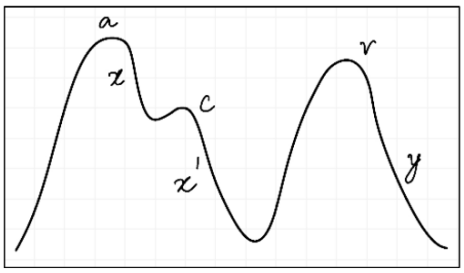
Cardiology - Part 1

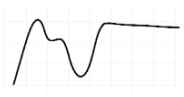
JVP

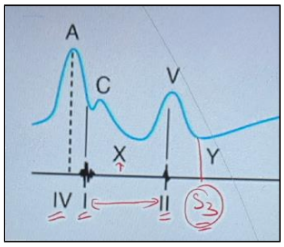
0:18

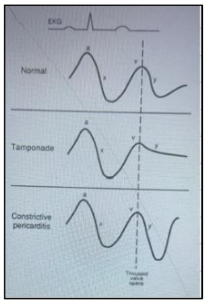


- 'a' → Atrial contraction
- 'c' → Tricuspid Bulge
- 'v' → venous inflow
- 'x' → Atrial relaxation
- 'x' → Ventricular systole
- 'y' → Early diastolic filling

- Abnormalities – causes:
  - Giant 'a' wave → TS, PS, Pulmonary HTN, RV - Diastolic dysfn.
  - Cannon 'a' wave → complete heart block, v. Tachycardia, V. Ectopics
  - ↑ 'c' wave → TR
  - Giant 'v' wave → TAPVD, TR
  - 'a' wave = 'v' wave → ASD
  - Rapid 'x' → Cardiac tamponade (TAX)
  - Rapid 'y' → Constrictive pericarditis (PAY)
  - 

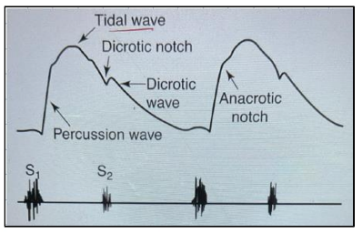
→ 'M' pattern → const. pericarditis
  - 
→ Cardiac Tamponade





ARTERIAL PULSE

11:33



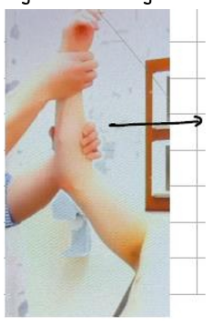
- Rate
- Rhythm
- Volume
- Character
- Condition of vessel wall
- Equality (Radio radial)
- Radio femoral
- Other peripheral pulses

- Rate:
  - Normal = 60–100 bpm
  - <60 → Bradycardia
    >100 → Tachycardia
  - Normally, In fever
    1° C ↑ → 10 bpm ↑ is increased
  - Relative Bradycardia
    - Fever is present but no ↑ in HR
    - Causes:
      - Typhoid
      - Leginella

- Chlamydia
- Mycoplasma
- Dengue fever
- Brucella

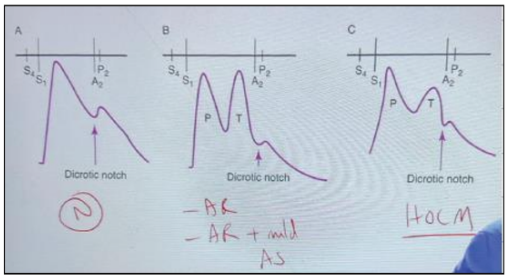
- Rhythm:
  - Irreg – Irreg – pulse:
    - Atrial fib
    - MAT
    - V. Ectopics
  - Reg. Irreg:-
    - Pulsus bigemeny
    - Pulsus alternans
    - Heart block

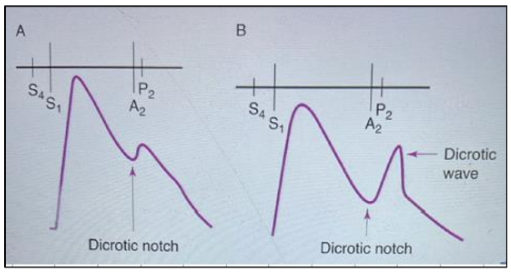
- Volume:
  - High volume: (Magnus)
    - Fever
    - Thyrotoxicosis
    - Exercise
    - AR
    - Anemia, Pregnancy
  - Low volume: (Parvus)
    - AS
    - MS
    - PS
    - Shock
  - Collapsing pulse / Water Hammer pulse:
    - High volume (Magnus) conditions



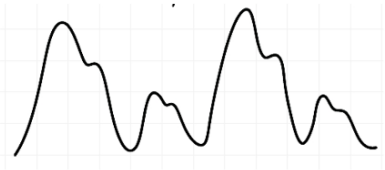
Ellicitation of Water Hammer Pulse

- Pulsus Bisfiriens
  - Sever AR
  - AR + Mild AS
  - HOCM
- Dicrotic pulse:
  - DCM
  - IABP
  - Hypovolemic shock
  - Typhoid

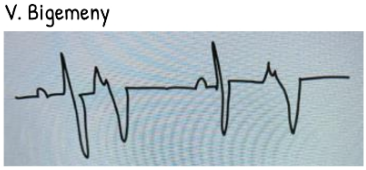


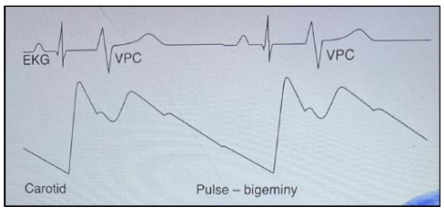


- Pulsus alternans
  - LVF (usually because of IHD)

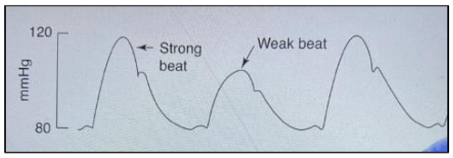


- Pulsus Bigemenus
  - V. Bigemeny



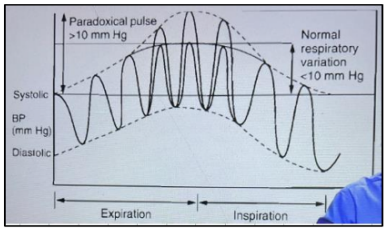


Pulsus bigeminus and ventricular premature contraction (VPC)



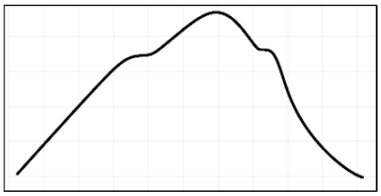
Pulsus alternans.

- Pulsus paradoxus
  - Cardiac tamponade
  - Const. pericarditis
  - Airway obst. Disease: COPD (Emphysema)



- Reverse Pulsus Paradoxus
  - HOCM
  - IPPV
  - Isorhythmic A-V dissociation

- Aortic stenosis:
  - Pulsus Parvus et tardus



HEART SOUNDS

32:10

- S_1
  → Loud S_1
  - M. Stenosis
  - Exercise
  - Hyper Kinetic states
  - Short PR internal soft S_1

  → Soft S_1
  - MR
  - AR
  - V. Aneurysm
  - Prolonged PR
  - Calcified mitral valve

  → Variable intensity of S_1
  - At. Fib.
  - CHB
  - V. Ectopics

- S_2
  $A_2 - P_2$ split
  - Split → (N) - Inspiration
  - Expiration → Single sound

  → Wide variable split

- MR
- RBB
- VSD
- Pulm HTN c̄ RVF
- Pulm stenosis c̄ intact septum

→ Wide & Fixed split

- ASD
- TAPVD
- Reverse split ($P_2 - A_2$)
- LBBB
- RV - pacing
- AS

→ Narrow split

- Pulm. HTN
- PDA

- S_3
  - Physiological → Pregnancy
  - Heart failure
  - MR
  - TR
  - VSD
  - PDA
  - AR

- S_4
  - HTN
  - Acute - MR
    Acute - AR
  - IHD
  - AS
  - Pulmonary stenosis

- Ejection click:

→ Pulm EC:	→ Aortic EC:
- ↑ on Expiration	- No variation c̄ respiration

- Opening Snap
  - M. Stenosis

    S_2 – OS gap → short → Severe M. Stenosis
    ↓
    Longer murmur

    OS → High pitch

HYPERTENSION 42:28

- BP
  - Patient should be seated comfortably, with back supported and legs uncrossed, and the upper arm bared.
  - Upper arm should be at heart level.
  - Cuff length and width should be 80% and 40% of arm circumference respectively.
  - Cuff should be deflated at <3 mm Hg/sec.
  - Column or dial should be read to nearest 2 mm Hg.
  - First audible Korotkoff sound is systolic pressure; last sound, diastolic pressure.
  - There should be no talking between subject and observer (or other person).

- **European society**

Category	Systolic (mmHg)		Diastolic (mmHg)
Optimal	<120	And	<80
Normal	120-129	And	80-84
High normal	130-139	And/or	85-89
Grade 1	140-159	And/or	90-99

- **American Heart Association (AHA)**

Normal	<120	And	<80
Elevated BP	120-129	And	<80
Stage 1	130-139	Or	80-89
Stage 2	≥140	Or	≥90
Hypertensive crisis	≥180	Or	≥120

- Threshold for starting Anti-Hypertensive drugs → 140/90 mm Hg
- In pts. Of CAD & HF, Anti - hypertensive therapy → Beyond 130/80 mm Hg Target BP of < 130/80 mm Hg
- In elderly, target → between 130-140/80-90 mmHg
- ACEis & ARBs → young (<60)

CCBs & Diuretics → old (>60 yrs)

- ACEis / ARBs + CCB's
  ↓
  1st line combination
- Statins → HTN + Dyslipidaemia
- Aspirin → No role as prophylactic agent in HTN
- Rx - HTN → 1st line Drugs:
  - ACEis / ARBS
  - CCB's
  - Chlorthalidone

HTN Crisis:

- HTN ≥ 180 (or) ≥ 120 mm Hg
  Urgency Emergency

I	B-NR	In adults with a hypertensive emergency, admission to an intensive care unit is recommended for continuous monitoring of BP and target organ damage and for parenteral administration of an appropriate agent.
I	C-EO	For adults with a compelling condition (i.e., aortic dissection, severe preeclampsia or eclampsia, or pheochromocytoma crisis), SBP should be reduced to less than 140 mm Hg during the first hour and to less than 120 mm Hg in aortic dissection.
I	C-EO	For adults without a compelling condition, SBP should be reduced by no more than 25% within the first hour; then, if stable, to 160/100 mm Hg within the next 2 to 6 hours; and then cautiously to normal during the following 24 to 48 hours.

Type of Hypertensive Emergency	Recommended Drug Options and Combinations	Drug to avoid
Myocardial ischemia and infarction	Nicardipine plus esmolol Nitroglycerin plus labetalol Nitroglycerin plus esmolol	Hydralazine, diazoxide, minoxidil, nitroprusside
Acute kidney injury	Fenoldopam Nicardipine Clevidipine	

Aortic dissection	Esmolol plus nicardipine Esmolol plus clevidipine Labetalol Esmolol plus nitroprusside	Hydralazine, diazoxide, minoxidil
Acute pulmonary edema, LV systolic dysfunction	Nicardipine plus nitroglycerin[2] plus a loop diuretic Clevidipine plus nitroglycerin[2] plus a loop diuretic	Hydralazine, diazoxide, beta-blockers
Acute pulmonary edema, diastolic dysfunction	Esmolol plus low-dose nitroglycerin plus a loop diuretic Labetalol plus low-dose nitroglycerin plus a loop diuretic	

- Scleroderma:
  - HTN – crisis
  - Rx

    ACEis

Cardiology - Part 2

ISCHEMIC HEART DISEASE

0:15

- Typical Angina (Definite)
  - Meets three of the following characteristics
    1) Substernal chest discomfort of characteristic quality & duration
    2) Provoked by exertion (or) emotional stress.
    3) Relieved by rest (or) GTN.

- Atypical angina (probable) - Non-cardiac chest pain
  - Meets two of these characteristics
  - Meets one (or) None of characteristics

• young woman with history of migraines, acute chest pain, and ST-segment elevation	• Coronary vasospasm (Prinzmetal angina)
• A tall, thin person with long arms with acute chest and back pain (especially "tearing" sensation), a normal ECG, and an aortic diastolic murmur	• Marfan syndrome and aortic dissection
• A patient who recently travelled or with immobility, sharp or pleuritic chest pain and nondiagnostic ECG	• PE
• A tall, thin young man who smokes with sudden pleuritic chest pain and dyspnea	• Spontaneous pneumothorax
• A postmenopausal woman with substernal chest pain following severe emotional/ physical stress has ST-segment elevation in the anterior precordial leads, troponin elevation, and unremarkable coronary angiography	• Stress-induced (takotsubo) cardiomyopathy. Look for characteristic apical ballooning on ventriculogram.

A young man with substernal chest pain, deep T-wave inversions in V2-V4, and a harsh systolic murmur that increases with Valsalva maneuver — HCM

Tests in IHD

Stress	Test	Anatomical
• Exercise • Vasodilation • Inotropes • Dobutamine	• ECG • Nuclear • TC^{99} • Th^{201}	• CT Angio • CT calcium score • MRI • PET scan

Avoid
- COPD
- Asthma

Avoid
- Arrhythmias,
- V. tachycardias

- Avoid – ECG:
- Resting ECG ab (N)
- LBBB
- WPW
- Pacemaker + at
- Digoxin

IHD
- Stable (IHD)
- ACS

- Stable Angina
  Angina Pectoris
- Chest pain – exertion
  Chest pain < 10 mins
- Pain relieved → rest
  → Nitrates
- Chronic history
- Rx
  - Nitrates
  - β Blockers
  - CCB's
  - Ranolazine

- Ivabradine
- Aspirin - 81mg/day
- Risk reduction
- Statins

- Acute coronary syndrome

ST ↓

Unstable Angina / NSTEMI

- Pain - At rest
- Pain > 10 mins
- Troponin - cardiac Biomarker
  +ve → NSTEMI
  -ve → Unstable angina
- Rx - Heparin
  Bivaluridin
  Antiplatelet drugs
  → Aspirin + P_2Y_{12} inhibitor
  - Ticagrelol
  - Prasugrel
  - Clopidogrel
- Nitrates
- β Blockers
- O_2
- Statins

- TIMI score:
  ≥3 → Angio → Procedure.

ST ↑

STEMI

→ RX:

- Rest
- Aspirin - 325 mg
- Morphine
- O_2 - (Spo_2 < 90%)
- Nitrates
- β Blockers (oral)
- Statins / Heparin

Prognostic Variables (1 Point each)
Age ≥ 65 y
≥3 Traditional CAD risk factors[a]
Documented CAD with ≥50% diameter stenosis
ST-segment deviation
≥2 Anginal episodes in the past 24 h

Aspirin use in the past wk
Elevated cardiac biomarkers (creatine kinase MB or troponin)

- In patients with unstable angina/NSTEMI, immediate angiography is indicated if any of the following are present:
- Hemodynamic instability
- HF
- Recurrent rest angina despite therapy
- New or worsening MR murmur
- Sustained VT

- **STEMI:**
  Thrombolytics
- If anticipated time to do PCI > 2 hrs
- Door to needle < 30 mins

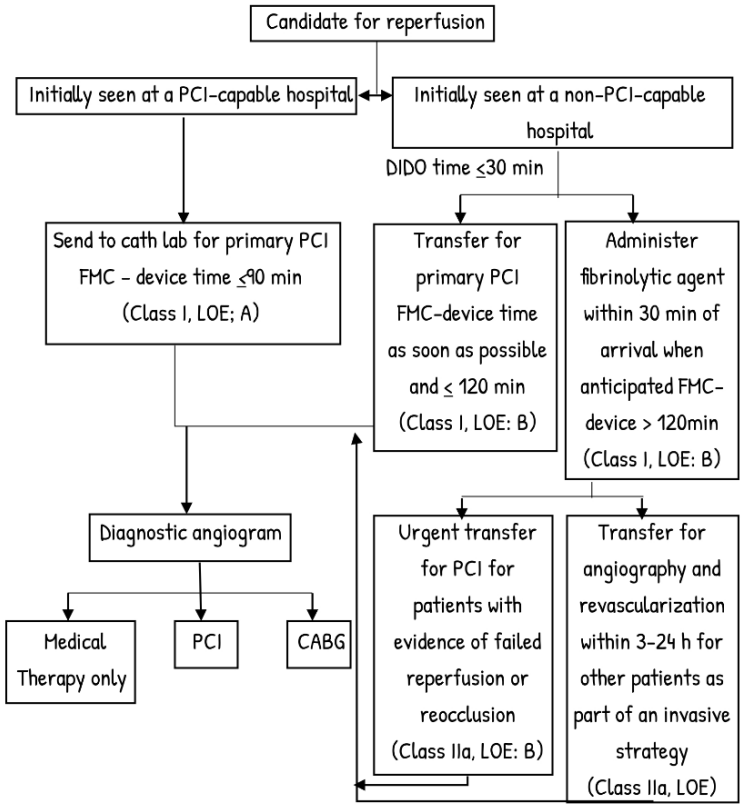
Primary Percutaneous
oronary intervention (PCI)

- If anticipated time to do PCI < 2 hrs
- Door to Balloon < 90 mins

Absolute Contraindications	History of chronic, severe, poorly controlled hypertension
Any previous intracerebral hemorrhage	Severe uncontrolled hypertension on presentation (SBP >180 mm Hg or DBP >110 mm Hg)[a]
Known cerebrovascular lesion (e.g., arteriovenous malformation)	History of ischemic stroke (>3 mo), dementia, or known intracranial abnormality
Ischemic stroke within 3 mo	Traumatic or prolonged (>10 min) CPR or major surgery (<3 wk)
Suspected aortic dissection	Recent (within 2-4 wk) internal bleeding
Active bleeding or bleeding diathesis (excluding menses)	Noncompressible vascular puncture site
Significant closed head or facial trauma within 3 mo	For streptokinase/anistreplase: previous exposure (>5 d, or previous allergic reacion to these agen.s
	Pregnancy
	Active peptic ulcer disease

	Current use of anticoagulants: the higher the INR, the higher the bleeding risk

- Management of IHD:



- Coronary Artery Bypass - Graft:
  - Triple vessel (Diabetics)
  - LMCA / Prox. LAD > 50% occlusion

- Prinzmetal's Angina (Variant Angina)
  - Coronary Artery spasm
  - RCA - m/c → Inferior wall
  - ECG → ST↑, ST ↓

- No evolving changes
- (N) → Sometimes
- Angio → (N)
- R_x → CCB's + Nitrates

Be careful! DMK

- Do not choose thrombolytic therapy for patients with NSTEMI or for asymptomatic patients with onset of pain >24 hours ago.
- Unlike medical therapy for stable CAD, routine use of nitrates, calcium channel blockers, or ranolazine generally has no role in the post-STEMI setting.
- Do not choose ranolazine for treatment of ACS.

- Complications of Acute MI:
  - Mechanical complications (VSD, Papillary muscle rupture & LV free wall rupture) may occur 2 to 7 days after an MI
  - Accelerated idioventricular rhythm (AIVR):
    - TT / PCI
    - Reperfusion arrhythmia
    - Transient
    - Rate - 40-100 / min
    - No P-wave, QRS - Broad - Regular

MYOCARDIAL INFARCTION *40:51*

- IWMI
- Anterior
- Anterior septal
- Lateral

ST↑

Leads	Anatomic Location	Coronary Artery
II, III, aVF	Inferior	RCA >> LCx
V2-V4	Anterior	LAD
V1-V4	Anteroseptal	LAD
I, aVL, V5, V6	Lateral	LCx > LAD
LBBB	Anterior	LAD
V4R	Right Ventricle	RCA
V1, V2 Depressions (ST↓)	Posterior	RCA >> LCX
Electrically Silent		LCx

HEART FAILURE

44:04

- EF < 40% → $HF_{\gamma}EF$
- EF > 50% → $HF_{p}EF$
- EF → 41-49% → $HF_{n}EF$

Symptoms	Signs
Dyspnea	Elevated jugular venous pressure
PND	Hepatojugular reflux
Orthopnea	Third heart sound
Fatigue	Laterally shifted cardiac apical impulse
Palpitations	Dependent edema
Dependent edema	Basal crepitations
Cachexia	Tender hepatomegaly

- Radiology → Cardiomegaly
  Pleural effusion

Progression of heart failure

Stage A At risk	Stage B Asymptomatic	Stage C Symptomatic	Stage D Refractory
At high risk for heart failure but without structural heart disease	Structural heart disease without signs of symptoms of heart failure	Structural heart disease with prior or current symptoms of heart failure	Refractory heart failure requiring specialized interventions
Examples • Hypertension • Diabetes • Family history	Examples • Prior infarct • Asymptomatic valve disease	Examples • Symptomatic valvular lesion • Exertional dyspnea • Fatigue	Examples • Resting symptoms • Hospitalized patients

- Pharmacological therapy for HFγEF

STAGE – A: (At risk)

- Address risk factors:
  - Treat HTN
  - Smoking cessation
  - Manage lipids
  - Regular exercise
  - Control weight
  - ACE is / ARBS

STAGE – B: (Asymptomatic)

- ACE – IS / ARB's → Class 1
  - ACE – I'S
    ↓
    ARBS if

ACE – I's → contraindicated

- Avoid ACE – I + ARB combo

→ β – Blockers → Class I

- Combo ACE – I + β – Blocker
  ↓
  Better than Alone
- Avoid Non – DHP CCB's
  (Diltiazem & Verapamil)
- Carvedelol
- Metoprolol → β – Blockers
- Bisoprolol

STAGE – C: (Asymptomatic)

- ARNI → Angiotensin Rs Neprolysin (-)
  Valsartan + Sacubitril
- ACE – I + β B
- Volume overload → Diuretics
- Indians /Black → Hydralazine / Nitrates
- EF < 35%; K^+ < 5 → Spironolactone
- Ivabradine → HR > 70 despite β – Blockers

- Treatment of HFpEF

HFpEF Characteristic	Treatment Recommendations
Volume overload symptoms	Diuretic
Hypertension	ACE inhibitor, ARB, β-blocker
Atrial fibrillation	β-blocker, non-DHP CCB, digoxin, amiodarone
Diabetes / CKD	ACE inhibitor, ARB
Coronary artery disease	ACE inhibitor or ARB + β - blocker

ACUTE HEART FAILURE *54:54*

- Congestion → ↑ JVP, B/L crepts, S3+, Orthopnea, Edema
- Perfusion → Low Pulse pressure, Cool extremities, Hypotension
- Congestion at rest

Perfusion at rest		NO	YES
(N)		Warm + Dry	Warm + Wet
↓		Cool + Dry	Cool + Wet

- Treatment:
  - Congestion → Diuretics
  - Cool + Dry → Inotropes, Mech. Support
  - Coal + Wet → Diuretics, Inotropes, Vasodilators

	Nitroglycerin	Nitroprusside	Nesiritide
Mechanism	Increase NO synthesis and cGMP	Increase NO synthesis and cGMP	Activate guanylate cyclase - linked NP receptor A to increase cGMP

Clinical effects	Vasodilator (Venous arterial)	Vasodilator (Venous = Arterial)	Vasodilator (Venous = arterial)
Indication	Warm & wet. Cold & Wet. HTN Crises. ACS	Warm & wet. Cold & wet. HTN Crisis.	Warm & wet Codl & wet

CARDIOGENIC SHOCK *59:26*

- Nor Epinephrine

PWCP: Pulmonary capillary wedge pressure CI: Cardiac Index GDMIT: Guideline directed medical therapy	LOW PERFUSION AT REST?		
CONGESTION AT REST ?		NO (CI > 2.2 L/min/m_2)	YES (CI < 2.2 L/min/m_2)
	NO (PCWP<18 mmHg)	GDMT	INOTROPES + IV FLUIDS
	YES (PCWP>18 mmHg	DIURETICS VASODILATORS	DIURETICS INOTROPES

- A BNP level > 400 pg/ml is compatible with HF & a level < 100 pg/mL effectively excludes HF as a cause of acute dyspnoea
- Kidney failure, older age & female - ↑ BNP obesity - ↓ BNP
- NSAIDS (or) Thiazolidinediones → worsen HF
- Non-DHP CCBS (Diltiazem, Verapamil)
  ↳ Harmful to pts. With HF.

Cardiology - Part 3

CARDIAC ARRHYTHMIAS

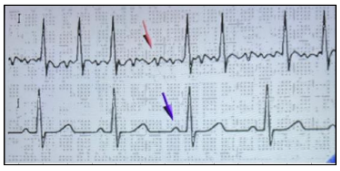
0:16

Atrial fibrillation:

- Atrial rate - 300 - 550 / min
  ↓
  Wavy base line = ECG

- R-R - ECG → Fluctuating
  ↓
  Irregularly irregular pulse

- JVP - 'a' - absent



- Rx

Treatment

Rate	Rhythm	
• β - Blockers	• Ibutilide	
• CCB's (D/V)	• Dofetolide	
• Digoxin	• Amiodarone	III
	• Dronadarone	
	• Precainamide - Ia	

Other Drugs

- Anticoagulants
  - Cause for A. fib - volvular Heart disease → Warfarin
  - Cause for A.fib - Non - valvular → CHADSVAS

    Heart Disease ≥ 2→ NOAC

    0, 1 ↴

    Aspirin

- CHADS Vascular score:

RISK FACTORS	POINTS
C – congestive heart failure	1
H – hypertension	1
A – age > 75 y	2
D – diabetes mellitus	1
S – stroke or TIA, embolus	2
V – vascular disease	1
A – age 65–75 y	1
Sex – female	1

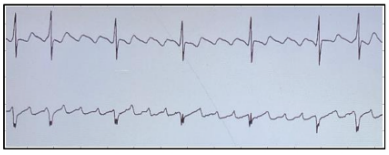
Atrial flutter

- Atrial rate – 200 to 450 / min

  300 → 150

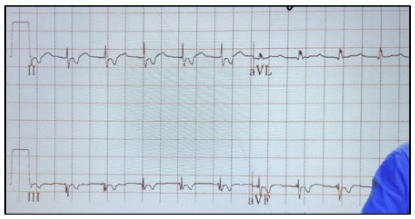
  Atrial Rate : Ventricular rate

  2 : 1



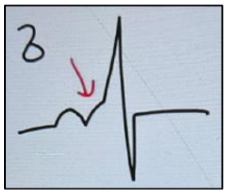
- Rx → Similar to A. fibrillation

- SVT → PSVT
  - AVNRT → m/c
  - AVRT
  - ECG
    - P – retro – inverted P waves
    - QRS – Narrow
    - Rate – 150 – 250 / min
    - R-R interval → Regular



- Rx
  - Carotid massage
    ↓
    Inj. Adenosine - 6 mg - IV
    ↓
  - β - Blockers
  - CCB's (D/V)

Wolff – Parkinson white syndrome

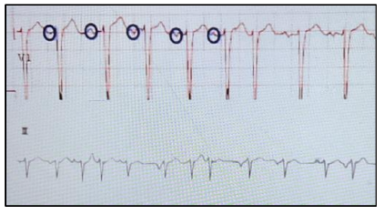


ECG → Short PR
→ Broad QRS → Type A → (L)
→ S Wave → Type B → (R)

- Rx
  - I_a, I_c, III
  - Radiofrequency ablation - Accessary pathway

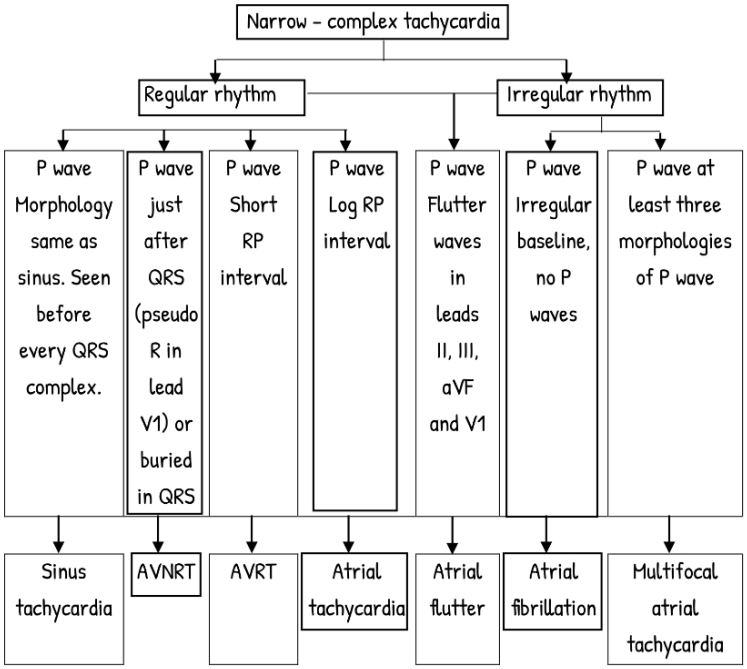
Multifocal atrial Tachycardia

- ECG → (3) different morphological 'P' waves



- Causes: COPD
- Rx → If COPD not a cuase
  ↓
  β Blockers

Narrow complex tachycardia



V. Arrhythmias

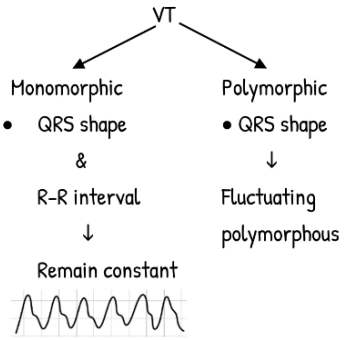
- V. Ectopics → PVC

Unifocal
- ECT → Morpho Similar
- Ectopics

Multifocal
- ECG → Morpho changes ectopics

- **V. Bigeminy**: Alt. beat - unifocal ectopic

- **V. Trigeminy**: Every 3rd beat – unifocal ectopic
- **Run of V. Ectopics** → VT
  - > 30 secs → sustained VT
  - < 30 secs → Non – sustained VT

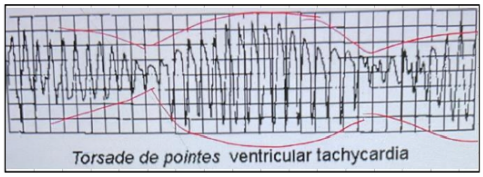


Polymorphic VT

- Long QT
  - Congenital LQTS
  - Acquired → Torsades de pointes

- Long QT:
  - Macrolide & Fluoroquinolone antibiotics (Moxifloxacin)
  - Terfenadine & Astemizole AntiHistamines
  - Antipsychotics & Antidepressant drugs
  - Methadone
  - Antifungal drugs
  - Class Ia & III Antiarrhythmics

- ECG:



- Rx → $MgSO_4$

- Prevention - Polymorphic VT:
  - Congenital LQTS - β Blockers
    - Pacemaker
  - Acquired Long QT - Remove the underlying cause

V. Fibrillation

- ECG

- Rx → Non synchronized shock
  - Defibrillator shock

Cardiac Asystole

- ECG:

- Not a shockable
- CPR
  - Chest compression : Ventilation
    30 : 2
  - Rate → > 120/min
  - Depth → 2-2.4 inches
    5-7 cms

Heart blocks

- Type - 1 → Prolonged PR
  PR > 0.20 secs → WenKebach's
- Type - 2 → Mobitz - I → Progressive prolongation of PR
  Mobitz - II → missed QRS
  Fixed PR

- Type - 3 → Complete Heart Block
  - No relationship b/w P & QRS
  - RR → Equal
  - PP → Equal

- Management
  - Type - 2 - Mobitz - II (symptomatic) & Type - 3

↓

Pacemaker Implantation

- Type - 1 & Type - 2 (Mobitz - I)

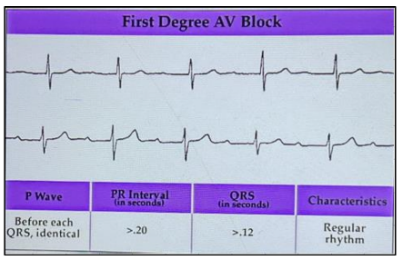
↓

No need of pacemaker /

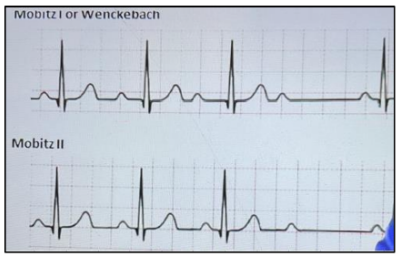
May be Atropine

- ECG:

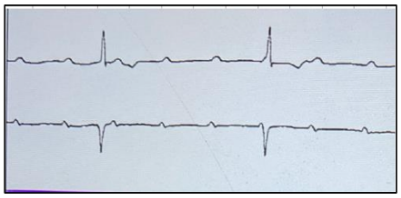
Type - I:



Type - II



Type - III



P Wave	PR Interval (in seconds)	QRS (in seconds)
Normal but not related to QRS	None	N/A

Management of Arrhythmias

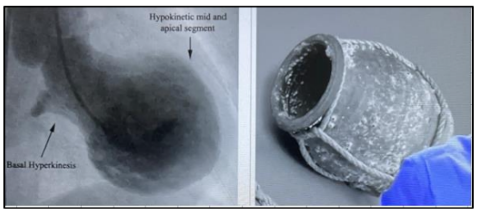
Shock

Synchronized
- Cardioversion

Non - Synchronized
- Defibrillation
- Pulseless VT
- V. Fib

CARDIOMYOPATHIES *35:50*

- Takatsubo: Sympathetic Heart
  - F > M
  - Extreme stress (emotional)
  - Chest pain
  - ECG - ST ↑
  - Tn ↑
  - Echo - Hyperactive Basal,
    Hypokinetic apical segment
  - Angio - (N) → Stunned Myocardium



- Treatment:
  - ACE - Is + β Blockers

Arrhythmogenic Rt. Ventricular Dysplasia
- Fat → RV
- ECG → Epsillon waves

HCM → HOCM (ISS)
- Autosomal Dominant
- Echo → SAM → Systolic Anterior motion of mitral valve, MR, thick septum
- Patho → Muscle fibre disarray
  - Fibrosis

• Murmur ↑	• Murmur ↓
• Valsalva	• Squatting
• Standing	• Hand grip
• Nitrates	• Supine
	• β - Blockers

- Rx → β - B
  - Dysopiramide
  - CCB → D/V
  - Alcohol → Septum | ICD |
  - Septal → Myectomy

Restrictive Cardiomyopathy:

- Amyloidosis
- Fabry's
- Gaucher's
- End myocardial fibrosis (Caranoid)
- Radiation
- Drugs - Ergotamine
- HF_pEF → Diastolic dysfunction
  Echo → Large Atria
- Amyloidosis → Tafamidis

Dilated Cardiomyopathies

- Idiopathic
- Viral
- Alcohol
- Hemochromatosis
- Sarcoidiosis
- Eosinophilic
- Drugs → Doxorubicin, Daunorubicin, Traztuzumab
- Echo → Systolic dysfn.
  - $HF_\gamma EF$

INFECTIVE ENDOCARDITIS

44:07

- Duke's Criteria

Major Criteria	Minor Criteria
1. Blood culture positive for typical IE-causing microorganism 2. Evidence of endocardial involvement Diagnosis • 2 major criteria • 1 major and 3 minor • 5 minor criteria	1. Predisposition – heart condition or i.v. drug abuse 2. Fever-temp. >38°C 3. Vascular phenomena – arterial emboli etc. 4. Immunologic phenomena – glomerulonephritis, Osler's nodes, Roth's spots 5. Microbiological evidence – positive blood cultures but do not meet major criteria

- Acute IE → Staph • aureus
  SABE → Strepto • viridans
  ↳ Pre – existing damaged valve
- Clinical features:

Fever	80–90
Chills and sweats	40–75
Anorexia, weight loss, malaise	25–50
Myalgias, arthralgias	15–30
Back pain	7–15
Heart murmur	80–85
New/worsened regurgitant murmur	20–50
Arterial emboli	20–50
Splenomegaly	15–50
Clubbing	10–20
Neurologic manifestations	20–40
Peripheral manifestations (Osler's nodes, subungual hemorrhages, Janeway lesions, Roth's spots)	2–15
Petechiae	10–40

Laboratory manifestations	
Anemia	7–90
Leucocytosis	20–30
Microscopic hematuria	30–50
Elevated erythrocyte sedimentation rate	60–90
Elevated C-reactive protein level	>90
Rheumatoid factor	50
Circulating immune complexes	65–100
Decreased serum complement	5–40

- Treatment

Streptococci	
Penicillin-susceptible streptococci. S. gallolyticus (MIC < 0.12 μg/mL)	• Penicillin G (2–3 mU IV q4h for 4 weeks) • Ceftriaxone (2 g/d IV as a single dose for 4 weeks • Vancomycin (15 mg/kg IV q12h for 4 weeks) • Penicillin G (2–3 mU IV q4h) or ceftriaxone (2 g IV qd for 2 weeks Plus Gentamicin (3mg/kg qd IV or IM, as a single dose or divided into equal doses q8h for 2 weeks)
Relatively penicillin resistant streptococci, S. gallolyticus (MIC > 0.12 μg/mL and <0.5 μg/mL)	• Penicillin G (4 mU IV q4h) or ceftriaxone (2 g IV qd) for 4 weeks Plus Gentamicin (3 mg/kg qd IV or IM, as a single dose or divided into equal doses q8h for 2 weeks) • Vancomycin as noted above for 4 weeks

Moderately penicillin resistant streptococci (MIC, >0.5 μg/mL and < 8 μg/mL) Granulicatella, Abiotrophia or Gemelia spp.	• Penicillin G (4–5 mU IV q4h) or ceftriaxone (2 g IV qd) for 6 weeks Plus Gentamicin (3 mg/kg qd IV or IM as a single dose or divided into equal doses q8h for 6 weeks)

Enterococci
• Penicillin G (4–5 mU IV q4h) plus genetamicin (1 mg/kg IV q8h), both for 4–6 weeks • Ampicillin (2 g IV q4h) plus gentamicin (1 mg / kg IV q8h), both for 4–6 weeks • Vancomycin (15 mg/kg IV q12h) plus gentamicin (1 mg/kg IV q8h), both for 6 weeks • Ampicillin (2 g IV q4h) plus ceftriaxone (2 g IV q12h) both for 6 weeks

Staphylococi (S. aureus and coagulase – negative)	
MSSA infecting native valves (no foreign devices	• Nafcillin, oxacillin, or flucloxacillin (2 g IV q4h for 4–6 weeks) • Cefazolin (2 g IV q8h for 4–6 weeks) • Vancomycin (15 mg/kg IV q12h for 4–6 weeks)
MRSA infecting native valves	• Vancomycin (15 mg/kg IV q8–12h for 4–6 weeks)

Table 123–8 High-Risk Cardiac Lesions for which Endocarditis Prophylaxis is Advised before dental procedures
Posthetic heart valves Prior endocarditis Unrepaired cyanotic congenital heart disease, including palliative shunts or conduits Completely repaired congenital heart defects during the 6 months after repair Incompletely repaired congenital heart disease with residual defects adjacent to prosthetic material Valvulopathy developing after cardiac transplantation

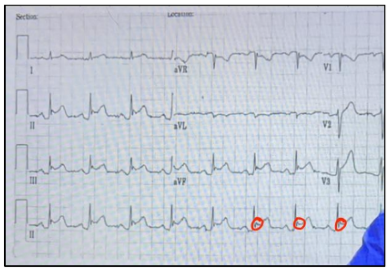
PERICARDIAL DISEASE

50:37

Acute pericarditis

- Causes:
  - Idiopathic
  - Viral
  - Auto immune
  - Uremia
  - Malignancy
  - Drugs → Hydralazine

- C/f → sharp → positional chest pain
  O/E → Pericardial rub
  → Fever
- ECG → Concave - upward - ST↑
  Diffuse - saddle shaped
  - PR - depression
  - Absence of reciprocal changes



- Rx → Aspirin
  → Ibuprofen
  → Indomethacin
  + Colchicine
  → Steroids → Contra - indicated

- Constrictive pericarditis:
  - Infection - TB
  - Malignancy
  - Trauma

- Radiation
- CHF → HFpEF
- ↑ JVP → x⁺ y descent⁺
- Ascites
- Hepatomegaly
- Kussmaul's sign +
- Pulsus paradoxus

Cardiac tamponade

- Beck's triad
  - ↓ BP
  - ↑ JVP
  - Muffled Heart sounds
- Pulsus paradoxus
- JVP → Rapid 'x'
  → 'y' → Prolonged / Absent
- ECG → Electrical alternans
- Treatment → pericardial tap

Rheumatology – Part 1

ARTHRITIS *0:18*

• **Inflammatory arthhhritis** ○ Morning stiffness > 30 mins ○ ESR ↑, CRP ↑ ○ Synovial fluid → TLC > 2000 / μL ○ X-Ray: → Bone errosions +	**Degenerative arthritis** <30 mins (N) • TLC < 2000/μL • X-Ray: → New Bone formation Osteophyte

RHEUMATOID ARTHRITIS *1:58*

- F > M
- HLA → DR_1, DR_4
- Arthritis
  - B/L sym – small joints
  - PIP
  - MCP → m/c
  - Wrist
  - Elbow
  - Knee
  - Ankle
  - MT-P
  - Vertebrae → C_1, C_2
  - DIP → Spared

- Osteoarthritis:
  - PIP, DIP → m/c
  - Base of thumb
  - MCP, Wrist, Ankle → Spared
  - Hip & knee
  - MT-P
  - Vertebrae → Lower cervical, lumbar
- Criteria: 6 out of 10 ≥ 6 points

Classification Criteria for RA

JOINT DISTRIBUTION (0-5)	
1 large joint	0
2-10 large joints	1
1-3 small joints (large joints not counted)	2
4-10 small joints (large joints not counted	3
>10 joints (at least one small joint)	5
SEROLOGY (0-3)	
Negative RF AND negative ACPA	0
Low positive RF OR low positive ACPA	2
High positive RF OR high positive ACPA	3
SYMPTOM DURATION (0-1)	
<6 weeks	0
≥6 weeks	
ACUTE PHASE REACTANTS (0-1)	
Normal CRP AND normal ESR	0
Abnormal CRP OR abnormal ESR	1

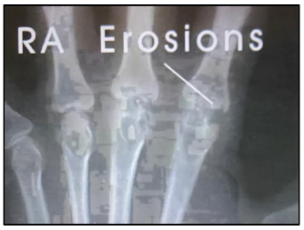
- Ocular
  - Keratoconjuctivitis seca
  - Episcluitis
  - Scluitis
- Uveitis → not seen
- Lung → Pl. effusion
  → ICD

Coplan's → Pulm. Nodules
+ Fibrosis (Pneumoconiosis)
Coal workers

- Heart
  - ↑ IHD
  - Pericarditis
  - Restrictive cardiomyopathy
  - MR

- Splenomegaly
- Blood
  - Anemia of chronic disease
  - Neutropenia
  - DLBLL
- Neuro
  - Compressive Neuropathy
  - Mononeuritis multiplex
- Renal
  - Membranous nephropathy
  - NSAIDS → Interstitial inflammation
    → CKD

- Skin → Vasculitic Rash
- Investigations:
  - Anti - CCP - Abs - sp↑↑
    - 60-70%
  - Anti - MCV
    → Mutated citrullinated vimentin
    - SP ↑↑
    - Sn = 60-70%
  - Rheumatoid factor → Sn = 50-70%
    → sp ↓
- X - Ray: Erosions in MCP joint.



- Treatment
  - Steroids
  - DMARDs
    - HCQ → Retinopathy, Prolonged QT
    - Methotrexate → LFT, TC, DC

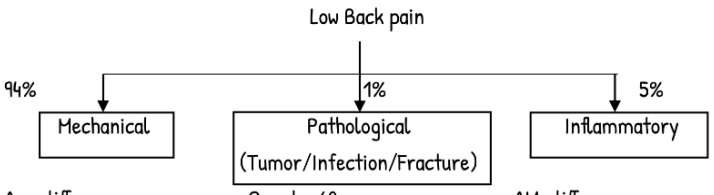
- Leflunamide → contra - ind - pregnancy
- Suphasalazine → TC, DC
  → Oligospermia

↑ risk of infections
- Anakinra - IL - 1
- Toclizumab, IL-6 — Antagonists
- Sarilumab
- Abatacept → Inhibits - $CTLA_4$ ↴
- Tofacitinib → Inhibits JAK pathway of T-cells (-) Co - stimulation
  ↓
  ↓ formation of cytokines

- Anti - TNF:
  - Etanercept → Reactivation of TB
  - Adalimumab → Neuropathy
  - Golimumab → Lupus like rashes
  - Certilizumab C.I → SLE, Hep - B
  - Infliximumab

SPONDYLO ARTHROPATHIES *17:00*

- Ankylosing spondylitis
- IBD associated Arthritis → Low Backache
- Psoriatic arthritis
- Reiteis (Reactive)
- Low Backache



Mechanical	Pathological (Tumor/Infection/Fracture)	Inflammatory
Am stiffness	Onset > 60 years	AM stiffness
Usually minor	Progressive over weeks	Usually prolonged
Maximum pain/stiffness	Night/rest pain	Maximum pain/stiffness
Late in day	Systemic symptoms	After midnight, early AM
Exercise/activity	H/O Malignancy	Exercise/activity
Worsens symptoms	Infection	Improves symptoms
Duration Acute or chronic	osteoporosis risk factors	Duration Chronic
Age at onset 20-65 years	Trauma	Age at onset <40 years
Radiographs		Radiographs
Osteophytes		Sacroiliitis,
Disc space narrowing		Syndesmophytes
Vertebral malalignment		Spinal ankylosis

- Inflammatory Backache - Criteria:

ASAS Experts

- Age at onset < 40 years
- Insidious onset
- Improvement with exercise
- No improvement with rest
- Pain at night (with improvement upon getting up)

≥4 criteria
Sensitivity 79.6%
Specificity 72.4%

2009 ASAS classification criteria for axial SpA
(in patients with back pain ≥ 3 months and age at onset < 45 years)

Sacroiliitis on imageing Plus ≥1 SpA feature	Or	HLA – B27 Plus >2 other SpA features
• Inflammatory back pain • Arthritis • Arthritis • Enthesis (heel) • Uveitis • Dactylitis • Psoriasis • Crohn's disease / ulcerative colitis • Good response to NSAIDs • Family history for SpA • HLA-B27 • Elevated CRP		Sacroilitis on imaging • Active (acute) inflammation on MRI highly suggestive of sacrolitis associated with SpA OR • Definite radiographic sacroilitis according to mNY criteria. Sensitivity 82.9% specificity 84.4% (overall Sensitivity 66.2%, specificity 97.3%

Ankylosing spondylitis

- Age = 20-40 yrs
- M > F
- Low backache > 3 months
- Restricted vertebrae movements
  ↳ Modified schober's test
- Ureitis → m/c – 33%
- Lung → ILD
  → Apical → Fibrosis
- AR
- ALL → Neuro +
- PLL → Radiculopathy +
- MRI → B/L sym – sacroilietis
- X – Ray:
  - Bamboo sign — HLA – B27
  - Dagger sign — – Sn > 90%

- Trolly Track - Sp ↓↓

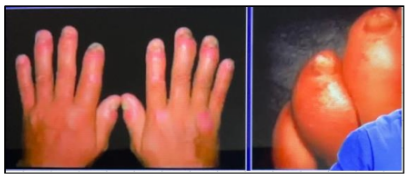
- Rx
  - NSAIDs
  - Regular exercise
  - Anti - TNF
  - Secukinumab - IL - 17
  - Uskekinumab - IL - 12/23 → Antagonist

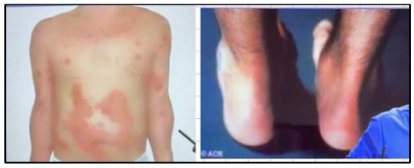
Psoriatic Arthritis: - CASPAR Criteria

Inflammatory musculoskeletal disease (joint, spine or entheseal) plus ≥ 3 points from the following criteria:

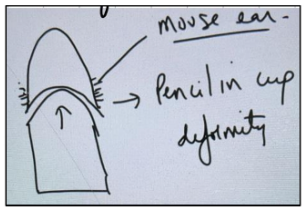
Criterion	Explanation	Points
Evidence of psoriasis		
Current psoriasis	Current psoriatic skin or scalp disease as judged by a dermatologist or rheumatologist	2
Personal history of psoriasis	History of psoriasis according to the patient or a family doctor, dermatologist, or rheumatologist	1
Family history of psoriasis	History of psoriasis in a first - or second - degree relative according to the patient	1
Psoriatic nail dystrophy	Typical psoriatic nail dystrophy (eg, onycholysis, pitting, hyperkeratosis)	1
Negative test for rheumatoid factor	Based on reference range at local laboratory; any testing method except latex, with preference for ELISA or nephelometry	1
Dactylitis		
Current dactylitis	Swelling of an entire digit according to observation on current physical examination	1
History of dactylitis	According to a rheumatologist	
Radiologic evidence of juxtaarticular new bone formation	III - defined ossification near joint margins (excluding osteophyte formation) on plain radiographs of hand or foot	

CASPAR=Classification Criteria for Psoriatic Arthritis, EKSA=enzyme-linked immunosorbent assay.
Taylor W et al. Arthritis Rheum. 2006;54(8):2665-2673, Table adapted from Ritchlin CT et a!. N Engl J Med. 20

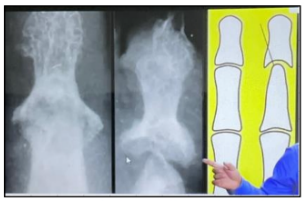




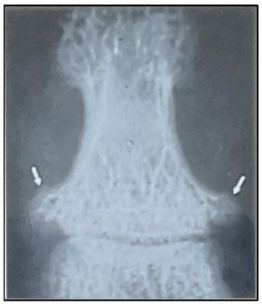
- DIP joint involvement



Tele skyping sign



Mouse ear psoriatic arthritis



- Treatment
  - Psoriasis + Arthritis
    - Methotrexate
  - Ps Arthritis → Anti - TNF
  - NSAIDs
  - Steroids
  - Anti - TNF
  - IL - 12 / 23 (-) → Uskekimumab
  - IL - 17 (-) → Secukimumab
  - CTLA - 4 → Abatacept
  - JAK → Totacitinib
  - PDE - 4 (-) → Apremilast

Reiter's (Reactive Arthritis

- Infections
  - Chlamydia - Mycoplasma genitalium
  - Shigella - HIV
  - Salmonella
  - Yersinia
  - Compylobacter

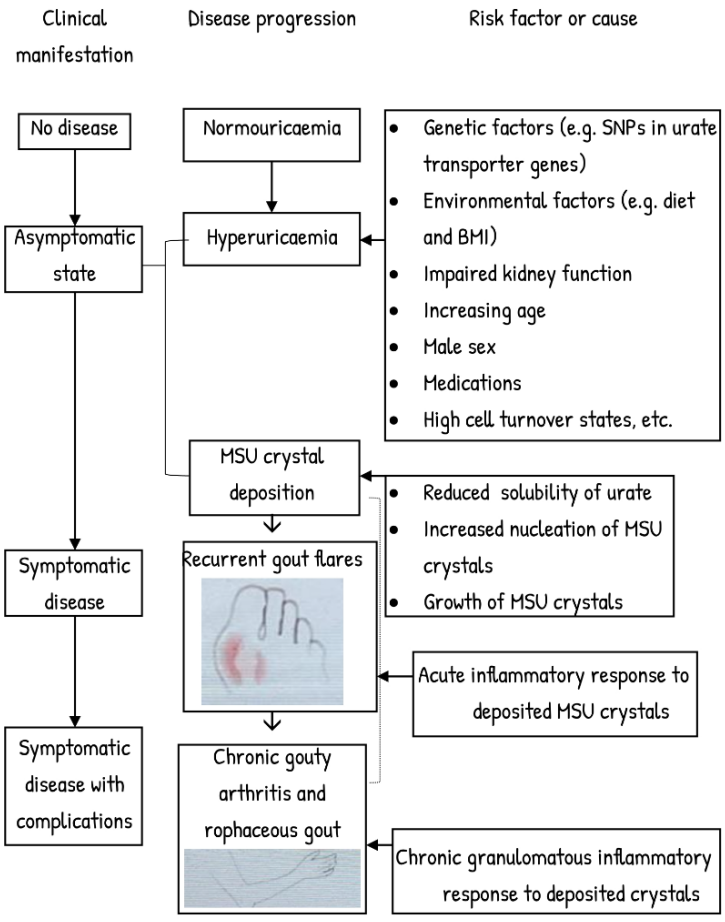
- Triad
  - Arthritis
  - Conjuctivitis
  - Urethritis

- Skin
  - Vesicles → Crust
    → Palms / sales → Keratoderma Blenorrhagica
    → Penile → Belanitis circinata
- Rx → Similar to psoriatic Arthritis

GOUT

35:20

- MC - joint → 1st MT - P - Podegra
- ↓ Temp → Uric acid crystal formation



- Synovial fluid Analysis
  - TLC > 2000/μL
  - Neg BF → parallel to polarized → yellow
  - Needle
  - Na urated crystals

- Rx → NSAIDs
  → Intra articular stands
  → Colchicine
  → Anakinra → IL - IR Blocker
  → Canakinumab → IL - I Blocker
  → Ralonacept → IL - I β Blocker
  → Acute Gout

UPRATE LOWERING DRUGS

- Allopurinal
- Febuxostat
- Uricosis → Pegloticase / Rasburicose
- Probenicid

PSEUDOGOUT *40:36*

- M/c → Knee joint
- Calcification +
- Associations
  - Hyperparathyroidsm
  - Hypocalciuria, hypercalcemia,
  - Hemochromatosis, hemosiderosis
  - Hypophosphatasia, hypomagnesemia
  - Hypothyroidsm, gout, neuropathic joints
  - Amyloidosis
  - trauma
  - OA

- Rx
  - NSAIDs
  - Intra articular stands
  - Colchicine
  - Anakinra → IL - IR Blocker

- Canakinumab → IL - 1 Blocker
- Ralonacept → IL - 1 β Blocker

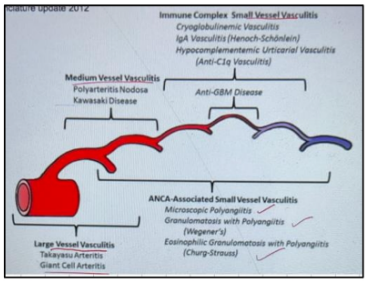
- Synovial fluid Analysis:
  - BF → +ve
  - Rhomboid shape
  - CPPD → Calcium Pyrophosphate Dehydrogenase

Rheumatology - Part 2

VASCULITIS 0:14

- Large vessel → Takayasu,
  Temporal
- Medium → Polyarteritis nodosa,
  → Kawasaki's
- Small vessel
  - Microscopic polyangitis (MPA)
  - Wegeneis (GPA)
  - Henoch Schontein purpurea
  - Churg - Strauss (EGPA)

Vasculitis
Chapel Hill Consensus Criteria
Nomenclature update 2012



TAKAYASU 3:28

- 3/6 → ACR
- Age < 40 yrs
- Claudication of extremities
- ↓ Brachial pulse
- BP diff > 10 mm Hg
- Bruit over subclavian / Aorta
- Arteriogram ab (N)

Major Criteria	Left mid – subclavian artery lesion
	Right mid-subclavian artery lesion
	Characteristic sign and symptoms of at least one month duration (limb claudication, pulselessness or pulse differences in limbs, fever, neck pain, transient amaurosis, blurred vision, syncope, dyspnea or palpitations)
Minor Criteria	High erythrocyte sedimentation (> 20mm h^{-1})
	Carotid artery tenderness
	Hypertension (> 140/90mmHg brachial or 160/90mmHg popliteal)
	Aortic regurgitation or annuloaortic ectasis
	Pulmonary artery lesion
	Left mid-common carotid lesion
	Distal brachiocephalic trunk lesion
	Descending thoracic aorta lesion
	Abdominal aorta lesion
	Coronary artery lesion

- Clinical manifestations – Takayasu

Potential clinical manifestations of arterial involvement in Takayasu Arteritis		
ARTERY	**PERCENTAGE OF ARTERIOGRAPHIC ABNORMALITIES**	**POTENTIAL CLINICAL MANIFESTATIONS**
Subclavian	93	Arm claudication, Raynaud's phenomenon
Common carotid	58	Visual changes, syncope, transient ischemic attacks, stroke
Abdominal aorta	47	Abdominal pain, nausea, vomiting
Renal	38	Hypertension, renal failure
Aortic arch or root	35	Aortic insufficiency, congestive heart failure
Vertebral	35	Visual changes, dizziness
Coeliac axis	18	Abdominal pain, nausea, vomiting

Rheumatology - Part 3

SYSTEMIC LUPUS ERYTHEMATOSUS

0:15

- Deficiency of C1q, C2, C4
- HLA - DRB_1, DR_3, DQA_2
- Ultraviolet light, smoking
- Epigenetic Ab (N)

} Predisposing factors

↓

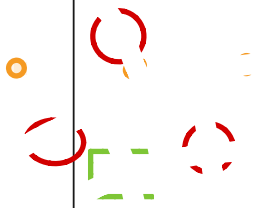
Ab (N) immune response

↓

Inflammation

↓

Damage to → organs
→ Renal, skin
→ Lung - fibrosis
→ Blood
→ CNS etc.



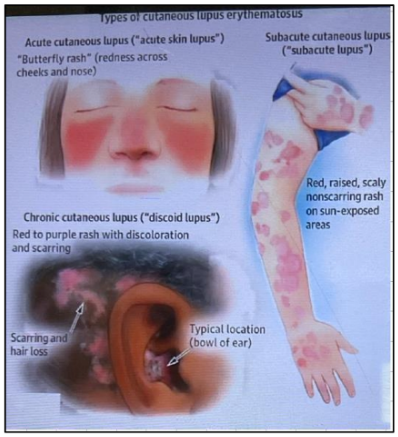
- Criteria
  - Systemic Lupus international collaborating clinic criteria (SLICC)
  - Skin
    - Acute → Malar rash
      → Erythema
    - Sub Acute → Red, ↑ Scaly
      (Annular Psoriasiform Rash) Non scalling rash on sub exposed areas
    - Chronic → rash → Discolouration, discoid, scarring +

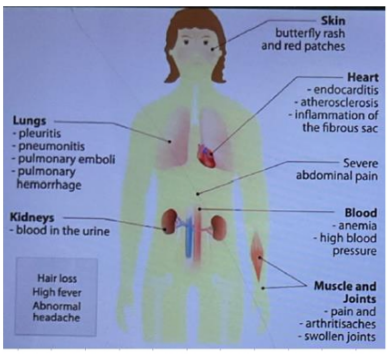
- Oral / Nasal ulcers
- Non scalling Alopecia
- Synovitis (Non erosive arthritis)
- Serositis
- Renal +
- Neurologic
  - Seizures, Psychosis, Neuropathis, Myelitis, confusion etc
- Blood
  - Hemolytic Anemia

- Leucopenia
- Lymphopenia
- PC ↓

- **Lab Criteria:**
  - ANA ➜ Most sn
  - Anti ds DNA ➜ correlates c̄ disease severity +
  - Anti - smith
  - Anti phospholipid
  - ↓ Complement
  - +ve coomb's test (Absence of Remolytic Anemia)

- Clinical Manifestations





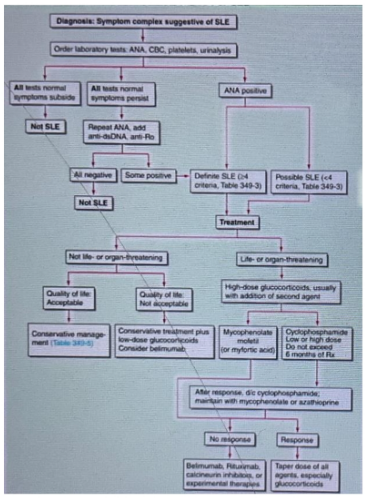
- Renal ➜ ISN
  - I ➜ Minimal mesangial
  - II ➜ Mesangia - proliferative
  - III ➜ Focal Nephritis
  - IV ➜ Diffuse Nephritis ➜ Wire loop deposits
  - V ➜ Membranous
  - VI ➜ Sclerotic Nephritis

- Treatment
  - HCQ's

Rx

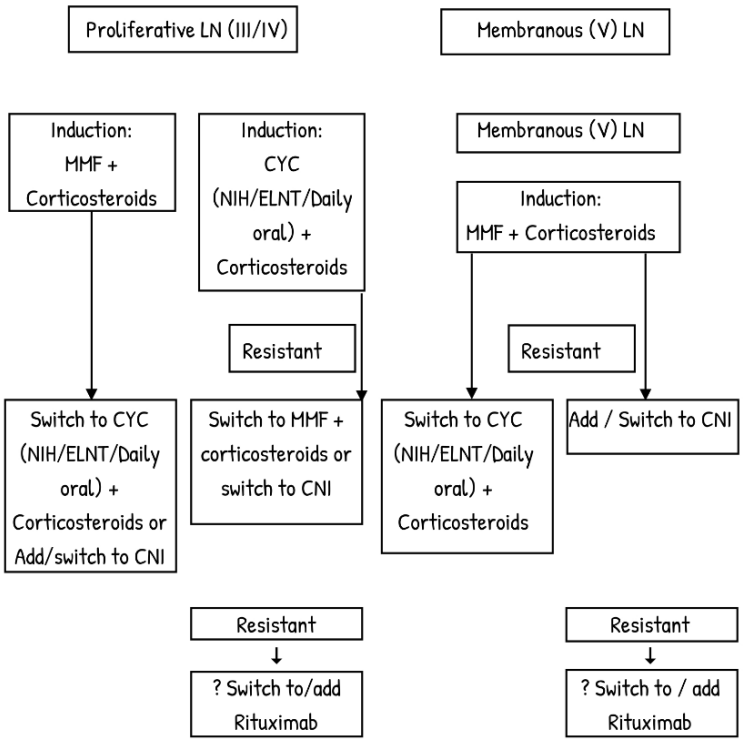
Non - threatening
- Conservation therapy
- ↓ Dose steroids
- Belimumab

Life / organ
- High dose steroids
- Cyclophosphamide
- Mycophenolate
- Azathioprine
- Belimumab
- Retixumab
- Sifalumimab



Rheumatology (Part-3)

Topic Notes: 9



- Subacute cutaneous LE – drug induced (Hydrachlorothiazide)
- Non scarring alopecia – m/c in LE.
  Periarticular inflammation – reducible Subluxation of the digits, swan neck deformities, ulnar deviation (Jaccoud arthropathy)
- Pain (or) limitation of motion of hips
  ↓
  Osteonecrosis

- Kidney disease – m/c in pts with anti-ds DNA antibodies
- Nephritis & ↑ S. creatinine – Urgent kidney Biopsy
- Antineuronal, Anti – NMDA receptor, Anti ribosomal P & APLA / LAC ➜ Assist in Δ of Neuropsychiatric LE
- SLE lung infiltrates ➜ Infectious
- Quiescent SLE ➜ Mild cytopenias
- APLA / LAC ➜ Venous & Arterial thrombosis, cardiac valve thickening / vegetations
- Newborns – +ve for Anti – Ro / SSA (or)
  Anti – La / SSB
  ↓
  SLE + Heart block

- Drug induced lupus
  - Hydralazine
  - Procainamide
  - Isoniazid
  - Minocycline

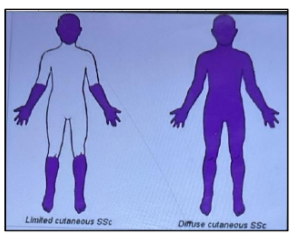
SCLERODERMA

23:36

- Localized
  - Morphea
  - Linea
  - En caup de Sabre
- Skin sclerosis
  Cardiac
  Lung fibrosis
  Eso. Dysmatility
  Raynaud's
  Obesity ➜ pseudo obst.
  ➜ Bowel

- Systemic
  - Limited
    CREST
  - Diffuse SS

Digital ulcers
Endocrine ➜ Hypothyroid
Renal crisis
Myopathy
Arthritis



- Cutaneous SSC Vs. diffuse cutaneous ds

CHARACTERISTIC FEATURE	LIMITED CUTANEOUS SSc	DIFFUSE CUTANEOUS SSc
Skin involvement	Indolent onset, limited to fingers, distal to elbows, face; slow progression	Rapid onset, diffuse: fingers, extremities, face, trunk; rapid progression
Raynaud's phenomenon	Antedates skin involvement, sometimes by years; may be associated with critical ischemia in the digits	Onset coincident with skin involvement; critical ischemia less common
Musculoskeletal	Mild arthralgia	Severe arthralgia, carpal tunnel syndrome, tendon friction rubs; small and large joint contractures
Interstitial lung disease	Slowly progressive, generally mild	Frequent, early onset and progression, can be severe
Pulmonary arterial hypertension	Frequent, late, may occur as an isolated complication	Often occurs in association with interstitial lung disease
Scleroderma renal crisis	Very rare	Occurs in 15%; onset may be fulminant; generally early (<4 years from disease onset)
Calcinosis cutis	Frequent, prominent	Less common, mild
Characteristic autoantibodies	Anti-centromere	Anti-topoisomerase I (Scl-70), anti-RNA polymerase III

- Calcinosis cutis
  Raynaud's
  Eso. Dysmotility
  Sclerodactyly
  Telengectasia

- GI:
  - Dysphagia
  - GERD
  - Stomach ➜ Gastroparesis
    GAVE ➜ Gastric Antral vascular Ectasia
  - Intestine ➜ Diverticulosis
  - Sphincter incontinence

- Rx
  - CCB's
  - PDE I ➜ Sildenafil
  - NTG typical
  - Endothelin R blocker ➜ Bosentan
  - Iloprost
  - Sympathectomy

- Pulmonary
  - Steroids + Immunosuppressants

SJOGREN'S SYNDROME *36:40*

- F:M = 9:1
- Sjogren's Sx:
  - Primary
  - Secondary
  - R. Arthritis
  - SLE
  - Scleroderma
  - MCTD
  - PBC
  - Autoimmune thyroid disease
- Dry eye
- Dry mouth
- Dry vaginal mucosa
- Extraglandular:
  - Arthralgia / Arthritis ➜ m/c
  - Blood ➜ cytopenias, cryoglobulinemia
  - Lymphomas ➜ MALT

➜ Marginal zone – B cell lymphoma

- Cutaneous vasculitis
- Raynauds
- Neuropathy
- RTA – Type – (1) RTA

- Serology
  - Abs ➜ Anti – Ro (SSa)
    Anti – La (SSb)
  - Labial Biopsy ➜ Minor salivary glands

↓

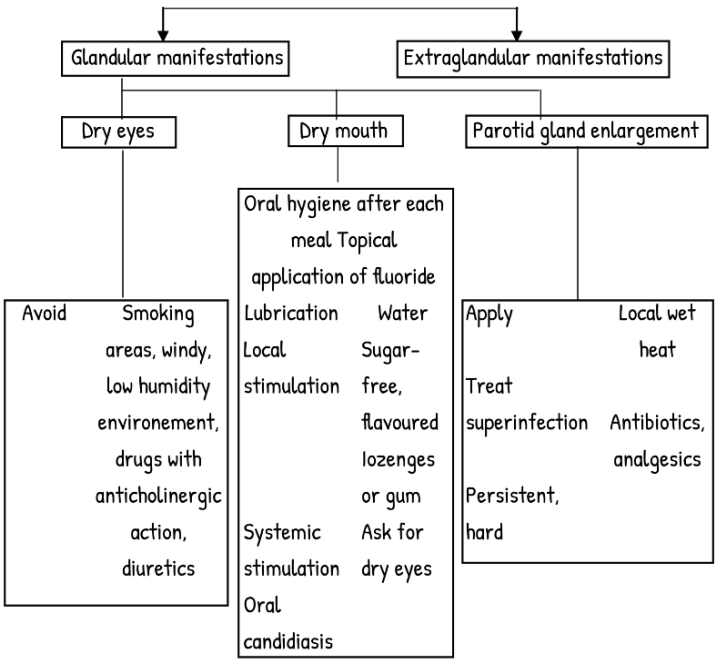
Lymphocytic ↓

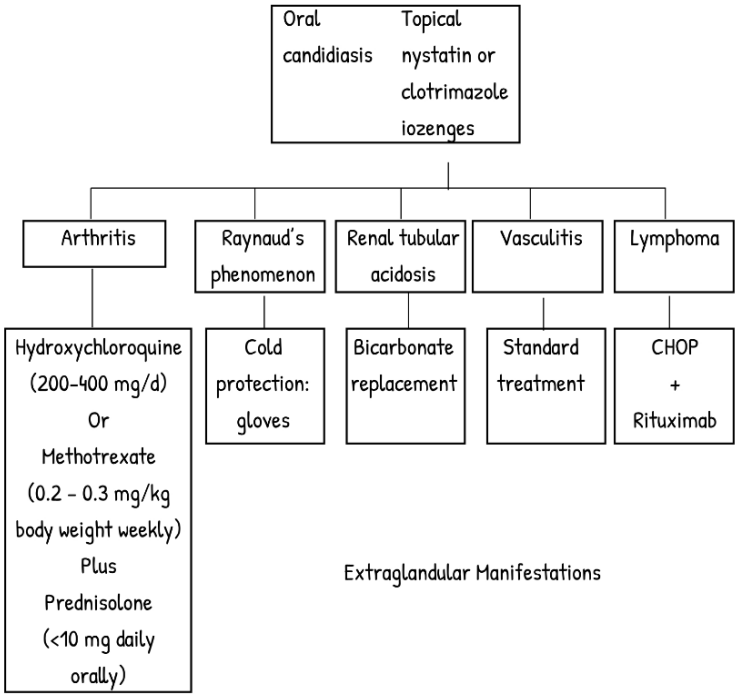
↓ CD_8

CD_4 ↓

HIV

- Treatment:





Extraglandular Manifestations

Pulmonology – Part 1

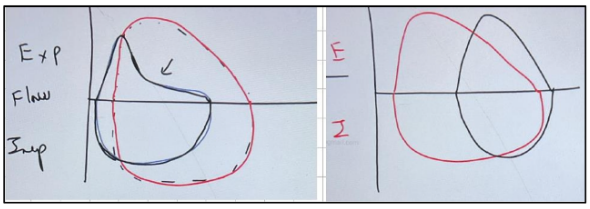
PULMONARY FUNCTION TESTS 0:20

Spirometry:

- FeV_1 - RV | body Plethysmagraphy
- FVC - FRC | - N_2 washout
  - TLC | - Helium dilution

Obst	Restriction
FeV_1 ↓↓	↓
FVC ↓	↓ / ↓↓
$\frac{FeV_1}{FVC}$ = ↓	$\frac{FEV_1}{FVC}$ = N/↑

- $\frac{FeV_1}{FVC}$ < 70% → obstructive
  $\frac{FeV_1}{FVC}$ > 70 → FVC > 80% - (N)
  → FVC < 80% - Restrictive



Obstructive Restrictive

- Diffusion capacity of CO (DLCO):

↓	↑
• ILD	• Alveolar Hemorrhage
• Emphysema (COPD)	• Polycythemia
• R-L - Shunt	• L-R - Shunt (VSD, ASD)
- TOF	
• Anemia	

- Asthma - DLCO → N/↑
- DLCO - (N)
  - Extra parenchymal Restrictive
    - Kyphoscoliosis

- Chest muscle ds

ASTHMA

8:38

1) Episodic Airway obst.
2) Airway Hyper responsiveness
3) Inflammation of the airways

- Classification of Asthma

Extrinsic

- Type - I HS
- Trigger → Food, Pollen, Dust etc
- Subtypes:
  - Atopic (Allergic)
  - Occupational
  - ABPA
- Childhood onset

Intrinsic

- Non - Immune mech.
  - Aspirin
  - Infection
  - Cold
  - Exercise
- No - F/H (or)
  P/H → Allergy
  → Atopy
- Adult onset

Type - 2

- Th_2
- IL-4, 5, 13
- Mast cells
- Eosinophils

Non - type - 2

- Th_{17}, Th_1
- Neutrophils
- IL - 6
  IL - 7
  IL - 8
- INF - γ

- Common Aeroallergens
  - Furry Animals
  - Dust mites
  - Mold
  - Cockroaches
  - Pollen

- Common Triggers:
  - Infections

- Medicines (Aspirin)
- Smoke
- Exercise, cold weather
- GERD

- Sputum:
  - Creola bodies
  - Curshmann's spirals
  - Charcoal leyden crystals

- Diagnosis:
  - Episodic Airway obst → Peak flow meter
    → > 20% variability
  - Airway Hyperresponsiveness
    - β_2 agonists – Albuterol – ↑ Fev_1 > 12%
    - Methacholine → < 0.8 mg/mL
      - FeV_1 ↓ – 20%
  - Inflammation of the Airway
    - Exhaled NO levels > 30 ppb
    - Sputum Eosinophilia
    - IgE ↑

- Rating – Asthma severity

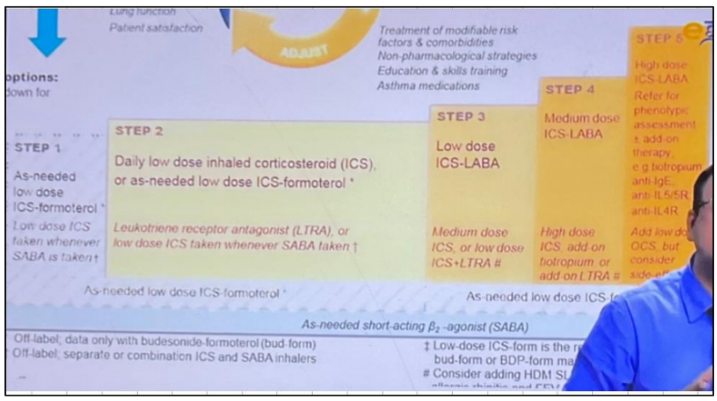
Variable	Intermittent	Mild persistent	Moderate persistent	Severe persistent
Symptoms	≤ 2 days / week	>2 days / week	Daily	Throughout day
Nocturnal Awakening	≤2 times/month	3–4 times / month	>1 week	Often daily
Impact on activity	None	Minor limitation	Some limitation	Extreme limitation
SABA Use	≤2 days/week	>2 days / week	Daily	Several per day

PFTs	Normal FEV_1 and FEV_1 / FVC	Normal FEV_1 and FEV_1 / FVC	Abnormal	Very abnormal

- Relievers & controllers – ASTHMA

Relievers	Controllers
Short-acting B2 agonists	Inhaled corticosteroids
Anticholinergic agents	Leukotriene modifiers
Systemic corticosteroids	Long-acting B2 agonists
	Methylxanthines
	Monoclonal antibodies against IgE

- GINA – 2019 Guidelines:



- Very severe category of drugs:

Agent Name	Mechanism of Action	Patient Population
Omalizumab	Anti-IgE	Elevated IgE level (30-1000 IU/mL) & allergen sensitivity
Mepolizumab & Reslizumab	Anti – IL – 5	Peripheral eosinophilia (150 – 400 eosinophils/μL)
Dupilumab	Anti-IL-4 (blocks IL-4 and IL-13 signaling)	Glucocorticoid – dependent severe asthma; better with eosinophilic disease
Tezepelumab	Anti-thymic stromal lymphopoietin (TSLP)	Moderate – severe asthma, non-eosinophilic disease

- Aspirin associated Asthma:
  - AERD ➜ A. exacerbated RD
  - Rx Leukotriene Antagonists

- Bronchial Thermoplasty:
  - Heat therapy ➜ Treat Asthma

COPD

30:01

- Diagnosis:

Symptoms
- Shortness of breath
- Chronic cough
- Sputum

Risk factors
- Host factors
- Tobacco
- Occupation
- Indoor / outdoor pollution

- Spirometry ➜ Regd. To make diagnosis
- Patho:

- Chronic Bronchitis:
  - Inflammation
  - Lymphocytic
  - Goblet cell metaplasia ➜ ↑ Secretion of mucus

  - Reid's Index
    $= \frac{\text{Ratio of mucous gland layer}}{\text{Wall thickness}} > 0.4$

- Emphysema:
  - Proteases ↑
    - Alveolar wall destruction
    - ↓ elasticity
    - Loss of pulm capillary bed
  - Centrilabular / Irregular ➜ Smoker's
  - Paraseptal
  - Panacinar ➜ $\propto_1$ AT deficiency

- COPD Type – A ➜ Emphysema:
  - Hyperinflation / Barrel chest
  - Tachypnea / Pursed lips
  - ↑ V/Q
    ➜ Tachypnea / Low Co
    ➜ Systemic hypoxia (↓ CO)
  - Weight loss

- COPD Type – B ➜ Chronic Bronchitis:
  - ↓ V/Q
    - Poor ventilation / ↑ CO
    - Cyanosis
  - CO_2 retention
    - Acidosis
  - Pulmonary Art. Constriction
    - Rt. HF

Emphysema and Chronic Bronchitis

	Predominant Bronchitis	**Predominant Emphysema**
Appearance	"Blue bloaters"	"Pink Puffers"
Age	40-45	50-75
Dyspnea	Mild, late	Severe, early
Cough	Early, copious sputum	Late, scanty sputum
Infection	Common	Occasional
Respiratory Insufficiency	Repeated	Terminal
Cor pulmonale	Common	Rare, terminal
Airway resistance	Increased	Normal or slightly increase
Elastic recoil	Normal	Low
Chest radiography	Prominent vessels, large heart	Hyperinflation, small heart

- FEV_1 ➜ ≥ 80% – Gold 1
  50-79 – 2
  30-49 – 3
  <30 – 4

- MMRC
- COPD Assessment test – CAT
- Post – Bronchodilator

$\frac{FEV_1}{FVC} < 0.7$

History

>2 Or >1 leading to hospital admission	C	D
0 or 1 (not leading to hospital admission)	A	B
	mMRC 0–1 CAT < 10	mMRC ≥ 2 CAT ≥ 10

Symptoms

- Treatment

Group	1st Line Rx	Escalation
A	SAMA or SABA prn	Try alternative class of bronchodilator
B	LAMA or LABA	LAMA and LABA
C	LAMA	LAMA and LABA
D	LAMA + LABA	LAMA + LABA + ICS

Cat – D

- Roflumilast
- Macrolides

Surgical treatment

- Lung volume reduction surgery
  - Upper lobe predominant
  - Low exercise capacity

- Long Term O_2 therapy – LTOT
  - $PaO_2 \leq 55$

PaO_2 <55 mmHg or SaO_2 < 88%, or
PaO_2 < 60 mmHg or SaO_2 < 89%,

- With cor pulmonale, right heart failure or polychythemia

Benefits for exercise – induced desaturation are unclear

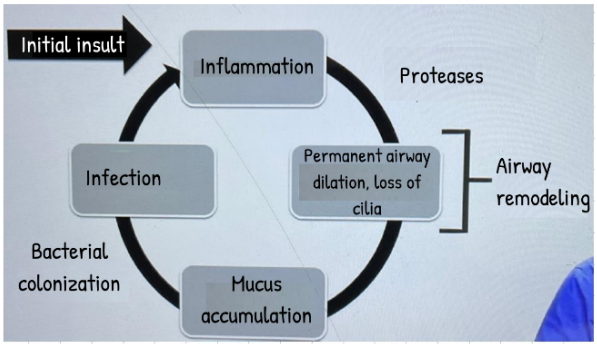
LOTT, NEJM 2016; 375 161;

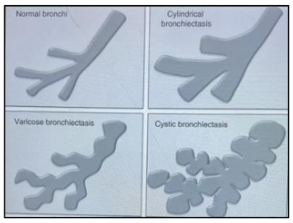
- Pulmonary rehabilation
- Treatment of severe exacerbations
  - Supplemental oxygen
  - Bronchodilators
  - Systemic corticosteroids
  - Consider antibiotics
  - Non-invasive mechanical ventilation
    - pH ≤ 7.35 and / or $PaCO_2 \geq 45$ mmHg
  - fluid status and nutrition
  - DVT prophylaxis
  - Co-existing conditions

BRONCHIECTASIS *44:00*

- Irreversible airway wall damage
- ⊂ dilation of Bronchi
- ⊂ chronic airway infection

Bronchiectasis Cycle





- Causes
  - Post infections ➜ TB
  - Cystic fibrosis

Causes of non-CF bronchiectasis

Idiopathic	Post-infective (ie, tuberculosis, pertussis)
ABPA	Chronic aspiration/GORD
Immunoglobulin deficiency	Ciliary dysfunction
Connective tissue disease related	Rheumatoid arthritis-related
Airways disease (asthma/COPD)	Non-tuberculosis mycobacterium
Foreign body inhalation	Inflammatory bowel disease-related

- Congenital Anatomic defects:
  - Primary ciliary Dyskinesia (Kartageneis Syndrome)
    - Bronchiectasis
    - Sinusitis
    - Situs inversus
    - Immotile sperm

- **William Campbell**
  - Bronchial cartilage deficiency ➜ 4^{th} – 6^{th} order Bronchi
  - Yellow Nails syndrome
    - Lymphatic hypoplasia
    - Lymphedema
    - Yellow n ails
    - Chylous effusion

- Mounier Kuhn syndrome:
  - Tracheobronchomegaly

- Investigations:
  - PCD ➜ TEM ➜ Transmission electron microscopy
    ➜ Video microscopy
  - Cystic fibrosis ➜ Sweat chloride test
    ➜ Genetic test for mutation of CFTR gene

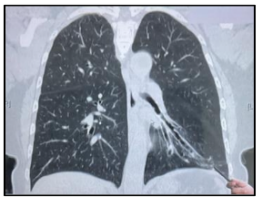
Clinical features

- Chronic productive cough
- Hemoptysis
- Recurrent pneumonia
- Asso ➜ sinusitis, infertility etc.

- O/E
  - Insp. Crepitations
  - Rhonchi +
  - Clubbing + + +

- Investigations:
  - Sputum - G/S
    - C/S
  - HRCT ➜ Lack of Bronchial tapering
    - Tram lines +

- PFT



- Treatment:
  - Antibiotics
  - Nebulized Tobramycin - CF

- Mucolytics
  - Iodides
  - Guaifenesis
  - Acetyl cysteine
  - Vh DNAse
  - Hyper osmolar aerosols (3-7% Nacl)

- Clearance of Secretions:
  - Chest physiotherapy + Postural drainage
  - Flutter valve
  - External electric vibrators

- Complications:
  - Pneumonia
  - Abscess
  - Septicaemia
  - Empyema
  - "Metastatic" Abscess
  - Amyloidosis

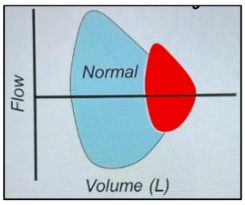
Pulmonology - Part 2

INTERSTITIAL LUNG DISEASES 0:18

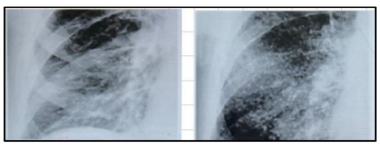
- Clinical features:
  - ➜ Symptoms:
    - SOB
    - Cough
    - Chest pain
    - Duration of symptoms

- Signs:
  - Hypoxia
  - Tachypnea
  - Insp. Crackles
  - Clubbing
  - Cor pulmonale

- Restrictive Lung Ds.



- X - Ray:



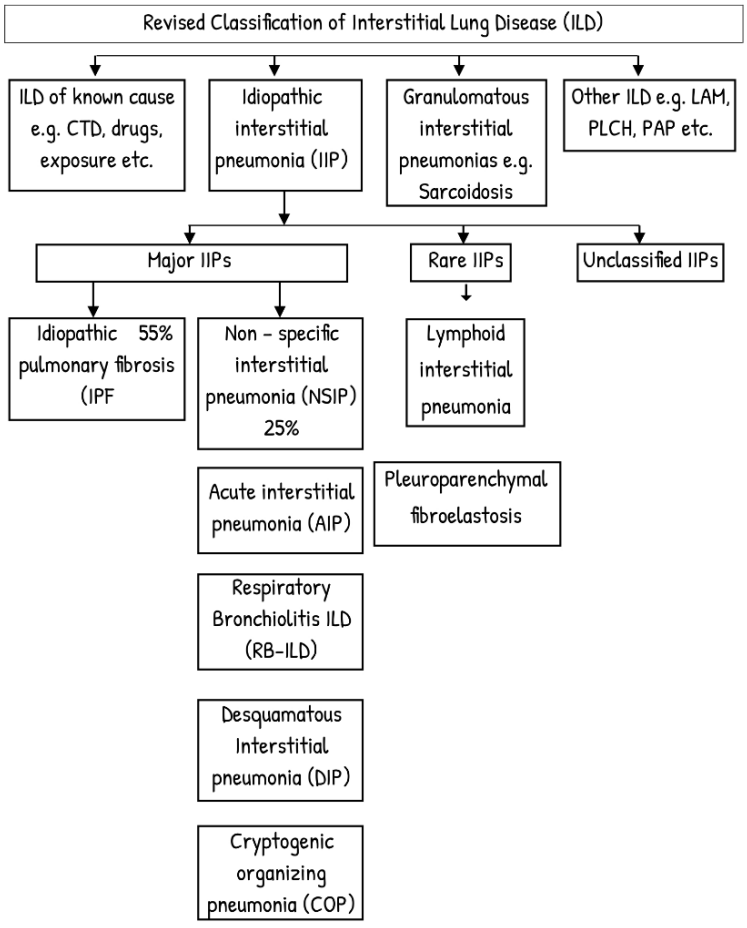
- Classification

Exposure related	CTD	Idiopathic
• Hypersensitivity Pneumonitis	• Systemic sclerosis	• IPF
• Pneumoconiosis	• R. Arthritis	• NSIP
• Radiation	• MCTD	• COP
• Medication	• Myositis	• RB - ILD
• Amiodarone	• SLE	• DIP

- Nitrofurantoin
- Methotrexate

- AIP

- Others:
  - Sarcoidosis
  - Vasculitis
    - Wegeneis
    - Churg - Strauss
  - Eosinophilic pneumonia
  - PLCH



- Idiopathic Interstitial Lung Diseases:

Category	Clinical Diagnosis	Pathologic pattern
Chronic fibrosing	IPF	UIP
	Idiopathic nonspecific interstitial Pneumonia (iNSIP)	NSIP
Smoking - related	Respiratory bronchiolitis - ILD (RB-ILD) Desquamative interstitial pneumonia (DIP)	Respiratory bronchiolitis Desquamative interstitial pneumonia
Acute / Subacute	Cryptogenic organizing pneumonia (COP) Acute interstitial pneumonia (AIP)	Organizing pneumonia Diffuse alveolar

- Involvement of ILD:

➜ **Upper Lobe**

  - Sarcoidosis, silicosis
  - Hypersensitivity pneumonitis Histiocytosis (PLCH)
  - Ankylosing spondylitis
  - Radiation pneumonitis RB - ILD
  - Pneumocystic pneumonia

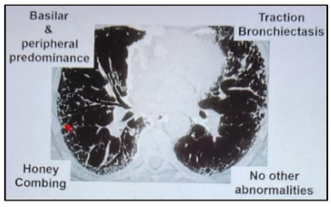
- Lower lobe
  - IPF
  - NSIP
  - CTD - ILD
  - Asbestosis
  - DIP
  - Drugs

IDIOPATHIC PULMONARY FIBROSIS (IPF) *9:43*

- Progressive dyspnoea on exertion
- Dry cough
- O/E ➜ B/L Lower crepts
  - Terminal insp. Crepts

- Terminal Velcro crepts
- Clubbing

- PFT → $\frac{FeV_1}{FVC}$ > 70%, FVC ↓↓
- Age > 50 yrs
- HRCT
  - Lower lobes
  - Ground glass - transient
  - Fibrosis - Honey combing
  - Sub pleural

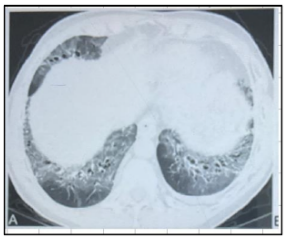


- Patho - UIP
  - No Granulomas

- Treatment:
  - O_2
  - Rx - GERD
  - Pirfemidone | Intracellular
  - Nintedanib | TKI
  - Lung Transplant

NON – SPECIFIC INTERSTITIAL PNEUMONITIS *17:30*

- HRCT



- Rx
  - Underlying cause
  - Steroids + Immunosuppressants

RESP. BRONCHIOLITIS – ILD *19:25*

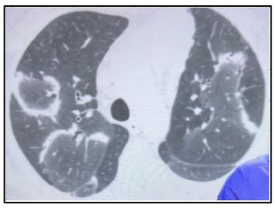
- Smoking
- BAL ➜ Golden alveolar macrophages
  (Smoker's macrophages)
- ILD ➜ Chronic
- HRCT ➜ Centrilobular ground glass nodules

DIP *21:03*

- Smoker's
- Lower lobe ➜ Ground glass opacities
- Sub pleural
- Cysts +
- Honey combing rare

CRYPTOGENIC ORGANIZING PNEUMONIA *22:01*

- Subacute
- Dyspnoea, Dry cough
- CT ➜ consolidation c̄ Reverse halo signs
  - Ground glass opacities +
  - Fibrosis ➜ uncommon
- Rx ➜ Steroids + Immunosuppressants



PULMONARY ALVEOLAR PROTEINOSIS *22:55*

- Alveolar macrophages – dysfunctional
- GMCSF

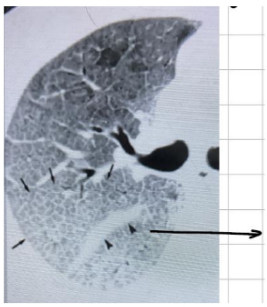
- Autoimmune ➜ Ab's - GM - CSF
- Hereditary ➜ Mutations ➜ $\propto$ / β chain of GM - CSF receptor
- Surfactant ↑

- C/F:
  - DOE
  - Dry cough / sputum ➜ whitish

- X-Ray:
  - Batwing appearance

- HRCT ➜ Crazy pavement appearance

- Rx
  - Mucolytics + chest physiotherapy
  - Whole lung lavage.



Crazy pavement appearance

CYSTIC DISEASES OF LUNG

27:34

- **Lymphangiomyomatosis (LAM)**
- Females ➜ 3rd - 4th decade

- Pneumothorax +
- -ve
- Cysts ➜ Thin walled
- Angiomyolipomas
  - Kidney

- **Pulm. Langhans cell Histiocytosis**
- Male
- Usually > 40 yrs
- Pneumothorax +
- Smoking +
- Cysts ➜ Thick walled
- Rx
  - Smoking cessation

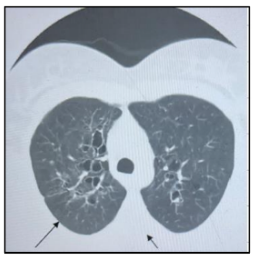
- VEGF - D - ↑↑
- Rx
  - Sirolimus (Rapamycin)
  - Supportive
  - Steroids + chemo Rx
    - Cladribine
    - Cyclophosph
    - Vinblastine
    - MTx
    - Etoposide

ABPA *30:30*

- Rosenberg - Patterson Criteria: 6/8
  1) Asthma
  2) Bronchiectasis - Central
  3) Blood - ↑ IgE,
  4) Eosinophilia
  5) Pulm infiltrates c̄ Fleeting opacities
  6) Positive precipitins for Aspergillus
  7) Positive skin test - for Aspergillus
  8) Ab's - against A - Niger / A. fumigatus

Minimal Diagnostic Criteria for
ABPA-Central Bronchiectasis (ABPA-CB)

- Asthma
- Central bronchiectasis
- Immediate cutaneous reactivity to Aspergillus species or A. fumigatus
- Elevated total serum IgE (>417 kU/L)
- Elevated serum IgE-A.fumigatus and or IgG-A.fumigotus compared to sera from prick positive patients with asthma



- BAL → Eosinophils

- Rx
  Steroids + Itraconazole

HYPERSENSITIVITY PNEUMONITIS *33:12*

- Type – III, IV HS

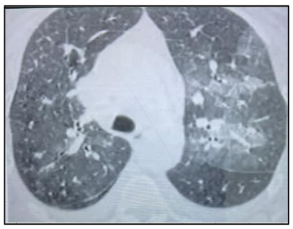
DISEASE	ANTIGEN	SOURCE
Farming / food Processing		
Farmer's lung	Thermophilic actinomycetes (e.g., Saccharopolyspora rectivirgula); fungus	Grain, moldy hay, silage
Bagassosis	Thermophilic actinomycetes	Sugarcane
Cheese washer's lung	Penicillium casei; Aspergillus clavatus	Cheese
Coffee worker's lung	Coffee bean dust	Coffee bean
Malt worker's lung	Aspergillus species	Barley
Miller's lung	Sitophilus granaries (wheat weevil)	Wheat flour
Mushroom worker's lung	Thermophilic actinomycetes; mushroom spores	Mushrooms
Potato riddler's lung	Thermophilic actinomycetes; Aspergillus species	Moldy hay around potatoes
Tobacco grower's lung	Aspergillus species	Tobacco
Wine maker's lung	Botrytis cinerea	Grapes
Birds and other Animals		
Bird fancier's lung (also named by specific bird exposures)	Proteins derived by parakeets, pigeons, budgerigars	Bird feathers, dropping, serum proteins
Duck fever	Duck feathers, serum proteins	Ducks
Fish meal worker's lung	Fish meal dust	Fish meal
Furrier's lung	Dust from animal furs	Animal furs
Laboratory worker's lung	Rat urine, serum, fur	Laboratory rats
Pituitary snuff taker's lung	Animal proteins	Pituitary snuff from bovine and porcine sources

Poultry worker's lung	Chicken serum proteins	Chickens
Turkey handling disease	Turkey serum proteins	Turkeys
Other Occupational and Environmental Exposures		
Chemical worker's lung	Isocyanates	Polyurethane foam, varnish lacquer
Detergent worker's lung	Bacillus subtilis enzymes	Detergent
Hot tub lung	Cladosporium species; Mycobacterium avium complex	Contaminated water. Mold on ceiling
Humidifier fever (and air conditioner lung)	Several microorganisms including: Aureobasidium pullutans; Candida albicans; thermophilic actinomycetes; Mycobacterium species; Kiebsiella oxytoca;	Humidifiers and air conditioners (contaminated water)

- Bloom Ag

EAA, Clinical findings

- Status — Dyspnea, cyanosis, Crepitant rales, Digital glubbing (chromic form)
- Chest X-ray — c Normal or small nodules/diffuse infiltrates/ ground glass appearance chronic form: pulmonary fibrosis
- HRCT — Normal or ground glass appearance centrilobular micronodules
- Lung function — Restriction, diffusing capacity decreases, hypoxemia, obstruction, hyperreactivity
- Lab. Tests — Rise of sedimentation rate, leukocytosis, neutrophilia
- BAL — Marked lymphocytosis, T helper / T supressor cells decreased



HRCT ➜ Mosaic pattern

(or) Head cheese appearance

- No eosinophilia
- Lymphopenia ➜ BAL - Lymphocytes CD8 > CD4

- Rx
  - Avoid ➜ Allergens
  - Steroids / Immunosuppressants.

Pulmonology – Part 3

PNEUMOCONIOSIS

0:16

Asbestosis:

- Straight → Crocidolite
  → Amphibole
  - Carcinogenic
- Serpentine → Crysolite
  - m/c – Asbestosis
- (4) patterns:
  → Pleural plaques
  - CXR → calcified pleural plaques

  → ILD → Lower labes
  → Shaggy Heart – blurred heart margins

  → Lung carcinoma (10 – 20 yrs)
  - Adenocarcinoma
  - Sq. cell carcinoma

  → Mesothelium: (20-40 yrs)
  - Malignant

Silicosis:

- Silica dust
- Stone quarry workers
- CXR → Upper lobe
  +
  HLN + → Egg shell calcification
  ↓
  - Sarcaidosis
  - Lymphoma – After RT
  - Histoplasmosis

- ↑ Pulm. TB
- ↑ Lung Carcinoma

Coal Workers:

- Massive upper lobe pulm fibrosis
- Pulm, nodules + RA → Caplabn's Sx

- Coal mine workers

BERYLLIOSIS 7:42

- Ceramic factories, computer factories
  ↓
  Motherboard
- Dental prosthesis material
- Nuclear power plants — Upper lobe — fever
- C/F: similar - sarcoidosis → + HLN — Arthralgia
- Diagnosis :→ Lymphocyte proliferation test
- Rx
  - Avoid - Beryllium
  - Steroids / MTx

When there is interstitial lung disease and the history is ..	Then the most likely diagnosis is	Characteristics unique disease are
Rock mining, quarraying, stonecutting, sandblasting	Silicon	Eggshell calcifications on chest x-ray; higher risk of pulmonary TB
Mining, insulation, construction, shipbuilding	Asbestos	Pleural plaques and calcifications on chest x-ray; barbell - shaped fibers on lung biopsy
Coal mining / west Virginia	Coal	Caplan syndrome; necrotic rheumatoid nodules in the periphery of the lung in a coal worker with RA
Machining and handling beryllium alloys. Computer mother-boards. Beryllium miners do not get berylliosis.	Beryllium	Can mimic sarcoidosis and show noncaseating granulomas on lung biopsy. Lymphocyte proliferation test diagnostic. Responds to early treatment with prednisone.

PLEURAL DISEASES

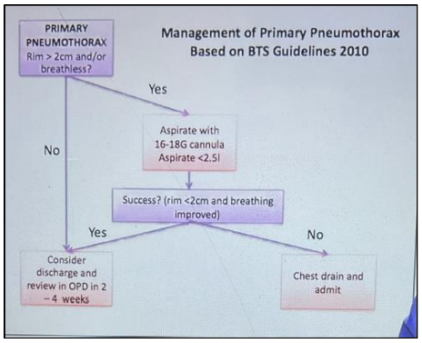
11:30

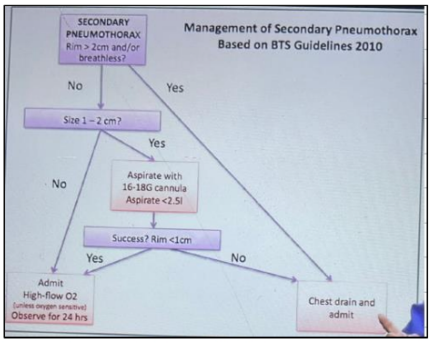
- Pneumothorax:
  - Primary
  - Secondary
  - Risk factors – pneumothorax

Risk factors for pneumothorax
Risk factors for PSP
Smoking
Family history
Thoracic endometriosis
Tall stature

Risk factors for SSP
COPD
Interstitial lung disease
Tuberculosis
Cystic fibrosis
Malignancy
Necrotizing pneumonia
Marfan syndrome

- Management





Pleural effusion:

- Light's criteria for distinguishing pleural transudate from exudate

Pleural fluid is an exudate if one or more of the following criteria are met:

- Pleural fluid protein: serum protein ratio > 0.5
- Pleural fluid LDH: serum LDH ratio > 0.6
- Pleural fluid LDH > two - third of the upper limit of normal serum LDH

- Causes - Transudate
  - CHF
    - 65% bilateral
    - 25% right unilateral
    - 10% left unilateral
  - Hepatic hydrothorax
  - Nephrotic syndrome
  - Hypoalbuminemia
  - Peritoneal dialysis
  - Urinothorax
  - Atelectasis
  - Trapped lung
  - SVC obstruction

- Causes - Exudative effusions

• Parapneumonic • Empyema • Malignancy (carcinoma, lymphoma, mesothelioma) • Pulmonary embolism • Tuberculous • Collagen - vascular (rheumatoid arthritis, lupus)	• Esophageal perforation • Radiation pleuritis • Drug - induced • Chylothorax • Meigs syndrome • Sarcoidosis • Yellow nail syndrome

- Parapneumoniac → Drainage → pH ↓
  → LDH ↑
  → Lobulated
- Low glucose → Rheumatoid Arthritis
  → Empyema

- ↑ protein, lymphocytic,
  ↑ ADA, Mesathelial cells ↓↓ } TB

Finding	Possible cause of pleural effusion
Distended neck veins, S_3 gallop, pulmonary crackles	Heart failure
Bilateral peripheral edema	Heart failure, nephrotic syndrome, cirrhosis
Calf or thigh swelling, erythema, edema, tenderness, palpable cord	Pulmonary embolus
Accentuated cardiac pulmonic sound, right ventricular heave	Pulmonary embolus
Lymphadenopathy	Malignancy
Ascites	cirrhosis

Bloody	Malignancy, pulmonary embolus, trauma, pneumonia, benign asbestos pleural effusion	Haematocrit If > 50% of the serum, it is a hemothorax; consider aortic rupture, and injuries to hilar structures, lung parenchyma
Milky	Chylothorax or cholesterol effusion	Triglyceride level
Yellow - green	Rheumatoid pleurisy	Serum rheumatoid factor Pleural fluid glucose <60 mg/dL (3.33 mmol/L)
Dark green	Bilothorax	Bilirubin
Dark brown/black	Long-standing hemothorax, fungal infection, malignancy	Haematocrit, cytology, fungal cultures
Purulent	Empyema	Aerobic and anaerobic cultures

ACUTE RESPIRATORY DISTRESS SYNDROME

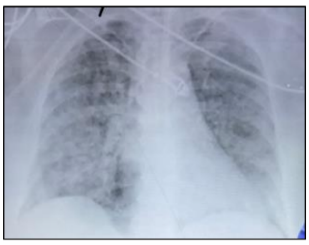
21:34

(ARDS)

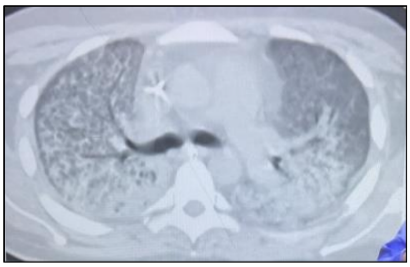
- Berlin Criteria
  - $\frac{PaO_2}{FiO_2}$ < 300 → < 300 – Mild
    < 200 – Moderate
    < 100 – Severe
  - B/L
  - Acute – (<1 week)
  - Pulm. Edema → Not due to hydrostatic cause (Cardiac)
    → Echo
- Causes:
  M/c → Gram -ve sepsis

DIRECT LUNG INJURY	INDIRECT LUNG INJURY
Pneumonia	Sepsis
Aspiration of gastric contents	Severe trauma
Pulmonary contusion	Multiple bone fractures
Near-drowning	Flail chest
Toxic inhalation injury	Head trauma
	Burns
	Multiple transfusions
	Drug overdose
	Pancreatitis
	Postcardiopulmonary bypass

- C/F:
  - Breathlessness
  - SaO_2 ↓ → Tachypnea / Tachycardia
  - Fever +
- CXR → B/L infiltrates



- CT ↴
  ARDS



- Rx
  - Ventilators
  - Low TV → 6 ml / Kg
  - PEEP → Positive End Exp. Pressure
    → Pplat < 30 cm H_2O
    → BP - Maintained
  - Early NM - Blockade
  - Prone position ventilation
  - ECMO
  - I : E ratio - Reversal
  - Avoid:
    - Surfactant
    - Steroid
    - HFOV

TREATMENT	RECOMMENDATION[a]
Mechanical ventilation	
Low tidal volume	A
Minimized left atrial filling pressures	B
High-PEEP or "open lung"	B[b]
Prone position	B[b]
Recruitment maneuvers	C
High-frequency ventilation	D
ECMO	B[b]
Early neuromuscular blockade	B[b]
Glucocorticoid treatment	D

Inhaled vasodilators (e.g., inhaled No, inhaled epoprosteol	C
Surfactant replacement, and other anti-inflammatory therapy (e.g., ketoconazole, PGE_1, NSAIDs	D

Pulmonology – Part 4

PULM. HTN

0:14

- Def^{n}:
  Mean Pulm. Art pressure ≥ 25 mmHg
- Pulm Arterial HTN – (PAH):
  - mPAP ≥ 25 mmHg
    PCWP ≤ 15 mmHg
    Pulm – Vasc. Resistance > 3 wood units

- classification:

1	Pulmonary arterial hypertension (includes idiopathic and heritable, and disease related to drugs and schistosomiasis and portal hypertension)
2	Pulmonary hypertension due to left – sided heart disease
3	Pulmonary hypertension due to lung disease and/or hypoxia
4	Chronic thromboembolic pulmonary hypertension and other pulmonary artery obstruction
5	Pulmonary hypertension with unclear or multifactorial causes

Group – 1:

- Idiopathic – F:M = 3:1 Mean age = 35 yrs
- Familial → Bone Morphogenic protein
  Receptor – 2 (BMPR – 2)
- CTD → Scleroderma, SLE
- Drugs → Methamphetamines, Anorexia
- Schistosomiasis

- C/f:
  - Dyspnoea
  - Fatigue
  - Chest pain
  - Syncope
  - Pedal edema

1. Pulmonary Arterial Hypertension
1.1 Idiopathic PAH
1.2 PAH with visoreactivity (acute and long term)
1.3 Heritable PAH
1.4 Drugs and toxins induced
1.5 Associated with:
1.5.1 Connective tissue disease
1.5.2 HIV infection
1.5.3 Portal hypertension
1.5.4 Congenital heart disease
1.5.5 Schistosomiasis
1.6 PAH with overt signs of venous / capillaries (PVOD / PCH) involvement
1.7 Persistent PH of the Newborn syndrome

2. PH due to left heart disease
2.1 PH due to heart failure with preserved E.F
2.2 PH due to heart failure with reduced E.F
2.3 Valvular heart disease
2.4 Congenital post - capillary obstructive lesions

3. PH due to lung diseases and /or hypoxia
3.1 Obstructive lung disease
3.2 Restrictive lung disease
3.3 Other lung disease with mixed restrictive / obstructive pattern
3.4 Hypoxia without lung disease
3.5 Developmental lung disorders
LAM ? Sarcoid ?

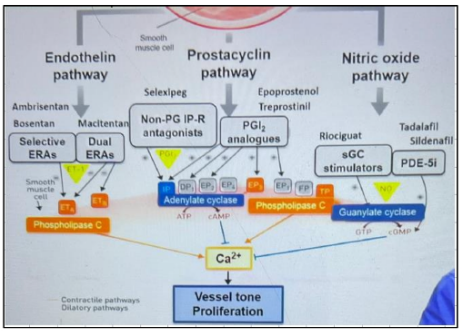
4. PH due to pulmonary artery obstruction
4.1 Chronic thromboembolic PH
4.2 Other pulmonary artery obstructions

5. PH with unclear mechanisms
5.1 Haematologic disorders
5.2 Systemic disorders
5.3 Others
5.4 Complex congenital heart disease
LAM ? Sarcoid ?

- O/E
  - ↑ JVP, Giant 'a' wave
  - RV – Heave
  - Loud P_2
  - Hepatomegaly, Ascites, P. edema
  - S_3 (Rt. Sided)
  - TR
  - PR

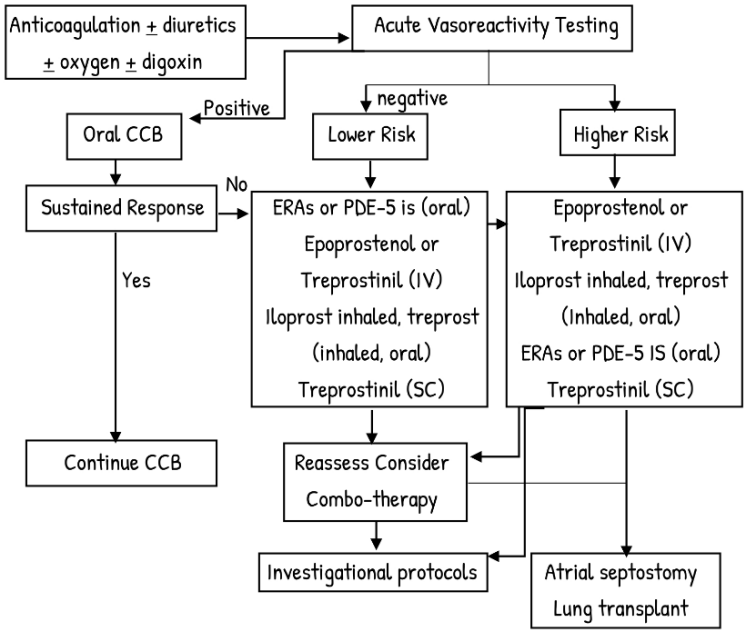
- Treatment:
  - (8) oral therapies:
  - Bosentan
  - Ambrisentan
  - Macitentan
  - Sildenafil
  - Tadalafil
  - Riociguat
  - Oral treptostinil
  - Selexipag

- (2) parenteral therapies
  - Epoprostenol
  - Teprostinil
- (2) Inhaled therapies
  - Iloprost
  - Treprostinil



- Treatment Algorithm

PAH Treatment Algorithm



Lower Risk - Oral therapy first

High Risk - IV prostanoid first line IF Candid

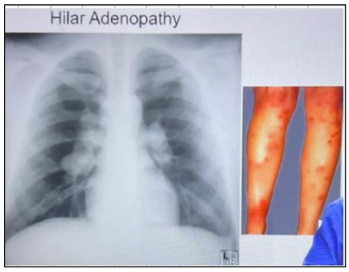
Pulmonology (Part-4)

Topic Notes: 6

SARCOIDOSIS

13:02

- Lofgren's Sx:
  - Females
  - Hilar Lymphadenopathy
  - Erythema nodosum
  - Fever, Arthritis



- Heerfordt's Sx → uveoparotitis
  - H^+, S^+, LN^+
  - Cardiac → Cardiomyopathies, Arrhythmias
  - Skin → E.N, Lupus pernice, dermatitis
  - Lung (90%)
  - URT → Chr. Sinusitis
  - Renal → stones +
  - Neurologic → psychiatric, Thalamic pain syndrome
  - (Ca) - 1 ∝OH ↘ Vit - D↑ → ↑Ca

- Lung:
  - Stage (1) → HLN +
    (2) → HLN + Interstitial ds
    (3) → Interstitial ds.
    (4) → end - stage fibrosis (UL)
  - Pleural eff. < 5%

- Gallium scan:
  - Panda sign
  - λ sign

- Rx
  - Steroids
  - MTx
  - Azathioprine
  - Leflunamide
  - Mycophenalate

- Refractory → Anti - TNF

Table 1. TREATMENT OF PULMONARY SARCOIDOSIS

Chest X-ray stage 0/1

No symptoms

No systemic therapy

Level 1A (123)

Chest X-ray stage 2 to 4

Symptomatic

Treat with corticosteroids

Level 1A (89, 123)

Initial dosage of 20-40 mg prednisone or its equivalent

Level 1B (89, 124)

Treat for 12-24 mo

Level 1C (90, 91, 125)

Steroid - sparing alternatives for chronic pulmonary sarcois

GIT - Part 1

HEPATOLOGY – LFTS

0:25

- Aminotransferases → AST } Hepatocellular injury
  → ALT }
- ALP → Cholestatic
- Liver synthetic fn → Albumin
  → PT
- Liver metabolism → Bilirubia
- Test for liver fibrosis
  - Blood test
  - USG / MRI
- Hepatocellular → AST / ALT ↑
- Cholestatic → ALP ↑
- Mixed
- R - Ratio
  - $\frac{ALT}{ALP}$ = R - Raio
  - ALT ↑↑ > ALP → R - Ratio > 5
  - ALP ↑↑ > ALT ↑ → R<2
  - R = 2-5 → Mixed
- AST: ALT ratio > 2 → ALD
- AST: ALT ratio <1 → NAFLD
  → Viral Repatitis
  ↓
  Cirrhosis
- AST } > 1000 units / L
  ALT }
  - Drug overdose (acetaminophen)
  - Ischemic hepatitis
  - Viral hepatitis
  - Biliary obst.
    → Stone → BD

Alkaline Phosphatase: (GGT / 5N) ↑

- Intrahepatic:
  - PBC
- Drugs
  - Antibiotics

- Anti-epileptics
- Anabolic steroids

- Infiltrative ds.
  - Sarcoidosis / Amyloidosis / Hemochromatosis
- Sepsis, TPN → ICU

→ Extrahepatic:

- Choledocholithiasis
- PSC
- Malignancy
  - Pancreatic Ca
  - Cholangio Ca
  - Ampullary Ca

Bilirubin:

Heme
↓
Protoporphyrin
↓
Biliverdin
↓
Bilirubin

Bilirubin → Conjugated liver → Bile duct
↓
Intestine
Urobilinogen | Stercobilinogen

- Total Bilirubin = 1.2 mg/dL
  Unconj Bilirubin = 0.9 mg/dL
  Conj. Bilirubin = 0.3 mg/dL

VIRAL HEPATITIS

10:50

A	B	C	D	E	
→ Feces → Acute 1P → 30 days Fulminant Hepatitis 0.2	← Blood A/C 60 days 1%	/ body fluids A/C 50 days	→ A/C 5-20%	Fees Acute [1/c/ - chr] 40 days 1-2% Preg	• A - 30 days • E - 40 days • C - 50 days • B / D - 60 days

- Least risk of fulminant Hep → Hep-C

Acute Viral Hep

- Fatigue
- Jaundice
- V/N
- Arthralgia / Arthritis
- LFT's → ALT↑↑ R>5
  → ALP ↑

HEPATITIS A

13:06

- HAV
- RNA - V
- Hepatoviruses
- Picornavirus family
- Spread → Close personal contact
  → Feco - Oral
- (5) Patterns:
  1) Anicteric
  2) Symptomatic - Jaundice
     → Self limiting → 2 months
  3) Cholestatic Jaundice → > 10 weeks
  4) Relapsing - 2 (or) more bauts of Acute - HAV
     ↳ 6-10 wks
  5) FHF - 0.1 to 0.2 %

- Rx
  - Supportive
  - Hydration
  - Dextrose
  - Vaccine
    - HAVRIX
    - VAQTA
    - TWINRIX
  - Pre - Exposrue:
    - Hep - A - Ig → < 2 wks

- Post - Exposure:
  - HA - Ig (Within 14 days)

HEPATITIS – B

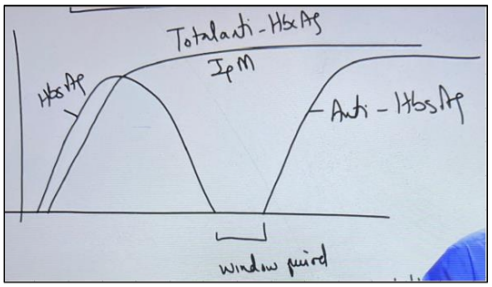
15:30

- DNA Virus - HBV
- Mode of transmission
  - Vertical: Mother → Baby (chronic)
  - Horizontal
    - Trans-sexual → m/c
    - Needle stick
    - Bld. Transfusion
    - Injection Drug use

    95% → Acute
    5% → Chronic

- Acute HBV:
  - 95% → resolution
  - Supportive Rx
  - Polyart - nodosa
  - Cryoglobulinemia
  - Skin rash → Gianotti crosti Sx

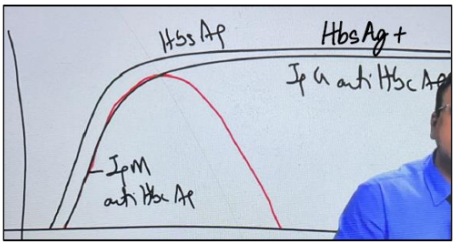
- Acute HBV - Serology



- Core → Ig Manti Hbc Ag
  ± Anti HbsAg

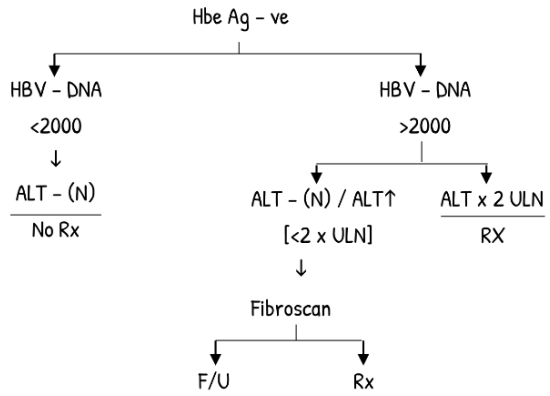
- Markers of Viral Replication: Qualitative → HbeAg+; Quantitiative → Hbv - DNA ↑

- Pre core mutant:
  - HbeAg – Absent
  - ↑ risk of cirrhosis, HCC
- Chronic HBV – Serology:



- Anti – Hs Ag → Vaccinated
- Hbs Ag +
  Igm Anti HbcAg } Acute Hepatitis
- Anti – Hbs Ag
  IgG Anti Hbc – Ag } recoverd
- Hbs Ag+ IgG – Anti Hbc + → CHB
- No Hbs Ag Igm
- No nti HbsAg Anti Hbc Ag
- Associated features:
  - PAN
  - Memb. GN
  - EMC
  - Popular acrodermatitis – Gianotti – Crosti
- CHB: HbAg + IgG anti Hbc Ag +
  → HBV – DNA → ALT – (N) → No Rx
  < 20,000
  → HBV > 20,000 iu/dL

↓
ALT → ALT – (N) → No Rx
ALT ↑ (2x ULN)
↓ ↓
X2 ULN Fibroscan
↓ → followed up
Rx → Rx



- Rx
  - Peg / NF∝
  - Nucleoside / Nucleotide

Peg / NF ∝	Nucleoside / Nucleotide
• Inj → S.C. inj • Poorly tolerated • No resistance • Finite Rx - 48 wks • C-I: ○ Immunosuppressed ○ Cirrhosis (Decompensated) ○ Pregnancy ○ Post - transplant ○ Psychiatry	• Oral • Well tolerated • Resistance + → Tenofovir -ve • Danger Durations → Lifelong Rx +ve

  - Tenofovir Alafenamide (Prodrug - Tenofovir)
  - Tenofovir
  - Entacavir
  - Adefovir
  - Telbuvidine
  - Lamivudine
  - HIV + HBV
  - Emitricitabine

- Tenofovir
- Lamivudine

- Hbe Ag+

Nucleoside analogues → Seroconversin ——— Stop
↓ To anti Hbe Ag 12 months
Hbe Ag -ve → Life long
↳ Anti - Hbs Ag

TABLE 332-8 Preexposure Hepatitis B Vaccination Schedules

TARGET GROUP	NO. OF DOSES	DOSE	SCHEDULE, MONTHS
RECOMBIVAX-HB (Merck)[a]			
Infants, children (<1-10 years)	3	5 μg (0.5 mL)	0, 1-2, 4-6
Adolescents (11-19 years)	3 or 4	5 ug (0.5 mL)	0-2, 1-4, 4-6 or 0, 12, 24 or 0, 1, 2, 12
	Or		
Adults (≥20 years)	2	10 μg (1 mL)	0, 4-6 (age 11-15)
Hemodialysis patients	3	10 μg (1 mL)	0-2, 1-4, 4-6
<20 years	3	5 μg (0.5 mL)	0, 1, 6
≥20 years	3	40 μg (4 mL)	0, 1, 6
ENGERIX - B (GlaxoSmithKline)[c]			
Infants, children (<1-10 years)	3 or 4	10 μg (0.5 mL)	0, 1-2, 4-6 or 0, 1, 2, 12
Adolescents (10-19 years)	3 or 4	10 μg (0.5 mL)	0, 1-2, 4-6 or 0, 12, 24 or 0, 1, 2, 12
Adults (≥20 years)	3 or 4	20 μg (1 mL)	0-2, 1-4, 4-6 or 0, 1, 2, 12
Hemodialysis patients[b]			
<20 years	4	10 μg (0.5 mL)	0, 1, 2, 6
≥20 years	4	40 μg (2 mL)	0, 1, 2, 6

- Post - Exposure:
  - Vaccinated → Anti- HbsAg titre
    >10 → No issue

- Vaccinated → <10 → HbIgG + vaccine
- Non-vaccinated → HbIgG + vaccine

HEP – D *38:41*

- Delta virus
  - HBV + HDV } ↑ Risk of fulminant Hep.
  - Acute + HDV }
- Co - Infection - Ig M anti HbcAg
  - Hbs + Anti - HDV
- Super - Infection - IgG anti HbcAg
  HbsAg + Anti - HDV

HEP-C *40:33*

- RNA - V
- HCV → Hepacivirus
  → Flavivirus
- Transmission
  - Inj → Drug
  - Bld. Transfusion
  - Sexual
- HCV - RNA ↑
  Anti - HCV ↑
  Acute Hep - C → Chronic Hep.
- Extra - hep:
  - Lichen planus
  - PCT
  - Mixed cryoglobulinemia
  - Non - Hogdkins lymphoma
  - AI thyroiditis
  - Monoclonal r pathies
  - MPGN

- Investigations:
  - LFT
  - Anti - HCV
  - HCV - RNA

- Liver fibrosis

- Treatment

DAA's for HCV

- NS3A Protease inhib
  - Simeprevir
  - Paritaprevir
  - Grazoprevir
  - Glecaprevir
  - Voxilaprevir
- NS5B Polymerase inhib
  - Sofosbuvir (Nuc)
  - Dasabuvir (non-Nuc)
- NS5A inhib
  - Ledipasvir
  - Ombitasvir
  - Elbasavir
  - Pibrentasvir
  - Velpatasvir
  - Daclatasvir
  -

Who should be treated and no

- Genotype 1
  - Glecaprevir – pibrentasvir x 8-16 wks (TE cirrhosis)
  - Sofosbuvir – velpatasvir x 12 wks
  - Sofosbuvir – ledipasvir x 8-24W (TE cirrhosis)
  - Grazoprevir – elbasvir x 12W (16W + RBV for 1a/high level RAVs)
- Genotype 2
  - G/P x 8-12 wks
  - SOF/VEL x 12 wks
- Genotype 3
  - G/P x 8-16 wks
  - SOF/VEL x 12 wks (+RBV for TE cirrhotic)
- DAA experienced
  - SOF / VEL / VOX x 12 wks
- Ideally, all should be treated
- For those with advanced fibrosis, don't forget HCC screening

HEP – E

46:45

- RNA - V
- Hepeviridae family
- MC → acute Hep → India
- Feco - oral - spread

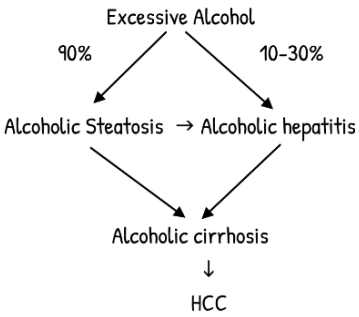
- No parenteral / sexual
- Symptoms:
  - Jaundice
  - Fatigue
  - RUQ - Pain
  - Nausea / vomiting
  - ALT ↑
  - Anicteric

- Pregnancy → Transplacental transmission +
- Rx
  - Immunocomprised → Liver transplant
    Chronic

GIT – Part 2

ALCOHOLIC LIVER DISEASE

0:15

- Males > 3 drinks / day
- Females > 2 drinks / day
- 1 drink = 10 g of alcohol = 30ml of spirit
- Binge drinking = drinking → Blood alcohol (80mg/dl → 2 hrs)
- Arrack → 40-50%
- Toddy → 5-10%
- Male - 40-80g / day → 10 yrs
- Female - 20 - 40 g / day → 10 yrs
- 10 to 20% → heavy drinkers → cirrhosis
- 

- Acetaldehyde addicts
- ↓ Glutathione
- ↑ NADH: NAD ratio
- ↑ free radical
- Investigations:

  → LFT:
  - AST, ALT < 400 / UL
  - AST : ALT > 2:1
  - GGT ↑
  - Carbohydrate deficient transferrin

- CDT:
  - MCV ↑ → Macrocytic

ALCOHOLIC HEPATITIS

4:07

- Jaundice within 60 days → heavy alcohol
- Jaundice
  Fever
  Anorexia
  Tender hepatomegaly
- AST & ALT 300 AST: ALT >2
- Maddrey's discriminant fn
  F = 4.6 x (PT – control PT) + Total Bilirubin
  DF > 32 → Severe alc. Hep
- Lille score
  - Age
  - Creat – < 0.45 → 6 months survival 85%
  - a/b – > 0.45 → 6 months survival 25%
  - PT
  - Bilirubin

Model for End – stage Liver Diseases (MELD)

	1-year survival (%)	
MELD score	**No complications**	**Complications**
<9	97	90
10–19	90	85
20–29	70	65
30–39	70	50
	MELD from SI units	
10 x (0.378 [In serum bilirubin (μmol/L) + 1.12 [In INR] + 0.957 creatinine (μmol/L) + 0.643)		
MELD from non-SI units		
3.8 [In serum bilirubin (mg/dL)] + 11.2 [In INR] + 9.2 (mg/dL)] + 6.4		

- Revised MELD score (with sodium)

Creatinine = 1.9 mg/dL, bilirubin = 4.2 mg/dL, INR = 1.2, sodium = 133mEq/dl

1. Calculate original $MELD_{(i)}$ = (0.957 x Log_e 1.9) + (0.378 x Log_e 4.2) + (1.120 x Log_e 1.2) + 0.643 = 2.0039, multiply by 10 and round: 20
2. Formula: (Revised) MELD = MELD + 1.32 x (137-Na) - MELD* (137-Na)]

Recalculate: MELD = 20 + 1.32* (137-133) - [0.033*20
For Na = 127, the new score would be 27
For Na = 135, the new score would be 21

- Treatment

Alcoholic hepatitis
↓
Alcohol abstinence
Nutritional support
↓
Discriminant function >32 or MELD > 21
(With absence of co-morbidity)
↓
No GI bleeding, renal failure, or pancreatitis
↓
Prednisolone 32 or Prednisone 40 mg p.o daily for 4 weeks

NAFLD *8:46*

- NAFLD
  ↓
  NASH - Non - Alcoholic steato hepatitis
  ↓
  Cirrhosis
  ↙ ↘
  Decompensated HCC
- Dyslipidemia
- HTN
- Obesity
- DM
- AST: ALT > 2 → ALD
  AST: ALT < 1 → NAFLD / NASH
  ↓ ↓

=1 Cirrhosis

>1

	NASH	ASH
• Alcohol use	+/-	+++
• Glucose intolerance	++	+/-
• Obesity	++	+/-
• HDL	Low	Increased
• AST:ALT	<1	>2
• MCV	+	+++
• Jaundice	+	++
• GGT	+	>400
• ANI	<-2.2	>2.2

- Rx
  - Pioglitazone → T_2D
  - GLP - 1 Analog's
  - Vit - E
  - Obetacholic acid
  - Apoptosis (-) → Selonsertib

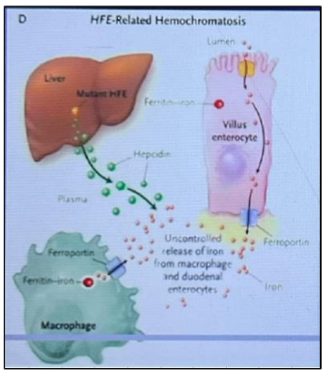
GIT – Part 3

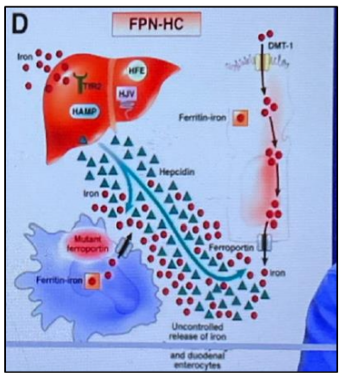
HEMOCHROMATOSIS

0:16

- Hepcidin ↑ ← HFE
  ↓
  Ferroportin channels

Iron Absorption in Hemochromatosis





OMIM	Name	Protein Defect	Inheritance
1	Classic Hemochromatosis	HFE	AR
2	Juvenile Hemochromatosis	2A: Hemojuvulin 2B: Hepcidin	AR
3	Hemochromatosis Type 3	Transferrin Receptor 2	AR
4	Ferroportin Disease Hemochromatosis	Ferroportin	AD

- C/F:
  → 25% → symptoms
  - ↑ LFT's
  - Fatigue
  - Pigmentation - Skin → ↑ Melatonin
    → Fe deposition

  → Slate Grey Bronze

- Diabetes
- Arthralgia / Arthritis → MCP - 2nd / 3rd
  → Osteoarthritis
  → Wrist
  → Knee
  → Ankle

- Hypogonadism (Secondary)
  → Pituitary
- Cardiomyopathy → Arrhythmias - 33%
- Thyroid ds
- Infections

- Liver:
  - Hepatitis → Fibrosis → Cirrhosis → Decomp
    → HCC
  - HH → 20 fold → ↑ HCC
  - Screening:
    - Symptomatic
    - Asymptomatic → ↑ Iron stores
    - 1st degree - relatives - HH
    - Transferrin sat > 45%
    - Ferritin > 200 - males
      Ferritin > 150 - females
    - Genetic → C282 tyr
      → H63D
    - Tr. Sat > 60% → Male } 90% → HH Accuracy
      > 50% → Females }
    - <45% → 97% NPV
  - Biopsy:
    → HII
    $= \frac{\text{HII}}{\text{Age}} \geq 1.9$ → HH

- Rx
  - Phlebotomy
  - Goal → ferritin = 50 - 100 μ / L
  - Cirrhosis / No reversal

- Testicular Atrophy / No rev
- Arthropathy
- ↑ energy
  ↑ cardiac fn
  ↑ DM control
  LFT's → (N)
  ↓ Abd. Pain
  ↓ Skin pigmentation
  ↓ Portal pressure

- Dietary:
- Vit C ↓
- Avoid → Fe supplements
  Alcohol

- Chelation Rx
- Deferiprone
- Deferasirox } Parenteral
- Deferaxamine

WILSON'S DISEASE *10:37*

- AR
- CRr - 13 → ATP > B - Defect
- Copper:
  - Absorbtion → 1-2 mg/day
  - Req: 0.75 mg/day
  - Excretion → Biliary
    → 10-15 → Renal loss
- ATP > B → Transport of copper - excretion - Bile
  → Incorporation of copper - ceruloplasmin
- Hepatolenticular degeneration :
  - ATP > B > 500 mutations
  - Diagnosis → 5 - 35 yrs
    → Young → hepatic
    → Older → Neuropsychiatric

- Liver

- Neurologic
  - BG
  - Tremor
  - Brainstem
- Psychiatric

Liver:

- Acute Hep → chronic Hep → Cirrhosis
  → Decomp.
  → HCC
- Alk. Phosphatase ↓
  - Acute LF
  - Transaminases < 1500 (2000)
  - AST: ALT > 2.2
  - ALP: Bilirubin - < 4

- Neurological
  - Dysarthria
  - Gait Ab (N) / Ataxia
  - Dystonia
  - Tremor → Wing Beating
  - Parkinsonism
  - Keyser Fleischer → Neuro → > 80%
    → Hepatic → 30-50%
    → Slit lamp

  - Type - 2 - RTA
    → Prox. Tubule defect
  - Bone
  - Coomb's -ve HA

- Investigations
  - Slit lamp - KF

- S. Ceruloplasmin ↓

- Rx
  - Penicillamine → Worsens neuro
  - Trientine
  - Tetrathiomolybolate → Neuro dysfn.
  - Zinc → ↓ Absorption - Copper int.
    → Maintenance
    → Asymptomatic

PRIMARY BILIARY CHOLANGIOPATHY *21:18*

- M/C → AILD
- 90% → females
- Medium age - 4th / 5th decase

- Asymptomatic
  - ALP

- Symptoms
  - Pruritus
  - Fatigue

- Criteria: 2/3
  - ALP ↑ > 1.5 x ULN
  - AMA +ve
  - Liver Biopsy

- Rx
  - URSODEOXYCHOLATE (UDCA)
  - Cholestyramine, sertraline, Naltrexone,
    Rifampicin
    ↓
    Pruritus
  - Ca & Vit - D

PRIMARY SCLEROSING CHOLANGITIS

25:17

- Chronic progressive, cholestatic LD
- Inflammation & fibrosis → EHB, IHB
- Males → M/c
- Age → 30-40 yrs
- Asso c̄ IBD
- Rt. Colon (IBD)
- Asymptomatic → Pruritis → cholangitis
- ↑ ALP
- Ab - P - ANCA +
- 10% Ig - G
- Cholestatic pattern

  ALP ↑↑
  ↓
  USG, AMA IBD
  ↓
  MRCP
  ↓
  SC

- Rx
  - UDCA
  - Balloon - Dilation
  - Stenting

- Complications:

  PSC
  - Cholongioca
  - Bact. Cholangitis

AUTOIMMUNE HEPATITIS

30:30

- F:M = 3:1, HLA - DR_3 / DR_4
- All ages
- Hyper gammaglobulinemia - IgG / Ab's ↑
- Biopsy → Interface Hepatitis
- Asso c̄ other AI ds.

- Steroids
- ALT ↑↑ → R>S

- C/f:
  - Fatigue / Anorexia
  - RUQ - Pain
  - N, V
  - Itching
  - Arthralgia

- Diagnosis:

Diagnosis: AIH scoring System

Gender	Female	+2	HLA	DR3 or DR4	+1
ALP: AST or ALT ratio	>3	-2	Immune disease	Thyroiditis, colitis, others	+2
	<1.5	+2			
γ-glob or IgG elevation	>2.0	+3			
	1.5-2.0	+2			
	1.0-1.5	+1			
	<1.0	0			
ANA, SMA or anti-LKM1 titers	>1:80	+3	Histological features	Interface hepatitis	+3
	1:80	+2		Plasmacytic	+1
	1:40	+14		Rosettes	+1
	<1:40	0		None of the above	-5
				Biliary changes	-3
				Other features	-3
AMA	Positive	-4	Treatment response	Complete	+2
				Relapse	+3
Viral markers	Positive	-3			
	Negative	+3			
Drugs	Yes	-4			
	No	+1			

Alcohol	<20 g/day	+2
	>60 g/day	-2

Pretreatment aggregate score
Definite = > 15: Diagnostic accuracy 9
Probable 10-15

ASCITES

34:10

- M/C → Cirrhosis
- Ascites → poor prognosis
- Cirrhosis
  ↓
  ↑ resistance to portal flow
  ↓

Overflow ← Portal HTN → Splanchnic vasodil
Hydrostatic P ↑ → Ascites
Splanchnic vasodil → ADH ↑, ↑ RAAS → Ald ↑ → Ascites

- SAAG
  - >1.1 → Portal HTN
    - Cirrhosis
    - Budd chiari
    - Cong. Hepatomegaly
      - Const. pericarditis
      - RHF
    - Alc. Hepatitis
    - Portal v. thrombosis
  - <1.1 → Not portal HTN
    - Nephrotic syndrome
    - Protein losing enteropathy
    - Peritonitis
    - TB Peritonitis
    - Peritoneal carcinometosis
    - Pancreatic ascites
    - Malignancy
    - Biliary ascites.

- Ascites:
  - TG > 200 mg/dL → chylous ascites
  - Amylase ↑ → Pancreatitis (2000 U / dL)
  - Bilirubin > 6 mg/dL → Bile leak (>5)
  - ALP ↑
  - CEA ↑
  - Salivary amylase ↑

  } Hallow vise

BACTERIAL PERITONITIS

40:10

- Neutrophils > 250 cells / mL
- Sec. peritonitis:
  - LDH ↑
  - Glucose < 50mg/dL
  - Protein > 1 mg/dL
  - Culture + ve
- Cirrhosis → Ascites
  ↓ WBCs > 500/mL
  SBP

- Causes:
  - E. Coli → MC → Cirrhosis + Ascites
  - Pneumococcal → Nephrotic + Ascites

- Rx
  → 3rd Gen. cephalosporins
  - Cefataxime
  - Pip / Taz
- Recurrence:
  - Norflax - 400 mg OD
  - Ciproflax - 500 mg OD
  - Cotrimoxazole

- Rx → Ascites
  - ↓ Na^+ intake → 4.6 - 6.9g / day
  - Diuretics → Spironolactone - 100 mg
    ↓
    400 mg daily
    → furosemide

Diuretic Refractory Ascites

- Therapeutic paracentesis
- TIPS Portosystemic shunt
- ↑ risks - Hep. Encephalopathy
- Peritoneo - venous shunts
- Indwelling draining catheters

GIT – Part 4

PEPTIC ULCER DISEASE

0:13

- 90% PUD → H. Pylori
  → NSAIDS
- H. Pylori → enzymes → Damage to muscle layers
  ↓
  Pro – inflammatory
  ↑ cytokines
  ↓
  Chronic inflammation

- NSAIDS → ↓ COX – 1 → ↓ PG's
  - ↓ Mucous prodⁿ
  - ↓ Blood flow
  - ↓HCO_3
  - ↓ Neutrophils
  ↓
  Ulceration

- NSAIDS → PUD
  - Older age
  - Prior H/o PUD
  - Smoking → ↑ Risk
  - Med → steroids, Anti – coagulants, Anti – platelets, SSRI, Bisphospho
  - Systemic → COPD, cirrhosis, uremia

- GI:
  - Malignancy – Gastric > Duodenal
  - Gastrinoma → Zollinger Ellison Sx
  - Infiltrative → Sarcoidosis, Crohn's
  - Viral infections → HSV, CMV
  - Roun – en by pass → Marginal ulcer
  - Stress ulcers

- Zollinger Ellison syndrome
  - Gastrinoma – 25% → MEN ↑
  - Gastrin ↑ – stomach → Acid ↑

Acid → Duodenal ulcers +

- pH < 2.0 - Gastrin > 1000 pg / mL

- Peptic ulcer disease:
  - Dyspepsia, Mild symptoms
  - Gastric ulcer - Pain → Worse with food
    → Pt. eats less - wt. loss
  - Duodenal ulcer - Pain → Subsides in taking food
    → Pt. eats more
    - Wt. gain

- Complications:
  - Bleeding → 10-15% - Pts
    - Overt → Melena, Hematemesis
    - Occult → Heme + stool, Iron def. Anemia
    - Perforation → Peritonitis shock
    - Penetration
    - Obstruction → N/V

- Rx
  - Uncomplicated → Ulcer
    → Standard Dose PPI
    - Gastric ulcer → 8 wks
  - Duodenal ulcer → 4 wks
  - GI Bleeding → PPI + / Endoscopic Rx
  - Perforation → Sx evaluation
    → PPI, Antibiotics, NPO
  - Obstruction

H. PYLORI

6:45

H. Pylori
↓
Rx

NSAIDS
↓
Discontinue NSAIDS

Low Dose Aspirin

1° Prevention	2° Prevention
↓	↓
Discontinue	Resumed after 1-7 days after bleeding stops

- Gram -ve Bacteria
- Helix shape
- Ability → produce urease
- Microaerophilic
- Flagella
- SES ↓
- Acqd. → During childhood
- Recurrence → FN + test after eradication
- Strain
  - CAG - A strain
    - Adenocarcinoma
    - Stomach
    - MALT Lymphoma

- Complications
  - PUD
  - Gastric Ca
  - MALT lymphoma
  - Iron def anemia
  - ITP

- Diagnosis
  - **Non - Invasive**
    - Urea breath test
    - Seroloty
    - Stool Ag
  - **Endoscopy**
    - Biopsy urease
    - Histology + Immunostain

- Rx → Prior exposure to Macrolide
  → Penicillin Allergy

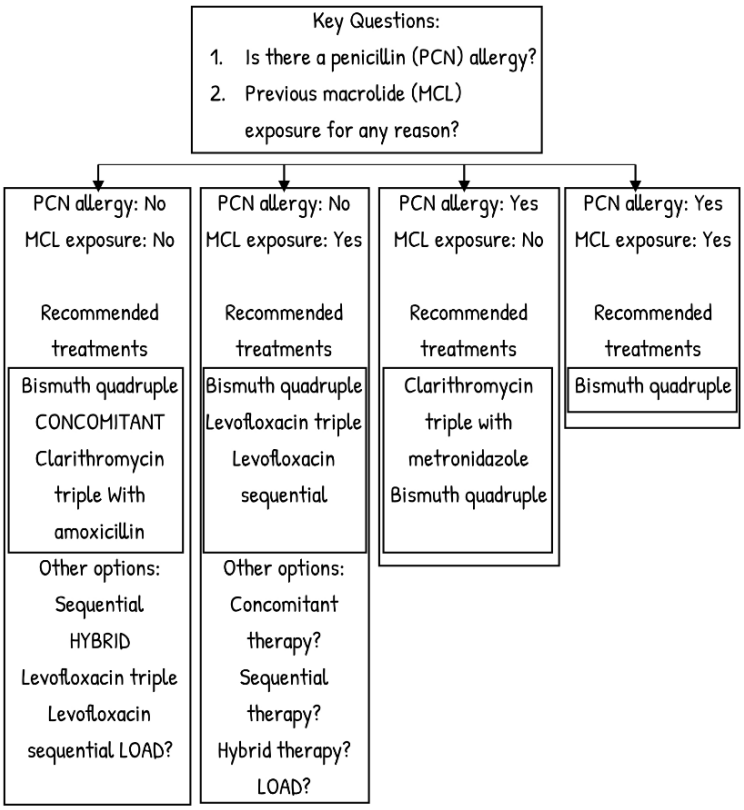


TABLE 317-5 Recommended First – Line Therapies for H. pylori Infection

REGIMEN	DRUGS (DOSES)	DOSING FREQUENCY	DURATION	ADA
Clarithromycin triple	PPI (Standard or double dose)	BID	14	Yes
	Clarithromycin (500mg)			
	Amoxicillin (1g) or Metronidazole (500 mg TID)			

Bismuth quadruple	PPI (standard dose)	BID	10-14	No
	Bismuth subcitrate (120-300 mg) or Subsalicylate (300 mg)	QID		
	Tetracycline (500 mg)	QID		
	Metronidazole (250 - 500 mg)	QID (250) TID to QID (500)		
Concomitant	PPI (Standard dose)	BID	10-14	NO
	Clarithromycin (500 mg)			
	Amoxicillin (1g)			
	Nitroimidazole (500 mg)			
Sequential	PPI (Standard dose)	BID	5-7	
	PPI, Amox, Clarithromyin (500mg), Nitroimidazole (500 mg)	BID	5-7	
Hybrid	PPI (standard dose) + Amox (1g)	BID	7	
	PPI, Amox, Clarithromycin (500mg), Nitroimidazole (500 mg)	BID	7	

Levofloxacin triple	PPI (standard or double dose) + Amox (1g)	BID	5-7	
	Levofloxacin (500 mg)	QD		
	Amox (1 g)	BID		
Levofloxacin sequential	PPI (standard or double dose) + Amox (1 g)	BID		

Neurology - 1

Headache, Vertigo & Movement Disorder

HEADACHE

00:21

Migraine	Tension Type	Cluster
• F > M	• F > M	• M > F
• U/L	• B/L	• U/L
• Throbbing	• Band like compressive	• Deep piercing
• One day	• Featureless headaches	• Peri-orbital
• Migraine associated features :	X	• Mins
○ N,V	X	○ Multiple
○ Photophobia	X	○ Episodic
○ Osmophobia	X	• Features F
○ Movt. ↑ → HA ↑ disabling	X	+
• Pound		+
○ Pulsatile		+
○ One day		+
○ U/L		Re
○ N/V		
○ Disabling		
• Aura → Classical migraine ↑ Risk of stroke		
• O/E → N	• O/E → N	• O/E → TAC
• Scalp tenderness	• Rx	• Red ye
• Focal deficits	○ Paracetamol	• Lacrimation
• No neck stiffness	○ NSAID's	• Rhinorrhea
• Calcitonin gene releated peptide Rx	• Present	• Nasal congestion
○ NSAIDs	○ TCA	• Rx
○ Metaclopromide /Prochloreperzine		○ Triptans - DOC
○ Triptans - 5HT IB 5HT ID Agonist		○ 100% O2
		○ Prevention
		○ Verapamil - DOC
		○ Steroids
		○ Lithium
		○ Tapiramate
		○ Melatonin

Migraine	Tension Type	Cluster
○ Eergot ○ Caffeine ○ Status migronosis • HA > 72hrs ○ Dopamine agonoists ○ IV – Ketrolac ○ Hydration ○ Gepants ○ Ubrogepant ○ Rimegepant • BB → Propranolol, Timolol ○ Valproate • TAC ○ Amitriptiline ○ Nortriptiline • CCB's → Flunarazine • MAOI's → Phenelizine, Cyproheptadine • MAB ○ Erenumab – S.C ○ Galcanezumab – S.C ○ Fremanenzumab – S.C ○ Eptinezumab – I.V ○ Batilunum toxin • SSRI's → Not used	• ↑ Effective	

Trigeminal Autoimmune Cephalgias :

Cluster	Paroxysmal Hemicranial HA	SUNCT
		• Short acting • U/L • Neualgic form • Conjuctival injection • Tearing

Cluster	Paroxysmal Hemicranial HA	SUNCT

• Min/Hrs +
• M . F
• Alcohol +
• Rx
  ○ Triptans
  ○ 100% O2
• Prevention
  ○ Verapamil
	• +
	• M = F
	• Indomethacin
	,,
		• See's
		• M = F
		• IV – lignocaine
		• Prevention
		  ○ Lamotrigine
		  ○ Topiramate
		  ○ Gabaoentin

Pseudo Tumor Cerebri :

- Idiopathic Intracranial HTN
- F > M
- Middle aged
- Vit A ↑, ↓
- Trtracyclins (post dated)
- CKD
- Endocrine → Hypoparathyroid, addison's
- OCP's / Pregancy
- Steroid use (or) withdrawal
- Headache + N, V
- Diplopia → Visula symptoms
- Pulsatile tinnitus
- Perimertry → Blind spot enlargement
- MRI – (N)
  - Ventricles
  - Optic N. Sheath – enlarged
  - Empty sella +
- Lumbar → ↑ CSF pr > 250mm H2O
- Rx
  - DOC → Actazolamide
  - Obsese → Weight reduction
    → Bariatric procedures
  - Topiramate
  - Optic N. Sheath fenestration +

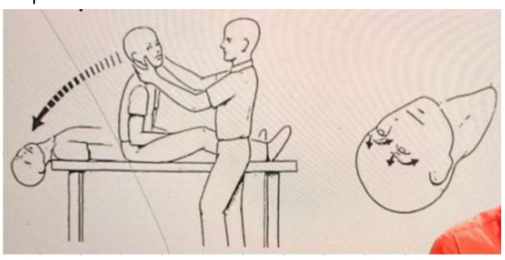
TRIGEMINAL NEURALGIA : *26:55*

- M/C → Cranila Neuralgia
- Multiple sclerosis
- Neurovascular contact → Superior cerebellar artery
  → Trigeminal
- C/F :
  - Pain → U/L
  - 5th → Maxillary + Mandibular
  - Shock like / electric → Trigger points
  - MRI → Demyelination +
    → Compression
    → MRA - Neurovasular
- Rx
  - Carbamazepine
  - Oxcarbamazepine
  - Baclofen
  - Lamotrigine
- Percutaneous radiofreq coagulation
- Post. Fossa microvascualr decompression

VERTIGO *34:16*

BPPV

- Benign paroxysmal positional vertigo
- Otolith → posterior (or) Lat. Semicircular canal
- Vertigo → Secs
  Triggered → Positional changes - Head
- Hallpike - Dix maneuver :



  - Vertigo
  - Upbeating/ Rotatory - Nystagmus +

- Rx
  - Epley's manuever
  - Semant manuever
  - Branelt - Daroff maneuver

Mennieres Disease :

- ↑ Pr → Endolymphatic sac
- Vertigo → mins to hrs
- Fullness → Inner ear
- Cochlear :
  - Hearing loss → sensorial
  - Tinnitus
  - Diplacusis
- Rx
  - TZD + K+ - Sparing Diuretics
  - Decompression surgery
  - Steroids → Local → Wick placement
  - Gentamycin → Local → Wick placement

Vestibular Neuronitis

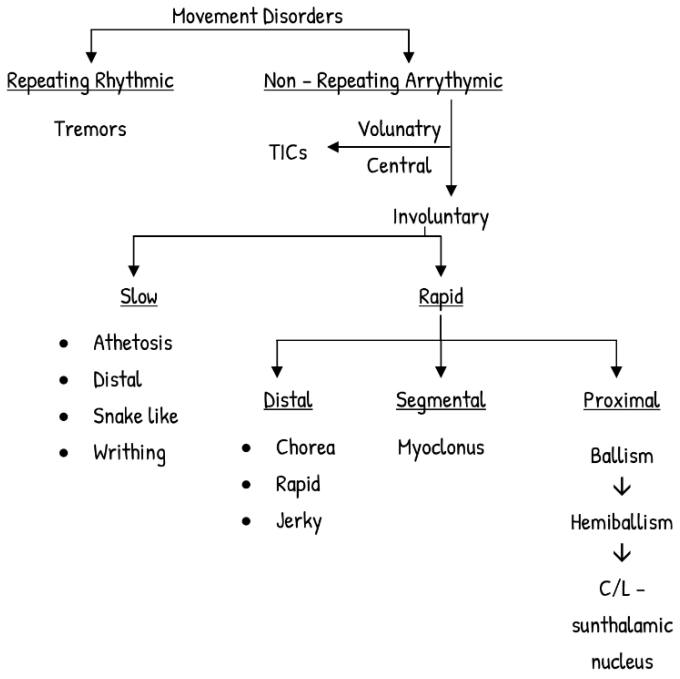
- Viral infection
- Fever, Cold, Nasal congestion , Throat pain etc
- Vertigo → mins to hrs
- O/E → Nystagmus → Horizontal
- Diagnosis → Head impulse +
- Rx
  - Beta histidine
  - Meclizine
  - Cyclizine
  - Steroids

Peripheral and Central Vertigo : HINTS protocol

	Peripheral	Central
• Head impulse	+ve	-ve
• Nystagmus	Unidirectional	Bidirectional
• Test of skew	-ve	+ve

MOVEMENT DISORDERS

44:22



TICS :

- Gilles de la Tourette
  - < 18yrs
  - M > F
  - TICS → Simple / Complex
  - Vocal → Palilabia, Echolalia, Coprolalia
  - Motor → Echopraxia, Copropraxia
- Rx
  - α-agonists
  - Guanfacine
  - Clonidine
  - Anti-psychotics

Tremors :

- Resting → ↓ On action → Parkinson's disease
  → ↑ On action → Red N. Lesions
  Rubral tremors
- Action → Terminal / Intention → Cerebellar
  → Postural - Essential
  - Thyrotoxicosis

Essential	Parkinson's
• -ve	• Hypokinesia +ve
• Titubation +ve	-ve
• Voice tremors +++	±
• F/H (AD) +++	±
• Tremor → ↓ on taking alcohol	-ve
• -ve	• Response to dopamine +++
• Rx ○ β-B ○ Primidone	

Neurology - 2 Parkinson's Ds, Dementia & MND

PARKINSONISM : 00:13

- Parkinsonism → Rigidity + Bradykinesia
- PD
- Atypical Parkinson's (Parkinsonian plus syndrome)
  - Progressive Supranuclear Palsy (PSP)
  - Multisystem Atrophy (MSA)
  - Corticobasal Degeneration (CBD)

Pathology

Tauopathies	α-syncleinopathies
• PSP • CBD • FTD	• MSA • Lewy Body Dementia • Parkinson's disease

PARKINSON'S DISEASE 03:45

- T → Tremor
  R → Rigidity
  A → Akinesia/Hypokinesia
  P → Postural Reflexes - Ab (N)

Clinical Manifestations

Cardinal Motor Features	Other Motor Features	Non Motor Features
Bradykinesia Rest tremor Rigidity Postural instability	Micrographia Masked facies (hypomimia) Reduced eye blinking Drooling Soft voice (hypophonia) Dysphagia Freezing	Anosmia Sensory disturbances (Eg : Pain) Mood disorders (Eg : Depression) Sleep disturbances (Eg : RBD) Autonomic disturbances Orthostatic hypotension Gastrointestinal disturbances Genitourinal disturbances Sexual dysfunction Cognitive impairment/Dementia

PSP :

- B/L - Sym
- Ocular → Vertical gaze paresis
  → Saccades
  → Square wave
- Facial dystonia
- Axial rigidity
- Postural instability
- MRI → Humming bird appearance

MSA :

- Shy Dragger Sx
  - Parkinsonism
  - B/L - Sym
  - Dysautonomia →Orthostatic Hypotension
  - Early falls

CBD

- Asym : Parkinsonsim
- Dystonia, Myoclonus
- Cortical sensory deficitis
- Apraxia
- Aphasia
- Behav. Ab (N)
- Alien hand phenomenon

PD	Atypical Parkinsons
• Asymmetrical • Dopamine response V. Good • Tremor +++++ • Rx - PD	• Symmetrical • CBD - Asym • Poor response to dopamine ±

Decarboxylase inhibitors	Carbidopa benserazide	Suppression of peripheral adverse effects of levodopa
Dopamine agonist		
Oral	Pramipexole, ropinirole, cabergoline	First-line treatment in younger patients, adjuvant therapy to limit total
Patch	Rotigotine	Similar top oral forms
Subcutaneous injection	Apomrophine	Rapid relief of sudden off time
Catechol-o-methyltransferase inhibitors	Entacapone (often used), tolcapone (hepatic toxicity)	Counteracting of wearing off phenomenon, prolongation of levodopa effect
Monamine oxidase type B inhibitors	Selegiline, rasagline safinamide	Initial therapy in mild cases, potention of levodopa effect tremor
Glutamate NMDA antagonist	Amantadine rimatidine	Dyskinesia tremor, fatigue
Anticholinergic agents	Trihexyphenidyl benztropine	Tremor, mild benefit against parkinsonism, higher adverse
Anticholnergic agents	Pimavanserin, quetiapine	Medication – induced psychosis, medication – reduction strate; mortality risk in patients with dementia
Noreinephrine precursor	Droxidopa	Neurogenic orthostatic hypotension, required (including liberal salt intake, fibrocortistone)

DEMENTIA

18:00

- Severe cognitive impairment
  - Cognitive fns :
    - Memory
    - Speech

- Behaviour
- Visuospatial
- Executive fns

- MCI [5-15%] Dementia
- Mini mental status examination (MMSE) : 30 score

Maximum	Score	
		Orientation
5		• What is the (year) (season) (date) (day) (month)?
5		• Where are we (state) (country) (town) (hospital) (floor) ?
3		Registration • Name 3 objects : 1second to say each. Then ask the patient all 3 after you have said them. Give 1 point for each correct answer. Then repeat until he/she learns all 3. Count trails and record. Trails_____
5		Attention and Calculation • Serial 7's. 1 point for each correct answer. Stop after 5 answers. Alternatively spell "world" backward
3		Recall • Ask for the 3 objects repeated above. Give 1 point for each correct answer
2		Language • Name a pencil and watch
1		• Repeat the following "No ifs, and or buts"
3		• Follow a 3-stage command : "Take a paper in your hand, fold it in half and put in on the floor"
1		• Read and obey the following CLOSE YOUR EYES
1		• Write a sentence
1		• Copy the design shown 

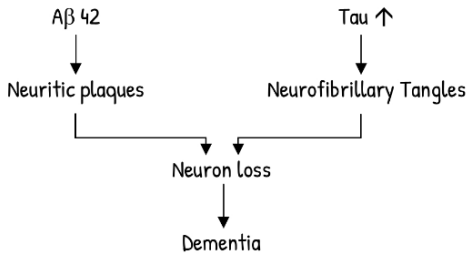
- Dementia

Reversible	Irreversible
• Vit - B12 def	• Alzheimer's disease
• Hypothyroid	• Vascular (multi infarct dementia)
• Subdural bleed	• Frontotemporal
• Infection	• Lewy body
• (N) Pressure hydrocephalus	• Huntington's creutzfield jakob
• Hashimoto's encephalopathy	• Parkinson's with dementia

Normal Pressure Hydrocephalus :

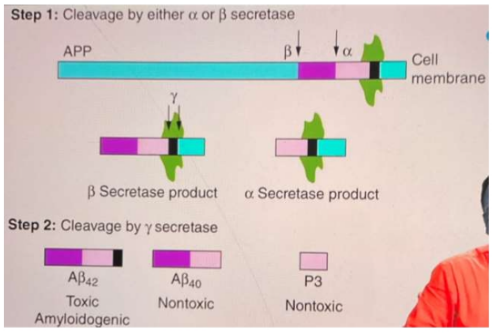
- CT/MRI → Enlarged ventricles
- Triad :
  - Dementia
  - Ataxia
  - Urinary incontince
  - Gait → Magnetic gait
- Rx
  - Ventriculo peritoneal shunt

Alzhimer's Disease :



- Aβ42 → Toxic Amyloidogenic

Aβ40
P3
} Non-Toxic



- C/F :
  - Memory → Episodic memory loss
  - Motor → Apraxia
    → Minimal → Moderate severity
  - Late → Delusion / Visual hallucinations
  - 4 A's
    - Amnesia
    - Apraxia
    - Aphasia
    - Agnosis → Visual agnosia
      Object agnosia

Vascular Dementia :

- Step ladder decline
- Pronounced gait ab (N)
  - Repeated falls
  - VMN → DTR's ↑ / ↑ Plantar
  - Apathy
  - Emotional incontinence → Explosive - Crying
    - Laughter
  - Cognitive slowing
- Rx → Alzheimer's
  - DONEPEZIL
  - RIVASTIGMINE
  - GALLANTAMINE
  - NMDA antagonist
    → Mimantine

Lewy Body Dementia :

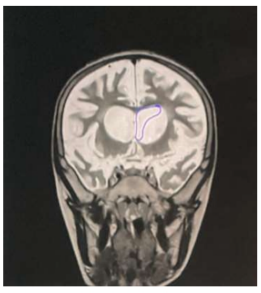
- Early visual hallucinations
- REM sleep – ab (N)
- Delirium/Fluctuations – Mental status
- Capgras Sz
- ↑ Sensitivity to medications – Like Antipsychotics
    - ↑ Risk – NMs
    - Syncopal/Seizure like
    - Autoimmune dis fns

Frontotemporal Dementia :

- Behavioural and Aphasia → Main problems
- Anosognosia → Denial of impairment
- New onset → Obsessive compulsive behaviour
- Hyperphagia
- Hyper sexuality
- Asso → MND (ALS)
- Drawing → Spared
- Apathy

Huntington's Disease :

- Ad
- CRr-4
- Trinucleotode → CAG Amplifications
- Motor → Chorea/Athetesis/Tremor
- Behavioural
- Oculomotor
- Cognitive deficits
- Anticipation
- MRI → Caudate atrophy
  → Box car ventricles



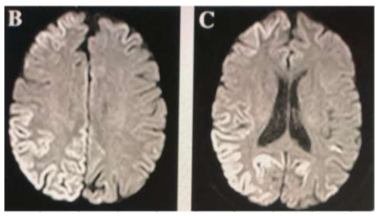
- ↓ Ach
  ↓ GABA
  ↑ Dopamine

- Chorea, Athetosis, Tremor → (Progresses) → Dementia
- Behav. → Agitation
  → Psychosis
- Dementia
- Rx
  - Tetrabenazine
  - Atypical anti psychotics

Creutzfeld Jakob Disease

- PRISONS
- PrPC → PrPSC → Other PrPC (α)
  ↓
  PrPSC (β)
- Patho :
  - Spongiform encephalopathy
  - Astrocytes → Gliosis
  - No inflammation
- SCKD - M/C
- Familial CJD
  - Fatal familial insomnia
  - GSS → Gerstmann Strusler Sheinker's
- Variant CJD → VCJD
- Iatrogenic CJD
- C/F :
  - Weight loss, Anxiety, Sleep disorders
  - Behav. Ab (N)
  - Visual hallucinations
  - Depression
  - Intellectual → Judgement
    → Organization skills
  - Memory/Speech/Visuospatial
  - Abolia
  - Akinetic mutism - Stupor

- Rapidly progressive dementia
- Myoclonic jerks → > 90% → Startle responses
- EEG → Generalized periodic (1/sec)
  → Biphasic/Triphasic

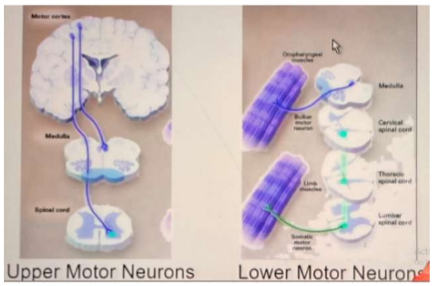


- MRI →Cortical Ribbory
  → Basal ganglia
  ↓
  Enhancement
  → VCJD → Pulvinar sign
- CSF → 14.3.3
  →Cell count
- Differences between cortical and subcortical dementias

Cortical and Subcortical dementias		
	Cortical	Subcortical
Examples	Alzheimer's Disease	Parkinson's disease Huntington's disease
Speed of processing	Normal	Slower than normal
Memory	Severely impaired Recognition and recall affected	Forgetfulness Recognition better
Language	Aphasia	Normal
Frontal 'executive' abilities	Preserved in early stages	Disproportionately impaired early in disease
Visuospatial and perceptual abilities	Impaired early	Impaired
Personality	Unconcerned	Apathetic and inert
Mood	Usually normal	Depression common

MOTOR NEURON DISEASE

52:55



UMN	LMN
• Spasticity	• Flaccidity
• ↑ Tone	• ↓ Tone
• ↑ DTR's	• ↓/Ab – DTR's
• ↑ Plantars	• Non – Response Platars
X	• Wasting
X	• Fasciculations

Motor Neuron Disease by Anatomy

1. Diseases of the upper motor neurons
   - Hereditary spastic paraparesis (HSP)
   - Primary lateral sclerosis (PLS)
2. Diseases of Both Upper and Lower Motor Neurons
   - Amyotrophic Lateral Sclerosis (Familial and Sporadic)
3. Diseases of the Lower Motor Neurons
   - Polio & Polio – like enteroviruses
   - West Nile virus
   - Kennedy's Disease (Spinobular Muscular Atrophy : SBMA)
   - Progressive Muscular Atrophy (PMA)

Amyotrophic Lateral Sclerosis : (Lou Gehrig's)

- Extraocular muscles, Bladder } Spared
- Sensory – (N)
- CSF – (N)
- Intellectual – (N) (exceptions – associated with FTD)

- 2 Types :
  - Familial → AD
    → SOD, gene defect
    → ORF gene defect
  - Sporadic :
    - Mitochondrial dysfunction
    - Glutamate excitotoxicity → Riluzole
    - Oxidative damage → Edararene
    - Inflammation
    - TDP43 accumulation
- C/F :
  - Combined UMN + LMN
  - Asym
  - B/L
  - 12th → Fasoculations - Tongue

Spinomuscular Atrophy (SMA)

- I → Infantile → Werdnig Hoffman's disease
  II → Childhood (early)
  III → Late childhood →Krugelberg Weilander's
  IV → Adult
- Pure LMN
- Rx
  - NUSINERSEN
  - ONASEMNOGENE (Zolgensma)
- Gene therapy → SMN1
  SMN2

Neurology - 3 - Muscle Disorders

MUSCLE DISORDERS - MYOPATHIES 00:14

Duchenne's	Becker's
• Dystrophin → ↓/Abs	• Dystrophin - Qty (N) ○ Functional defect
• X -linked R	• X - linked
• Males	• Males
• Prox > Distal	• Prox > Distal
• Gower's sign +	+
• Hypertrophy - Caff	• Hypertrophy - Caff
• Children	• Adults / Adolescents
• Unable to walk without support beyond 12yrs	• Walk without support > 15yrs
• CK ↑↑	• CK ↑↑
• Cardiomyopathy ++	• +
• IQ ↓ ±	• -

- Rx
  - Steroids
  - Eteplersin → Exon 51
- Valley's sign
  - In deltpoid muscle, only the central fibres originating from the acromion process are enlarged
  - Inferomedial part of infraspinatus muscle is enlarged

Fascio Scapulo Humeral :

- AD
- Face muscles +
- Shoulder + → Winging of scapular

- Dorsiflexors - Fott +
- No Cardiomyopathy
- Polyhill sign
- Deafness
- Coat's disease

Myotonia Dystrophica :

- AD
- MD - 1 → CTG
  MD - 2 → CCTG
- Myotonia +
- Face - muscles +
- Winging - Scapula, Dorsiflexors - Foot
  ↓
  Foot Drop
- Distal > Proximal
- Facies → Frontal Baldness
  → Hatchet Facies
- Cataract → Fit tree pattern
- Mental retardation
- Hypogonadism → Gynecomastria
- Conduction ab (N) - Heart
- Rx - MEXILITENE

Emery Dreituss :

- Upper Limbus → Prox muscles
  Lower Limbus → Distal muscles
  } Involved
- Muscles contractures
- Cardiac arrhythymias

Limb Girdle Muscular Dystrophy :

- 2 types
  - LGMD - 1 : AD
  - LGMD - 2 : AR

Becker's	LGMD
• Adolescents	• Adolescents +
• XLR	• AD / AR
• Males	• M/F
• Caff hypertrophy +++	• ±
• Prox > Distal	• Prox > Distal
• Gowers +	• +

MYOSITIS *17:03*

- Autoimmune
- Abs +
  - Anti – Jo – 1
  - Anti – Mi – 2 → Dermatomyositis (Good prognosis)
- ESR ↑
- CK ↑↑
- EOM – Spared
- Bulbar – Involved +

Polymyositis	Dermatomyositis	I.B. myositis
• P > D	• P > D ○ Skin rash + ○ Associate with malignancy +	• D ≥ P
• Patho : ○ Intramyceal ○ Endomyceal inflammation	• Perivascular • Perifassicular inflammation + Atrophy	• Vacuoles ↓ Inclusion bodies

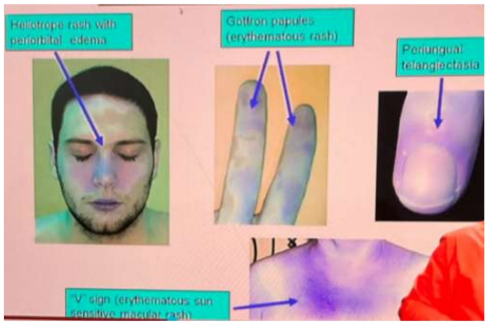
- Rx – Steroids + Immunosuppressants

DERMATOMYOSITIS *22:44*

- Heliotrope Rash → Pericorbital
- Gottran's papules → On Knuckles
- Trunk – V –sign
  - Sharel sign

- Mechanic's hands
- Periungual telegectasia
- Muscles – (N)
Skin + } D. sine myositis
- Anti – SRP :
  - Polymyositis > Dermatomyositis
  - Cardiomyopathy
- Anti – Synthetase Ab :
  - Polymyositis > Dermatomyositis
  - ILD
  - Rheumatoid Arthritis

DM – Skin Manifestations



MITOCHORNDRIAL MYOPATHY 26:37

- Maternal inheritance
- MERRF → Myoclonic epilepsy with ragged red fibres
- MELAS → Mitochondrial myopathy with LA and stroke like episodes

Kearn's Sayre Sx :

- Age < 20yrs
- CPEO
- Atypical retinitis pigmentation
- CSF → Protein ↑
- Conduction ab (N) heart
- Ataxia

PERICARDIC PARALYSIS *30:15*

- Episodes → Transient weakness
- K+ → Variation
  → PP+ → Channel defect
- CK – (N)

Hypokalemic PP	Hyperkalemic PP
• Ca channel defect • ↑ carbohydrate intake → ppt weakness • Thyrotoxicosis • K+ ↓↓ • -ve • On cold → -ve exposure	• Na channel defect • K+ – ↑/(N) • Myotonia + • Myotonia → weakness

NMJ DISORDERS : *34:18*

- Fluctuating weakness
- EOM + → Ptosis
  → Diplopia
- Bulbar → Dysphagia
  → Dysarthria
- CK – (N), Muscle Biopsy – (N)
- NCV – (N)
- EMG – Ab (N)

Myasthenia Gravis	Lambert Eaten Myasthenia Sx (LEMS)
• Post synaptic • Ab's → Ach-R → Muscle sp. Kinase → LRP – 4 • On exertion ○ ↑ weakness • Early ○ Ptosis, Dipolpia • DTR's → (N)/↓ • -ve	• Pre-synaptic • Ab's → Fast Ca channels → P/Q • On exertion ○ ↓ weakness • Early ○ Prox. Muscles ○ LL's • DTR's → Abs • Autoimmune dysfn +

Myasthenia Gravis	Lambert Eaten Myasthenia Sx (LEMS)

• EMG
  ○ RNS (Repititive N. Stimulation)
  ○ Decremental
• 75% → Thymic Ab (N)
• 65% → Thyroid hyperplasia
• 10 to 15% → Thymoma
	• Incremental
	• 50% → Small cell Ca

Botulinum toxin

- Pre-synaptic
- SNARE proteins → Affected
- Autonomic +
- IOM +
- EOM +
- Descending pattern → 1st → Bulbar → Limb muscles +

Myasthenia Gravis :

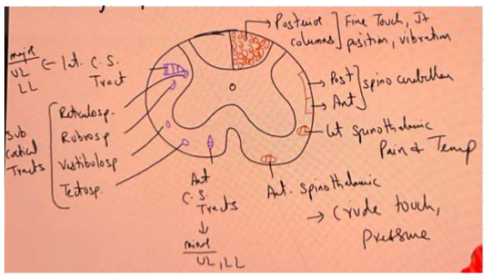
- Ocular MG (> 3yrs) → Only EOM
- Generalized
  - EOM +
  - Bulbar +
  - Hoarseness
  - UL, LL } Prox. muscles
  - Chest muscles → Myasthenia crisis
- Most sn → sf - EMG - Block + Jitter
- Most sp → Ab's → Ach R
- Ice pack test
- Edrophonium test
- Rx
  - PYRIDOSTIGMINE
  - Generalized MG

- CT - Chest → Thymectomy exceptions
  - → Age < 15yrs
  - > 50yrs
  - → Anti - musk
  - → Ocular MG
  - → FVC ↓
- Pyridostigmine
- Immunosuppressant :
  - → Steroids/Azathioprine/Rituxumab

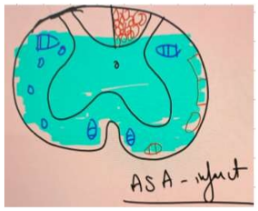
- Myasthenic crisis → Plasmapheresis
- LEMS
  - Plasmapheresis
  - 3, 4 - Diaminopyridine
  - Pyridostigmine

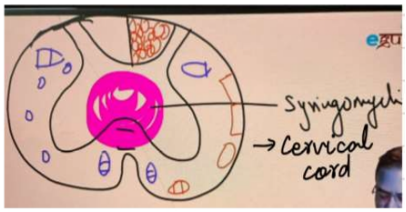
SPINAL CORD DISEASE 48:25

- Tracts of spinal cord :



- Post. Columns → Tabes Dorsalis
- C.S Tracts → UMN
  +
  Post. Columns → Proprioception loss
  - SACD
  - HIV myopathy





SYRINGOMYELIA

- Pain + temp → loss
  Touch → (N)
  } D.A

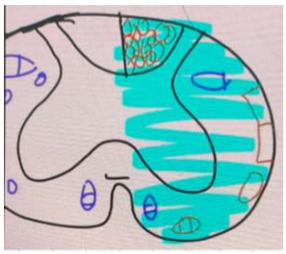
- Nape - Neck
- UL's
- Shoulders
  } Cape like distribution

Syringomyelia – chiarri :

- Herniation of cerebellum + medulla
- Type - I
- Type - II → Arnold chiarri

Brown – Sequard Sx :

I/L	C/L
• Loss of proprioception • Weakness	• Pain + Temp ↓ Loss



Conus and Canuda Equina Lesions

Cauda Equina	Conus Lesion
• Radicular pain	• Diffuse pain (functional)
• Low backache +	• Backache ±
• Asym - saddle anesthesia	• B/L saddle anesthesia
• Asym weakness +++	• Weakness + sym ±
• Knee jerk - Abs	• ±
• ±	• Bowel/Bladder ++++
• ±	• Loss of Bulbocavernous Loss of anal reflex
Intramedullary	Extramedullary
• Inside - piamater	• Outside piameter
• Diffuse pain	• Radicular pain
• Sacral spinning	• Early sacral involvement
• Later - C.S. tract → sym	• Early C.S. tract → asym
• Bowel/Bladder +++	• ±
• CDF → -ve	• CSF → Ab (N)

Neurology - 4 - Brainstem Disorders

BRAINSTEM DISORDERS

00:16

Medial

- Medial lemniscus → C/L loss - proprioception
- Medial longitudinal fasciculus → INO
- Motor pathways → C/L - weakness
- Medial CN - 3, 4, 6, 12

Lateral

- Spinocerebellar → Ataxia - I/L
- Sympathetic → Horner's - I/L
- Spinothalamic → C/L - Loss of pain + Temp
- Sensory tract of V N → I/L → Loss of sn of face

Brainstem

- Mid Brain
  - 3 - Ophthalmoplegia
  - 4 = S.O
- Pons :
  - 5 - Sensory - face
  - 6 - LR
  - 7 - Face muscles
  - 8 - Hearing
- Medulla :
  - 9 - Sn → post-ph. Wall - Gag reflex
  - 10 - Palatal muscles → Uvula
  - 11 - SCM, TZ
  - 12 - Tongue lesion → I/L - deviation

Lateral medullary syndrome / Wallenberg / PICA

- Sympathetic → I/L - Horneers
- Spinothalamic → C/L - Loss of pain + Temp
- Spinocerebellar → I/L - Ataxia
- Sn - Tract of V N → I/L - Sn - Face → Lost
- Vestibular - N → Vertigo, N, V
- N. Ambigous → Dysphagia, Dysarthria
- Vertebral A > PICA

Medial medullary syndrome

- Vertebral A > ASA
  - Motor tracts → C/L weakness
  - 12th N – palsy → I/L
  - Medial lemniscus → C/L loss of Propriception – Body

PONS *11:40*

Millard Gubler	Forilles

• Motor → C/L weakness
• 7th N – Palsy → LMN → I/L
• 6th N – Palsy – I/L (Diplopia)
	• Motor → C/L weakness
	• 7th N- Palsy → LMN → I/L
	• PPRF (Parapontine Reticular formation)
	  ○ I/L
	  ○ Gaze paralysis

MID BRAIN *14:09*

Weber's Syndrome

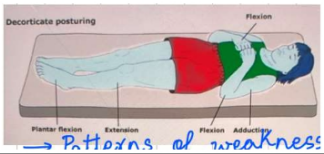
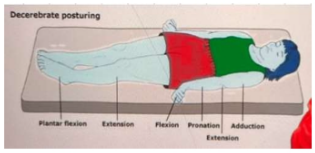
- Post – cerebral art. Infarct
- Cerebral peduncle
  Motor → C/L – weakness
- 3rd N palsy → I/L
  → I/L – Opthalmoplegia
- Subst. Nigra → C/L – Parkinsonism
- Corticobular → C/L – UMN – 7th, 12th } Palsy

Benedikt's Syndrome

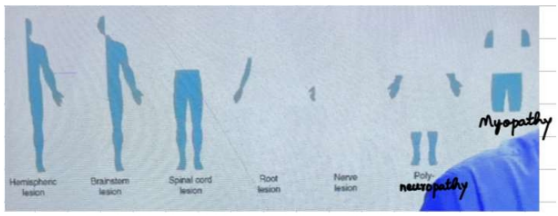
- Tegmentum lesion
  - 3rd N palsy → I/L opthalmoplegia
  - Red N → C/L → Athetosis/Tremor/Chorea
  - Medial lemniscus → C/L – Loss of proprioception

Nothnagel's

- Tegmentum → 3rd – I/L palsy
  → C/L – cerebellar ataxia
- Claude's → Benedikt's + Nothnagel's (Does not have any motor ab (N))

Decorticate	Decrebellate
Lesion → Above Red N • UL → Flexion • LL → Extension 	Lesion → Below Red N • Diffuse extension 

Patterns of Weakness



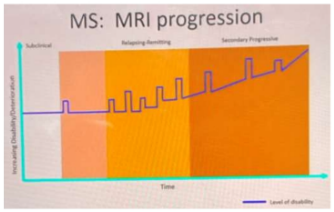
MULTIPLE SCLEROSIS 24:49

- Autoimmune
  - Triggers → Vit - D ↓
    → EBV
    → Smoking
- Pathophysiology : Inflammation
  - Macrophage, microglia, or B cell → react to myelin present it on surface → peripheral T cells activated, express adhesion molecule → Cross BBB → spread inflammatory cytokines (TNF-a, IFN-gamma)
  - CNS bystanders activated (epitope spreading)
  - CNS cells activated include : monocytes, microglia, dendrirtic cells, NK cells, B and T cells

- Microglia can release damaging NO, free radicals, proteases
- Dysfunctional regulatory T cell pathway also likely contribute

- Patho - IDG
  - Autoimmune
    ↓
    Demyelination

    Oligodendrocytes — Astrocytes
    - Remyelination — - Gliosis



- Multiple Sclerosis

  DIS — DIT

  - Multiple lesions
  - Different presentations
  - Different times

- Mc Donald's Criteria
  - DIS can be Demonstrated by ≥ 1 T2 Lesion in at leat 2 of 4 areas of CNS :
  - Periventricular
  - Juxtacortical
  - Infratentrorial
  - Spinal cord

  Based in Swamtin et al 2006, 2007
  Gadeolinium enhancement of lesions is not required for DIS
  If a subject has a brainstem or spinal cord syndrome, the symptomatic lesions are excluded from the criteria and do not contricbute to lesion count

  MRI = Magnetic reasonance imaging
  DIS = Lesion dissemination in space
  CNS = Central nervous system

- DIT can be demonstrate by :
  1. A new T2 and/or gadolinium – enhancing lesions on follow-up MRI, which reference to a baseline scan, irrespective of the timing of the baseline MRI
  2. Simutaneous presence of asymptomatic gadolinium – enhancing and nonenhancing lesions at any time

  Bases on montalban et al 2010
  MRI = Magnetic reasonance imaging
  DIT = Lesion dissemination in time

- Multiple Sclerosis :

Optic N	Periventricular	Spinal cord	Brain stem	Cerebellum
↓	↓	↓	↓	↓
Optic Neuritis	Bands of sclerosis ↓ Dawson's finger	Tr. Myelitis	• INO • 5th – Trigeminal Neuralgia • 9th – Glosso Neuralgia	• Ataxia • In – co ordination • Dysmetria • Hypotonia

- F : M = 3 : 1
- 20 – 40 yrs
- Points against MS :
  - < 15, > 60yrs } Age
  - Only post. Brain

Symptoms

Symptoms	Percentage of Cases	Symptom	Percentage of Cases
Sensory loss	37	Lhermitte	3
Optic neuritis	36	Pain	3
Weakness	35	Dementia	2
Paresthesias	24	Visual loss	2
Diplopia	15	Facial palsy	1
Ataxia	11	Impotence	1

Symptoms	Percentage of Cases	Symptom	Percentage of Cases
Vertigo	6	Myokymia	1
Paroxysmal attack	4	Epilepsy	1
Bladder	4	Falling	1

LHERMITTE'S : *35:37*

Cx Cord

- Neck → Shock like Sn → Spine
- Uthoff's → Warm → Worsen

Multiple Sclerosis	Devie's NOM Neuromyelitis optica
• Optic neurtitis → U/L	• B/L
• Tr. Myelitis +	• +
• Relatively smaller segments	• ≥ 3 segments
• ±	• Hiccups +++
• -ve	• Endocrinopathy → Hypothalamic +
• Dawnson's fingus periventrocular +	• ±
• -ve	• Ab's → Aquaperin - 4 Ab's

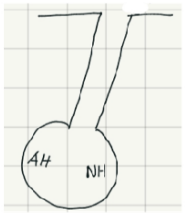
- Rx
  - Steroids
  - Vit - D

Infections	Oral
• INF - β	• Fingolimod
• Glatiranes	• Dimethyl fumerate
• Mitixantrone	• teriflunamide
• Natalizumab	

  - Ocrelizumab → Anti - CD -20
  - Alemtuzumab → Anti - CD 52
  - Natalizumab → PML - Progressive multifocal encephalopathy
  - Secondary progressive - INF - β
  - Primary progressive → OCR + INF - β

Endocrinology - 1

Pituitary :



Hypothalamus = Regulatory of pituitary
AH = Adenohypophysis
NH = Neurohypophysis

Hormones from Hypothalamus	Ant Pituitary
CRH	ACTH
TRH	TSH
GHRH	GH
GnRH	FSH, LH

- Prolactin under inhibitory control
  ↑ (-)
  Dopamine
- Hormone synthesized by hypothalamus
  ↓
  Reach NH through neurons
  ↓
  Stored and released
  ↓
  ADH, Oxytocin

ADH DISEASES *03:06*

SIADH

- Syndrome of Inappropriate ADH secretion

ADH ↑
↓
On V2 receptor
↓
Aquaporin - 2 channels
↓
H2O reabsorbed
↓

↓

Plasma Volume ↑

↓

ANP released = Natriuresis = won't let edema to form Euvolemia

- True Hyponatremia
- Euvolemic
- Urine osm > Plams osm
- UNa > 20mEq/l
- Hypouricemia
- Water loading test
  - Normal person = ADH level decreases
  - In SIADH patient = ADH remains high
- Headache
- Lethargy
- Fatigue
- Altered sensorium
- Seizures
- Coma
- Death

CAUSES *06:28*

- Tumors, Trauma
- Infections, Drugs

Causes of SIADH

Neoplastic	Pulmonary	CNS	Drugs	Other
Lung • Small cell • Mesothelioma GI • Stomach • Pancreas GU • Bladder • Prostate • Endometrium	Infection • Pneumonia • Abscess • TB • Aspergillosis Asthma Cystic Fibrosis PPV	Infection • Abscess • Meningitis • AIDS Bleed • Subdural • SAH CVA Head trauma	AVP anaglogues • Desmopressin • Oxytocin • Vasopressin	Idiopathic Hereditary (V2 receptor)

Neoplastic	Pulmonary	CNS	Drugs	Other
Thymoma Leukemia Lymphoma Sarcoma		MS, GBS Shy-Drager	Stimulate AVP release/action • SSRIs • Antiepsychotics • Ant-epileptics • NSAID's • MDMA	

Treat

- Fluid restriction
- Correction of Na
- V2 receptor blocker :
  - Conivaptan
  - Tolvaptan
- Urea = to maintain osmol
- Underlying disease treat

POLYURIA *08:48*

- Urine > 3L/d

Primary polydipsia	Diabetes Inspides
• drinking of H2O • Urine osmolality low • ↓ freq of nocturnal urine passage • Serum Na decreases • Psychiatric compulsive drinker • Water deprivation test ↓ Urine osmo increase by 50% (>50%)	• Urine osm low • ↑ freq of urine • Serum Na increases • Water deprivation test ↓ Urine osm fails to increase ↓ Remains low

Primary polydipsia	Diabetes Inspides
• Treat : Psychiatry	• Treat : DI Central → Desmopressin Nephrogenic → Thiazide

POLYURIA → Urine osm ↓ *11:36*

↓

ADH/Copeptin levels

ADH ↑ → • NDI

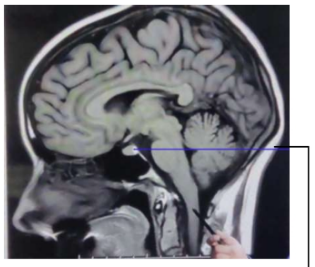
ADH ↓ → • Central DI
• 1° polypsia

↓ MRI

Bright spot on post pituitary

Present → Central DI

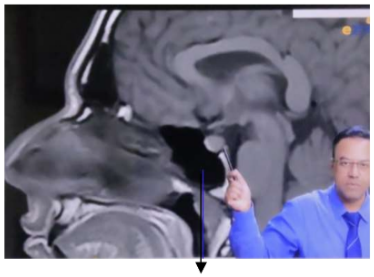
Absent → 1° polydpsia



Bright spot (+)

↓

1° Polydipsia



Bright spot absent

↓

Central DI

ANT PITUITARY *14:00*

- M/C functional adenoma = Prolactinoma

Prolactinoma

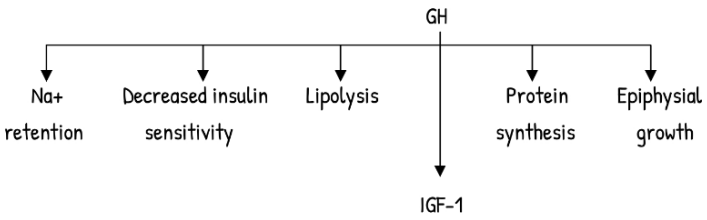
- Normal prolactin = < 30μg/L
- Causes :
  - Pregnancy
  - Hypothyroidism
  - Dopamine blockers = Metaclopramide
    Antipsychotics
- Triad in female = Amenorrhea
  Galacetorrhea
  Infertility
- Male : Impotence (Erectile dysfunction)
- Adenoma > 1cm = Macrodenoma
  < 1cm = Microadenoma
- Treat : Cabergoline
  In pregnancy : Bromocriptine

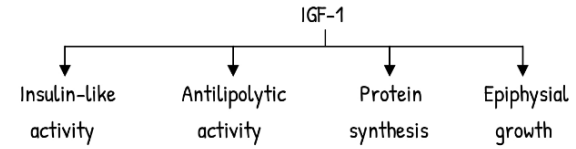
Patient with visual symptoms
↓
Caberglone
↓
Worsening symptoms → Then surgery (Trans sphenoidal resection)

GH TUMOR → ACROMEGALY 18:44

- 2nd M/C

↑ GH
↓
Liver
↓
↑ IGF-1



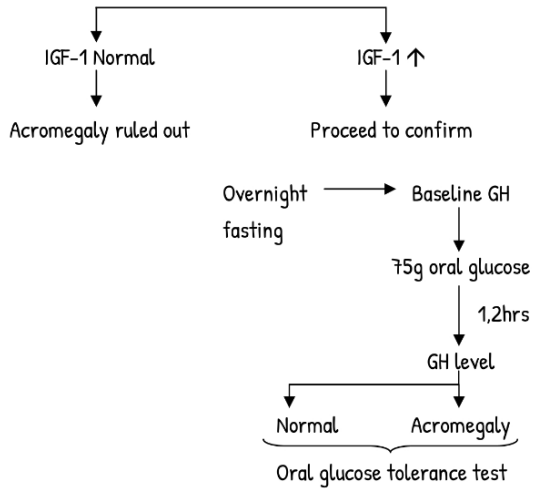


ACROMEGALY *20:22*

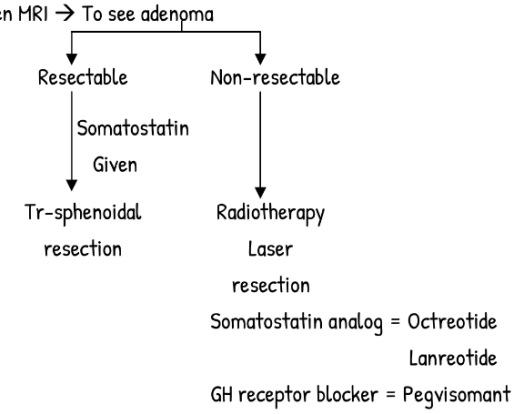
- Enlargement of hands, feet, skull, jaw
- Int organs like liver, spleen increases
- Squaring of mandible
- Macroglossia
- Pharyngeal/Laryngeal hypertrophy - Coarse deep voice
- DM
- HTN
- Cardiomegaly
- LV failure
- Arthralgia, Arthritis
- Polyps in colon
- Vertebral bodies ↑ = Spinal stenosis
- Moist doughy handshake = ↑ Sweating

DIAGNOSIS *23:22*

- Screening test = IGF-1



- Then MRI → To see adenoma

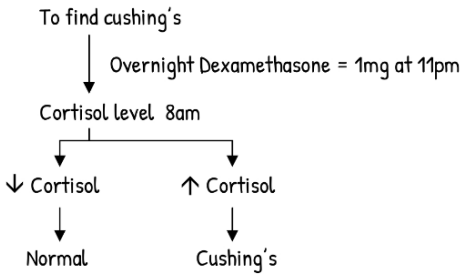


- Cabergoline
- Tamoxifen

} Also useful

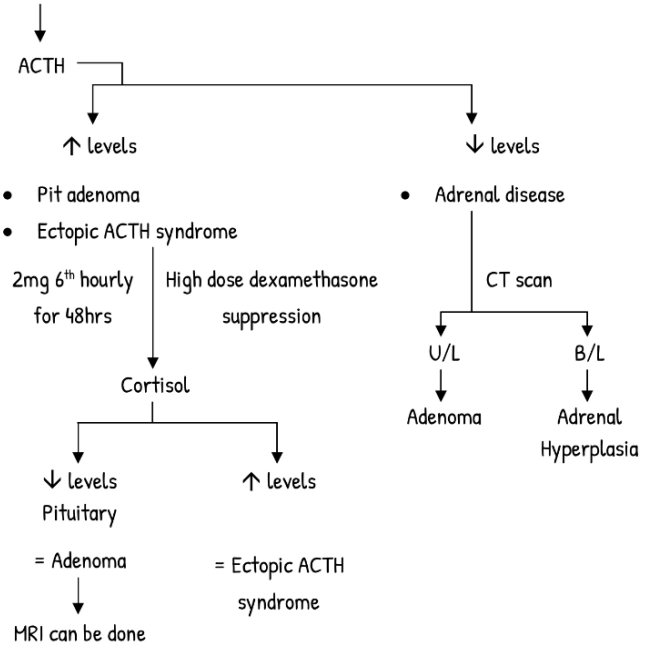
CUSHING'S SYNDROME 28:25

- Weight gain = Truncal obesity, Thin extremities
- Moon facies
- Buffalo hump
- Supraclavicular / Suprascapular fat
- Abd skin striae (>1cm)
- HTN
- Menst abnormality = Amenorrhea
- Prox myopathy
- Mental retardation
- Bruising
- Hirustism
- Flushed app on face
- Diff cushing's from pseudocushing's (Alcoholic obesity)



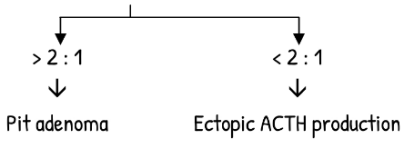
- Midnight salivary cortisol also seen
- 24hr urine cortisol

CUSHING'S *32:43*



- Petrous sinus = ACTH level
  Peripheral = ACTH level

Petrous : Peripheral ratio



MANAGEMENT OF CUSHING'S *37:40*

Medication management for treatment of cushing syndrome

Steroidogenesis inhibitors (inhibits cortisols synthesis)	Pituitary directed (inhibits ACTH secretion)	Glucocorticoid receptor antagonist (inhibits cortisol action)
Ketoconazole Metyrapone Mitotane Etomidate	Pasireotide Cabergoline	Mifespristone

HYPOPITUITARISM *38:36*

- Shechan's syndrome
  - In postpartum
  - Postpartum hemorrhage → Pit Necrosis
  - Inability to lactate
  - Amenorrhea
  - Acute presentation = 2° adrenal insufficiency
    ↓
    Shock
  - Chronic - After 9yrs
    ↓
    - Hyponatremia
    - Anemia
    - Hypoglycemia
  - MRI shows enlarged pit → Thin rim of enhancement
    ↓ Eventually
    Atrophy = Empty sella
  - Treat : Steroids
    Hormone replacement

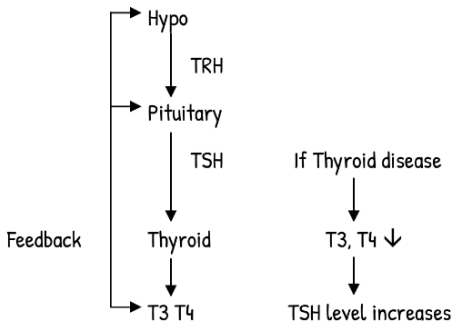
Endocrinology - 2

Thyroid

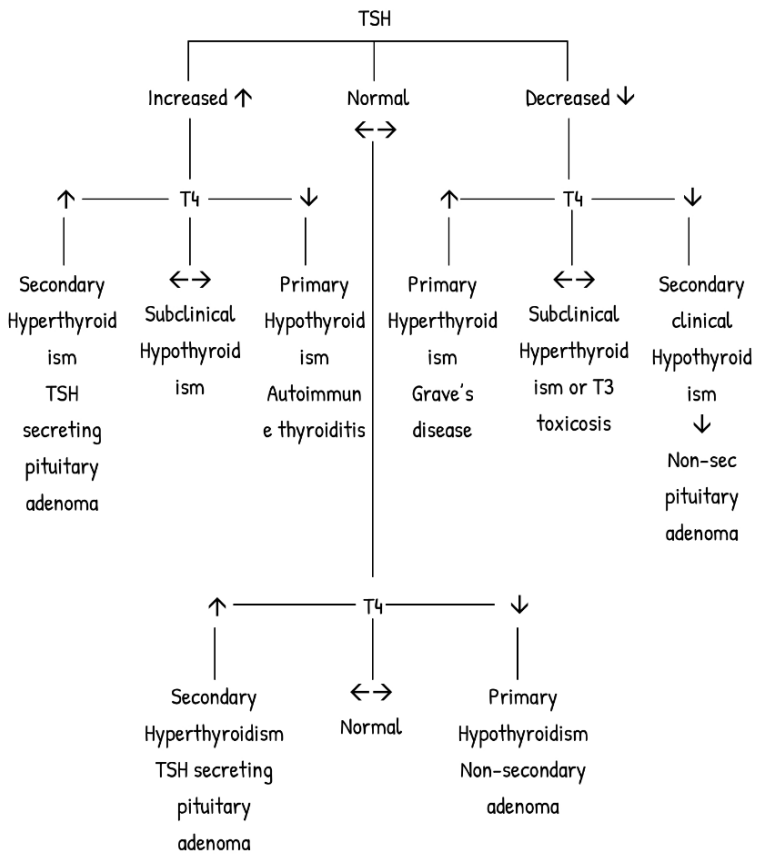
- T4, T3
- T3 active
- T4 converts to T3 periphery by deiodinase

Characteristics of Thyroid Hormones

Characteristic	Thyroxine (T4) Less potent than (T3)	Triiodothyronine (T3)
Produced from thyroid	Produced and secreted from the thyroid gland	≤ 20% of daily production is from the thyroid gland
Conversion	Precursor to T3	~ 80% Produced from peripheral conversion of T4 to T3
% Protein bound	~99.96% Protein bound	~99.5% Protein bound
Plasma	7 Days	1.5 Days
Other notes	Exogenous T4 is used most commonly for thyroid hormone replacement	Biologically more active than T



- Due to TRH, prolactin levels also increasing



HYPERTHYROIDISM / HYPOTHYROIDISM

06:55

Hyperthyroidism	Hypothyroidism
• Heat intolerance	• Cold intolerance
• Weight loss	• Weight gain
• Tremors	• Lethargy
• Anxiety	• Fatigue
• Increased sweating	• Constipation
• Proximal muscle weakness	• Prox myopathy
• Amenorrhea	• Menorrhagia
• Polyuria	• Thick coarse skin

Hyperthyroidism	Hypothyroidism
• Osteoporosis • A. Fibrillation • Hypokalemic periodic paralysis • High output cardiac failure	• Hyporthermia • Loss of outer 1/3rd of eyebrow • Hyponatremia

Radioactive Iodine Uptake (RAIU) ↑ + Thyroxicosis

- Grave's
- Toxic adenoma
- MNG (Toxic)
- Choriocarcinoma (HCG ↑)

RAIU ↓ + Thyrotoxicosis

- Subacute thyroiditis
- Post partum thyroiditis
- Thyroid hormone ingestion
- Straum ovarii

RAIU + Hypothyroidism

- Thyroiditis (Exception : Hashimoto's = Variable RAIU)

THYROIDITIS *11:33*

Hashimoto's	Subacute Dequervains	Reodle's
• Autoimmune • Anti-thyroid peroxidise Ig • Ant-TG Ig • Addison's • Vitiligo • Path : Chronic Lymphocytic thyroditis • Hurtles cells (+)	• Post viral • Fever • Sore throat • Gold • Pain Tenderness - in thyroid • Treat NSAIDs, Steroids, β-blockers, Prophylthiouracil (PTU)	• Idiopathic fibrosis • Stridor • Dysphagia • Hypothyroid only • Fibrosis in hand ↓ Dupytreu's contracture • Retroperitoneal = Ormand's disease • Penile fibrosis = Peyronius • Treat Tamoxifen

POST PARTUM THYROIDITIS *09:25*

- Autoimmune
- Ig against TG, TPO
- Silent thyroditis = No tenderness
- 20% Hypothyroid
- Transient condition = Support treatment

MYXEDEMA COMA *21:19*

Risk factors

- Female
- Elderly
- MI, Stroke, Sepsis = Triggers

Features

- TSH ↑, T3, T4 ↓
- Mental → Lethargy → Coma
- Psychosis
- Hypothermia (<94°F)
- Bradycardia
- Hypotension
- ↓ HR, Respiratory rate
- Hypoxia, ↑ CO2

Treat

- Steroids
- Thyroxine (T4) = IV
- Liothyroxine (T3) = IV → Not to be used in adults
- Adrenal function might be low = Steroids

T4

- IV = loading dose = 200-400mg
  IV T4 = 75% of oral dose
- In Hypothyroidism = > T4 = 1.6µg/kg

Grave's Disease	Toxic Adenoma
• Autoimmune • Ig against TSH receptor ↓ Thyroid stimulating IG, Long-acting thyroid stimulators ↓ Pump more I2 ↓ T4, T3 ↑ = TSH ↓ • RAIU ↑ = Homogenous uptake • GAF deposition present ↓ Retro orbital area ↓ Proptosis in Endocrine = Exophthalmos • Thyroid Acropacy • Pretibial Myxedema	• Autoimmune • Nodules formed ↓ Pumps I2 inside ↓ T4, T3 ↑ TSH ↓ • RAIU ↑ = Nodular uptake • Absent

Treat :

- Beta-blockers
- Methimazole / Carbimazole / PTU
  ↓ ↓
  Better in 2nd trimester — Better in 1st trimester
- Surgery, Radio - Iodine Ablation

THYROID STROM *31:40*

Thyroid hormones act on thyroid receptor and also sensitize catecholamine receptor
↓
Even a small increase in thyroid hormones, will pose a problem
↓
Thyroid storm

Criteria for Thyroid Storm

Thyrotoxicosis (elevated FT3 and/or FT4) is a prerequisite, and it requires various combinations of following symptoms :

- CNS manifestation (restlessness, delirium, psychosis/mental aberration, lethargy/somnolence, coma)
- Fever (38 C/100.4 F or greater)
- Tachycardia (130/min or higher)
- CHF (pulmonary edema, rales, cardiogenic shock, or NYHA class IV)
- GI/Hepatic manifestation
  (Nausea, vomiting, diarrhea, total bilirubin 3mg/dl or more)

Definite Thyroid Storm – Thyrotoxicosis (elevated FT3 and/or FT4) plus – At least one CNS manifestation plus one or more other symptoms (fever, tachycardia, CHF, GI/Hepatic) "OR" A combination of at least three features among fever, GI/Hepatic, CHF, or tachycardia

Suggested Thyroid Strom – A combination of at least two features among tachycardia, CHF, GI/Hepatic, Fever "OR" A patient with thyroid disease, presence of goiter and exophthalmos who criteria for TS1 but TFTs not available

Treat : β-blockers
PTU
Steroids
I2 (If C/I = Potassium perchlorate)

- Do not use aspirin (↑ T3)
- Do not do USG, RAIU
- Don't use I2 before PTU

  PTU → I2 ✓

Wolf-Chiakoff	Jod Basedow's
I2 too much ↓ Thyroid hormones ↓↓ (T3, T4)	I2 given too much ↓ Thyroid hormone ↑↑ (T3, T4)

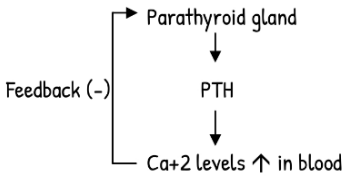
SICK EUTHYROID SYNDROME *37:23*

- Problem in peripheral conversion of T4, T3
- TSH levels are normal

	T3	T4	TSH
Mild	↓	Normal	N
Moderate	↓	↑/N	↓
Severe	↓	↓	↓

- Treat : Even hypothyroid, should not use thyroid hormones

PARATHYROID *40:19*



Parathromone

- ↑ Ca
- ↓ PO4
- ↑ Alk phosphatise
- Normal Ca = 9-10.5mg/dL
- Normal PO4 = 2.5-4.5mg/dL

	Ca	PO4	PTH	Alk phosphatase
Hyperparathyroid (parathyroid adenoma > Parathyroid hyperplasia)	↑	↓	↑	↑
Hypoparathyroid	↓	↑	↓	↓/Normal
Rickets/Osteomalacia	↓/N	↓	↑	↑/N
Sarcoidosis Granuloma ↓ Vit D ↑	↑	↑	↓	-
Malignancy = Lung, Renal, Breast Ca ↓ ↑ PTH related peptide ↓ Stimulates gland	↑	↓	↓	↑

	Ca	PO4	PTH	Alk phosphatase
Osteoporosis	N	N	N	N
Multiple mycloma ↓ Plasma cells produce osteoclast activating factors	↑	↑/N	↓	N
Pseudo hypoparathyroid	↓	↑	↑	↓/N
Pseudo pseudo hypothyroid ↓ Problem not in gland, in bone	N	N	N	N
Familial Hypo Calciuric hypercalcemia ↓ Defect in calcium sensitizing receptor (Urine (a++ ↓)) ↓ • No renal stones • AD = Family history • < 30yrs	↑/N	↓/N	↑	↑

Note :

Both pseudo and pseudo pseudo hypoparathyroid features of Albrights ostedystrophy

- Short metacarpals = 4th, 5th
- Short metatassals = 4th, 5th
- Short stature
- Round facies

HYPERPARATHYROID *51:53*

- Parathyroid Adenoma
- Lab = ↑ Serum Ca
- Symptoms
  - Renal stones
  - Peptic ulcer disease
  - Behavioural abnormality
  - ↑ Ca = deposit in cornea
  - Osteitis fibrosa cystic

- Sub periosteal resorption = Middle phalanges
  Long bones
- Skull = Salt and pepper appearance

Guidelines for Surgery in Asymptomatic Primary Hyperparathyroidism

Parameter	Guideline
Serum Calcium (above normal)	> 1mg/dL
Renal	Creatinine clearance <60mL/min 24-h urine for calcium >400mg/d and increased stone risk by biochemical stone risk analysis Presence of nephrolihiasis or nephrocalcinosis by X-ray, ultrasound, or CT
Skeletal	BMD by DXA : T-score <2.5 at lumbar spine, tital hip, femoral neck, or distal 1/3 radius Vertebral fracture by X-ray, CT, MRI or
Age	< 50

Hypoparathyroid

- Infiltrating disease in para gland
- Post surgery
- Low Mg

HYPERCALCEMIC CRISIS *53:28*

- Ca ↑↑
- Polyuria
- Dehyration = Give IV fluids → Then start diuretic after volume stabilized
  ↓ ↓
  Present as renal failure Diuretic to excrete Ca++ out

Therapies for severe Hypercalcemia

Treatment	Onset of Action	Duration of Action	Advantages	Disadvantages
Most Useful Therapies				
Hydration with normal saline	Hours	During infusion	Rehydration invariably needed	Volume overload

Treatment	Onset of Action	Duration of Action	Advantages	Disadvantages
Forced dieresis : Normal saline plus loop diuretic	Hours	During treatment	Rapid action	Volume overload, cardiac decomposition intensive monitoring, electrolyte disturbance, inconvenience
Pamidronate	1-2 days	10-14 days to weeks	High potency, intermediate onset of action	Fever 20% hypophosphatemia, hypocalcemia, hypomagnesemia, rarely jaw necrosis, atypical temporal fracture
Zoiendronate	1-2 days	> 3 weeks	Same as for pamidronate (lasts longer)	Same as pamidronate above
Denosumab	1-2 days	> 3 weeks	Strongest antresorptive	Occasional severe hypocalcemia, rarely jaw necrosis, skin infections, atypical femoral fracture
Special Use Therapies				
Calcitonin	Hours	1-2 days	Rapid onset of action; useful as adjunct in severe hypercalcemia	Rapid tachyphytaxis
Phosphate oral	24hr	During use	Chronic management (with hypophosphatemal) low toxicity if P<4mg/dL	Limited use except as adjuvant or chronic therapy

Treatment	Onset of Action	Duration of Action	Advantages	Disadvantages
Glucocorticoids	Days	Days, Weeks	Oral therapy, antitumor agent	Active only in certain malignancies, vitamin excess and sarcoidosis, glucocorticoids
Dialysis	Hours	During use and 24-48 h afterward	Useful in renal failure, onset of effect in hours can immediately hypercalcemia	Complex procedure, reserved circumstance

Endocrinology - 3

Adrenal insufficiency

Primary Adrenal insufficiency - Addison's

Addison's disease	2° adrenal insufficiency
• Disease in adrenal	• Disease above adrenal Ie Hypothalamus (or) pituitary
• Serum Cortisol ↓ Aldosterone ↓ Androgen ↓	• Serum cortisol ↓ • Serum Aldosterone Normal • Serum Androgen Normal
• ACTH levels increases • Pigmentation (+)	• ACTH level decreases • Pigmentation (-)

Causes of Addison

- Autoimmune (M/C in world)
- TB (M/C in India)

PGA – Poly glandular Autoimmun syndrome

PGA-1	PGA-2
• Hypoparathyroid • Chronic mucocutaneous candidiasis • Lymphomas • Other autoimmune	• Hypo/Hyperthyroid • Vitiligo • Premature ovarian failure • Type - I DM • Pernicious anemia

ADRENAL INFECTIONS *06:30*

- TB
- CMV
- HIV
- Crypticoccosis
- Histoplasmosis
- Cocidiodomycosis

Adr - infiltrating disease

- Metastasis
- Lymphoma
- Sarcoidosis
- Hemochromatosis

ADR - HEMORRHAGE *07:55*

- Meningococal sepsis (Waterhouse Freidrichsen)
- Drugs = Antocoagulants

Addison's Disease

Acute	Chronic
• Adr crisis • Acute abd = Nausea, Vomiting, Abd pain • Postural hypotension = Shock • Fever • Stupor - Coma	• Fatigue • Hyper pigmentation (1°) • Hyponatremia • Hyperkalemia • Met acidosis

Confirmation

- Short synacten test

  Inj : ACTH
  ↓
  Cortisol measured
  ↓
  If cortisol < 16mg/dL = 1° Adr insufficiency

Adr Crisis

- IV - fluids
- IV hydrocortisone

  100mg
  ↓
  200mg in next 24hrs

- Mineralocorticoid later

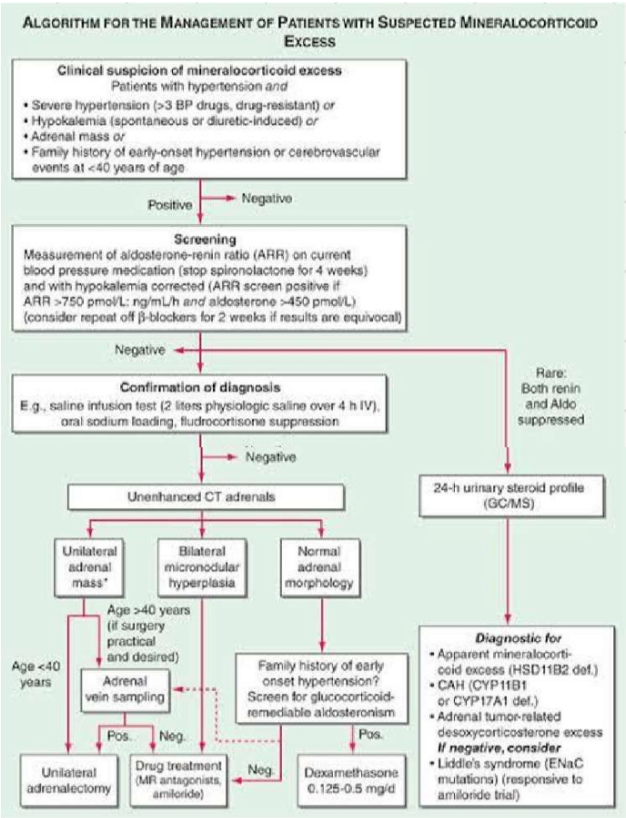
Chronic Adr Insufficiency

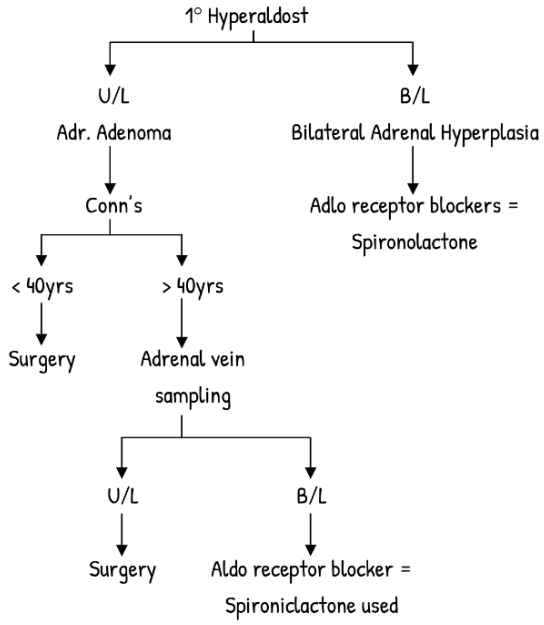
- Hydrocortisone
- Mineeralocorticoid → Fludrocortisone given

PRIMARY HYPERALDOSTERONISM *15:25*

- Aldost ↑
- Na+ ↑/ Normal → ANP → Na + H2O decreases
- Hypokalemia
- Met. Alkalosis
- HTN
- Rennin ↓

If $\frac{Aldost}{Rennin}$ > 20 → Hyperaldosteronism





PHENOCHROMACYTOMA *22:35*

- Tumor = Catecholamines (NE > Epinephrine)

Features

Triad

- Headache
- Palpitations
- Sweating

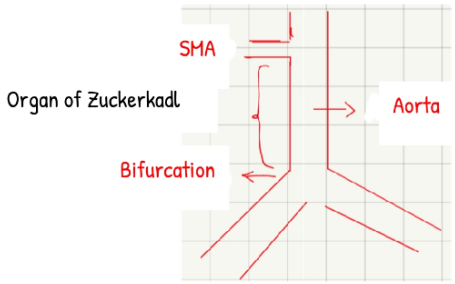
Clinical Features associated with Pheochromocyt listed by frequency of occurrence

1. Headache
2. Profuse sweating
3. Palpitations and Tachycarida
4. Hypertension, Sustained or Paroxysmal
5. Anxiety and Panic attacks
6. Pallor
7. Nausea

8. Abdominal Pain
9. Weakness
10. Weight loss
11. Paradoxial response to antihypertensive drugs
12. Polyruia and Polydipsia
13. Constipation
14. Orthostatic hypotension
15. Dilated cardiomyopatyy
16. Erythrocytosis
17. Elevated blood surgar
18. Hypercalcemia

Other Organs Affected

- Extra adrenal = Organ of Zuckeerkandl

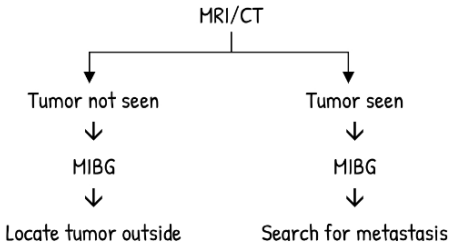


Investi

- 24 hr urine = Fractional metanephrines + Catecholamines
- Plasma = Free metanephrines + Catecholamines

MRI/CT

26:00



- Most accurate = DOPA – PET
  PET – CT

Treat

- Beta blockers contrainidicated
- α-blockers

Phenoxybenzamine
↓ Phentolamine
↓ Prazosin
α-blockade
↓
Beta-blocker
↓
Then surgery

MULTIPLE ENDOCRINE NEOPLASIA 29:22

Multiple Endocrine Neoplasia (Men) Syndrome

Type (Chromosomal Location)	Tumos (Estimated peneterance)	Gene and Most frequently mutation codons
MEN 1 (11 q 13)	Parathyroid adenoma (90%) Enteropacreatic tumor (30-70%) • Gastrinoma (> 50%) • Insulinoma (10-30%) • Nonfunctioning and PPoma (20-55%) • Glucagonoma (<3%) • VIPoma (<1%) Pituitary adenoma (15-50%) • Prolactinoma (60%) • Somatotropinoma (25%) • Corticotropinoma (<5%) • Nonfunctioning (<5%)	MEN 1 83-84, 4-bp del (≈ 4%) 119, 3-bp del(≈3%) 209-211, 4-bp del (≈8%) 418. 3-bp del (≈4%) 514-516, del or ins (≈7%) Intron 4ss (≈10%)

Type (Chromosomal Location)	Tumos (Estimated peneterance)	Gene and Most frequently mutation codons
	Associated tumors • Adrenal cortical tumor (20-70%) • Phenochromocytoma (<1%) • Bromchopulmonary NET (2%) • Gastric NET (10%) • Lipomas (>33%) • Angiofibromas (85%) • Collagenomas (70%) • Meningiomas (8%)	
MEN 2 (10 cen-10q 11.2) MEN 2A MTC only MEN 2B (also known as MEN 3) MEN 4 (12p 13)	 MTC(90%) Phenochromocytoma (>50%) Parathyroid adenoma (10-25%) MTC (100%) MTC (>90%) Phenochromocytoma (>50%) Associated abnormalities (40-50%) • Mucosal neuroma • Marfanoid habitus • Medullated corneal nerve fibers • Megacolon Parathyroid adenoma Pituitary adenoma Reproductive organ tumors (eg : Testing caner, neuroendocrine cervical carcinoma) Adrenal + Renal tumors	

ZOLLINER - ELLISON'S SYNDROME *32:30*

- Gastrin ↑ = Acid production ↑ = Stomach
- Next most common location of gastrinoma = Duo
  = Pancreas

Diagnosis

- Stomach pH < 2
- Gastrin > 1000pg/mL

INSULINOMA *33:25*

In Pancreas

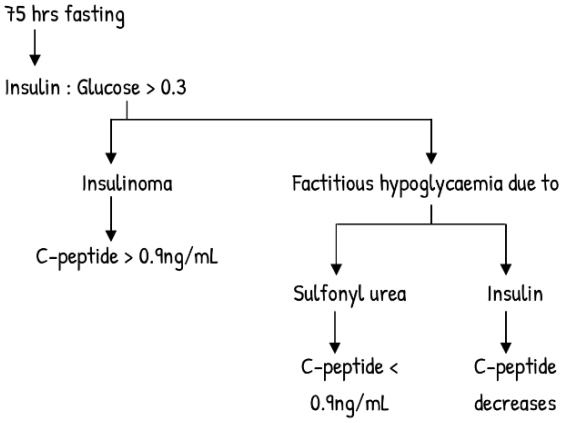
- Head = 33%
  Body = 33%
  Tail = 33%
- Episodes of Hypoglycemia

Whipple's Triad

- Hypoglycemic symp
- Symp decreases on glucose ingestion
- B, sugar < 50

INVESTIG *34:59*

- 75 hrs fasting



Investig

- To localize = Endoscopic USG
  ↓
  Surgery

Treat : Diazoxide

VIPoma / Verner Morcism / WDHA syndrome

- VIP
- Localization in Pancreas
- Water Diarrhea
- Hypokalemia
- Hypochlorhydria

Glucagonoma

- ↑ Glucagon
- Skin → Rash → Necrolytic erythema migrans
- Weight loss
- Glucose intolerance

Somatostatinoma

- ↑ somatostatin
- Triad
- DM
- Cholelithiasis
- Diarrhea

Endocrinology - 4

Diabetes

- Fasting glucose ≥ 126mg/dL
- Postprandial glucose ≥200mg/dL
- Random glucose > 200mg/dL + Symp = Polyuria
  Polydypsia
  Polyphagia
  Paresthesis
- HbAIC ≥ 6.5

Pre-diabetes

- Fasting plasma glucose = 100 - 125mg/dL
  ↓
  Impaired fasting glucose
- Post prandial glucose = 140 - 199 mg/dL
  ↓
  Impaired glucose tolerance
- HbAIC = 5.7 - 6.4

METABOLIC SYNDROME *02:25*

		American	Indian
• Abd girth	Male :	≥ 102cm	90cm
	Females :	≥ 88cm	80cm

- Triglycerides ≥ 150mg/dL
- HDL ≤ 50mg/dL = Males
  ≥ 40mg/dL = Females
- BP ≥ 130/85 mmHg
- Fasting glucose ≥ 100mg/dL

Type - I DM	Type - II DM

• Usually < 25yrs
• Autoimmune
• Weight loss ↓
	• Usually > 45yrs
	• Peripheral insulin resistance
	• Insulin resistance phenotype
	  ○ Obesity
	  ○ Dyslipedmia
	  ○ HTN

<table>
<tr><th>Type - I DM</th><th>Type - II DM</th></tr>
<tr><td>

- Antibodies present

Diagnosis sensitivity and specific of autoimmune markers in patient with newly diagnosed type 1 diabetes mellitus

<table>
<tr><th></th><th>Sensitivity</th><th>Specificity</th></tr>
<tr><td>ICA antibody</td><td>44-100%</td><td>96%</td></tr>
<tr><td>Gluatmic acid decarbxylase (GAD65)</td><td>70-90%</td><td>99%</td></tr>
<tr><td>Insulin (IAA)</td><td>40-70%</td><td>99%</td></tr>
<tr><td>Tyrosine phosphatise (IA-2)</td><td>50-70%</td><td>99%</td></tr>
<tr><td>Zinc transporter 8 (ZnT8)</td><td>50-70%</td><td>99%</td></tr>
</table>

- Familial history (+) or (-)
- HLA - DR3, DR4

</td><td>

- Antibodies absent

- Familial history (+) (+) (+)
- Absent

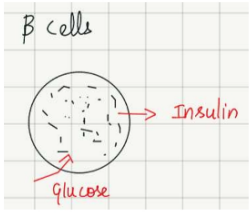
</td></tr>
</table>

MATURITY AND DIABETES IN YOUNG *07:03*

- Age < 25yrs
- AD = 3 generations +

Types :

Type - I → HNF - 4α
Type - II → Glucokinase
Type - III → HNF - 1α
Type - IV → IPF (Insulin promoting factor -1)
Type - V → HNF - 1B
Type - VI → ND - 1 (Neurogenic Diffrentation - 1)
Type - VII → KF - 1 (Kruppel like factor - 1)



- In MODY, there is defect in taking glucose inside cell = so by feedback insulin is not released

Treatment

Sulfonyl urea (Low dose)
↓
Act in K+ channels
↓
Cause release of insulin

COMPLICATION OF DM

10:33

Micro-vascular	Macrovascular	Non-vascular
• Retinopathy • Neuropathy • Nephropathy	• IHD • Stroke • PVd	• Glaucoma • Cataract • Skin lesions • Gastroparesis • Infections

Targets

- HbAIC ≤ 7.0
- Pre - pradial < 130
- Post - prandial < 180

Treat

- Metformin = Associated with lactic acidosis
  ↓
  Metformin = Stop if Creatinine = 1.4 Female
  Creatinine = 1.5 Male
- Decrease metformin if creatinine clearance - 45mL/min
  Stop, metformin if creatinine clearance - 30mL/min
- Sulfonyl urea = Problem is Hypoglycemia, Weight gain

- TZD's

  Pioglitazone = Prevents stroke
  = Worsen HF
  = Weight ↑
  = Dyslipidemia
  = Bladder Ca

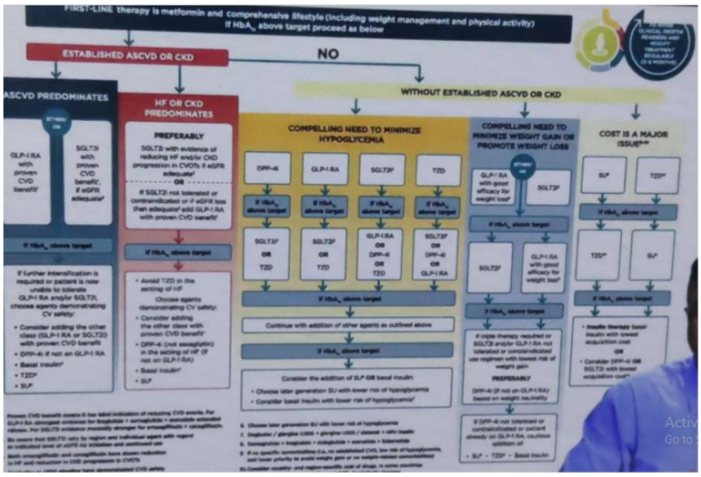
  Stop this if it is grade - 3,4 cardiac failure

- SGLT - 2 inhibitors

  Dapaglifoxin
  Empaglifoxin
  Canaglifoxin
  ↓
  ↑ Risk of amputation

  ↑ UTI
  Causes dehydration = Tale plenty of fluid

- Causes weight loss, Cardioprotective



INSULINS

20:56

Basal Insulin	Duration of action
• NPH	12hr
• Glargine = Acidic	24hrs
• Detemir	
• Degludec	42hrs

Peakless

Prandial insulin (Regular insulin = 30-45 mins to act)

- Peak
- Faster action (within 0-15mins)
- Lys - Pro
- Aspart
- Glu-lisine

Dawn's Phenomenon	Somogyi Phenomenon
• FBS ↑ • Night dose insulin inadequate ↓ So FBS ↑ • ↑ Night insulin	• FBS ↑ • Night dose insulin excess ↓ Hypoglycemia ↓ counter regulatory FBS ↑ • ↓ Night insulin

Condition	Goal or indication	Treatment
Hypertension	BP goal < 140/90mmHg (JNC 8) ; < 140/80mmHg (ADA) ; consider < 130/80mmHg for nephropathy or some young patients (ADA)	Any first-line drug (JNC-8) ACE inhibitor or ARB (ADA)
Diabetes and average cardiovascular risk	Age > 40 years, diabetes, and a 10year ASCVD risk < 7.5%	Moderate intensity stain
Diabetes and increased cardiovascular risk	CAD, peripheral vascular diseases or ASCVD rick ≥ 7.5%	High intensity or ARB BP < 130/80 (ADA)
Diabeteic retinopathy	Proliferative and non proliferative retinopathy	Excellent blood glucose and BP control and smoking cessation Panretinal laser photocoagulation for PDR and severe NPDR Intraocular injections of bevacizumab or ranibizumab for severe NPDE and PDR or macular edema

Condition	Goal or indication	Treatment
Diabetic peripheral neuropathy	Numbness, tingling, burning, heaviness, pain or sensitivity in stocking - glove distribution	Amitriptyline, venlafaxine, duolxetine, paroxetine, pregabalin, gabapentim, valproate, or capsaicin cream
Sexual dysfunction	Erectile dysfunction	Oral phosphodiesterase inhibitor (sildenafil, vardenafil, tadalafil)
Gastroparesis	Early satiey, nausea and vomiting	Small feedings, metoclopramide or erythromycin
Diabetic foot	Ulcer or osteomyelitis	See infectious disease, foot infections

	DKA	HHS
Blood glucose	> 250mg/dL (>14Ommol/L)	> 600mg/dL (>40mmol/L)
PH	< 7.3	> 7.3
HCO3	< 15	> 15
Serum osmolality	Varies	> 315
Urine ketones	+++	Small or none
Water deficit	4-6 L	8-12 L
Anion gap	> 12	No changes
Demographics	Mostly type I DM Young people and children	Mostly type II Elderly mentally or physically impaired
Insulin activity	Absent	Insulin resistance
Mortality rate	5%	20%-60%

Management of Diabetic Ketoacidosis

1. Confirm diagnosis (↑ plasma glucose, positive serum ketones, metabolic acidosis)
2. Admit to hospital; intensive care setting may be necessary for frequaent monitoring or of pH < 7.00 or unconscious
3. Assess :
   Serum electrolyte (K+, Na+, Mg2+, Cl-, bicarbonate, phosphate)
   Acid base status - pH, HCO3, PC2, β-hydroxybutyrate
4. Replace fluids : 2-3L of 0.9% of saline over first 1-3h (10-20mL/kg per hour) ; subsequently, 0.45% saline at 250-500mL/h when plasma glucose reaches 250mg/dL (13.9mmol/L)

5. Administer short-acting insulin : IV (0.1 units/kg) then 0.1 units/kg per hour by continuous IV infusion ; increase two- to threefold if no response by 2-4h, if the initial serum potassium is < 3.3mmol/L (3.3meq/L), do not administer insulin until the potassium is corrected
6. Assess patient : What precipitated the episode (non compliance, infection, trauma, pregnancy, infarction, cocaine) initiate appropriate workup precipitating event (cultures, CXR, ECG)
7. Measure capillary glucose every 1-2h; measure electrolyte (especially K+, bicarbonate, phosphate) and anion gap every 4h for first 24h
8. Monitor blood pressure, pulse, respirations, mental status, fluid intake and output every 1-4h
9. Replace K+ : 10meq/h when plasma K+ < 5.0-5.2meq/L (or 20-30meq of infusion fluid) ECG normal, urine flow and normal creatine documented; administered 40-80meq/h serum potassium is > 1.2mmol/L (5.2meq/L), do not supplement K+ until the potassium is corrected
10. See text about bicarbonate or phosphate supplementation
11. Continue above until patient is stable, glucose goal is 8.3-13.9 mm (150-250mg/dL) and acidosis is resolved. Insulin infusion may be decreased to 0.05 - 0.1 units/kg per hour
12. Administer long-acting insulin as soon as patient is eating 2-4 hour overlap in insulin infusion and SC insulin injection

Nephrology - 1

Urine Analysis

Proteinuria | Hematuria

- Proteinuria = upto 150mg/d = Normal
- Albuminuria - upto 30mg/d = Normal

If Albumin = 30 - 300mg/d = Microalbuminuria
= > 300mg/d = Macroalbuminuria

Spot Albumin : Creat Ratio

- If 30 - 300mg alb / g creat = Microalb
- If > 300mg alb / g creat = Macroalbum

Dipstick

- Cannot detect gamma globulin (γ)

If urine protein > 3.5g/d → Nephrotic
Albumin > 2.2g/d → Nephrotic

Hematuria

- Microscopy = > 2 RBC per field

Urine dipstick +ve blood → Do microscopy
If RBC not seen
Centrifugation of urine not done → RBC collect our at bottom
With clear supernatant

- If non - clear supernatant (whole pink/red), and dipstick (+) blood
  - Hemoglobinuria
  - Myoglobinuria
  - Lysed RBC's

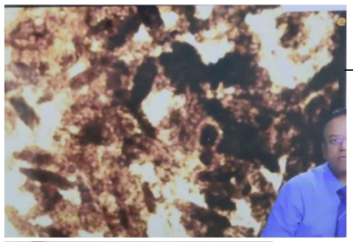
- If red supernatant, Dipstcik (-) blood
  - Porphyria
  - Beetroot ingestion
  - Phezaopyridine

RBC IN MICROSCOPY *08:41*

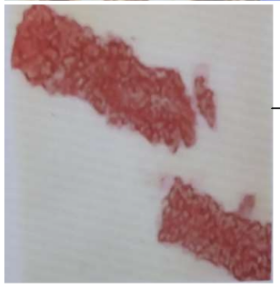
Isomorphic RBC	Lysomorphic/Acanthocytes/RBC casts
↓	RBC
Problem below level of nephrons	↓
↓	Problem in glomeruli
At collecting tubule, pelvis of kidney etc	↓
	Acanthocytes = Mickey mouse app

Casts

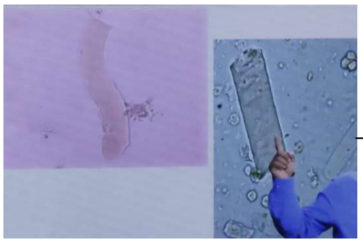
- WBC = Pyelonephritis, Interstitial nephritis
- RBC = Glomerulo nephritis
- Broad waxy = CRF
- Muddy brown / Granulan / Pigmenrt epithelium = ATN
- Hyaline casts = Even in Normal



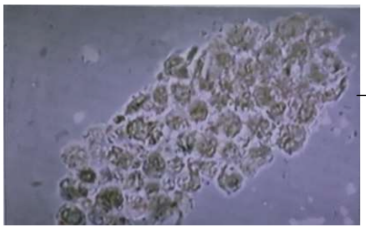
→ Muddy brown casts



→ RBC casts



→ Broad waxy casts in renal failure



→ WBC casts

11:54

THIN BASEMENT MEMB DISEASE	ALPORTS DISEASE

• α3, α4 defects
• Hematuria (+) Loin pain
• Autosomal inheritance
• Ocular symp absent
• Deafness absent
	• α3, α4, α5 of type IV collagen affected
	• Hematuria (+) Proteinuria (+)
	• Heriditary nephritis
	• Ocular symp.
	  ○ Ant lenticonus
	  ○ Keratoconus
	  ○ Megalocornea
	  ○ Retinal defects
	• Deafness

GLOMERULAR DISEASE

14:55

Nephrotic Syn	Nephritic Syn
• Proteinuria > 3.5g/d • Hematuria (+) (or) (-) • Fatty casts • Lipidemia (+) • HTN in focal segmental glomerular sclerosis (FSGS)	• Proteinuria < 3.0g/d • Hematuria (+) • RBC casts • Lipids (+) (or) (-) • HTN (+) (+) (+)

Nephrotic Syn	Nephritic Syn
• Ig ↓ → Infections ↓ Pneumococcus	• (+) or (-)
• Anti thrombin III, Protein-C also lost ↓ ↑ Thrombosis	• Rare here -
• Minimal changes disease • FSGS • Membranous glomerular dis • DM • Amyloidosis • MPGN	• PSGN • IgA Nephropathy • ANCA (+) GN • Anti GBm • Good posture disease • MPGN

MINIMAL CHANGE DISEASE *18:51*

- Idiopathic
- M/C in children
- In allergy, Insect bite
- In Hodgkin lymphoma
- Also known as NIL = Normal in light microscopy
- In electron microscope = Resorption of pericytes
- Immunofluorescence = Normal

MEMBRANOUS NEPHROPATHY *19:42*

- Idiopathic → MPGN → Mesangioprolf
- Infections with HBV, Malaria, Syphilis, Leprosy, Flariasis, schistosomiasis
- Carcinomas → Lung, GIT
- Autoimmune → RA, SLE
- Drugs → Probenecid
  Penicillamine
  NSAID

Path

- Thick BM
- Sub epitheli deposists
- Epimemb spikes

1/3 of people = Spont remission
1/3 of people = Stable renal disease
1/3 or people = End stage renal disease

- Antibodies to M type phospholipase - A2

Treat

- ACE inhibitors
- ARB's
- Diuretics
- Statins
- Anticoagulant
- Steroids + Alkylating agents
  - Calcineurin inhibitors
  - Rituxumab
  - Mycophenolate

FOCAL SEGMENTAL GLOMERULO SCLEROSIS (FSGN) *25:09*

Classification of Focal segmental Glomerulosclerosis
Primary (idiopathic) Focal segmental Glomerulosclerosis (FSGS)
FSGS not otherwise specified (NOS)
Glomerular tip lesion variant of FSGS
Collapsing variant of FSGs
Perihilar variant of FSGS
Cellular variant of FSGS
Secondary FSGS
With human immunodeficiency virus disease
With intravenous drug absue
With other drug (eg : Pamidronate, interferon, anabolic steroids)
With identified genetic abnormalities (eg : In podocin, alpha - actinin-4, TRPC6)
With glomerulomegaly :
○ Morbid obesity
○ Sickle cell disease
○ Cyanotic congenital heart disease
○ Hypotoxic pulmonary disease
○ Oligomeganephronia

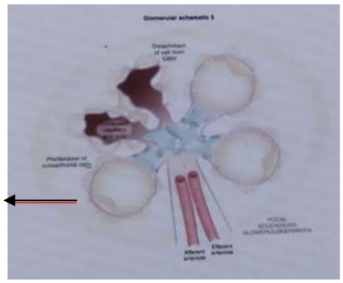
With reduced nephron numbers :

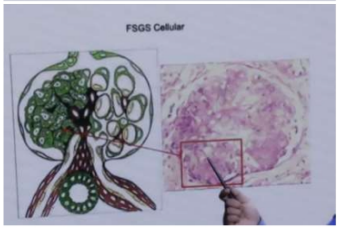
- Unilateral renal agenesis
- Oligomeganephronia
- Reflux – interstitial nephritis
- Post focal cortical necrosis
- Post nephrectomy

- HIV
- VUR
- HTN, Obesity
- Sickle cell

	Primary FSGS	Secondary FSGS
Onset	Sudden	Insidious onset
Proteinuria	Nephrotic range (>3.5g/day)	Typically non – nephritic range
Serum albumin	Hypoalbuminemia (>3.5g/dL)	Normal to low – normal levels
Foot process Effacement	Diffuse and typically > 80%	Focal
Treatment	Immunosuppression RAAS blockade	RAAS blockade ; Focus on underlying etiolgy

Visceral proliferation of cells
↓
FSGS



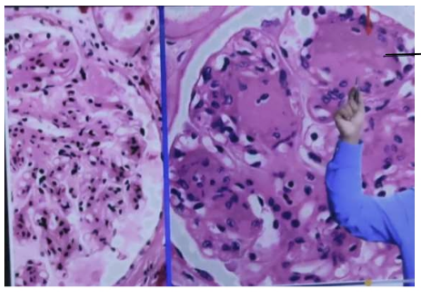


DM NEPHROPATHY *29:39*

- Grade 1 = hyperfiltration
  Grade 2 = Micro - albuminuria
  Grade 3 = Macro albuminuria
  ↓
  End stage disease

Path

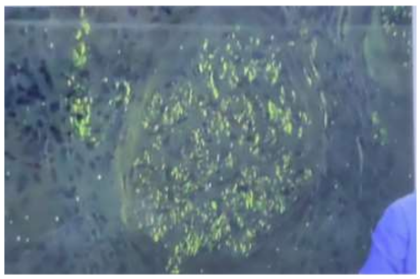
- Kimmelsteel Wilson nodule
- Diffuse glomerulo sclerosis



→ Hypalonous material

AMYLOIDOSIS *31:24*

- Abd fat biopsy
  ↓
  Then renal (visceral) biopsty
  ↓ Congo red
  Apple green bifringence on polarised microscope



NEPHRITIS *32:31*

PSGN	IgA Nephropathy
• Starts with pharyngitis (streptor) ↓ 7-21 days Hematuria • Pyoderma impetigo (streptococc) ↓ > 1 month Hematuria • C3 levels decreases, C4 = Normal • HSP -ve Path • Light micro : ○ Acute diffuse prolif GN • Electron micro : ○ Sub epithelial deposits ○ Epithelial humps • Immunifluores : ○ Lump Bumpy ○ Starry sky	• Pharyngitis ↓ ≤ 2 days Hematuria (Syn pharygitis) • C3 = Normal • Diarrhea → Hematuria • HSP +ve Path • Mesangial proliferation GN • Immunofluores : IgA ↓ Fluffy deposits

ANCA (+) GN *37:53*

- Pauci immune GN
- C3 levels normal
- C- ANCA → Wegners (GPA)
  P-ANCA → MPA
  Churgg Strauss (EGPA)
- Focal necrotizing nephropathy → Glomerulonephritis → Crescentric

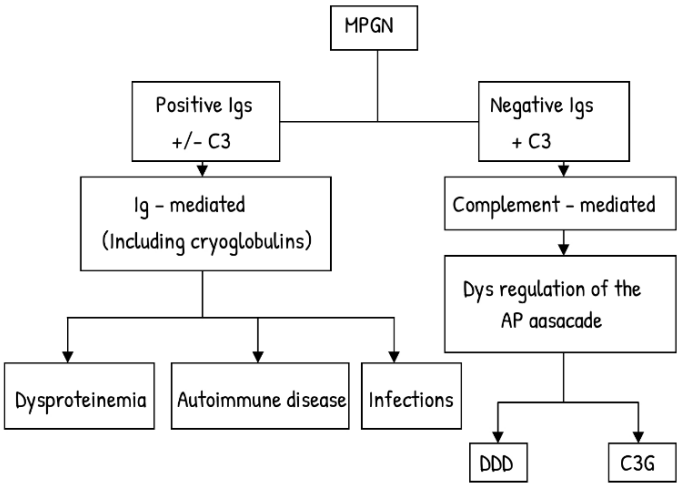
ANTI-GBM DISEASE/GOOD POSTURE SYN *39:06*

- Both lung, kidney involved
- Hematuria (+)
- Diffuse alveolar hemorrhage
- IF : Linear deposits of Ig with (or) without complement 3 in basement memb

- Plasmapheresis
- Steroids

MEMBRANO PROLIFERATIVE GN *40:39*

MPGN - a simple classification



Secondary Causes of Immune mediated MPGN

- Infection
  - Hepatitis C and B
  - Visceral abscesses
  - Infective endocarditis
  - Shunt nephritis
  - Malaria
  - Leprosy
  - Schistosoma
  - Mycoplasma
- Rheumatologic
  - SLE
  - Sjogren's syndrome
  - Sarcoidosis
  - Cryoglobulinemia with or without HCV

- Malignancy
  - Carcinoma → Liver, Breast ovary
  - Lymphoma
  - Leukemia
  - Hypergammaglonulinemia

Path

Ig's deposits	C3 deposits
• M+GN	• Dense deposits
• Sub endothelial	• Intramemb
• Tram - Track app	• Ribbon - like deposits
• Splitting of basement meme	• C3 nephritic factor

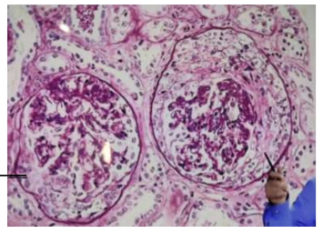
Rapidly progressive glomerulo nephritis (RPGN)

Classification & Pathogenesis

- Type - I RPGN (Anti-GBM antibody induced disease)
  - Idiopathic
  - Goodpasture syndrome = Type II HS reaction
- Type - II RPGN (Immune complex)
  - Idiopathic, Postinfecious, SLE, Henoch-Schonlein purpura (IgA), others
- Type - III RPGN (Pauci-immune)
  - ANCA associated, idiopathic, Wagener granulomatosis, PAN

- Parietal epithelial proliferation
- Crescents (+)
- Rupture of BM

Crescent like ←

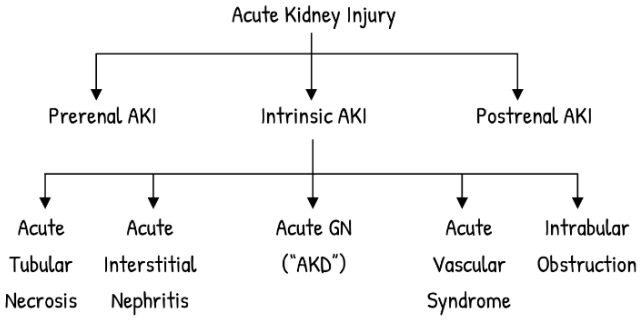


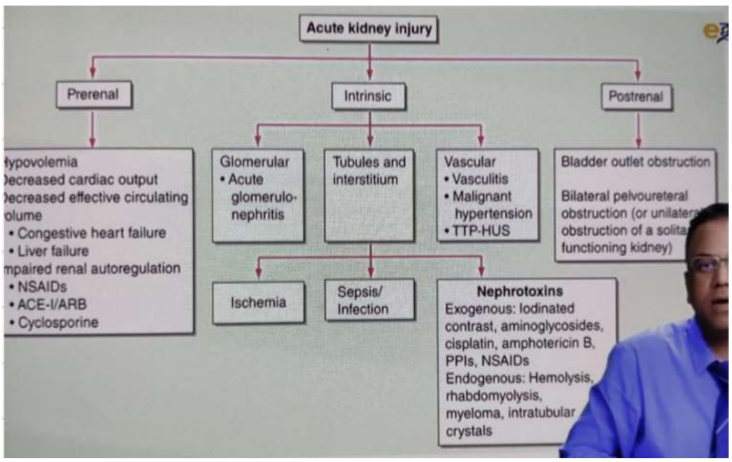
Nephrology - 2

Acute kidney injury

Stage	Urine output	Serum Creatinine
1	< 0.5mL/kg/hr - 6hr	> 0.3mg/dL - 48hrs
2	< 0.5mL/kg/hr - 12hr	≥ 2-2.9 times baseline
3	< 0.3mL/kg/hr - 24hrs (or) Anuria > 12hrs	≥ 3 times baseline (or) Dialysis (or) 0.5mg/dL

Classification of Etiologies of AKI





Common Causes of AKI

Outpatient	Inpatient	International

• Pre-renal
  ○ ACE – I when vomiting
  ○ ACE – I + NSAID
• Obstruction
  ○ BPH, Stones
	• Medical ICU : ATN from sepsis, drugs
	• Cardiac floor : Contrast, Cardiac surgery, Cardio-renal
	• SICU : Rhabdomyolysis, sepsis, postop ATN
		• Sub-Saharan Africa
		  ○ Malaria (1% of severe cases)
		  ○ Diarrhea
		• Tropics
		  ○ Leptospirosis
		• Others
		  ○ Post-strep
		  ○ Crush syndrome

Pre-renal	ATN
• $\frac{BUN}{Crea} > 20$	• $\frac{BUN}{Crea} < 20$
• $U_{Na} < 40$	• $U_{Na} > 40mEq/L$
• Fractional excretion of Na < 1% $= \frac{Urine}{Plasma\ Na} \times \frac{P\ crea}{Urine\ crea} \times 100$	• Fractional excretion of Na > 2%
• Frac. Excretion of urea < 35%	• Frac excretion of urea > 35%
• $\frac{U\ cr}{P\ cr} > 40$	• $\frac{U\ cr}{P\ cr} < 40$
• Urine osmol > 450mosm/L	• Urine osmol < 450 mosm/L
• Specific gravity > 1.018	• SG < 1.018
• Hyalne casts	• Muddy brown (or) Granuular casts

PHASES OF ATN

12:35

Natural Clinical Course of ATN

- Initiation phase (hours to days)
  - Continuous ischemic or toxic insult
  - Evolving renal injury
- Maintenance phase (typically 1-2 weeks)
  - Maybe prolonged to 1-12 months
  - Established renal injury
  - GFR < 10 cc/min, the lowest UOP

- Recovery phase
  - Gradual increase in UOP toward post – ATN diuresis
  - Gradual fall in Scr (may lag behind the onset of diuresis by several days)

Acute Indication for Dialysis

- Creatinine level is not an indication for dialysis
- Remember your vowels
  - A – Acidosis (metabolic acidosis)
  - E – Electrolyte Abnormalities (hyperkalemia)
  - I – Ingestants/Toxins (Lithium)
  - O – Overload (volume overload causing respiratory distress)
  - U – Uremia (systemic effects – uremic encephalopathy, uremic pericariditis)

ACUTE INTERSTITIAL NEPHRITIS *14:24*

- Due to drugs (PPI)
- Maculopapular rash
- Pyuria
- Polyuria, polydipsia
- BP normal
- Minimal (or) Absent edema
- Eosinophiluria
- Acute ↑ in serum creatinine

Drugs

- Antimicrobials (ampicillin, ciprofloxacin, methicillin, penicillin, rifampicin, sulfonamides)
- Non steroidal anti-inflammatory drugs (acetylsalicylic acid, fenoprofen, ibuprofen, indomethacin, naproxen, phenylbutazone, piroxicam, tolmetin, zomepirac)
- Acid suppressor (omeprazole, pantoprazole, rabeprazole, cimetidine)
- Others (phenytoin, furosemide, allopurinol, phenindione)

Infections

- Direct infiltration (leptospirosis, cytomegalovirus, candidiasis)
- Reactive to systemic infections (streptococcal infection, diphtheria, Hantavirus)

Systemic disease

- Metabolic disease (urate nephropathy, hypercalcemia nephropathy, oxalate nephropathy)

- Immunologic reactions (transplant rejection, systemic lupus erythematosis, sarcoidosis, cryoglobulionemia)
- Neoplastic diseases (lymphoproliferative diseases)

Idiopathic Causes

These are the most common causes of acute interstitial nephritis, but this list is not exhaustive

- Patient on angiogram → Started having ↑ in serum creatinine levels
  ↓
  Renal dysfunction

Contrast induced nephropathy	Atheroemboli induced
Contrast used ↓ In angipgram ↓ Kidney problems	↓ While passing catheter in angiogram ↓ Damage the plaque ↓ Emboli → Kidney injury

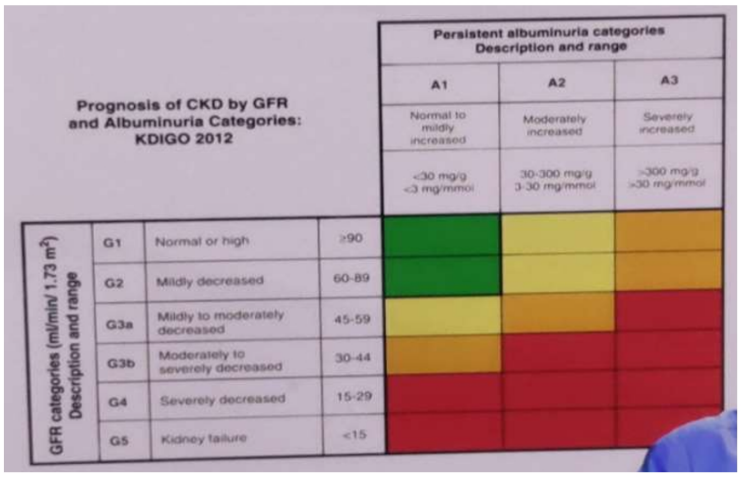
• < 5 days
• No gangrene
• C3 normal
• Absent
• Absent
• Prevention
  ○ Hydration (saline)
  ↓
  Dissolve the contrast
  ○ Iso osmolar contrast used
	• > 5days
	• Gangrene in lower limbus
	• C3 ↓↓
	• Livedo reticularis
	• Eosinophiluria (++)
	• Prevention :
	Try choosing radial artery instead of femoal artery

CHRONIC KIDNEY DISEASE *23:38*

KDIGO Classification

	GFR	Albuminuria
G1	> 90mL/min	A1
G2	60-89mL/min	A2
G3	30-59mL/min	A3

	GFR	Albuminuria
G3a	45-59mL/min	
G3b	30-44mL/min	
G4	15-29mL/min	
G5	0-14mL/min	



- USG shows
  - Echogenic kidneys
  - Loss of cortic-medullary differentiation
  - Shrunken kidney

In DM

Polycystic kidney disease, Multiple myeloma } USG does not show shrunken kidney

- Anemia
- HTN
- Vit D ↓
- PTH ↑

} Renal osteodystrophy } Point toward CKD

MANAGEMENT

29:06

Stage	GFR (ml/min/1.73m2)	Management goals
1	≥ 90	Diagnosis, treat slow progression reduce CV risk
2	60-89	Slow progression, reduce CV risk
3	30-59	Manage complications
4	15-29	Prepare for renal replacement therapy (RRT)
5	< 15	RRT

- BP control
- ↓ proteinuria → RAAS blockade
  Protein restriction
- Smoking cessation
- Glycemic control in DM
- AKI = must be controlled
- Sodium bicarbonate = slow progression of CKD
- ↓ Uric acid = Haloperidol
- Ca, PO_4, PTH monitor with CKD stages 3-5

Aim for Normal Phos and Ca

- Ca x Phosph product < 55
- Dietary phosph restriction
- PO4 binders =
  - Ca - Containing if hypocalcemic
  - Sevelamer
  - Lanthanum carbonate
- Treat Vit D def
- Active Vit D (calcitriol) so more PTH won't be released
- Cinacalcet (sensipar)

For Anemia

- Fe deficiency treated

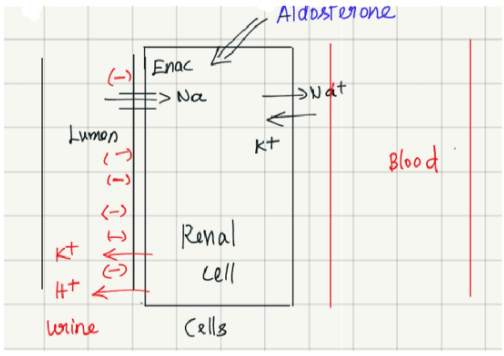
BARTLER'S SYNDROME 35:24

- Problem in $Na^+/K^+/2Cl^-$ transporter
  ↓
  Loss of Na in urine
  ↓
  Polyuria = Renin ↑ Aldo ↑
- Hypokalemia
- Met alkalosis
- Loss of Ca^+ in urine
- Urine calcium high = Renal stones
- Normal BP

Treat :

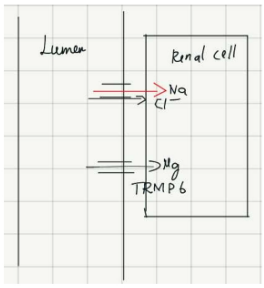
- Spironolactone
- NSAIDs like indomethacin
- Correction of electrolytes

LIDDLE'S SYNDROME (PSUEDO HYPERALDOSTERONISM) 39:16



- E Nac hyperfunctions → Na^{++} build up
  ↓
- HTN
- Renin ↓
- Aldost ↓
- Hypokalemia
- Met alkalosis
- Urine Ca ↓↓

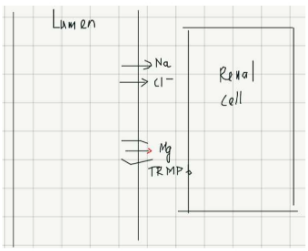
GIDDLEMAN'S SYNDROME *42:45*



- Problem in transporting Na, Mg
  ↓
  Na, Mg lost in urine
- Polyuria
- Normal BP
- Since Na lost in proximal part, Na will be more reabsorbed in distal part
  ↓
  So, K^+ lost in urea
- Hypokalemia
- Metabolic alkalosis
- U_{Mg} ↑↑
- U_{Ca} ↓ = No renal stones

GORDAN'S SYNDROME *46:01*

- Pseudo hypoladosteronism type - 2



Due to mutation in WNK gene
↓
Na- Cl- transporter, Mg++ channel overworks
↓
↑ Na, Mg absorption

- HTN
- U_{Mg} ↓
- Hyperkalemia
- M. Acidosis
- U_{Ca} ↑ = Renal stones
- Renin suppressed by feedback
- Aldo ↓

POLYCYSTIC KIDNEY DISEASE

50:15

AD PKD :

- PKD - 1 = Defect in gene chromosome - 16 → ↑ severe
- PKD - 2 = Defect in gene on chromosome - 14

Renal	Extra - Renal
• Flank pains • UTI • Renal stones • Hematuria • HTN • CKD • End-stage renal disease AR - PKD • Cyst birth • Kidneys are large at birth • Hepatic fibrosis	• Hepatic cysts • Diverticulosis • Cyst in pancreas, spleen • Aneurysms

Nephrology - 3

Acid - Base

- pH = 7.35 – 7.45
- PCO2 = 35 – 45mmHg
- HCO3 = 22 – 28 mmol/L
- Metabolic
  - Acidosis = HCO^-_3 ↓
  - Alkalosis = HCO^-_3 ↑
- Respiratory
  - Acidosis s = CO_2 ↑
  - Alkalosis = CO_2 ↓

COMPENSATION FORMULA 01:35

Met. Acidosis :

Winter's formula

$CO_2 = 1.5\ (HCO^-_3) + 8 \pm 2$

Met. Alkalosis

For every 10 ↑ in HCO^-_3

CO_2 should increase by 6

Respiratory		HCO^-_3	CO_2
Acidosis	Acute	1 ↑	10 ↑
	Chronic	4 ↑	10 ↑

i.e, for every 10% increase in CO_2, HCO^-_3 should increase by 1 (acute)

		HCO^-_3	CO2
Alkalosis	Acute	2 ↓	10 ↓
	Chronic	4 ↓	10 ↓

i.e, for every 10% decrease in CO_2, HCO^-_3 decrease by 2

Q) pH = 7.3 CO_2 = 26 HCO^-_3 = 12

Ans : pH → Acidosis

HCO^-_3 ↓ → Metabolic

If respiratory problem means = CO2 should not be washed away

- Met Acidosis

Expected $CO_2 = \frac{3}{2}(12) + 8 \pm 2$

$= 24 - 28$

∴ Met. Acidosis with compensatory resp. Alkalosis

Trick

pH	CO_2	HCO^-_3	
↓	↑	Resp	R O (Resp = Opposite direction)
↑	↓		M E (Met = Same direction)
↓	↓	Metabolic	
↑	↑		

Q)

pH	CO_2	HCO^-_3
7.10	7.0	12
↓	↓	↓
Acidosis	Indicates resp	Indicates Metabolic

So, Resp acidosis + Met acidosis

∴ So mixed acidosis

(Note : Compensation always moves in opp direction)

SERUM ELECTROLYTES 11:16

Na = 135 - 145 mEq/L

Hyponatremia

↓

Plasma osmolality (measured)

↑	Normal value	↓
• DM • Mannitol ↓ Treat underlying problem	Psuedohyponatremia • ↑ Triglycerides • ↑ Proteins (multiple myeloma)	True hyponatremia

(Plasma osmolality = $2Na + \frac{Glu}{18} + \frac{BUN}{2.8}$)

True Hyponatremia (or) Hypo-osmotic Hyponatremia

↓

ECV

Hypervolumia	Euvolumia	Hypovolumia	
• CCF • Cirrhosis • Nephritic	• SIADH • Hypothyroidism	Urine Na > 20 • Diuretics • ATN • Acute intestinal nephritis	Urine Na < 20 • GI = Diarrhea, vomiting • Skin = burns, sweating

CORRECTION OF HYPONATREMIA *17:36*

- Acute (symptomatic) → Rapid correction
- Chronic (mild symp/asymptomatic)
  - Slow correction
  - < 6-8mEq/24hrs

    ↓

    If it crosses 10

    ↓

    Central pontine myelinolysis
    (CPM (or) osmotic demyelination)

HYPERNATREMIA *19:39*

- Water deficit = TBW $(\frac{Na-140}{140})$ → (1)

  TBW = Male = 0.6 x Wt

  Female = 0.5 x Wt
- Ongoing H2O losses

  Free water clearance = V $(1 - \frac{U_{Na}+U_K}{P_{Na}})$ → (2)

  V = Volume of urine
- Insensible loss

  = 10mL/kg in person → (3)

- Add (+) + (2) + (3) = give that much water

If Hypotension = Normal saline

↓

Now, if person starts improving (↑ urine output (or) BP normal (or) adequant hydration)

↓

Give 5% Dextrose

½ Normal Saline

K^+ = 3.5 - 5.5 mEq/L

HYPERKALEMIA *23:58*

In acute management

- Ca → Ca gluconate, $CaCl_2$ — Given
- Insulin + Glucose can be given
- β_2 agonist
- Diuretics
- K+ binders
  - Patiromer
  - Zirconium
- Do not use calcium carbonate
- Do not use 50% dextrose without insulin
- Do not use sodium polystyrene (as it can cause intestinal nephritis)

(or)

Kayexelate

HYPOKALEMIA *26:41*

K^+ deficit = (3.5 - K^+) x Wt x 0.4

- Give oral K+
- If not possible, give IV
- In IV (peripheral) → Do not given more than 10mEq/hr
- In IV (central) → Do not give more than 20mEq/hr

Hypocalcemia

↓

Mg should be corrected