

ELECTROLYTES IMBALANCE

NA

More than 145
HYPER

less than 135
HYPO

Both present with neurologic sx

Caused by the 6 Ds:

- Diuresis - DI
- Dehydration - Diarrhea
- Docs (iatro) - Disease (Kidney, SCD)

Choice of fluid:

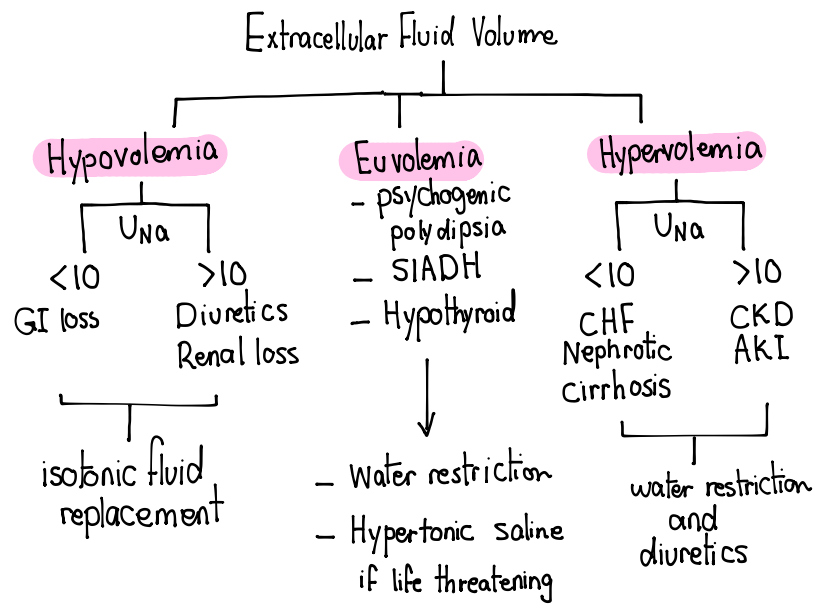
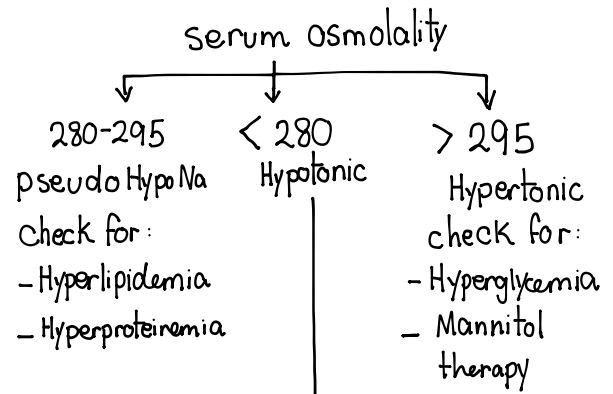
stable: D5W

unstable: Isotonic NS

Avoid rapid correction

complication: cerebral edema

(not more than 0.5 meq/L/h)



Avoid rapid correction: central pontine myelinolysis
(not more than 0.5 meq/L/h)

ELECTROLYTES IMBALANCE

More than 5 HYPER

K

less than 3.6 HYPO

- ⊗ Present with areflexia, weakness, arrhythmia, colic.. Flaccid paralysis
- ⊗ Etiology:
 1. pseudo: Hemolysis, leukocytosis, thrombocytosis
 2. MACHINE:
 - Medications: ACE-I, NSAIDS, BBs
 - Acidosis
 - Cellular destruction: Burns, trauma, Rhabdomyolysis
 - Hypoaldosteronism, Hypoinsulinemia
 - Intake, IV RTA
 - Nephrons, renal failure
 - Excretion problem
- ⊗ ECG changes: tall, peaked T, wide QRS, prolonged PR, loss of P
- ⊗ Tx: C BIG K:
 - Calcium gluconate
 - Bicarbonate
 - Insulin
 - Glucose
 - Kayexalate
- ⊗ Dialysis for renal failure/severe

- ⊗ Present with fatigue, cramps, ileus
- ⊗ Etiology:
 - Diarrhea, Diuretics, Drugs (gentamycin)
 - Laxative abuse
 - RTA I, II
 - Alkalosis
 - Hyperaldosteronism (1°, 2°)
 - Bartter, Gitelman's syndromes
 - Hypomagnesemia
- ⊗ ECG: T-wave flattening, U waves
- ⊗ Tx: Oral / IV potassium (not more than 20 meq/L/h)
Replace Mg

ELECTROLYTES IMBALANCE

More than 10.2
HYPER

Ca

less than 8.5
HYPO

⊗ Present with :

Bones: Fractures

Groans: constipation

Stones: kidney

psychiatric overtones:

- altered mental status

⊗ Etiology: CHIMPANZEES

- Calcium supplement

- Hyper PTH - Iatro (thiazide)

- Milk-alkali - Paget's

- Adrenal ↓, Acromegaly

- Neoplasm - Zollinger-Ellison

- Excess vit A - Excess vit D

- Sarcoidosis

⊗ ECG: Short QT

⊗ Tx: - IV hydration

- furosemide

- Calcitonin

- Bisphosphinates

⊗ Present with cramps, tetany,
perioral and acral numbness

- Chvostek's sign

- Trousseau's sign
Carpal spasm

⊗ Etiology:

- Hypo PTH (post thyroidectomy)

- Vit D ↓

- Acute pancreatitis

- Consider DiGeorge in infants

- Hypo Mg

⊗ ECG: prolonged QT

⊗ Tx: - replace Mg

- Oral Ca

(IV Ca in severe)

DEVELOPMENTAL MILESTONES

Gross Motor = GM
 Fine Motor = FM
 Social and behavioral = S
 Language and hearing = L

NEWBORN

GM = Flexed Limbs, Sym Posture, Head lag
 L = Startled to loud noises
 Vac: Hep B, BCG

6 wk - 2 m

GM = Raises head in prone (2 m)
 FM = Follows moving objects (with eyes)
 S = Smiles responsively
 Vac (2 m): 1st shot of:
 IPV, DTaP, Hib, Hep B, PCV13, Rota

6-8 m

GM = sits w/o support (7m)
 rolls from supine to prone.
 FM = (7m) transfers from hand to another
 L = Turns to soft sounds out of sight
 S = Puts food in mouth
 Stranger anxiety

4-6 m

GM = Sits with support
 FM = Palmar grasp
 Vac (6m): 3rd shot of:
 IPV, DTaP, Hib, Hep B, PCV13, Rota

3-4 m

GM = Head control
 rolls from prone to supine
 FM = Reaches out for toys
 L = Laughs and coos
 Vac (4m): 2nd shot of:
 IPV, DTaP, Hib, Hep B, PCV13, Rota

8-10 m

GM = Crawling (9m), Stands (10m)
 FM = Mature Pincer grip (10m)
 L = Diff sounds to call parents
 Vac (9m): Measles and MCV 4

10-12 m

GM = Walks unsteadily
 L = 2-3 words
 S = Waves bye-bye, plays peek-a-boo
 drinks from a cup with 2 hands (12m)
 Vac (12m): OPV, PCV13, MMR, MCV4

18-24 m

L = Joins 2-3 words to make simple phrases
 S = Symbolic play
 Vac (24m): Hep A


16-18 m


FM = Makes marks with a crayon
 Builds a tower of 3 cubes
 L = 6-10 words, show 2 parts of body
 S = Holds spoon and eats safely
 Vac (18m): OPV, DTaP, Hib, MMR, Varicella, Hep A

15 m

GM = Walks steadily

2-6 y

Draws: | 2y, ○ 3y, + 3½y, □ 4y, △ 5y
 tower of 6 cubes (2y)

 tower of 8 cubes (2½y)
 L = 2 sentences (2y)
 3-4 sentences (3y)

S = Interactive play takes turn
 Vac (4-6y): OPV, DTaP, MMR, Varicella

Main References:

- Kaplan USMLE Step 2 Lecture Notes: Pediatrics
- Illustrated text book of Pediatrics

 Fatimah Alowirdi

Acute < 6 wk
 Subacute 6-12 wk
 Chronic > 12 wk

MANAGEMENT

- Exercise as tolerated
- Pain killers:
 - ⊙ Acetaminophen 1st
 - ⊙ NSAIDs

DIAGNOSIS

History

- Evidence of systemic disease
- Evidence of neurologic compromise
- Evidence of psychological distress

RED FLAGS

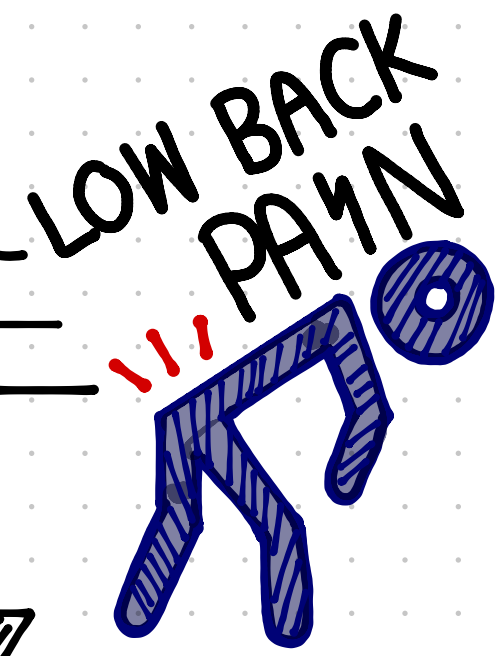
- ⊙ Age > 50
- ⊙ Constitutional sx
- ⊙ Neuromotor dysfunction
- ⊙ IV Drug use / Infection
- ⊙ Chronic disease
- ⊙ Features of Cauda Equina Syndrome

Physical Examination:

- Inspection, range of motion, palpation
- Straight leg raise test
- Neurological Exam

RISK FACTORS

- ⊙ Obesity
- ⊙ ♀
- ⊙ Smoking
- ⊙ physically strenuous exercise
- ⊙ psychological factors



ETIOLOGY

MECHANICAL

- sprains (ligaments)
- strains (muscle)
- Disk herniation
- Spondylopaties
- Fractures

NON-MECHANICAL

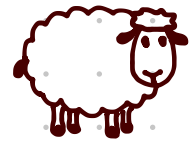
- Infectious (osteomyelitis)
- Neoplastic (primary or metastatic)
- Rheumatologic (ankylosing spondylitis)
- Referred pain
- Cauda Equina: (areflexia, urine retention, decreased anal tone..)

↳ EMERGENCY

AMINOGLYCOSIDES

- ⊙ Gentamicin / Tobramycin
- ⊙ G-ve + pseudomonas
- ⊙ ADE: Ototoxicity

TETRACYCLINES

- ⊙ Doxycycline : - STDS (LGV)
- Lyme
- Rocky Mountain Spotted fever
- Q fever 

PENICILLINS

- ⊙ Used for G+ve
- ⊙ Block cell wall formation
- ⊙ Now primarily used for strep infections
- ⊙ Penicillin → syphilis
- ⊙ Semi-synthetic penicillins: Such as oxacillin / nafcillin used for S. aureus → Osteomyelitis cellulitis

QUINOLONES

- ⊙ Levo / cipro - floxacin
- ⊙ Empiric
- ⊙ Contra / I in pregnant women.
- ⊙ Used for:
 - ↳ UTIs
 - ↳ Prostatitis

ANTIBIOTICS

and their most common indications



MACROLIDES

- ⊙ Erythro / Azithro / Clarithro - mycin
- ⊙ G + ve
- ⊙ Clarithro → MAC (HIV)
- ⊙ Azithro → Walking pneumonia
- ⊙ Cover atypicals
 - ↳ Legionella
 - ↳ Mycoplasma
 - ↳ Mycobacteria
 - ↳ Chlamydia
 - ↳ H. influenza

CEPHALOSPORINS

- | | | | |
|--------------------|-------------|---|------------|
| 1° | 2° | 3° | 4° |
| - Cefazolin | - Cefaclor | - Cefotaxime | - Cefepime |
| - Cefadroxil | - Cefoxitin | - Ceftriaxone | |
| - Cepalexin | - Cefotetan | (used for Spontaneous bacterial peritonitis + gonorrhoea) | |
| ⊙ 1° and 2° → G+ve | | ⊙ 3° for G-ve | |
| ⊙ 3° for G-ve | | ⊙ 4° for pseudomonas | |

OTHERS

- ↳ Trimethoprim / Sulfamethoxazole
 - Used in UTIs / prophylaxis for PCP (HIV)
- ↳ Rifampicin → TB and H. influenza
- ↳ Linezolid → MRSA / resistant skin infections

VANCOMYCIN

- ⊙ Effective against MRSA
- ⊙ Effective against C. diff. (taken orally)

ANTIBIOTICS

and their most common indications



ANTI-ANAEROBES

- ↳ Clindamycin
 - for anaerobes above the diaphragm
 - Causes C. diff diarrhea
 - ↳ tx by metronidazole

- ↳ Metronidazole
 - for anaerobes below the diaphragm
 - Tx of bacterial vaginosis, Trichomoniasis, diarrheal amoebiasis, and giardiasis

CARBAPENEMS

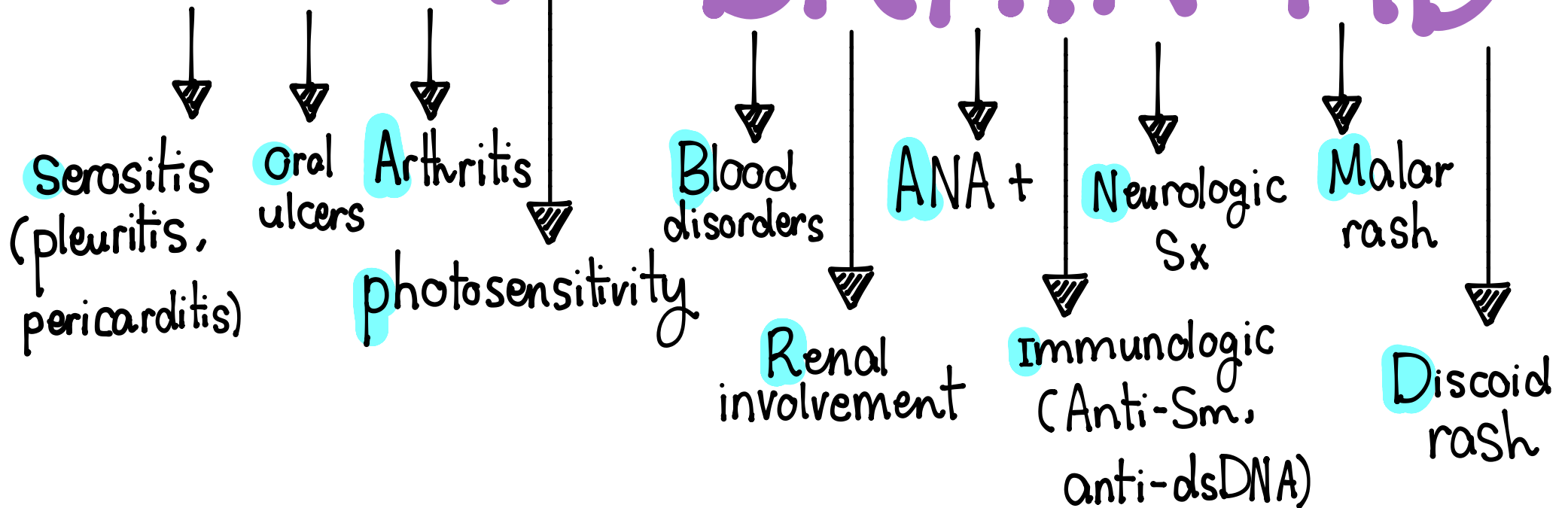
- ⊙ Imi / Meropenem
- ⊙ Not first choice
- ⊙ Used for febrile neutropenia

PCN/B-LACTAMASE

- ↳ Piperacillin / Tazobactam
 - Effective for pseudomonas
- ↳ Amoxicillin / Clavulanate

Diagnostic Criteria in SLE

"SOAP BRAIN MD"



Vasculitis syndromes

Small vessel vasculitis

Wegner's

- Upper respiratory: rhinitis/sinusitis
- Lower respiratory: Hemoptysis
- Renal: Necrotizing glomerulonephritis
- Associated with C-ANCA
- Confirmatory: Nasol septum biopsy
- Tx: Steroids + cyclophosphamide

Medium vessel vasculitis

polyarteritis Nodosa (PAN)

- Can involve all vessels except those of lungs
- Mononeuropathy, GI, Kidneys, Hep B
- Associated with P-ANCA
- Confirm: Nerves biopsy
- Tx: steroids + cyclopho

Chrug Strauss

- Similar to PAN
- Lungs involved: asthma
- Eosinophilia
- Confirm: Lung biopsy
- Tx: steroids + cyclopho

Large vessel vasculitis

Temporal arteritis

- Affects old pts (50-60y)
- Sx: Headach, jaw pain, vision problems, proximal polymyalgia
- ESR > 60
- Confirm: Temporal arteries biopsy
- Tx: prednisone 60 mg

Management of SLE

Mild disease

- NSAIDs
- Local Corticosteroids
- Hydroxy-chloroquine
SE: Retinal toxicity

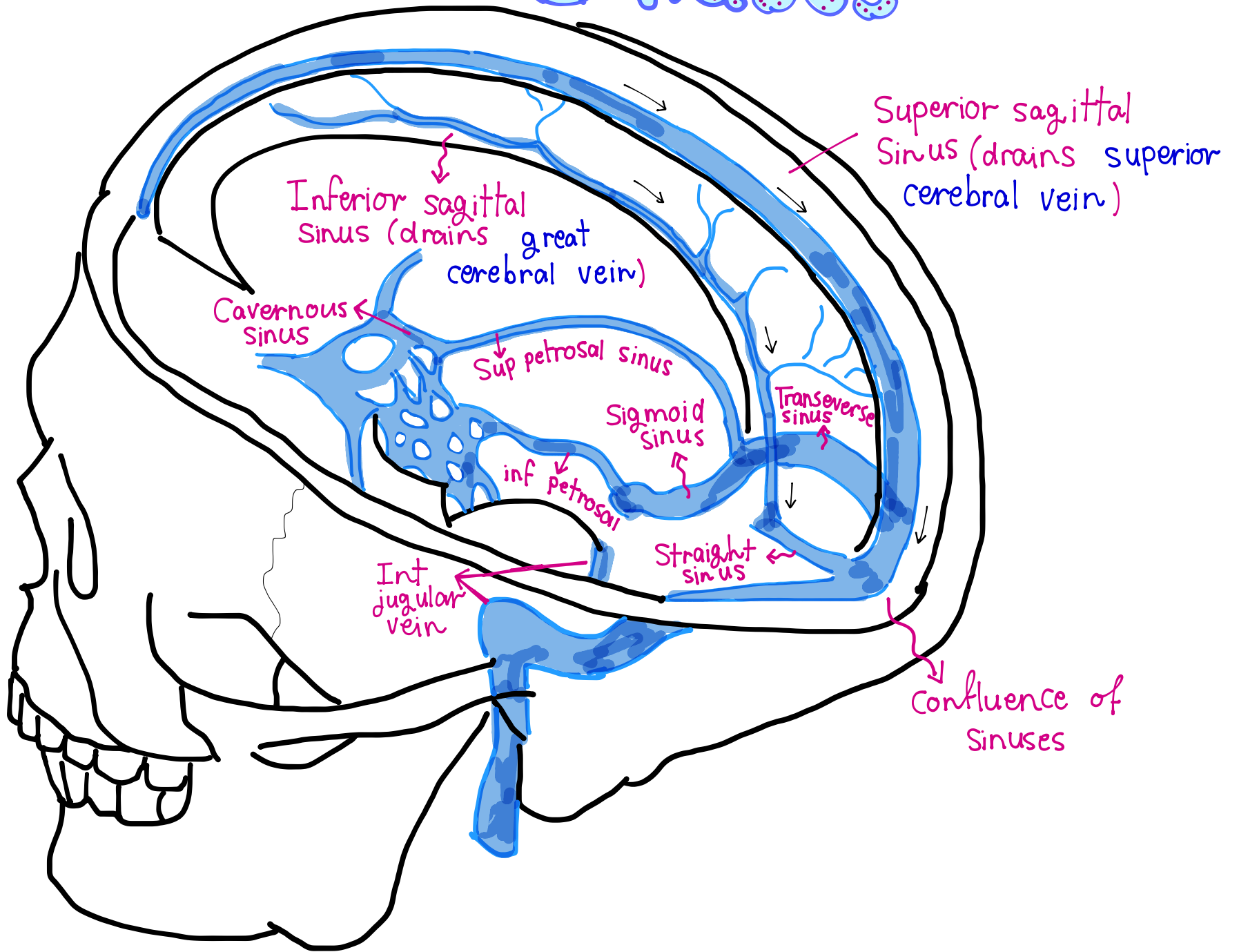
Severe disease

- Systemic corticosteroids
- Cyclophosphamide
SE: Hemorrhagic cystitis
Antidote: Mesna
- Mycophenolate Mofetil (MMF)

Maintenance

- Oral corticosteroid (prednisolone)
- Azathioprine, MTX, MMF

Dural Sinuses



The CSF is formed
in choroid plexus
of lateral ventricles

Inter-ventricular
foramina

Third Ventricle

cerebral
aqueduct

Fourth Ventricle

② Lateral Foramina
(Luschka)

Median Foramen
Megendie

Subarachnoid
Space

TB Treatment

Isoniazide (INH)

- It is bacteriostatic → resting bacteriocidal → growing bacilli
- It inhibits the biosynthesis of mycolic acid in the cell wall
- Parenteral / oral
- Acetyl isoniazide damages the liver. Another side effect is neuropathy. (Vit B6 deficiency)
- Phenytoin increases toxicity.

Pyrazinamide

- Bacteriocidal
- unknown mechanism
- Oral
- Can cause liver damage and hyperuricemia.

Rifampin

It inhibits DNA-d-RNA-P resistance can happen by changing the structure of the enzyme.

- Oral . Can be delayed with S-line aminosalicylic acid
- ADV.Es : not many
GIT / hepatic reactions

Ethambutol

- Bacteriostatic
- it inhibits arabinosyl transferase
 - no arabinosyl galactan
 - no cell wall
- oral
- Can cause reversible vision disturbances

Antifungal Agents

Polyene (Amphotericin B + Nystatin)

- These bind to ergosterol directly → disrupt the cell membrane
- Amphotericin → Broad spectrum
AdEs: Renal toxicity, Bone marrow depression - anemia because it has immuno-stimulant effects.
When used with Flucytosin → synergistic effect.
Rifampin and Minocyclin potentiate it.
- Shouldn't be used with vancomycin and aminoglycoside → nephrotoxicity
- Nystatin is more toxic → superficial infections.

Heterocyclic Nitrofurans (Grisofulvin)

- Oral and fat helps absorption
- For most superficial dermatophytes
- inhibits mitosis

Echinocanoids

- Caspofungin + micafungin inhibit β -1,3-D glucan → no c/wall
- For invasive aspergillus and candida
 - not active orally

Allylamines (Nefitine hydrochloride and terbinafine) they inhibit squalene monooxygenase → no lanosterol / fungicidal

Nefitine → topical

Terbinafine → Systemic / onychomycosis

Azoles

- Synthetic fungi static agents
- Two: Imidazoles and triazoles
 - ↓
 - Ketonazole (systemic)
 - ↓
 - Fluconazole
 - Posaconazole
 - itraconazole
 - Viroconazole
- They inhibit cytochrome P-450 α -14 dexamethasone → no conversion from lanosterol → ergosterol
- Ketonazole → mucosal infections. it causes hepatotoxicity and decreases Steroidogenesis (testosterone). Rifampin and phenytoin decrease it. It requires acidic pH → Shouldn't be used with antacids or peptic ulcer drugs (H₂-Blockers)
- Fluconazole → wider range than Ketonazole.
Candida and Cryptococcus neoformans

Antimetabolite

Flucytosine.
narrow spectrum → Cryptococcal meningitis.

Oral + CSF

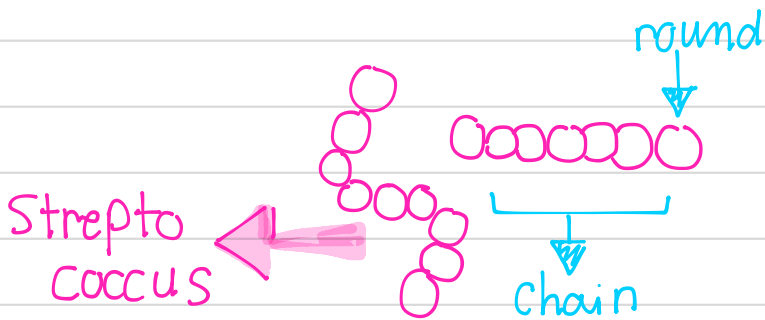
- ADVES: Bone Marrow depression → thrombocytopenia + leukopenia
- It inhibits thymidylate synthetase → no thalidic acid → No DNA

Group B Streptococcus

Diagnosis:

Lab:

- Initial testing includes Gram staining (GBS → G +ve)
- S. agalactiae and all streptococci are catalase -ve

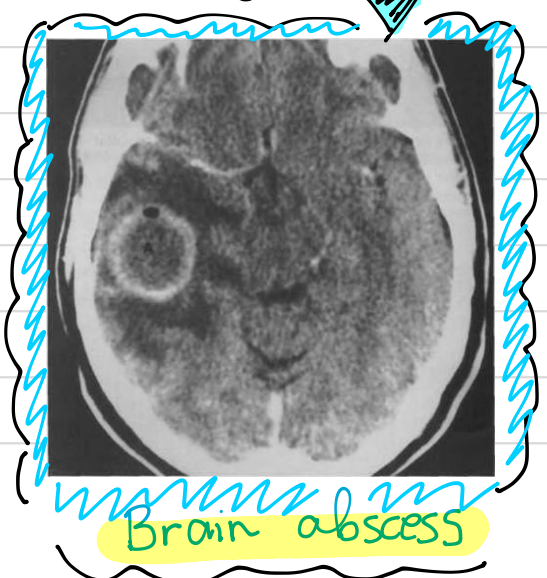


catalase is an enzyme that converts Hydrogen Peroxide to $\rightarrow O_2 + H_2O$
a +ve catalase test will result in formation of bubbles. (O_2)

- Blood culture: takes almost 48 hours (2-3 days)
- CSF drainage using LP. / +CRP if more than 10
treat for 5 days

Imaging:

- Chest radiograph for S. pneumoniae. → chest infiltration
- CT scan for meningitis reveals abscess
- MRI for soft tissue infection / osteomyelitis.



Management

- Antibiotics:

GBS are most sensitive to penicillin and ampicillin

antibiotic of choice

- resistance to erythromycin and clindamycin is common.

- treat for 10-15 days

PREVENTION

Intrapartum antibiotic prophylaxis (IAP) during delivery.

penicillin and ampicillin are used. If the mother is penicillin-allergic, clindamycin and vancomycin are alternatives.



Nephrotoxins



Pre-renal

- ⊗ ACE-Is
- ⊗ NSAIDs (Indomethacin)
- Both cause vasoconstriction
- ⊗ Cyclosporine and tacrolimus (calcineurin-inhs)
- ⊗ Also, diuretics

Intrinsic

ATN:

- ⊗ Aminoglycosides
- ⊗ contrast
- ⊗ Amphotricin B
- ⊗ Cisplatin
- ⊗ Myoglobin (Rhabdo...)

AIN:

- ⊗ Diuretic (thiazide)
- ⊗ Penicilins + B-lactams
- ⊗ Allopurinol
- ⊗ Sulfonamides (allergic reaction)

post-renal

Crystal Forming:

- ⊗ Acyclovir
- ⊗ Methotrexate
- ⊗ Sulfonamides

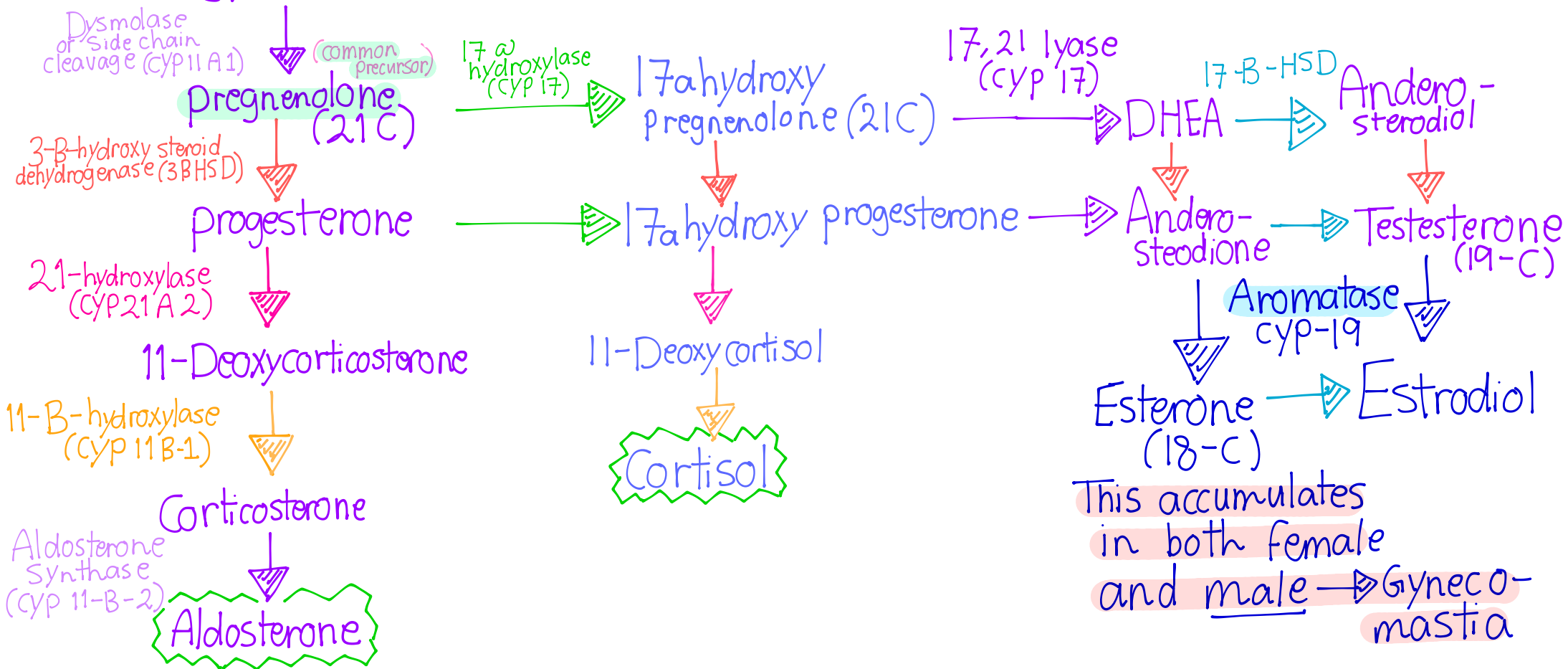
Summary of sexually transmitted diseases (STDs)

Microorganism	Signs, important features	Investigation (Lab)	Management
Syphilis by <i>Treponema pallidum</i>	<ul style="list-style-type: none"> • Primary: painless chancres • Secondary: Rash (palms and soles) • Tertiary: gummatous, not infectious 	<ul style="list-style-type: none"> • Dark-field microscopy • Direct florescent ab • PCR • Treponemal EIA 	Penicillins
Gonorrhoea by <i>Neisseria gonorrhoeae</i>	<ul style="list-style-type: none"> • PID • Ophthalmia neonatorum • Reactive arthritis 	<ul style="list-style-type: none"> • Smear gram stain • Culture • PCR 	Ceftriaxone or cefixime
Chlamydia by <i>Chlamydia trachomatis</i>	<ul style="list-style-type: none"> • Often asymptomatic • PID 	<ul style="list-style-type: none"> • PCR • Culture (gold standard) 	Macrolides or tetracyclines
Genital herpes by <i>HSV-2</i> (<i>most commonly</i>)	<ul style="list-style-type: none"> • Painful genital ulcers • Could re-occur by spreading through p.nerves 	<ul style="list-style-type: none"> • Detection of virus in a swab of the lesion • PCR 	<ul style="list-style-type: none"> • Saltwater bathing • Antivirals (acyclovir)
Genital warts by <i>Human Papillomavirus (HPV)</i>	<ul style="list-style-type: none"> • Warts commonly found in external genitalia and anus • Associated with cervical cancer 	<ul style="list-style-type: none"> • Clinical • Screening and exclusion • Biopsy of ab/N lesions 	<ul style="list-style-type: none"> • Antivirals • Podophylin extract • Vaccines (Prev)

Steroid Synthesis

First, cholesterol is synthesized from acetate (De novo) or taken from LDL. Acetate $\xrightarrow{\text{HMG-CoA reductase}}$ Cholesterol, and then it's taken to the mitochondria by Steroidogenic Acute Regulatory Protein (StAR) **rate-limiting step**.

Cholesterol (27C)



Chronic kidney disease(CKD) vs Acute kidney injury (AKI)

AKI

Deterioration of renal function over a course of hours to days

Significant elevation of serum creatinine

This results in:

Failure to maintain fluid and electrolyte homeostasis

Edema

Oliguria

Failure of nitrogenous waste removal

Azotemia

Hyperkalemia

CKD

Is recognized by the presence of structural renal damage

Decreased GFR less than 60 ml per minute

For 3 months or more

Characterized by

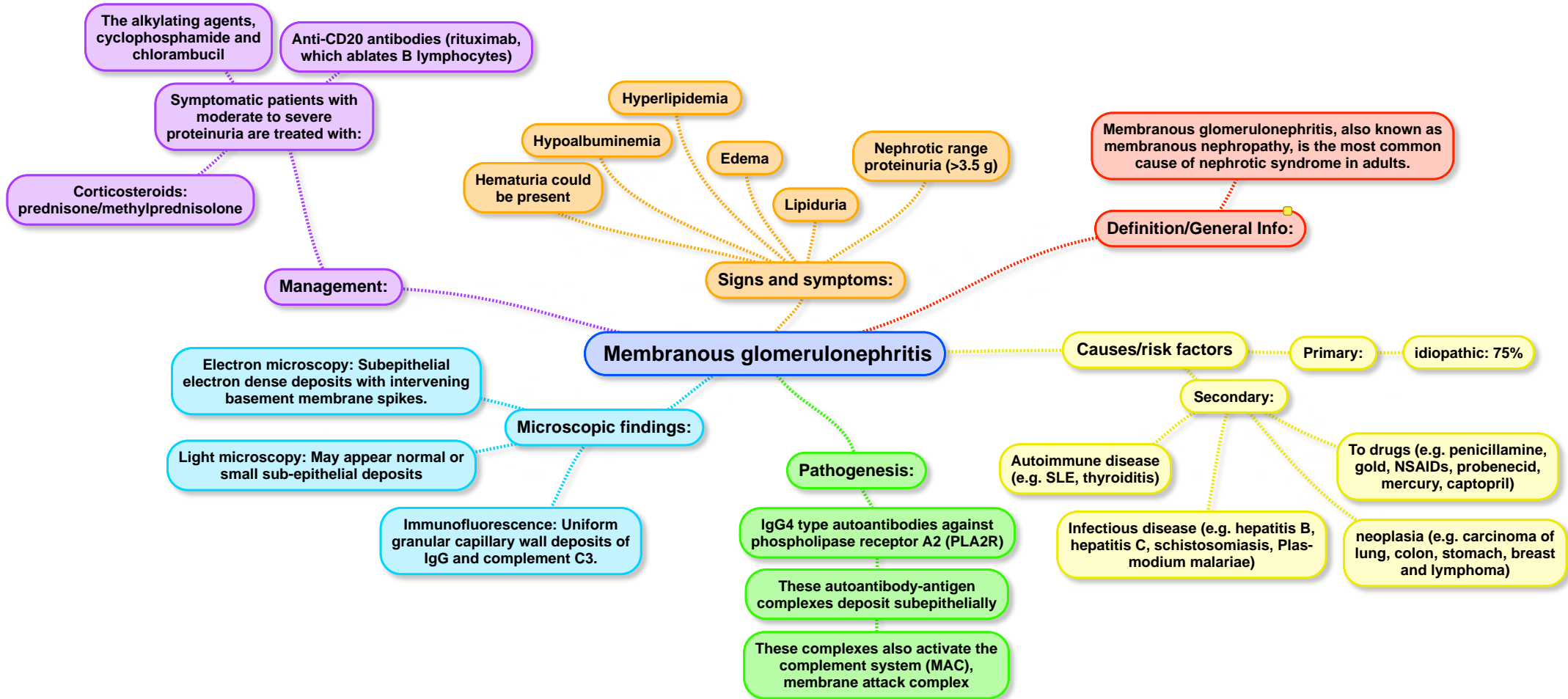
Anemia: Due to loss of erythropoietin

Uremia/Uremic complications

Hyperphosphatemia

Small shrunken kidneys

Secondary hyperparathyroidism



Ischemic Cascade

- Ischemic stroke \rightarrow \downarrow BF
- \rightarrow low perfusion \rightarrow E failure
- \rightarrow Consumption of Glycogen stores
- \rightarrow Switch fro Ox.P to an.gly
- \rightarrow Acidosis and \downarrow ATP
- \rightarrow failure of Na/K ATPase pump
- \rightarrow Loss of RMP
- \rightarrow More depol. \rightarrow More Glut
- \rightarrow Glut Binds to NMDARS
- \rightarrow Ca influx
- \rightarrow activ of proteases
- \rightarrow Loss of membrane integrity
- \rightarrow Cell edema/death

Insulin Effects

- ① Glycogen $\xrightarrow[\text{X}]{\text{Glycogen phosphorylase}}$ Glucose
- ② Glucose $\xrightarrow[\text{G}]{\text{hexokinase}}$ Glucose-6-phosphate $\xrightarrow[\text{G}]{\text{Glycogen Synthase}}$ Glycogen
- ③ Increase expression of (GLUT-4) in muscle and (GLUT-2) in liver.
- ④ Increase ribosome activity (protein synthesis)
- ⑤ Protein $\xrightarrow[\text{X}]{} \rightarrow$ Amino acid
- ⑥ Glucose $\xrightarrow[\text{G}]{} \rightarrow$ Acetyl CoA $\xrightarrow[\text{G}]{} \rightarrow$ TAG

PID

pelvic Inflammatory Disease

Diagnosis

- On examination: bilateral lower abdominal pain also, vaginal discharge
- Pregnancy test (dd: ectopic pregnancy)
- Labroscopy (Definitive test)

Complications:

- Tubo-ovarian abscess (TOA)
- Tubal factor infertility (1 in 8)
- Ectopic pregnancy
- Chronic pelvic pain

Causes:

- Chlamydia Trachomatis (most common)
- N. gonorrhoea
- Mycoplasma genitalium

Management:

- Broad spectrum antibiotics
- Metronidazole (anti-protzoal) + (anti-b)
- Ofloxacin (quinolone)

Definition:

Infection or inflammation of the female reproductive system (Fallopian tubes, uterus) It results from ascending micro-organisms from cervix or vagina.

Signs/symptoms:

- Lower abdominal pain
- Pelvic pain ● ↑ vaginal discharge
- Dyspareunia (painful sexual intercourse)
- Irregular menses ● Uterine tenderness
- Adnexal tenderness ● Cervical motion tend-

BREAST CANCER DIAGNOSIS

Fine-needle aspiration (FNA)

VS

Core-needle Biopsy

- ① A very thin hollow needle is used to take a small amount of fluid or tissue.
- ① Suitable for cytology testing
- ① Doesn't require anaesthesia
- ① Doesn't result in scarring
- ① Can't distinguish cell receptors
- ① Can't detect invasion

- ① Uses a larger needle than (FNA)
- ① Removes a small cylinder of tissue.
- ① Done with local anaesthesia
- ① Might cause a scar
- ① Shows cell receptors (ER, PR, HER2/NEU)
- ① Detects invasion

Types of Insulin

Long acting

Insulin glargin:

Long flat effect (no peak)

Insulin detemir:

has a FA chain that binds to Alb.

Sub-q

Intermediate acting

Neutral protamine hagedorn (NPH)

It's used in fasting control. Only sub-q adm.

Short and rapid acting

regular insulin

administered IV in case of PL: 50-120 E. mins

Insulin aspart, glulisin, lispro

Peak level: 30-90 mins

Both are used to mimic the prandial release of insulin

⊗ Standard treatment: Twice daily injections.

⊗ Intensive treatment: 3 or more → higher chance for hypoglycemia but ↓ Micro/macrovascular complications

CAUSES OF RECTAL BLEEDING

Diverticulitis

Accumulation of fecal matter in an outpouching of the colonic mucosa and submucosa, commonly in the sigmoid colon

Adenocarcinoma

Ulcerative Colitis

Benign Polyps

Adenomas | Hamartomas
Inflammatory

Proctitis

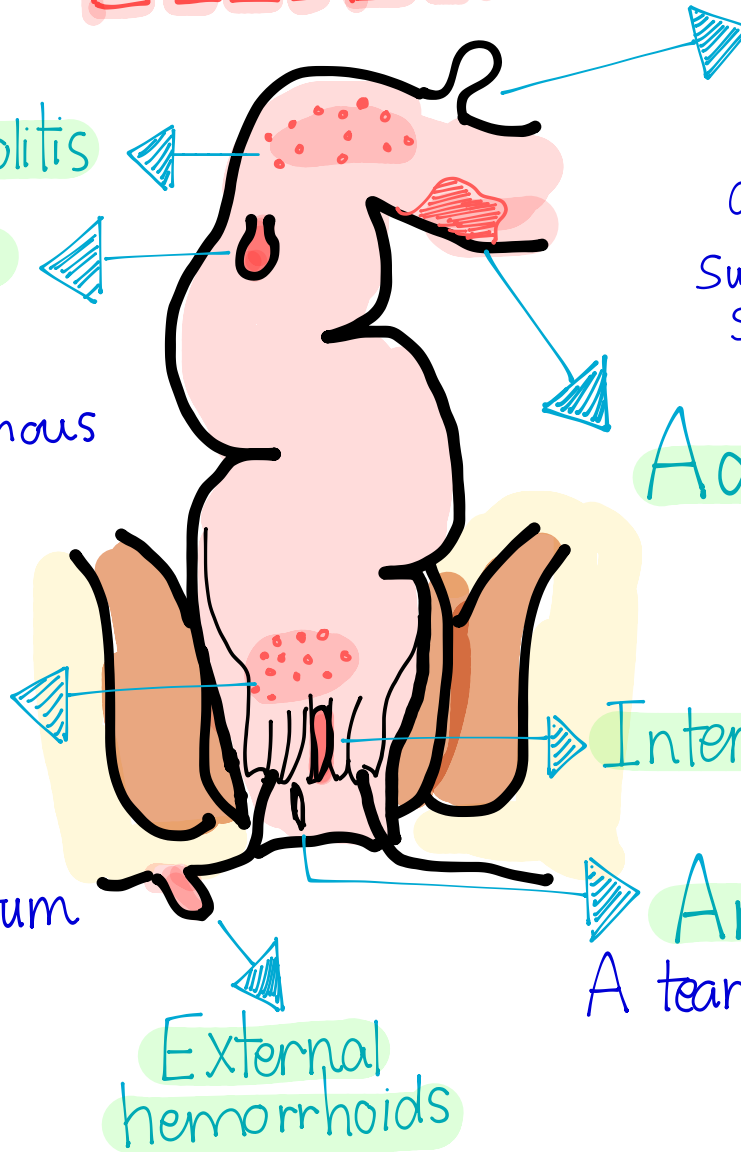
Inflammation of anus and rectum

Internal hemorrhoids

Anal fissures

A tear in the anal canal

External hemorrhoids



Types and morphology:

- By location:
 - Upper outer quadrant (50%)
 - Central (20%)
- Ductal carcinoma in situ (DCIS)
 - Excellent prognosis
 - Forms calcifications detected on mamography
 - Paget disease of nipple
 - Leads to invasive ductal carcinoma
- Lobular carcinoma in situ (LCIS)
 - Doesn't form calcifications
 - Incidental biopsy finding
 - Leads to invasive lobular carcinoma

Investigations:

- Mammography
- Fine-needle aspiration (cytology)
- Core biopsy (Histology)
- US • CT
- Bone scan
- The most common site for breast cancer metastasis is **bone**



Summary by:
Fatimah Alowirdi

Pathogenesis

- Genetic changes
 - Overexpression of HER2/NEU protooncogene
 - Mutation of tumor-suppressors BRCA1, 2, P53

Risk factors:

- Age (>30)
- Positive family history
- Early menarche and Late menopause
- Nullparity
- Radiation (For Hodgkin's lymphoma)
- Other: Smoking, alcohol, ↑BMI, high fat diet, HRT

Breast Cancer

Protective factors

- Breastfeeding
- parity
- Exercise
- ↓ Estrogen exposure

Management options:

- Surgical
 - Lumpectomy
 - Mastectomy
- Adjuvant radio/chemo
- Antiestrogens
 - Tamoxifen
 - Aromatase Inhs
- Monoclonal ab to HER2 (Trastuzumab)

Clinical presentation

- pain
- visible lumps
- Nipple retraction
- Peau d'orange (orange peel-like texture)
- Redness
- Discharge
- Skin dimpling