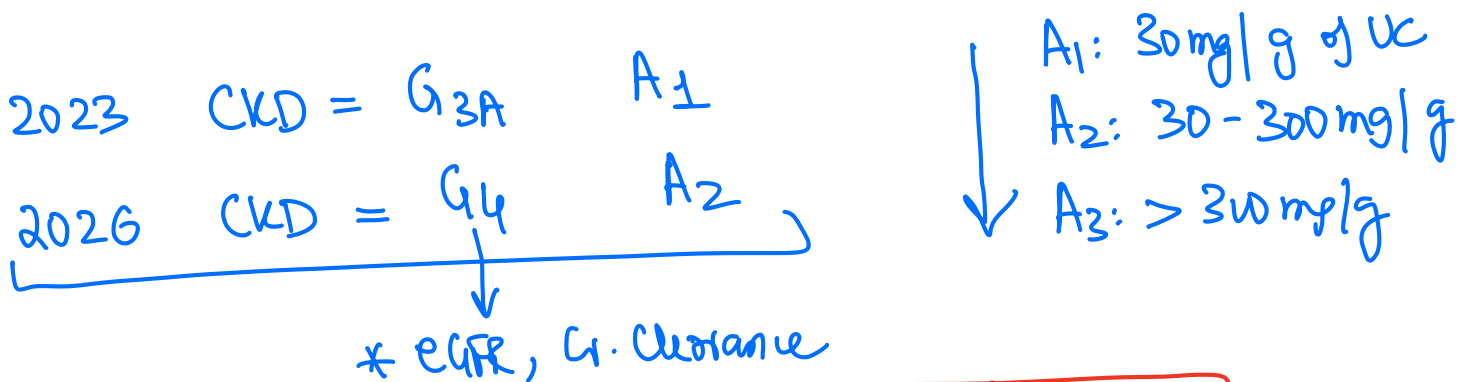
Diabetic Nephropathy

<p>DIFFUSE GLOMERULOSCLEROSIS M/C ↑</p>	<p>Kimmelstein-Wilson change Nodular Glomerulosclerosis most characteristic</p>
 <p>A</p>	 <p>B</p> <div style="border: 2px solid red; border-radius: 50%; padding: 10px; display: inline-block; margin-top: 10px;"> <p>PCT glycogen + Armani elastin change</p> </div>

<p>Earliest feature of diabetic nephropathy</p>	<p>HYPER FILTRATION</p>
<p>Screening test (UACR) ← =</p>	<p>urine albumin/creatinine : $\frac{30-300 \text{ mg}}{\text{g of urinary creatinine}}$</p>
<p>First line drug ↓ progression of</p>	<p>low dose ACEi or ARB</p>
<p>Additional drugs and interventions <u>downward</u></p>	<p>SALT2i: salt loss, SFB ↓: 5mm Hg insulin : 80% calculated dose * FINRENONE : Mineralocorticoid Receptor antagonist</p>

early diagnosis

* KFT: S. Creatinine: mg/dL : most specific Test

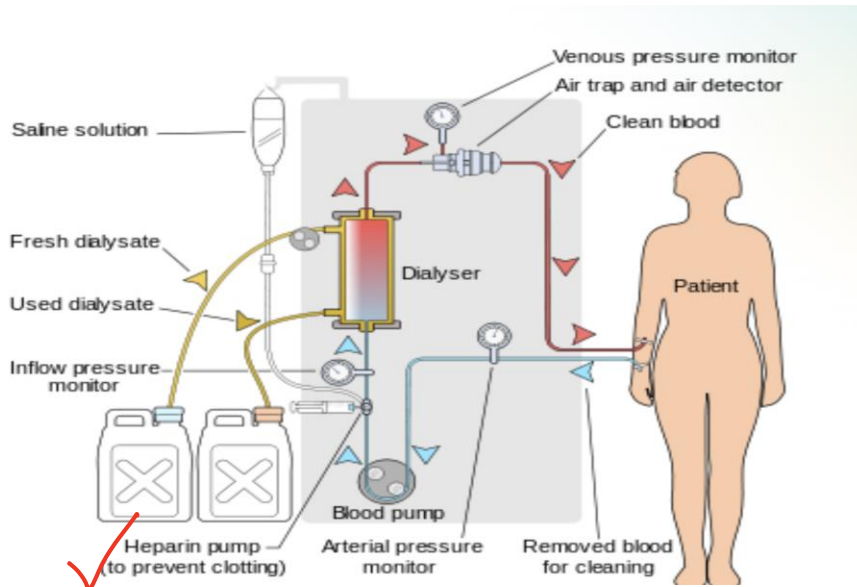


THIAZIDE: ↑ SUGAR ↑ lipid ↑ URIC Acid
K↓ Mg↓ M. ALKALOSIS

Renal replacement therapy

64

- * Preferred modality: Kidney transplantation
- * MC used modality: Hemo-dialysis



-MC complication of HD is HYPOTENSION (caused due to acetate used as buffer in dialysate due to its vasodilatory effects). Cooling the dialysate helps too in reducing this complication

-MC complication of recurrent HD is increased Accelerated atherosclerosis

-AV fistula site in non-dominant hand between Radial A artery and Cephalic vein and is called Cimino Brescia fistula

Q. All of the following improve with dialysis except?

a. Renal osteodystrophy

→ RUGOR JERSEY spine

b. Metabolic acidosis

H+

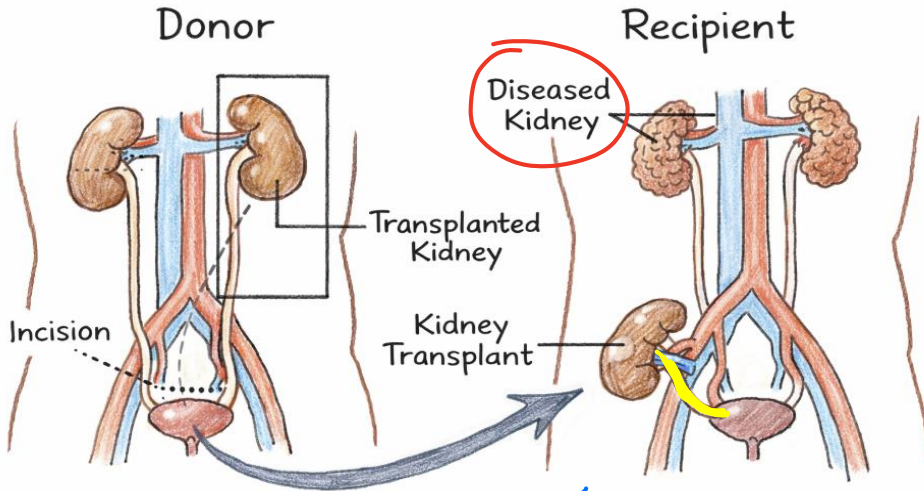
c. Hyperkalaemia

K+

d. Pulmonary oedema

H₂O excess

Kidney transplant



* Life expectancy enhanced by approximately 15 years ✓

Lesion with high recurrence tendency after kidney-transplantation: dense deposit disease

Lesion that does not recur after kidney transplantation: ALPORT syndrome

Q. Which of the following is absolute indication for urgent haemodialysis

- a. Uremic pericarditis
- b. Uremic melena
- c. Uremic encephalopathy
- d. Uremic asterixis

bleeding in pericardium
Hemopericardium
cardiac Tamponade

ALPORT: $\alpha 5$ chains of TYPE 4 collagen \neq , COL4A5 gene \neq
XLD, XLR, AD, AR

* father died of URAEMIA

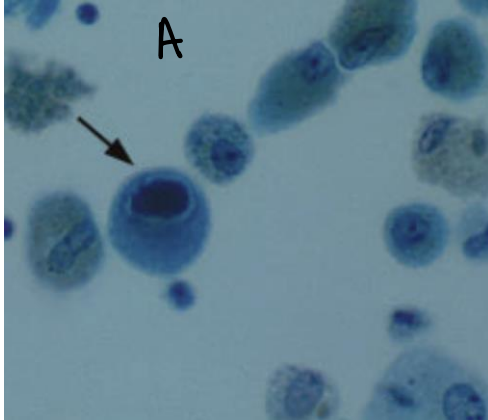
Ant. lenticulus

Hematuria \rightarrow RF

* Anti Rejection drugs: Cyclosporine, Azathioprine, prednisone

Opportunistic infections after kidney transplantation

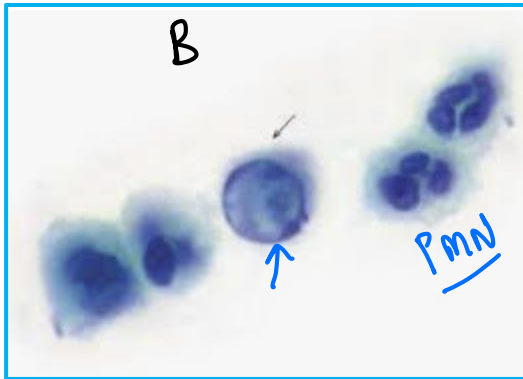
MC opportunistic infection leading to graft failure after 3 months of kidney transplantation with urine m/e finding shown is



CMV
 Basophilic
 I/N
 inclusion
 Owl eye app



MC opportunistic infection leading to graft failure after 8 months of kidney transplantation with urine m/e finding shown is



decoy cell
 Renal Tubular cell
 BK/Polyoma virus

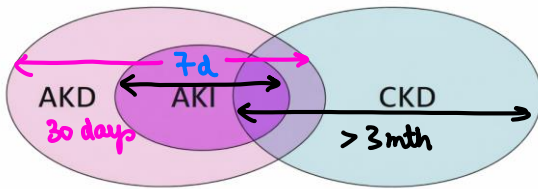
Graft rejection

Type	Hypersensitivity
Hyperacute (immediately)	T2
Acute ($< 6\text{mth}$)	T2/T4
Chronic (delayed)	T4

$\geq 6\text{mth}$

Acute kidney injury

KDIGO / RIFLE / AKIN criteria



C.K.D

$eGFR < 60 \text{ ml/min/1.73 m}^2$
x 3 months

G1	> 90 ml
G2	60-89
G3	30-59
G4	15-29
G5	< 15



Functional criteria for AKI

Time frame Within 7 days / 48 hours

Increase in Scr by $\geq 50\%$ within 7 days.

OR

Increase in Scr by $\geq 0.3 \text{ mg/dL}$ within 2 days.

Or Oliguria for ≥ 4 hours

urinary



Biomarkers of AKI

1. K-I-M-1
2. NGAL
3. CYSTATIN-C
4. IL-18

kidney injury - Molecule - 1

Neutrophil gelatinase associated lipocalin

* best method To calculate GFR

✓ CKD-EPI - Cystatin-C method

age gender, wt

Race

S. creatinine

Cystatin-C

- ✓ Creatinine clearance
- ✓ Inulin "
- ✓ UREA
- ✓ PAH "

✓ Calculate GFR, 4 yr, 100 cm height, 12 kg, S. creatinine 1 mg/dL

$$\frac{k \times Ht}{S. \text{ creatinine}} = \frac{0.41 \times 100}{1} = 41 \text{ ml/min}$$

SCHWARTZ FORMULA

AKI	Serum creatinine	Urine output ml/kg/hr 60kg: 60ml/hr x 24	Duration
Stage 1	1.5-1.9 Times ↑ above baseline OVER ~ 48 HOURS	< 0.5 ml/kg/hr	6 HOURS
Stage 2	≥ 2.0 - 2.9 Times ↑ " " "	< 0.5 "	12 HOURS
Stage 3	≥ 3.0 Times ↑ "	< 0.3 "	24 HOURS

AKI

-Leading cause of ICU admission:

-Anuria is defined as urine output less than 100 ml per day

-MC type of acute kidney injury: Pre-renal AKI ← PERFUSION ↓

- Preferred fluid for choice for patients of AKI - Normal saline *

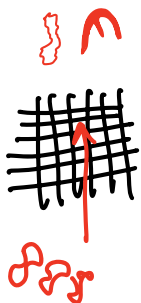
PRE-RENAL AKI: BURNS, Ac. pancreatitis, NSAIDs, COX-1 ⊖, PG ↓
CHOLERA, bleeding

RENAL AKI

DT HUS: E. coli O157: H7 : Acute dysentery
Rx: Quinolones

PS: Helmet cells
Schistocytes

↓
Shiga Toxin
⊕ Complement system



MICROTHROMBI
in Renal circulation
MAHA
Coombs ⊖ hemolytic A

GFR ↓: Renal #

RAAS: HTN
ANURIA
URAEMIA

Rx: STOP ANTIBIOTICS
Hemodialysis

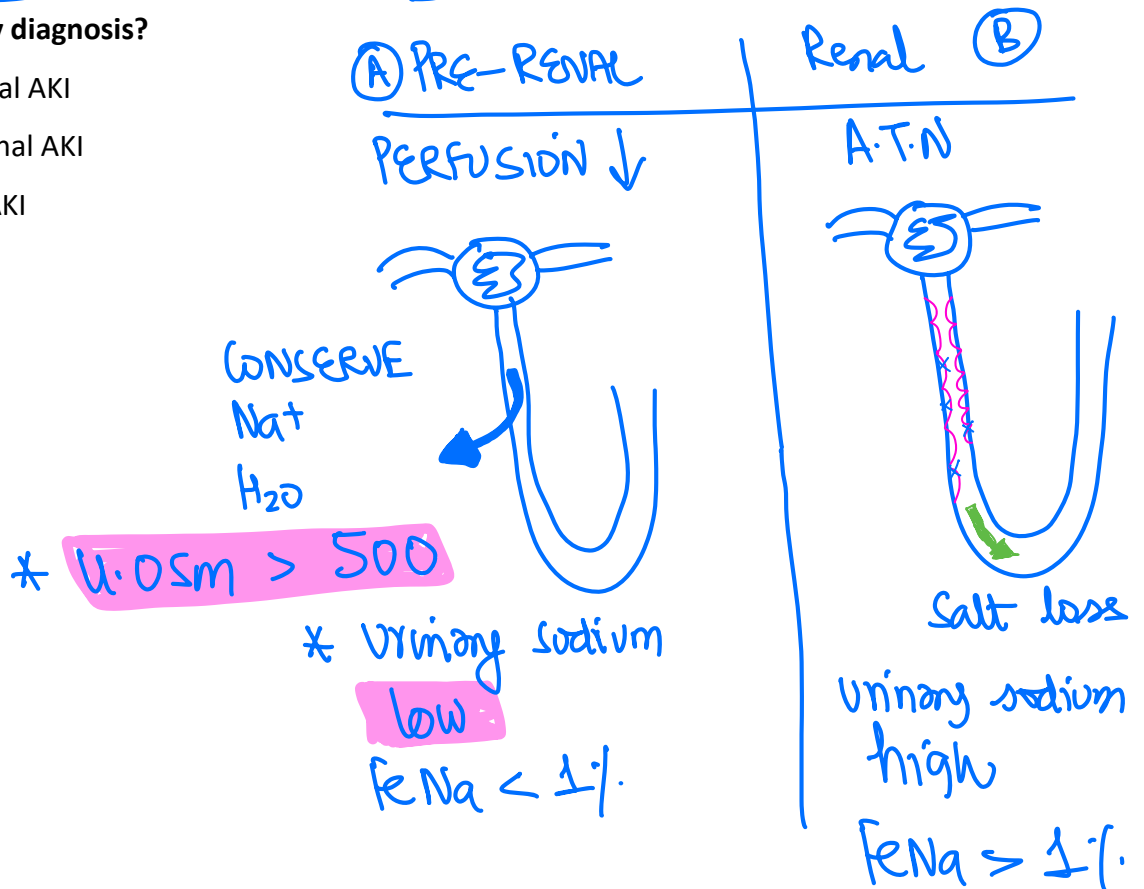
Indications for haemodialysis

- A:** Acidosis (pH < 7.1)
- E:** Electrolytes: Refractory Hyperkalaemia (K > 6.5 mEq/L) *
- I:** Intoxications *drugs*
- O:** Overload with fluid refractory to diuresis *HF*
- U:** Uremic pericarditis, uremic encephalopathy

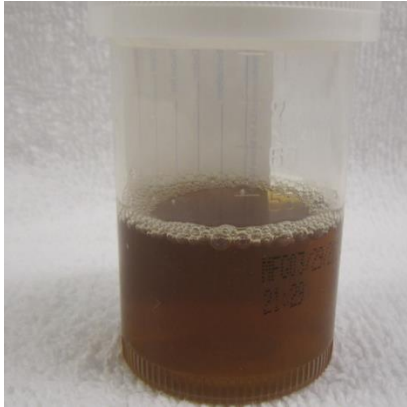
access site: → Int jugular vein
HD in AKI

Q. 15-year-old child develops diarrhoea with severe dehydration and oliguria. On admission Serum creatinine is 4 mg/dl with urine osmolality of 700 mosm/kg and urine sodium of 12 meq/L. what is the most likely diagnosis?

- a. Pre renal AKI
- b. Post renal AKI
- c. Renal AKI
- d. ATN

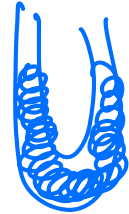


Q. Electrician is admitted to ER with burn and passage of red color urine. Labs shows increased CK MM levels with serum creatinine of 4 mg/dl. Which of the following will not be seen in this case



RHABDOMYOLYSIS

- * CRUSH injury, electrical burns
- * myoglobin - URIA
- * ATN



- a. Hypocalcaemia
- b. Hypokalaemia K^{\uparrow}
- c. Hypophosphatemia
- d. Hypomagnesemia

Q. Leading cause of renal failure in multiple myeloma

- a. Hypocalcaemia
- b. Hypercalcemia
- c. Bence Jones proteinuria
- d. Urine beta 2 microglobulin

CRAB
 plasma cells: bone lytic lesions
 - spine - Ribs
 - pelvis - skull

Kidney #

1. Nephrolithiasis : MC
2. Bence Jones proteins
3. viscosity \uparrow : supply of Tubules
Sluggish

IOC : BM Bx plasma cells : $>10\%$ + CRAB features

Rx: lenalidomide + dexona + Bortezomib

prognosis marker

→ urine β_2 microglobulin levels

* PPI = PMC, OSTEOMALACIA, AIN



MCC of post renal AKI : B.P.H

Non oliguric Acute kidney injury is caused by

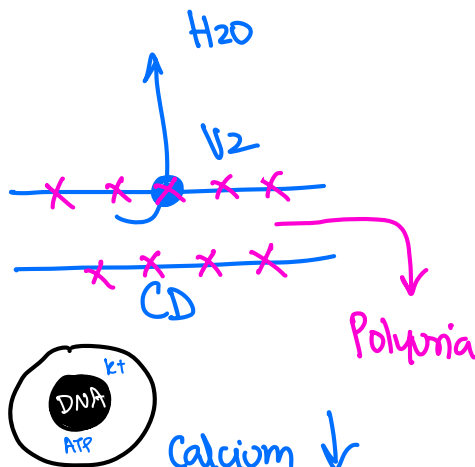
1. AIN : PPI, vancomycin
2. Contrast induced nephropathy : NAC
3. Aminoglycosides : TOBRAMYCIN, NETILMYCIN

DM

Features of tumor lysis syndrome: PUKE Calcium

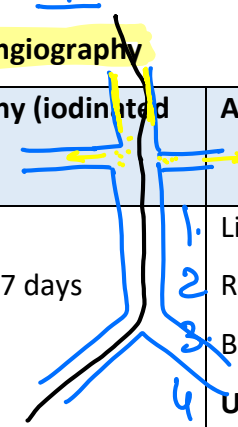
~~ATP~~ $P_{O_2} \uparrow$, URIC Acid \uparrow , K \uparrow

~~DNA~~ Rx: - RASBURICASE : DOC, 1st line IVF



Renal failure after coronary angiography

Contrast induced nephropathy (iodinated contrast)	Athero-embolic kidney disease
Good prognosis	1. Livedo reticularis
KFT returns to normal within 7 days	2. Rash
IV hydration	3. Blue toes
N-acetylcysteine (4. Urine <u>Eosinophilia</u>

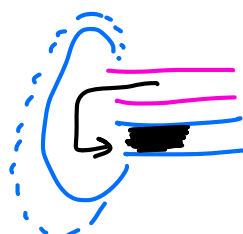


Renal failure after dysentery/ Diarrhoea

H.U.S : EHEC E. coli O157: H7	Renal vein THROMBOSIS
Normal sized kidney PS: Schistocytes *	<u>Unilateral or Bilateral enlarged kidneys</u>

dysentery / diarrhoea : AKI

1. $U_{Osm} > 500$, Urine sodium: low: PRE-Renal
2. Schistocytes, Pallor, (H) kidney: HUS
3. ANURIA + Bil enlarged kidney \Rightarrow RVT



* child : dehydrat^N
* adult : MGN