Embryo

Histo:
- cartilage
- epithelium
- organs
- glands

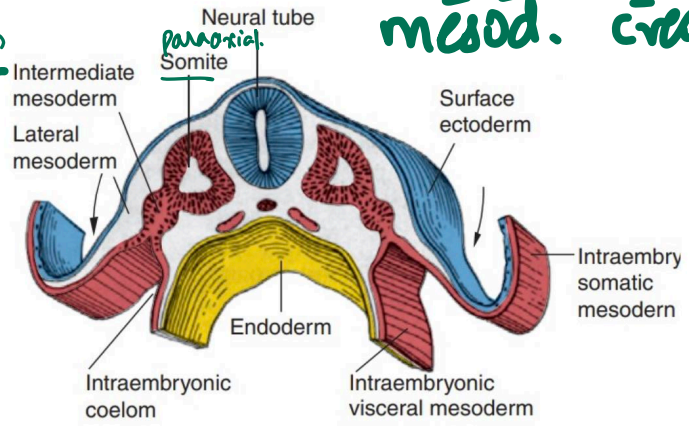
- Neonatal

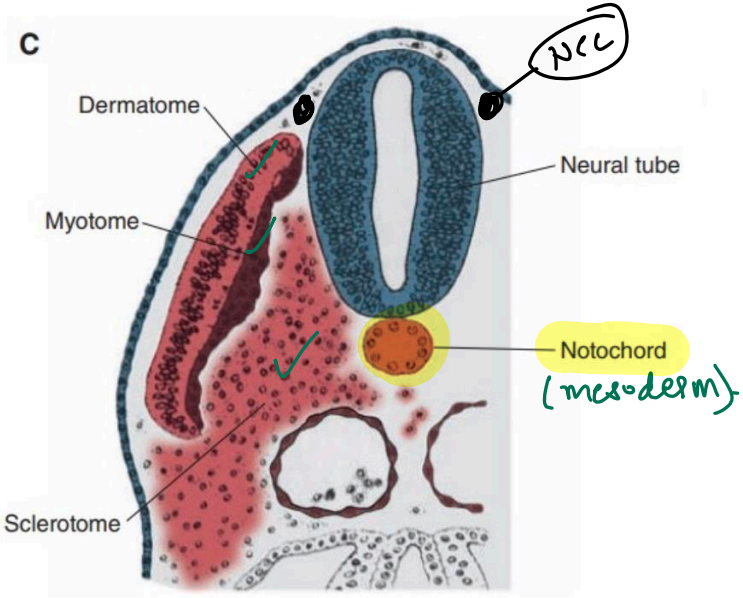
ANATOMY BINGE REVISION

Medsynapse by Dr. Nikita

Mesoderm derivatives

- **Paraaxial** (somites)
  - Axial skeleton-
  - Ribs , vertebrae
  - Skeletal muscles except pharyngeal arch
  - Duramater
  - Extra ocular muscles
  - Intrinsic muscles of tongue
- **Intermediate**
  - Genitourinary system
  - Mesonephric , paramesonephric ducts
  - Gonads
  - Adrenal cortex
- **Lateral plate**
  - Appendicular skeleton –Sternum, limb bones
  - Cardiac & smooth muscles
  - Pleura, peritoneum, pericardium
  - Blood cells; microglia, Kupffer cells
  - CVS
  - Lymphatic system





Ectoderm

Epidermis, hair, nails, sweat and sebaceous glands
Utricle, semicircular ducts, vestibular ganglion of CN VIII
Saccule, cochlear duct (organ of Corti), spiral ganglion of CN VIII
Olfactory placode, CN I
Ameloblasts (enamel of teeth)
Adenohypophysis
Lens of eye
Anterior epithelium of cornea
Acinar cells of parotid gland
Acinar cells of mammary gland

Epithelial lining of:
- Lower anal canal
- Distal part of male urethra
- External auditory meatus

Mesoderm

Muscle (smooth, cardiac, skeletal)
Extraocular muscles, ciliary muscle of eye, iris stroma, ciliary body stroma
Substantia propria of cornea, corneal endothelium, sclera, choroid
Muscles of tongue (occipital somites)
Pharyngeal arch muscles
Laryngeal cartilages
Connective tissue
Dermis and subcutaneous layer of skin
Bone and cartilage
Dura mater
Endothelium of blood and lymph vessels
Red blood cells, white blood cells, microglia, and Kupffer cells
Spleen
Kidney
Adrenal cortex
Testes, epididymis, ductus deferens, seminal vesicle, ejaculatory duct
Ovary, uterus, uterine tubes, superior 1/3 of vagina

Endoderm

Hepatocytes
Principal and oxyphil cells of parathyroid
Thyroid follicular cells thymus
Epithelial reticular cells of thymus
Acinar and islet cells of pancreas
Acinar cells of submandibular and sublingual glands
Epithelial lining of:
- Gastrointestinal tract
- Trachea, bronchii, lungs
- Biliary apparatus
- Urinary bladder, female urethra, most of male urethra
- Inferior 2/3 of vagina
- Auditory tube, middle ear cavity
- Crypts of palatine tonsils

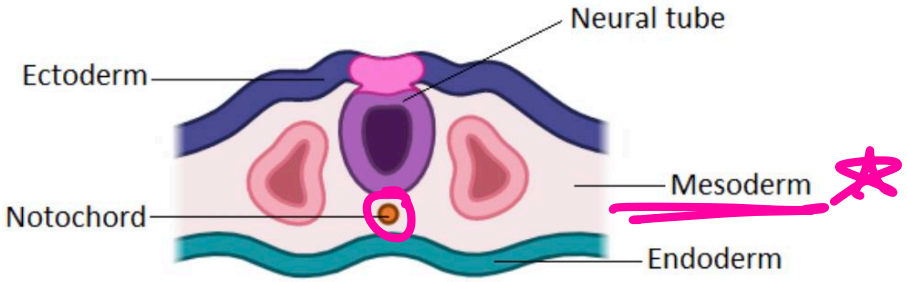
Neuroectoderm

All neurons within brain and spinal cord
Retina, iris epithelium, ciliary body epithelium, optic nerve (CN II), optic chiasm, optic tract, dilator and sphincter pupillae muscles
Astrocytes, oligodendrocytes, ependymocytes, tanycytes, choroid plexus cells
Neurohypophysis
Pineal gland

Neural Crest

Cranial neural crest cells:
- Pharyngeal arch skeletal and connective tissue components
- Bones of neurocranium
- Pia and arachnoid
- Parafollicular (C) cells of thyroid
- Aorticopulmonary septum
- Odontoblasts (dentin of teeth)
- Sensory ganglia of CN V, CN VII, CN IX, CN X
- Ciliary (CN III), pterygopalatine (CN VII), submandibular (CN VII), and otic (CN IX) parasympathetic ganglia

Trunk neural crest cells:
- Melanocytes
- Schwann cells
- Chromaffin cells of adrenal medulla
- Dorsal root ganglia
- Sympathetic chain ganglia
- Prevertebral sympathetic ganglia
- Enteric parasympathetic ganglia of the gut (Meissner and Auerbach; CN X)
- Abdominal/pelvic cavity parasympathetic ganglia



Neral tube develpomental stage 4

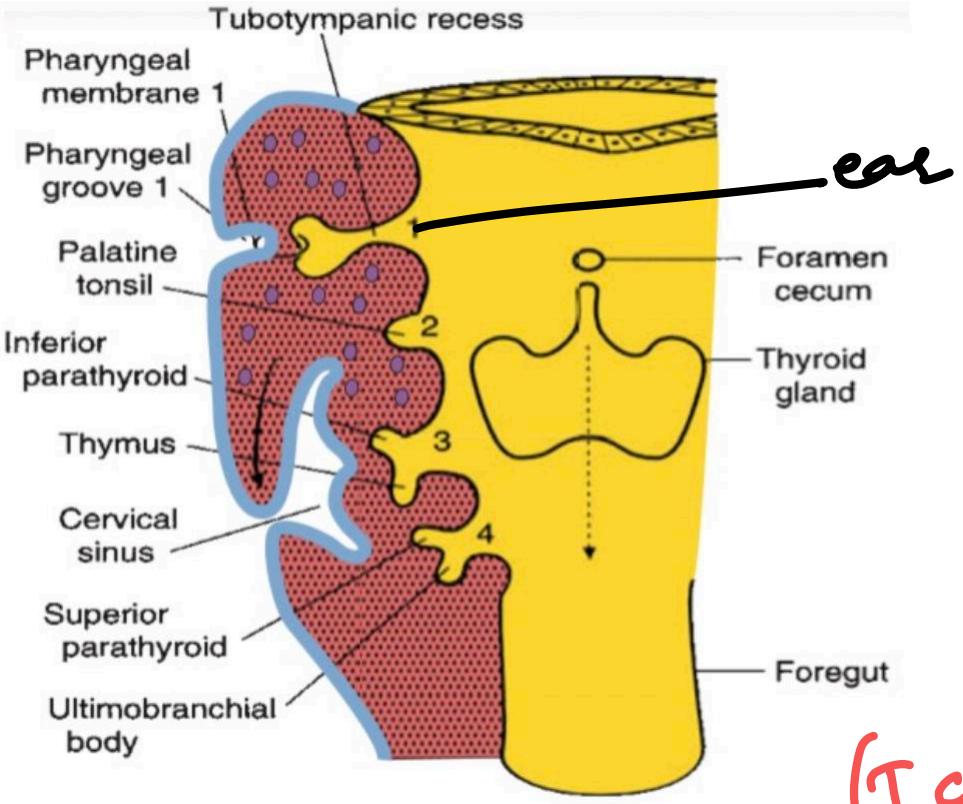
- **Notochord is derived from -** mesoderm

- **NOTOCHORD REMNANTS** (FYB)
  - **Nucleus pulposus**
  - **Apical ligament of dens**
  - **Tectorial membrane**

* chordoma.
  - clivus
  - sc.

physaliphorous

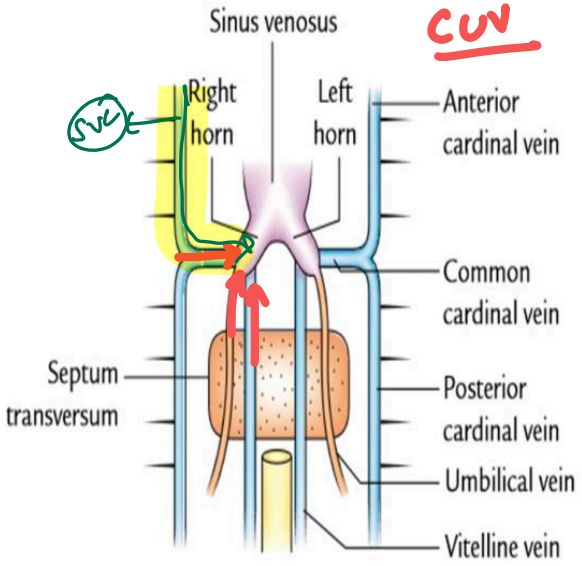
Pouch	Derivatives
First pouch	Pharyngotympanic tube Tympanic (middle ear) cavity
Second pouch	Palatine tonsil Intratonsillar cleft
Third pouch	Inferior parathyroid gland Thymus
Fourth pouch	Superior parathyroid gland Caudal pharyngeal complex* (ultimopharyngeal body)



ear

DiGeorge → 3,4 pouches. → ↓ (T cell.) ↓ Ca hypocalcemia (tetany)

Catch 22



CUV

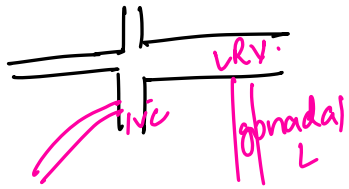
venous

Embryonic	Adult
Vitelline veins → liver	
Right and left	Portion of the IVC,[a] hepatic veins and sinusoids, ductus venosus, portal vein, inferior mesenteric vein, superior mesenteric vein, splenic vein
Umbilical veins (Regresses)	
Right →	Degenerates early in fetal life
Left →	Ligamentum teres → falciform ligament
Cardinal veins	
Anterior →	SVC, internal jugular veins
Posterior →	Portion of IVC, common iliac veins
Subcardinal	Portion of IVC, renal veins, gonadal veins
Supracardinal	Portion of IVC, intercostal veins, hemiazygos vein, azygos vein

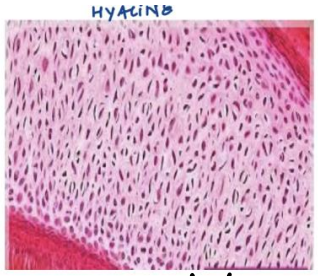
↳ connects LUV to oxygenated IVC

renal vein

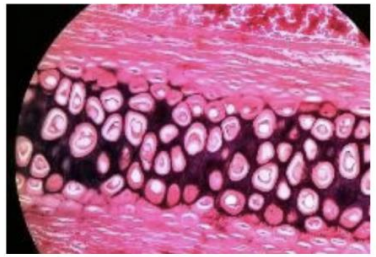
Supracardinal

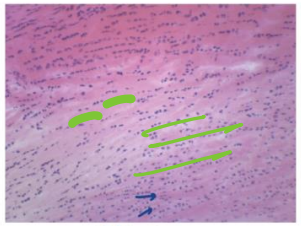


Cartilage



ground glass.


ELASTIC


FIBRO
fibre (rows)

- Yellow cartilage = Elastic
- Verhoeff's stain for – Elastic fibres
- Type 1 collagen – first = fibro
- Not covered by perichondrium – firm fibro (no peri)

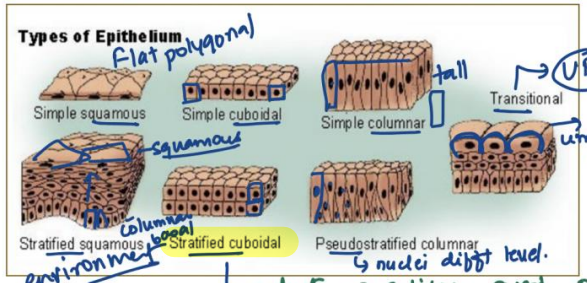
cart (two) lage → collagen type (2) ***

Hyaline = inhale

• Cricoid (CAT) • Arytenoid except ends • Thyroid • Trachea & bronchi • Epiphyseal plate • Costal cartilage • Articular cartilage at the ends of bones	fibrocart → firm shock abs • IVD • Pubic symphysis • Manubriosternal jt • Labrum- glenoid, acetabulum • Articular disc – TMJ, Sternoclavicular	midline elastic → does not calcify • Epiglottis • Eustachian tube • Ear pinna • External auditory meatus • Ends of arytenoid • Cuneiform • Corniculate

*** epiphyseal plate (hyaline)

EPITHELIUM

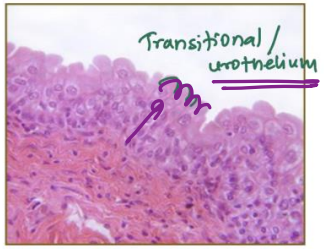


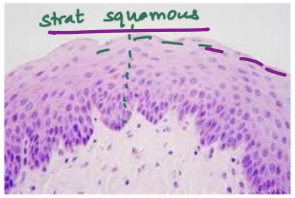
- unilayered
  - simple
  - pseudostratified
- multilayered
  - strat squamous
  - Transitional (UB)

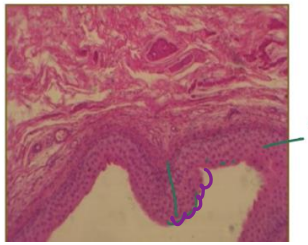
ducts → salivary, sweat, pancreat except sebaceous → strat squam

Epithelium type	Present in
Stratified squamous → environment	skin, cornea, EAC, vagina, anus, Tongue
Keratinised stratified squamous	skin, gingiva, H. palate, vermilion lip, papillae
Transitional → Reserve	UB, CAPUT → calyx to PU → Transitory, prost urethra
Pseudostratified columnar ciliated (PSCC)	Resp tract till prox bronchiole ★ cilia
Simple squamous → exchange	alveolus, endothelium, mesothelium – Bowman space, pleura, peritoneal

Pscc → pseudo strat ciliated columnar (Trachea)







URINARY TRACT EPITHELIUM

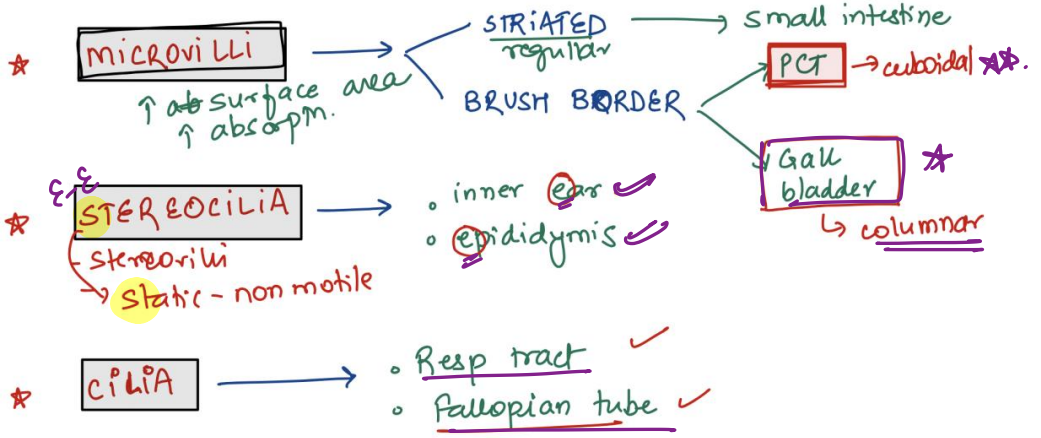
Site	Epithelium
Bowman's capsule	simple squamous
PCT ,Thick desc limb	cuboidal Brush border (microvilli)
Loop of henle	simple squamous
Thick asc limb , DCT	cuboidal
Collecting ducts	columnar without microvilli
Calxy to prostatic urethra	Transitional epith
Middle urethra – membranous, Spongy	NSC → PSC pseudostrat columnar
Terminal urethra → environment	strat squamous. (PSC)

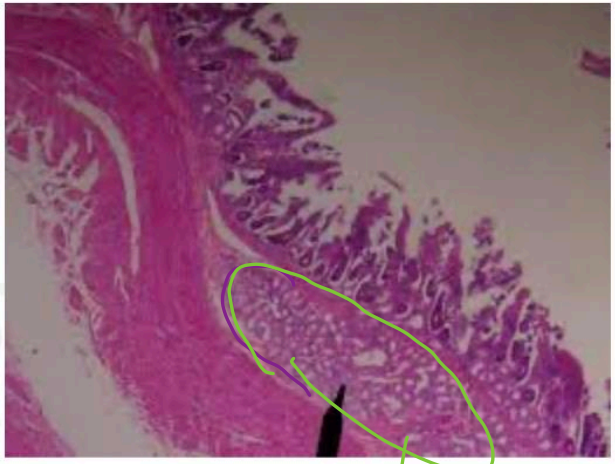
RESPIRATORY TRACT EPITHELIUM

Site	Epithelium
Nasal mucosa to proximal bronchiole	Trachea Pseudostrat ciliated columnar (PSCC)
Terminal bronchiole	cuboidal ciliated
Respiratory bronchiole	cuboidal nonciliated
Alveolus (exchange)	simple squamous.

GIT EPITHELIUM

Site	Epithelium
• Gingiva, • Hard palate, • vermilion lip, • filiform papillae	Keratinised stratified squamous epithelium
• Tongue, • Esophagus	strat squam. NK
• Anus → environm	strat squamous
• Intestine (glands)	columnar c microvilli → striated. (absorpn)

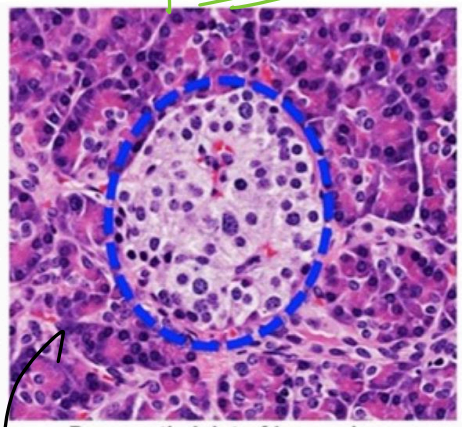




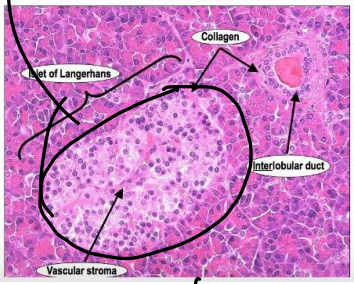
Brunner's → glands submucosa duodenum

* Peyer's → ileum

pancreas

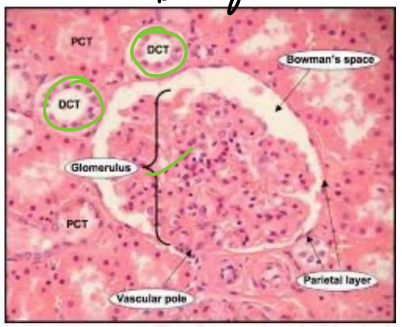


Pancreatic islet of Langerhans

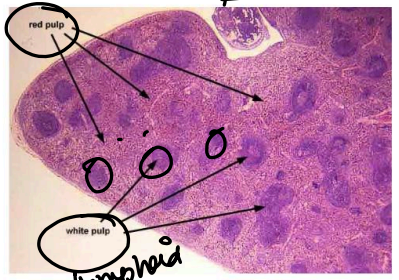


panc

Kidney



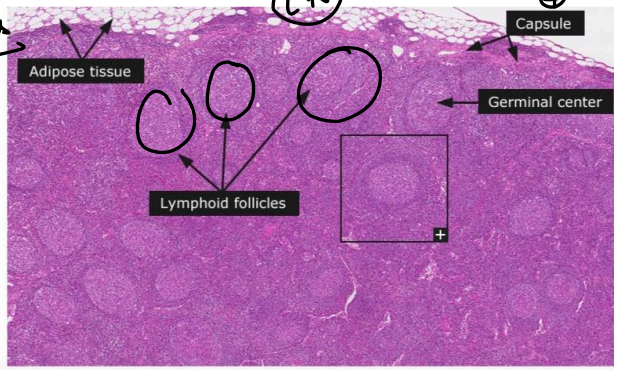
Spleen

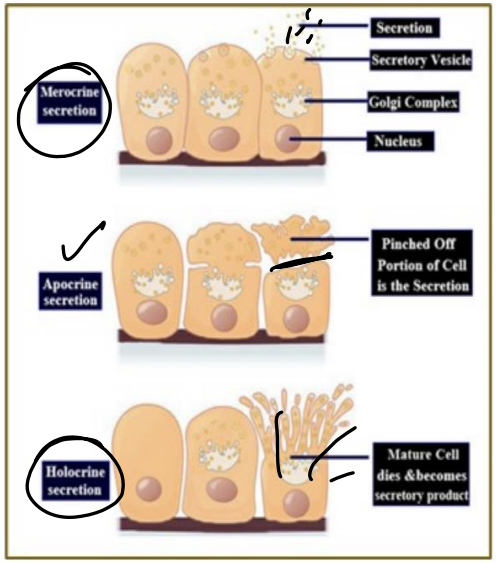


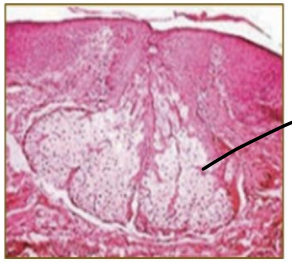
lymphoid

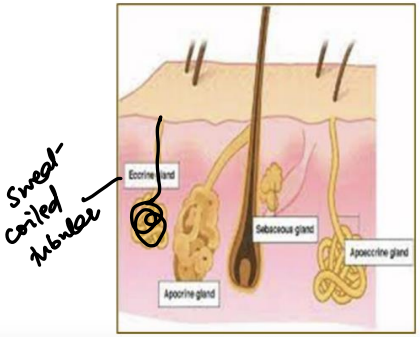
Thymus Hassall's corpuscles

L.N









Merocrine → "MERE" secretions → Eccrine sweat → palms soles no hair

Apple-MAc

Apocrine → "above" part (top)

MAC = :
- Mammary
- axilla.
- ceruminous

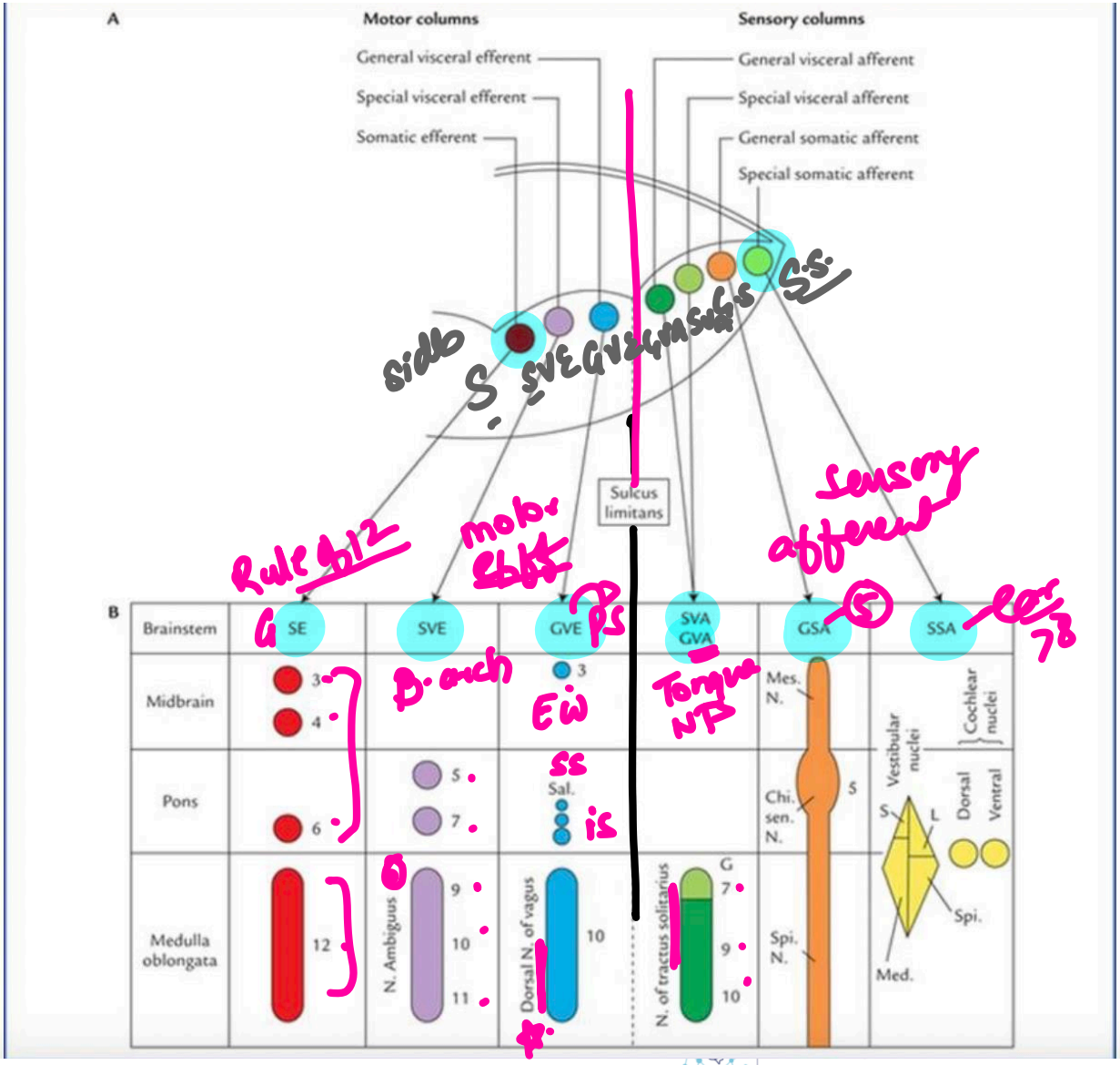
Holocrine → "whole"

↓

"sab"

- sebaceous
- Meibomian.

(N)



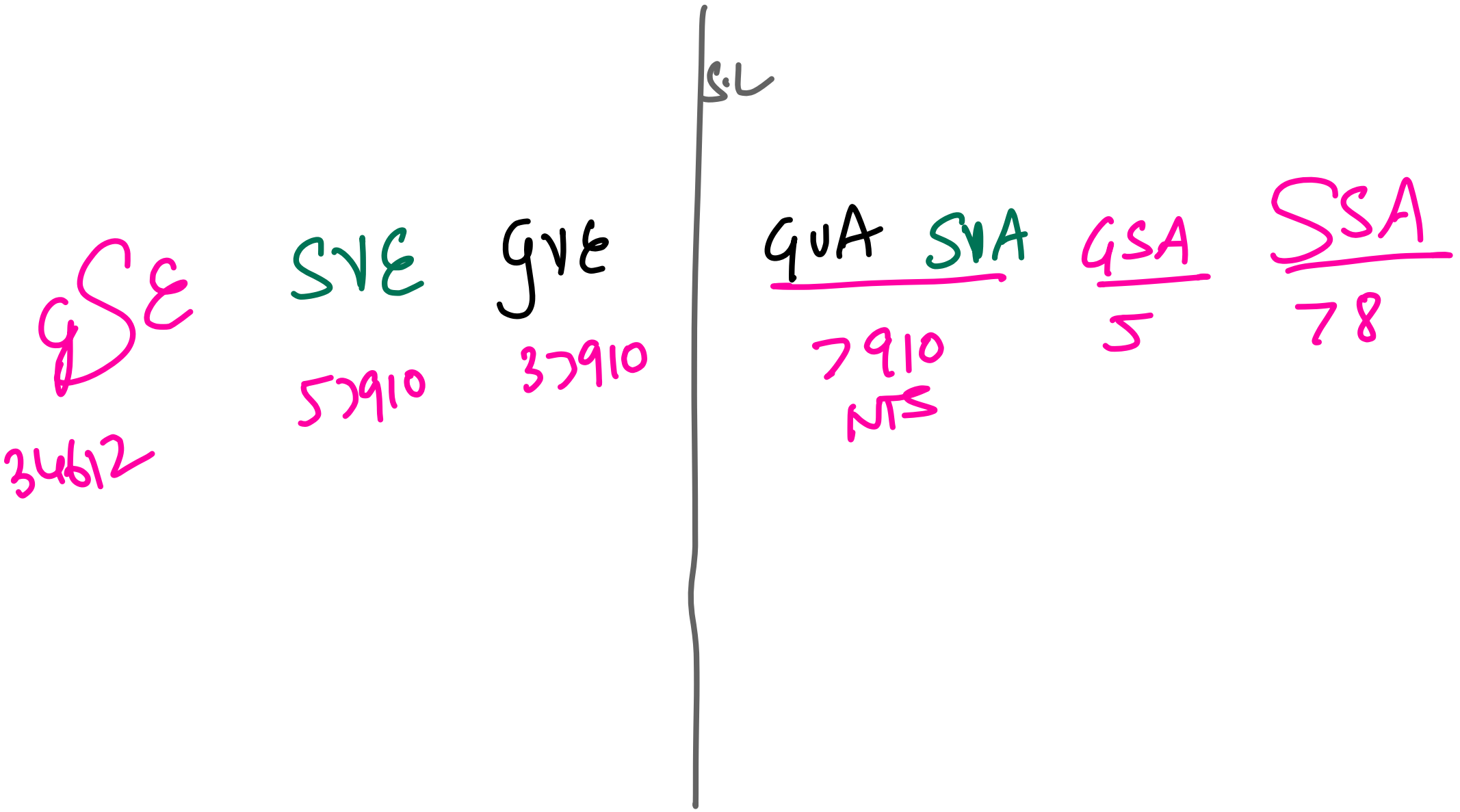
M - m
motor medial

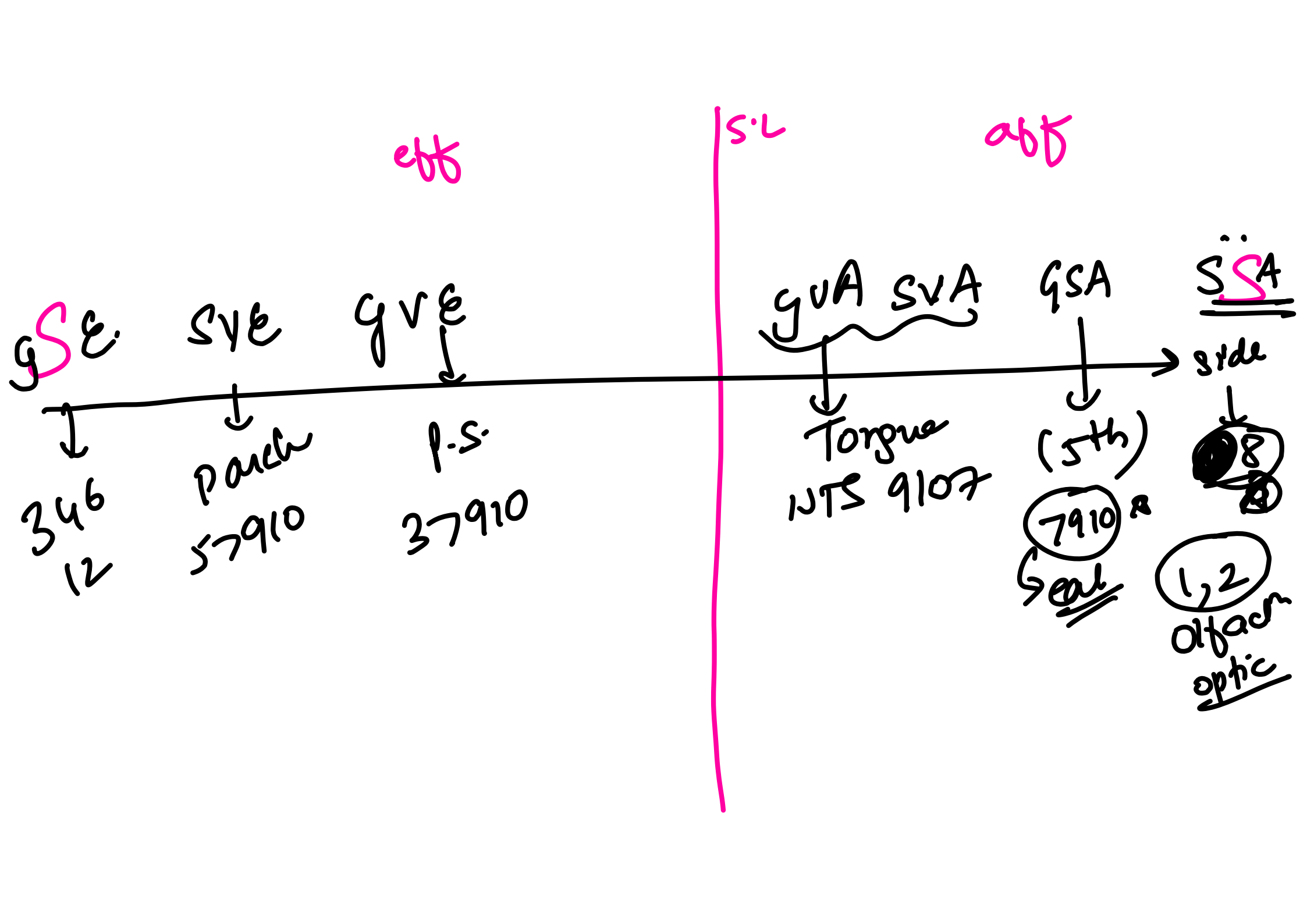
S - s
sensory sides (lat)
somatic - sides.

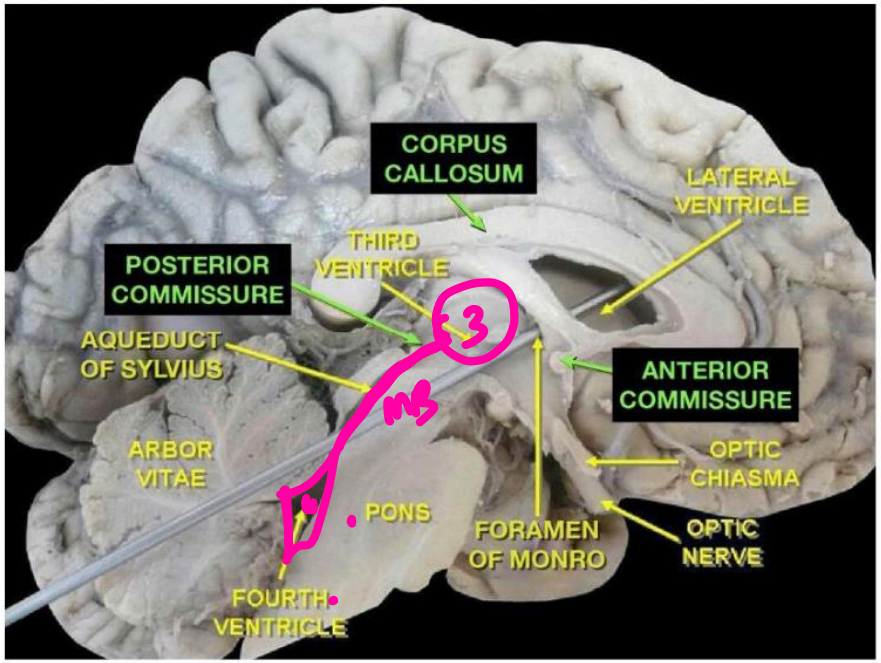
Somatic
G.S.E

SVE GVE GVA/SVA GSA

Somati
SSA


S.L
GSE
34612
SVE
57910
GVE
37910
QUA SVA
7910
NTS
GSA
5
SSA
78


eff
S.L
aff
GSE
SVE
GVE
GVA SVA
GSA
SSA
side
Torgue
NTS 9107
(5th)
7910
Seal
8
1,2
Olfact
optic
346
12
parch
5 7910
P.S.
37910

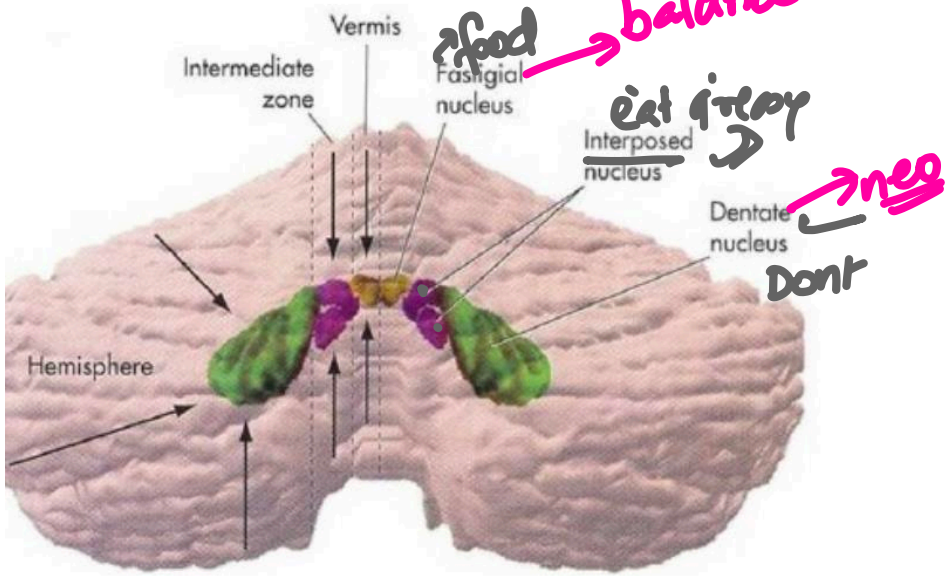


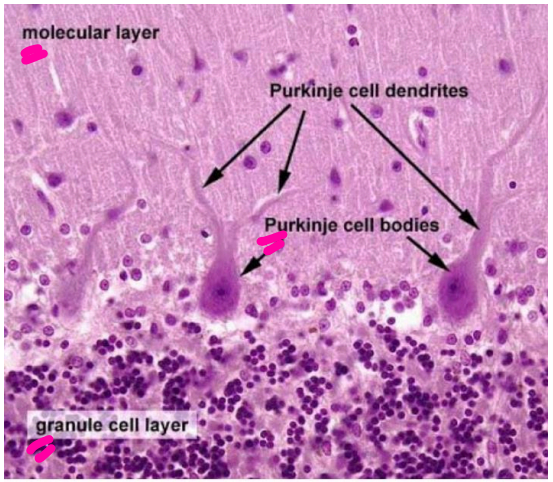
Papez

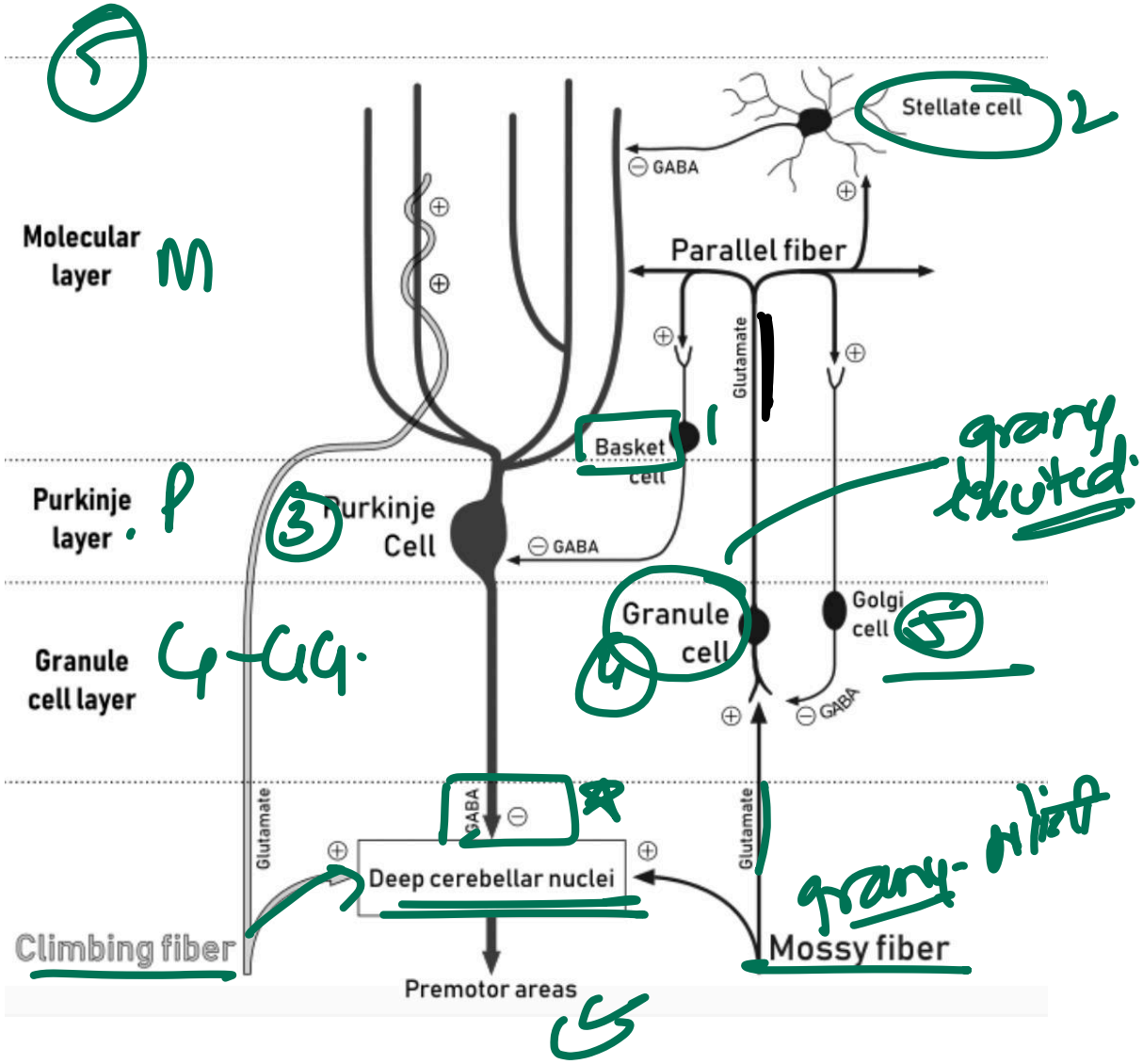
Fornix

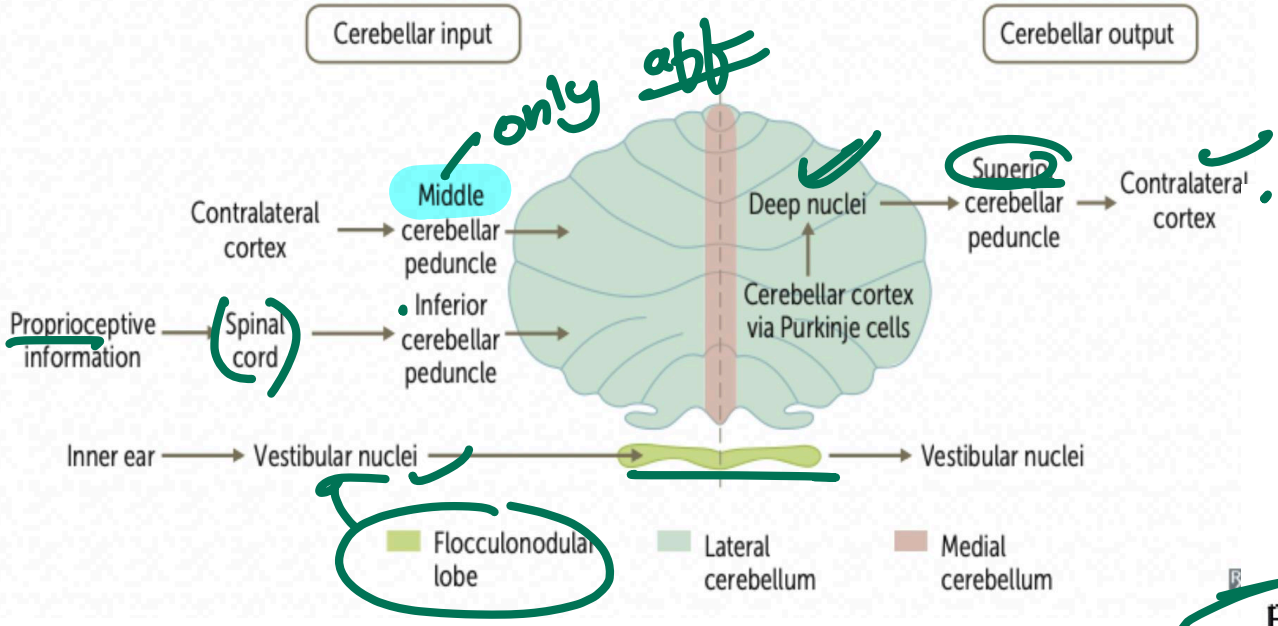
- assocn
  > comms
- Hippocamp
  ↓
  mambody

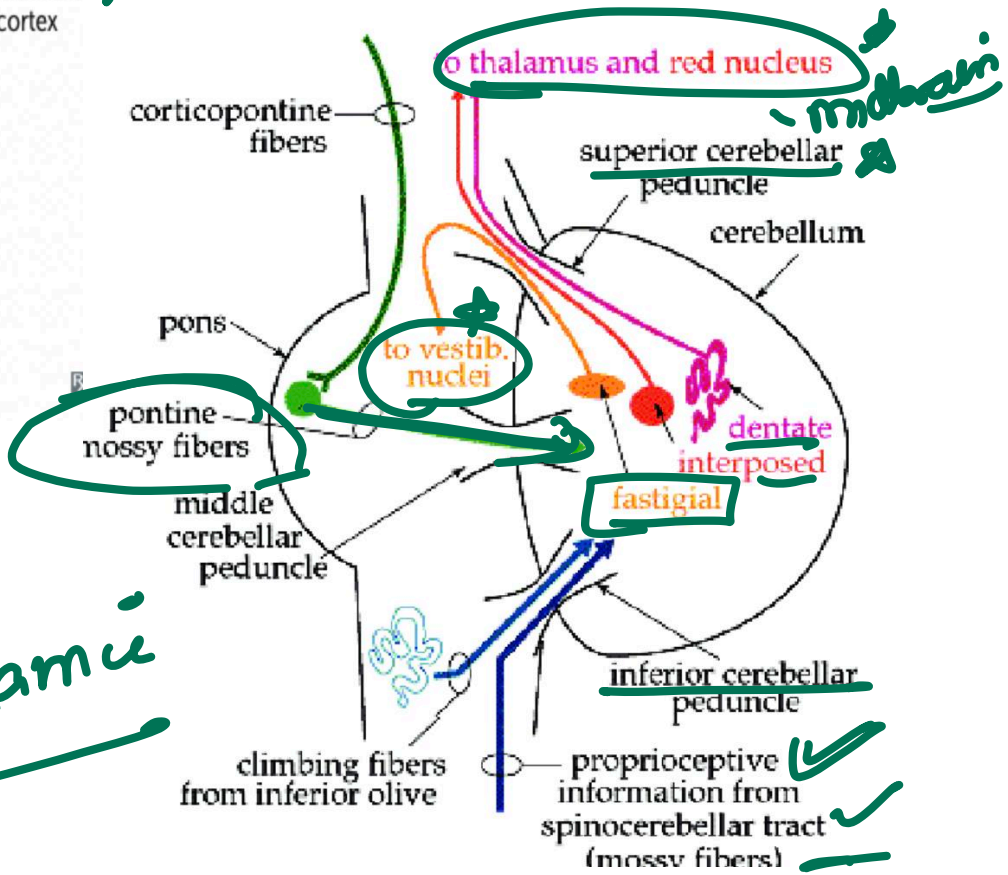
cingulate gyrus ← Thalamus (ant) ← mambody











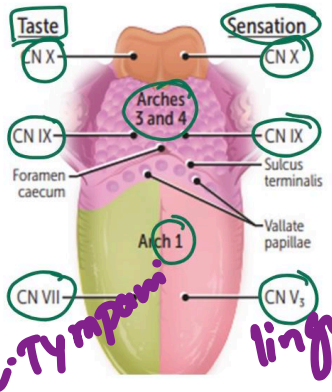
inf - s.c

sup - goes to cortex - dentate / rubrothalamic

Peduncle	Afferent fibers	Efferent fibers
Superior cerebellar peduncle	Anterior spinocerebellar tract	• Globose - emboliform - rubral pathway • Dentatothalamic pathway
Middle cerebellar peduncle - Largest, most, lateral and only afferent	Corticopontocerebellar pathway	No eff-
Inferior cerebellar peduncle	• Posterior spinocerebellar tract • Cuneocerebellar tract • Olivocerebellar tract • Reticulocerebellar tract • Trigeminocerebellar tract • Vestibulocerebellar tract	• Fastigial vestibular pathway • Fastigial reticular pathway

TONGUE

Taste → NTS → 9 10 7 → XS



C-Tympani
lingual

Part of tongue	Develops from arch	Nerve carrying general sensation	Nerve carrying taste sensation
Ant 2/3 rd	1	5 (lingual)	7 (chorda tympani)
Post 1/3 rd	3 → 9		9
Posteriormost	4 → 10		10

GVA NTS → 9 10 7

Important points about tongue

- Tongue develops from arch – 1, 3, 4 (x2)
- 12 CN is pure motor – develops from Basal ventral plate
- 12 CN palsy occurs in brainstem syndrome – medulla (Medial medullary syndrome) — Rule of 12 → 3 4 6 12 (GSE) — medial
- Tongue deviates to (Rt) side / same side — Tongue licks the wound

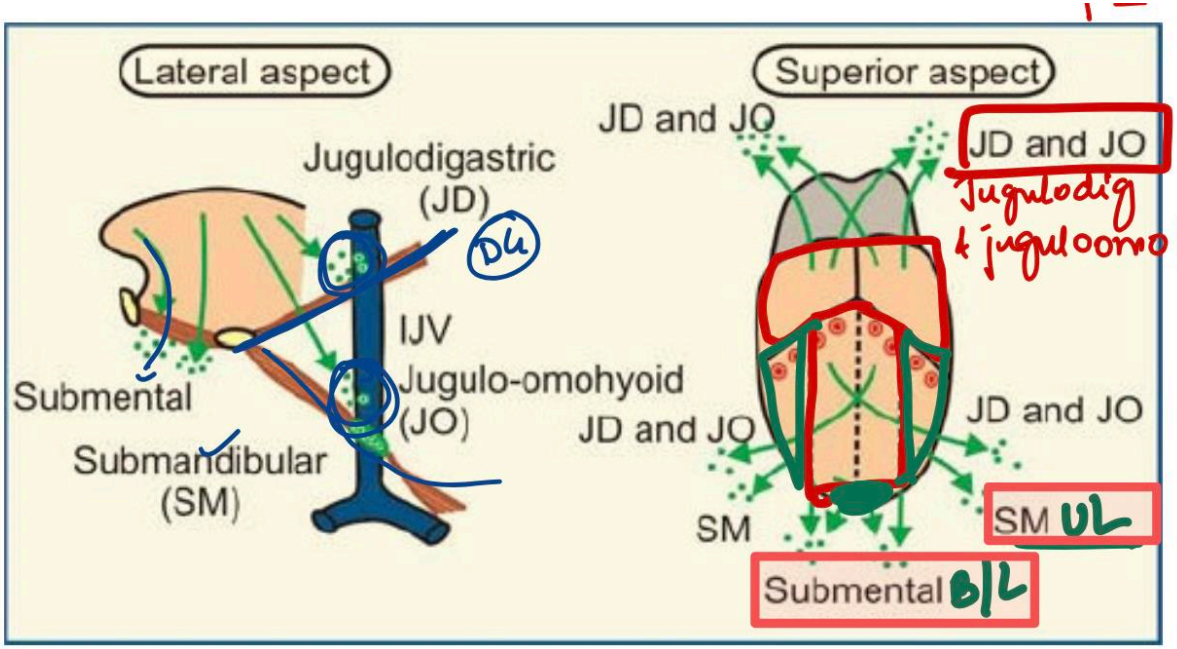
DASi
Dorsal alar sensory
BV
Basal ventral
↳ motor
12th

1 3 4
x2
5 → post
7 → pre
9 } GSE
10 } 3 4 6 12
10

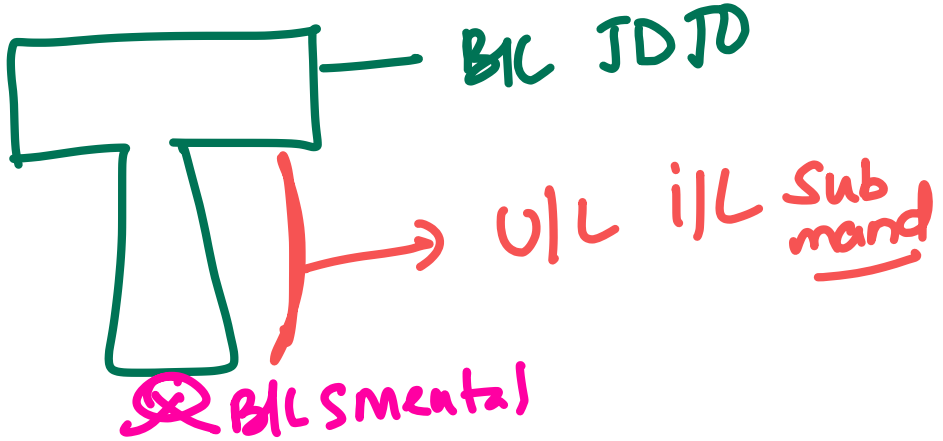
Thalamus
VPM
gustar
fac

Palatoglossus
6th

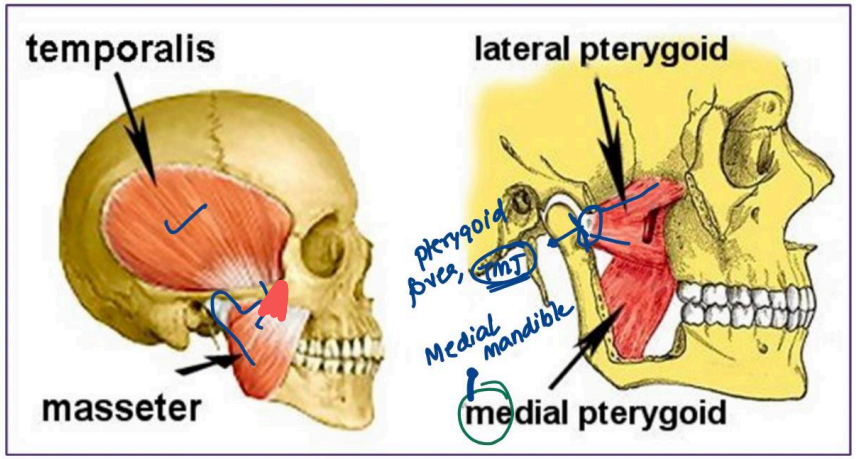
Somite GSE 12



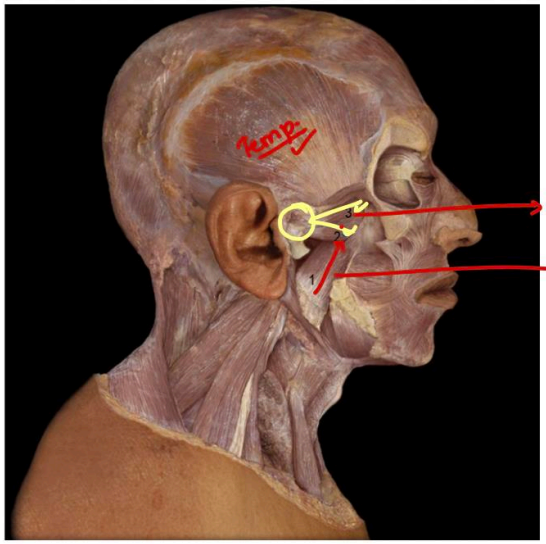
- Tip → B/L Submental
- Ant 2/3rd
  - Lateral border- U/L submandib
  - Central part – B/L JD & JO
- Post 1/3rd -



MUSCLES OF MASTICATION

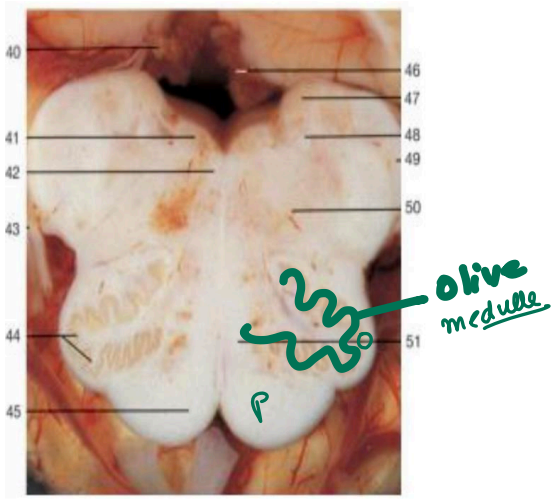


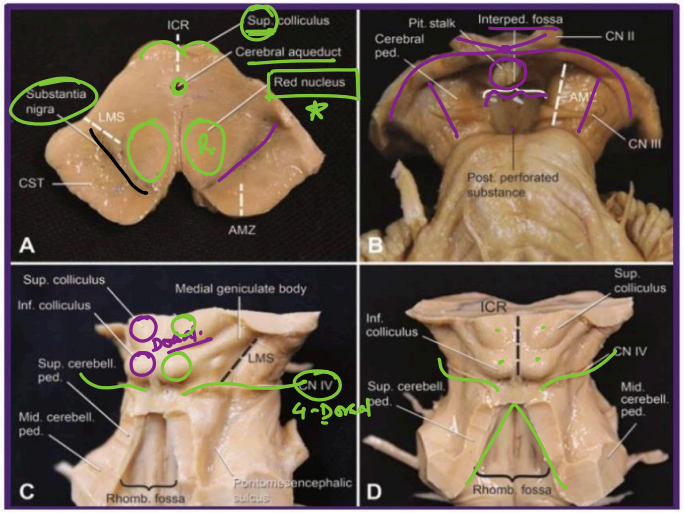
* BUCCINATOR xxx
↓
facial n
MASTICATION.
M → 1st arch.
↳ mandibular n
Trunk AD PD xxx
1 3
Me
MEDIAL P.

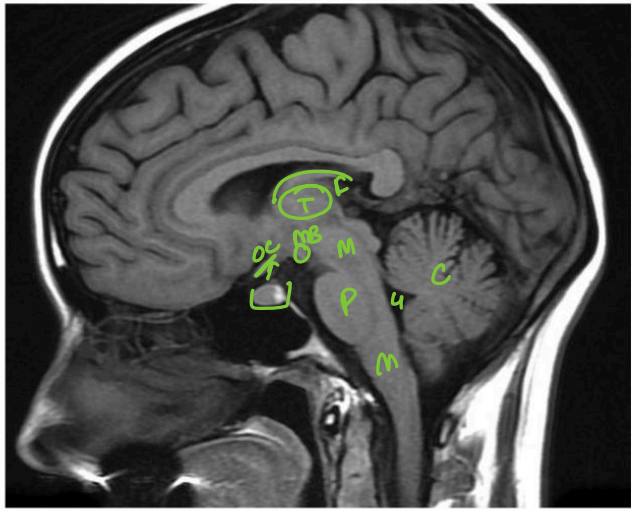


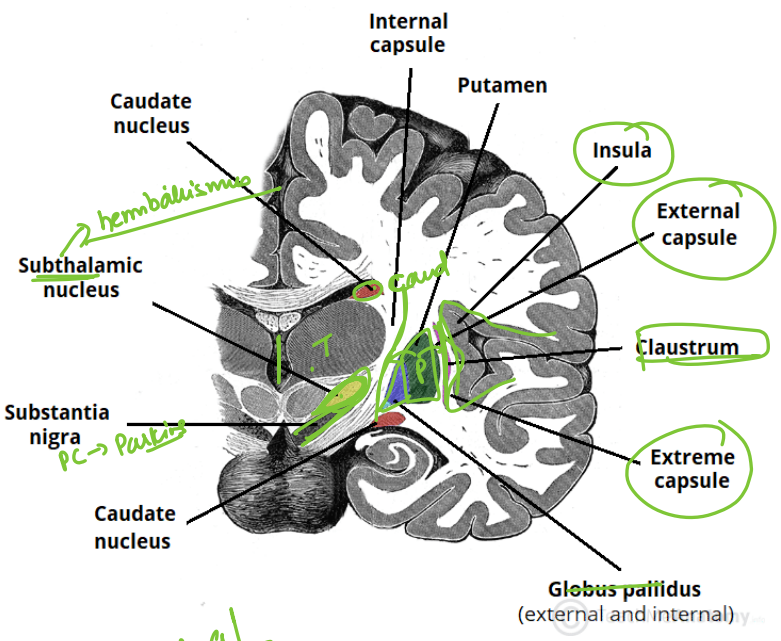
- All elevate mandible except (Jaw depressions / opening mouth is done by) - → L-L LP lower jaw
- All cause protrusion except Temporalis (attach)
- TMJ articular disc insertion → LP
- Coronoid process insertion
  ↳ Temporalis

. mandibular n (1st arch)
→ Trunk
→ Me → medial pterg
→ ant divs
Rest 3.

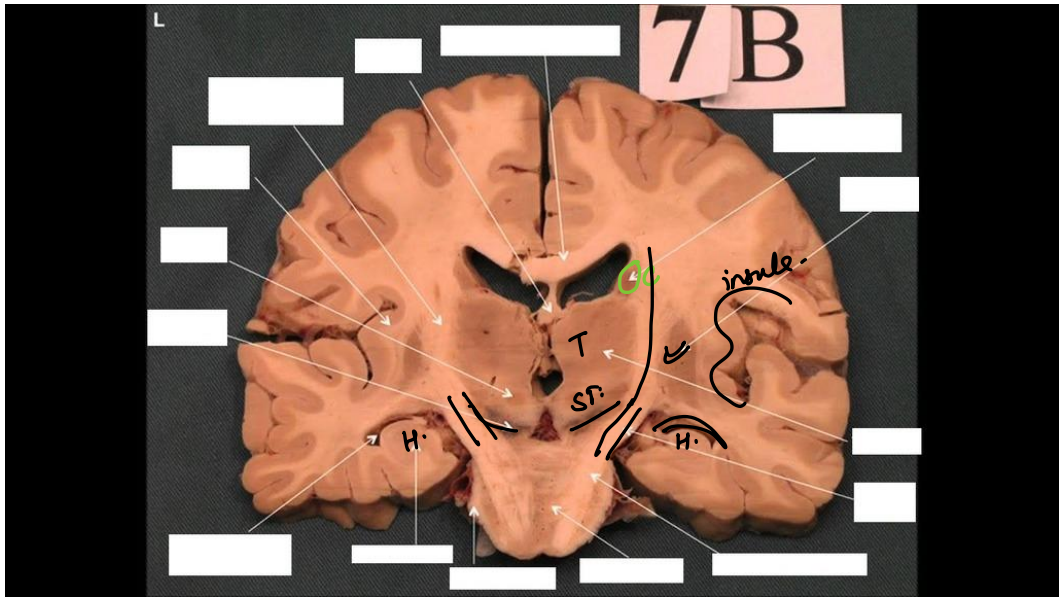


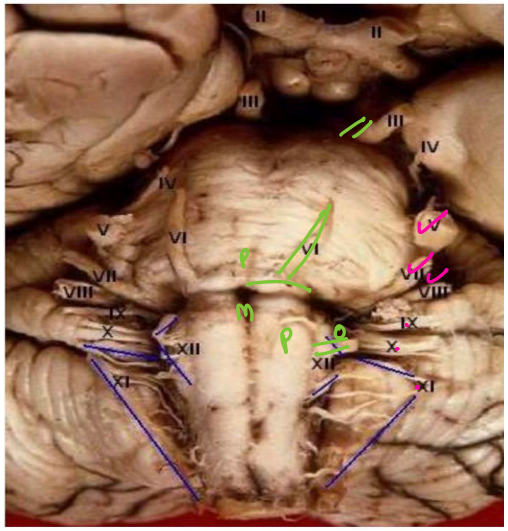






Subthal motor int?yp.





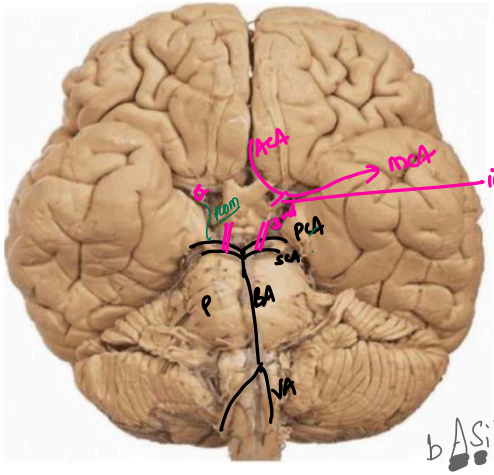
3 4 6 12
medial
motor
GSE

x ½ 4 MB
5-8 P
9-12 medulla

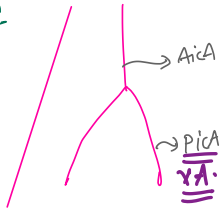
12 ant lat sulcus.

Wallenberg - lat med.
VA > PICA
· 9,10,11
· SPT
· SCT
· symp - Horner's

ICA → ∘ AC → PLIC
∘ ophthalmic a.



Pcom aneurysm
3rd CN palsy

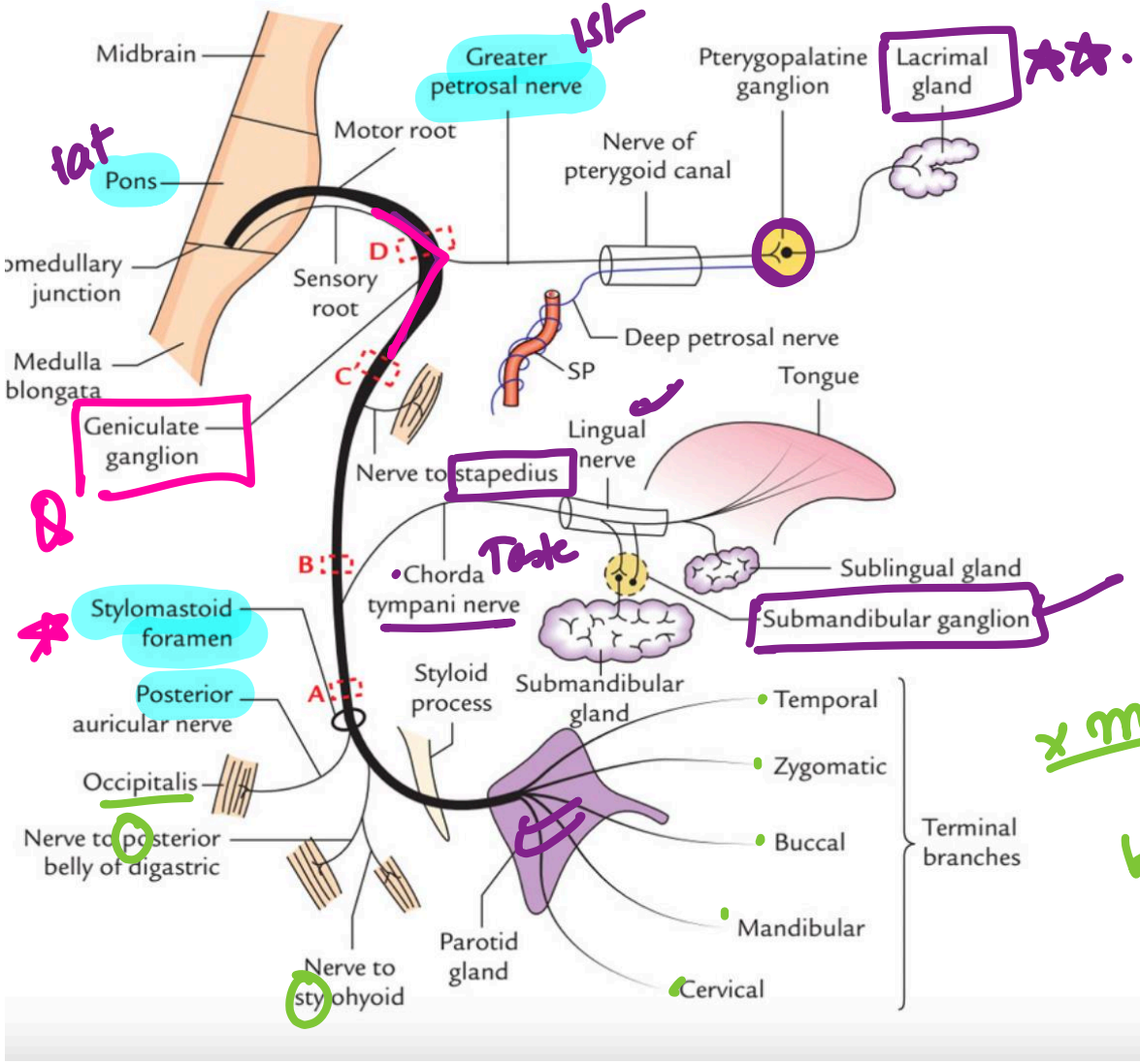


b ASilar
AICA > SCA

MEDSYNAPSE
Where Concepts Meet Mnemonics

Parasympathetic Ganglia of The Head & Neck

Nucleus	Pre-ganglionic	Ganglion	Post-ganglionic	Target organs
Edinger-Westphal nucleus (Oculomotor nerve)	Travels with the motor root of the oculomotor nerve	Ciliary ganglion	Travels via the short ciliary nerves	Sphincter pupilliae Ciliary muscles
Superior salivatory nucleus (Facial nerve)	Within the greater petrosal nerve & vidian nerve of pterygoid canal	Pterygopalatine ganglion	Joins the maxillary nerve	Lacrimal gland Nasopharynx Palate Nasal cavity
	Within the chorda tympani of the facial nerve	Submandibular ganglion	travel directly to target organs	Sublingual & submandibular glands
Inferior salivatory nucleus (Glossopharyngeal nerve)	Within the lesser petrosal nerve	Otic ganglion	Join the auriculotemporal nerve	Parotid gland
Dorsal vagal motor nucleus (vagus nerve)	Within vagus nerve	Located within multiple target organs	N/A	Smooth muscle of the trachea, bronchi & GIT

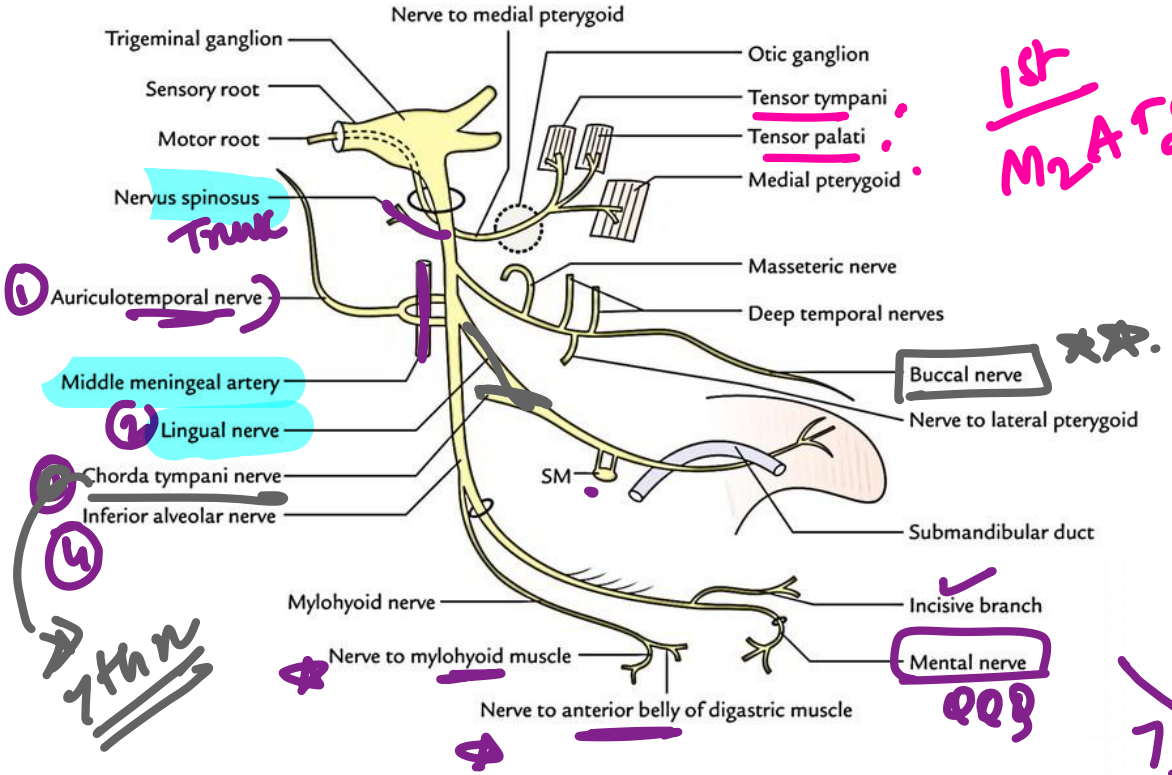


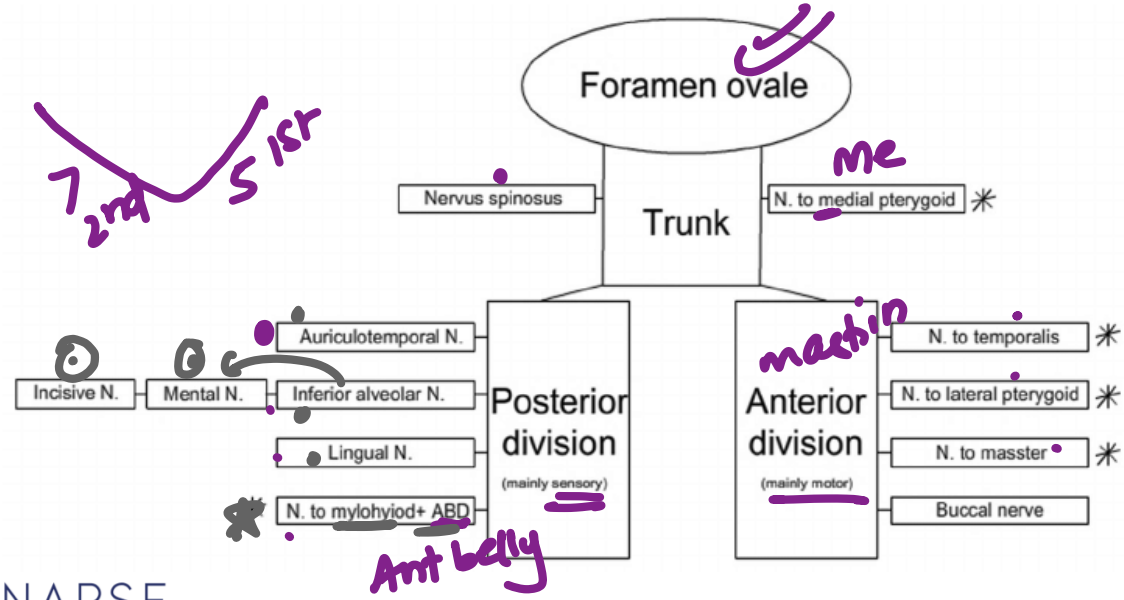
facial → AICA → lateral pontine

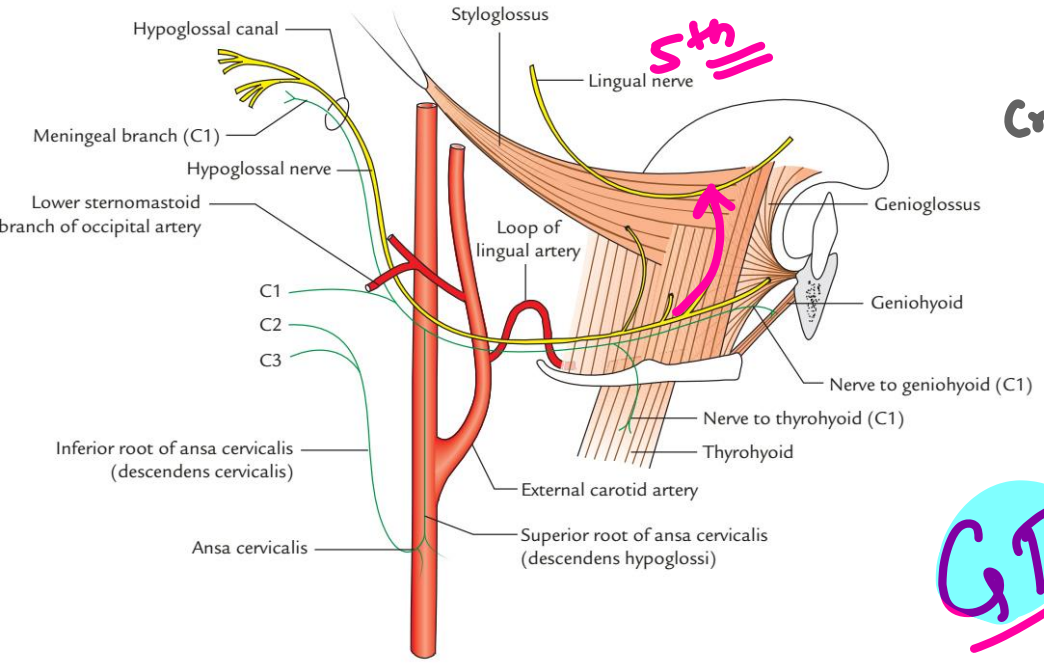
7 → 2nd ↓-S.

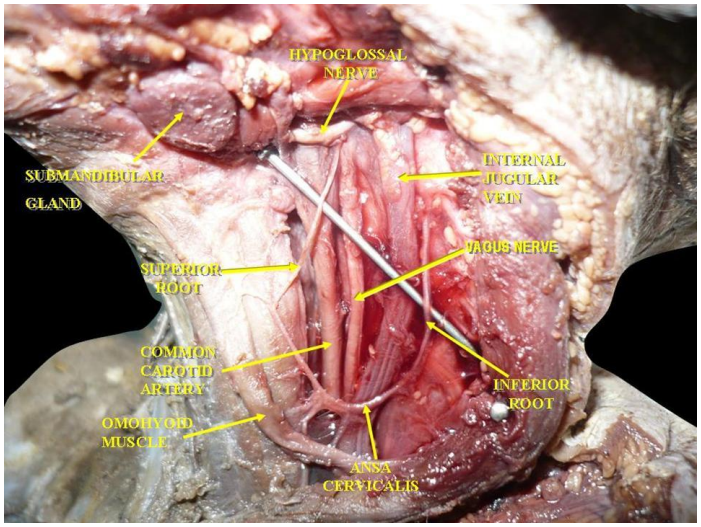
frey auriculotemp

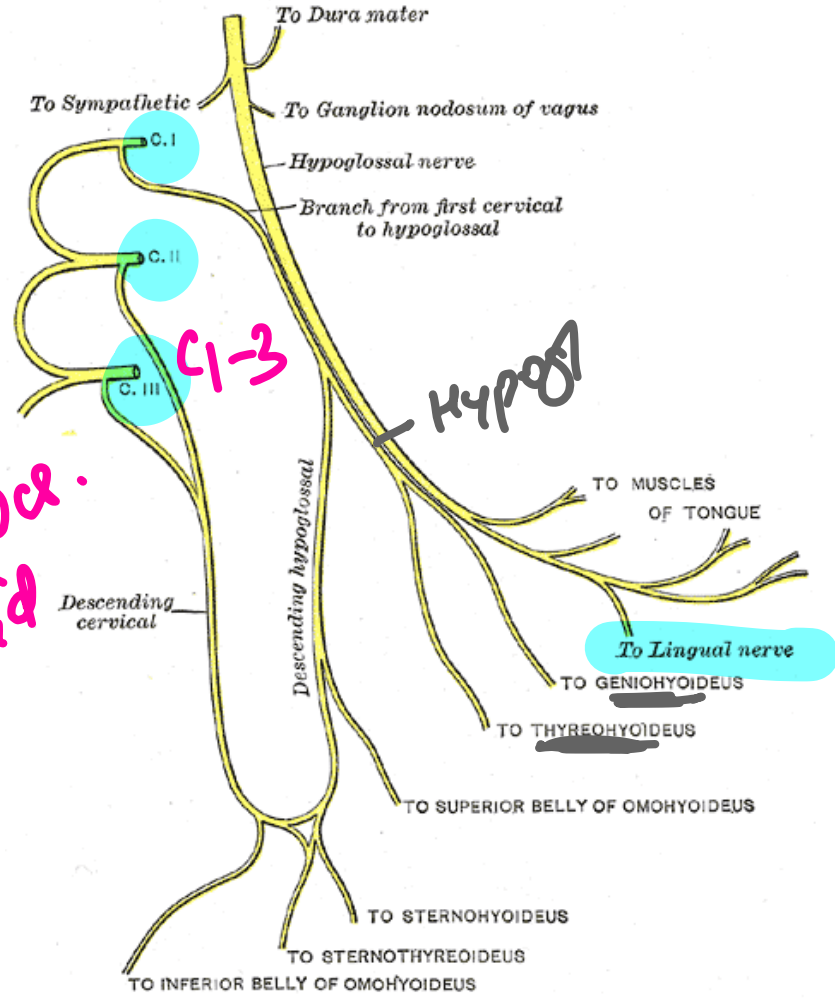
x menbal ↓ to submand











MEDSYNAPSE
Where Concepts Meet Mnemonics

REMNANTS OF CVS EMBRYONIC PARTS

EMBRYONIC PART	REMNANT
Sep. primum	Fossa ovalis floor
Sep. secundum	Fossa ovalis limbus /annulus (surr)
D. arteriosus	Ligamentum arteriosum
D. venosus	Ligamentum venosum
Umbilical artery	medial umb. ligament, sup vesical artery
Umbilical vein	left → ligamentum teres → falciform ligam

DA → d 6th arch (L)

left regresses

shunts oxy blood from LIV to IVC

2AV cord

UB

single umb a → a/w Renal anomalies

2AV

unequal div

TOF

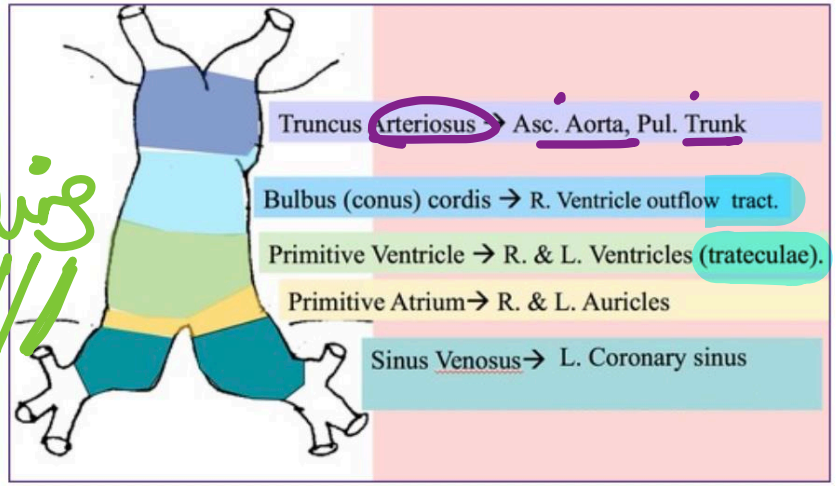
no septum PTA

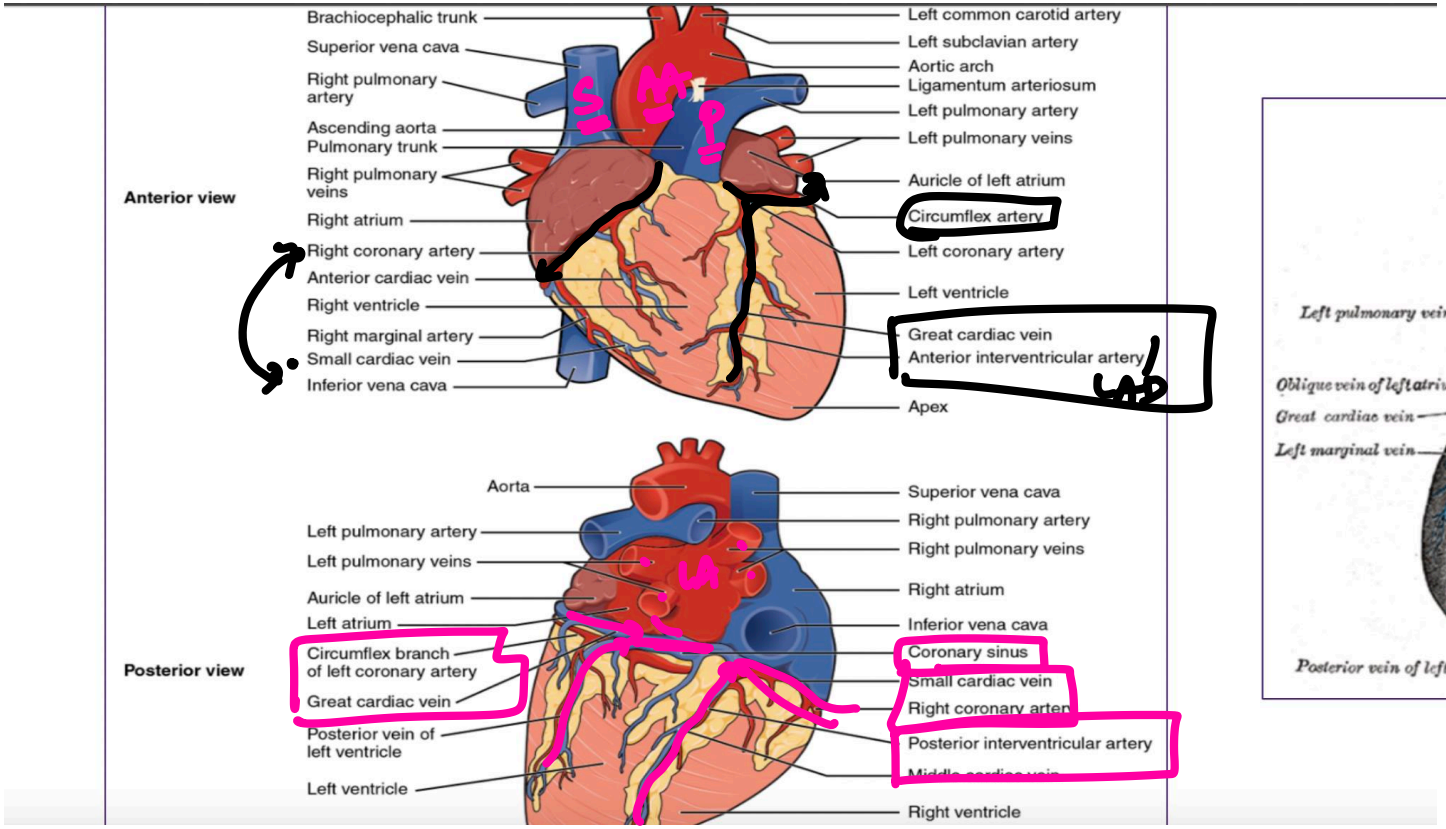
no spiralis TGA

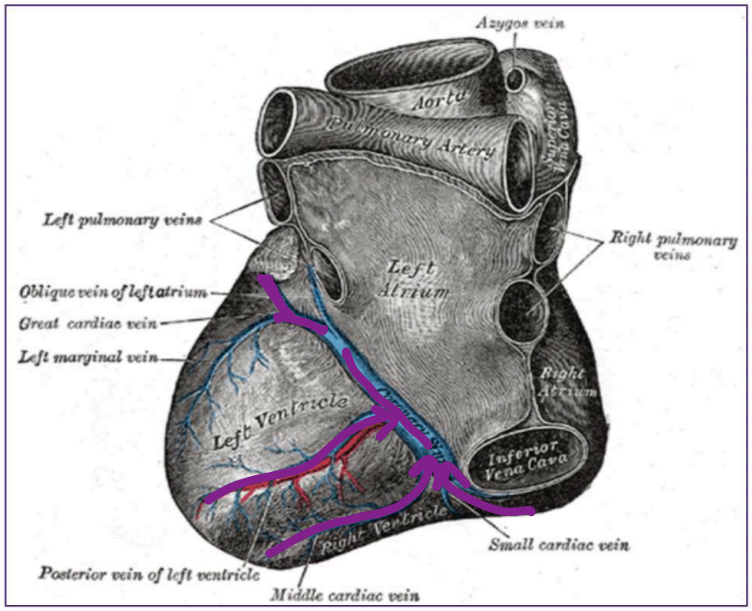
f.o

floor 1st primum

limbus surr secundum







Coronary sinus ⊕ → LA → oblique vein/ Marshall
LV → post vein

Xpp ant → Rt atrium direct

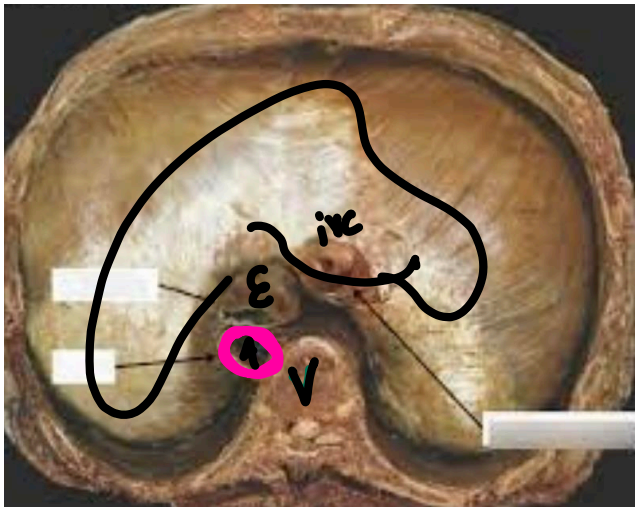
Great → Middle → Small

Great → front AIV

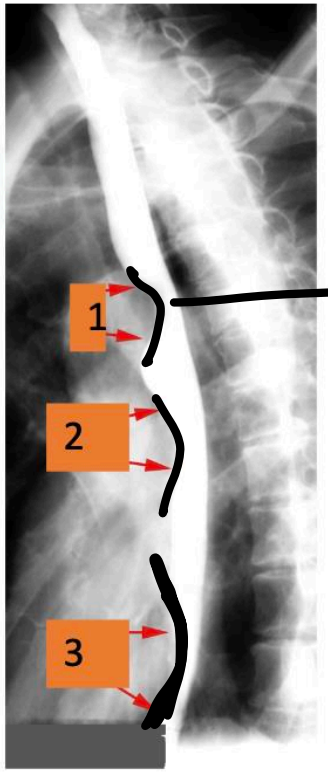
- post
- PIV

- RCA
- Rt AV groove

- LAD + LCx



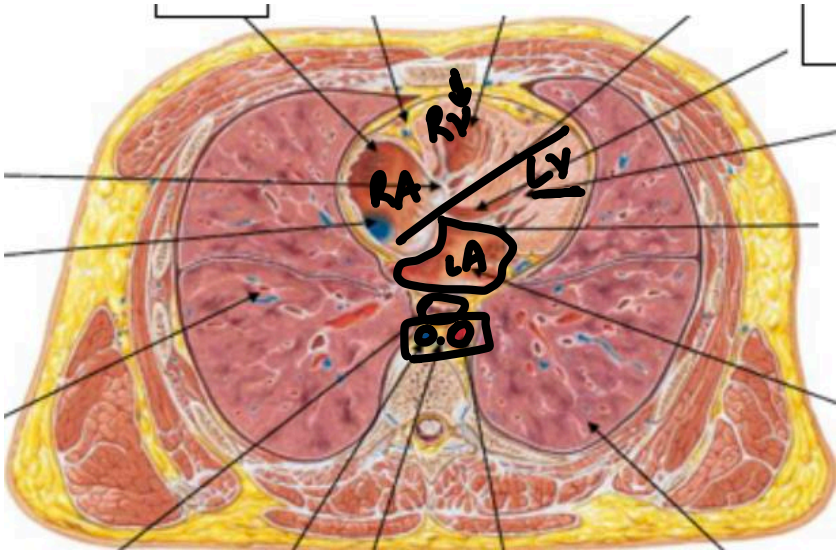
central tendon
↓
. caval opening

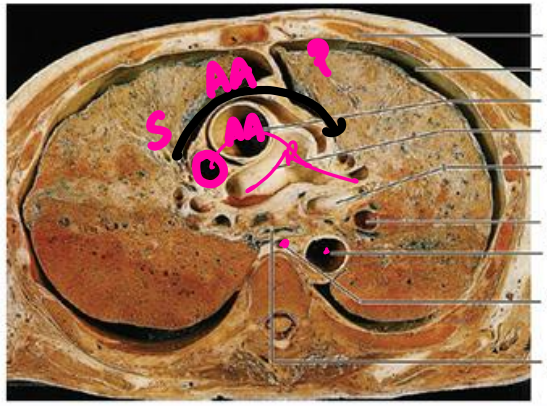


→ Aortic

Bronchus (L)

Cardiac
↳ (LA)
(dysphagia)

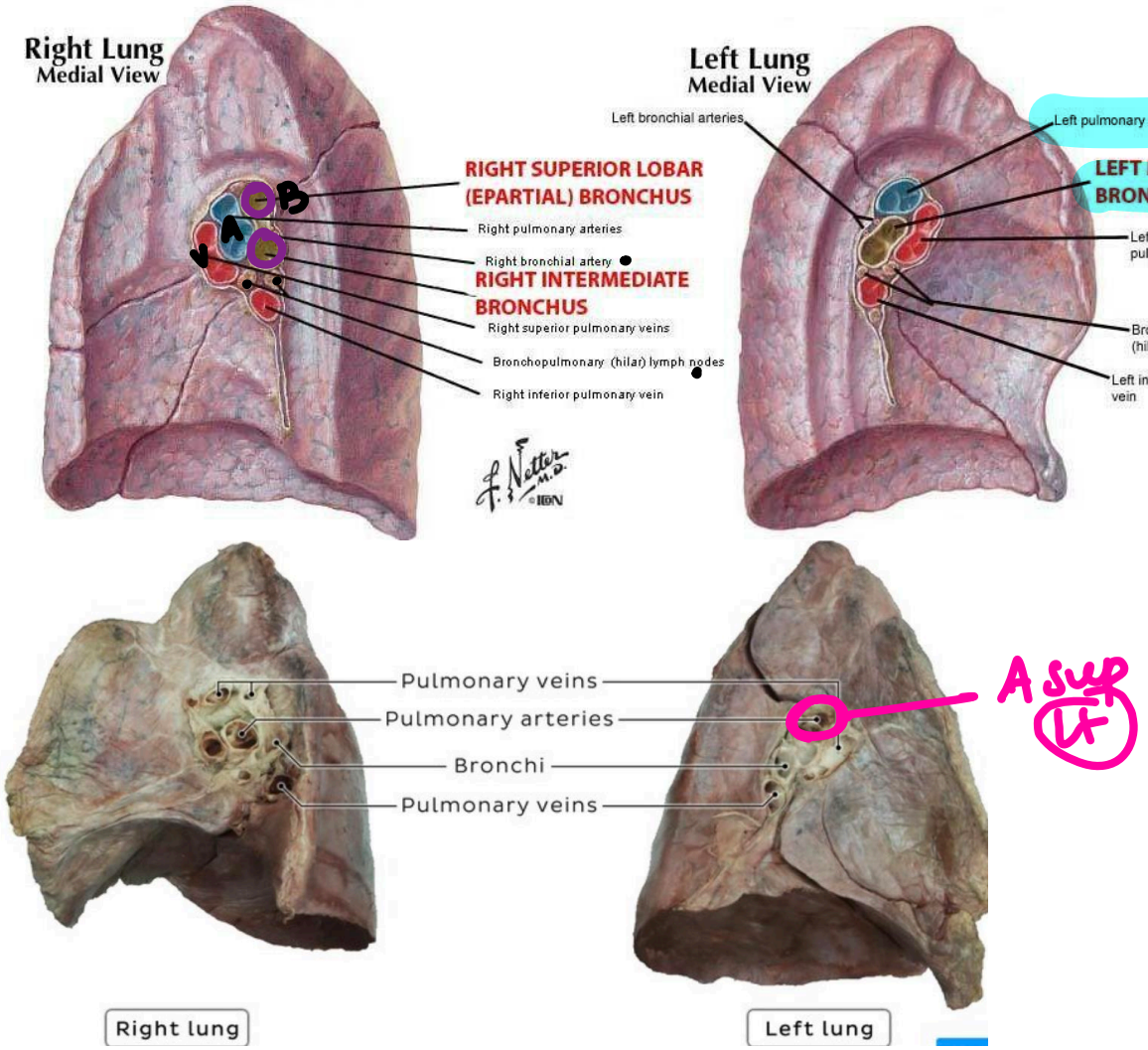




aorta

AT 12

- aorta
- azygos
- thoracic duct



above

A sup (Lt)

CXR → Hilum higher

(N) → (Lt)

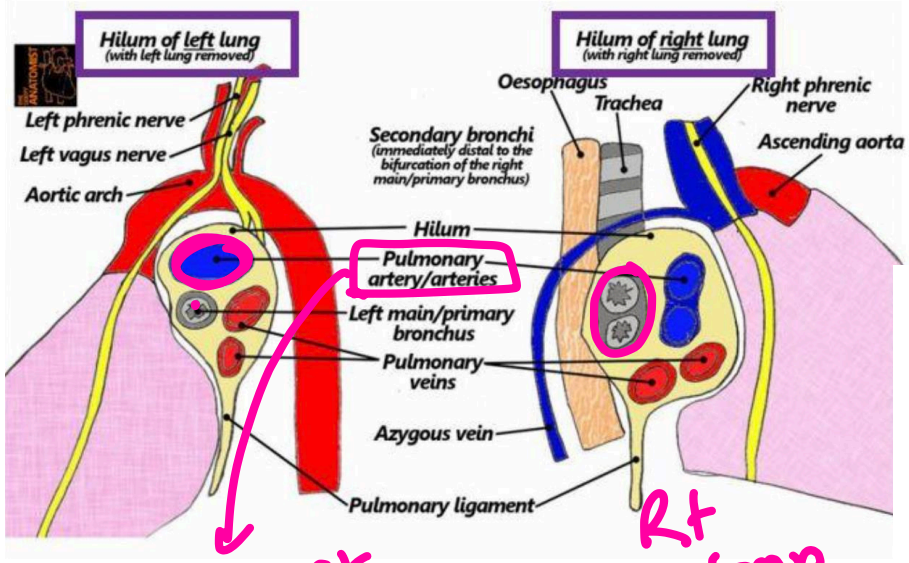
∴ Lt PA is higher

LAST - left art sup

RAPT → Rt art ant branch

ant to post

V A B

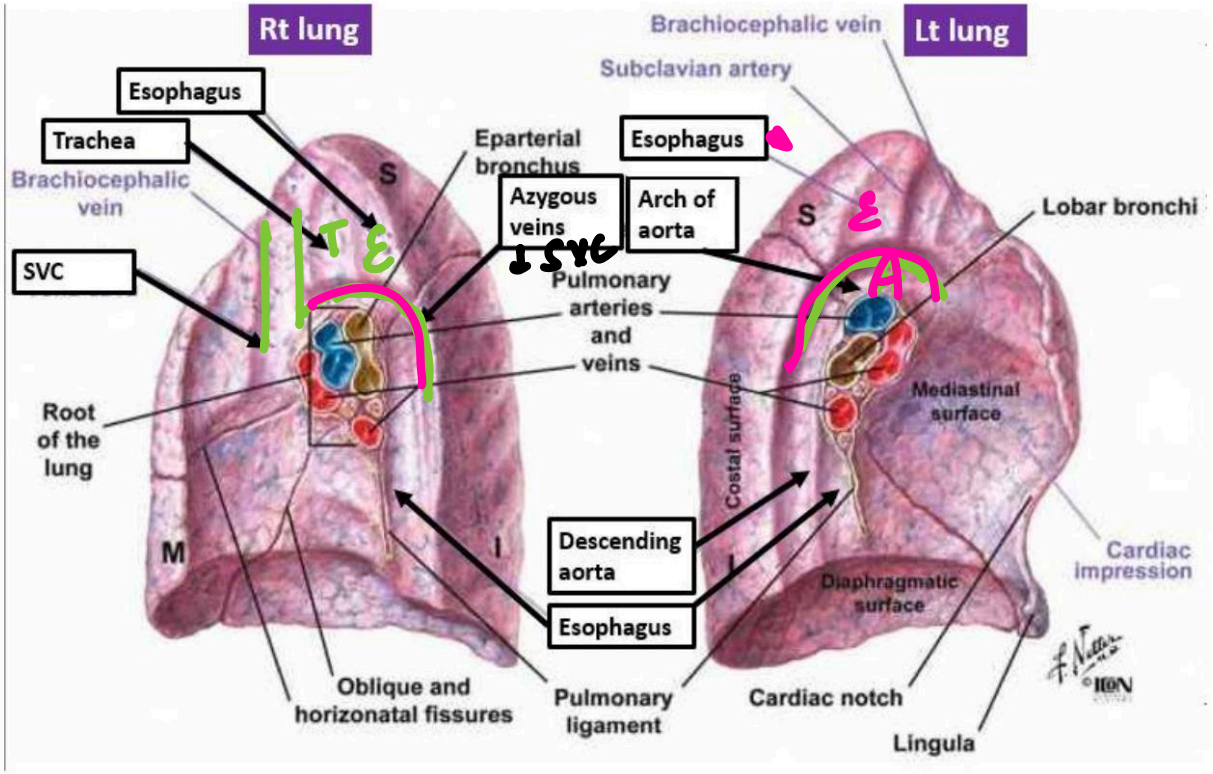


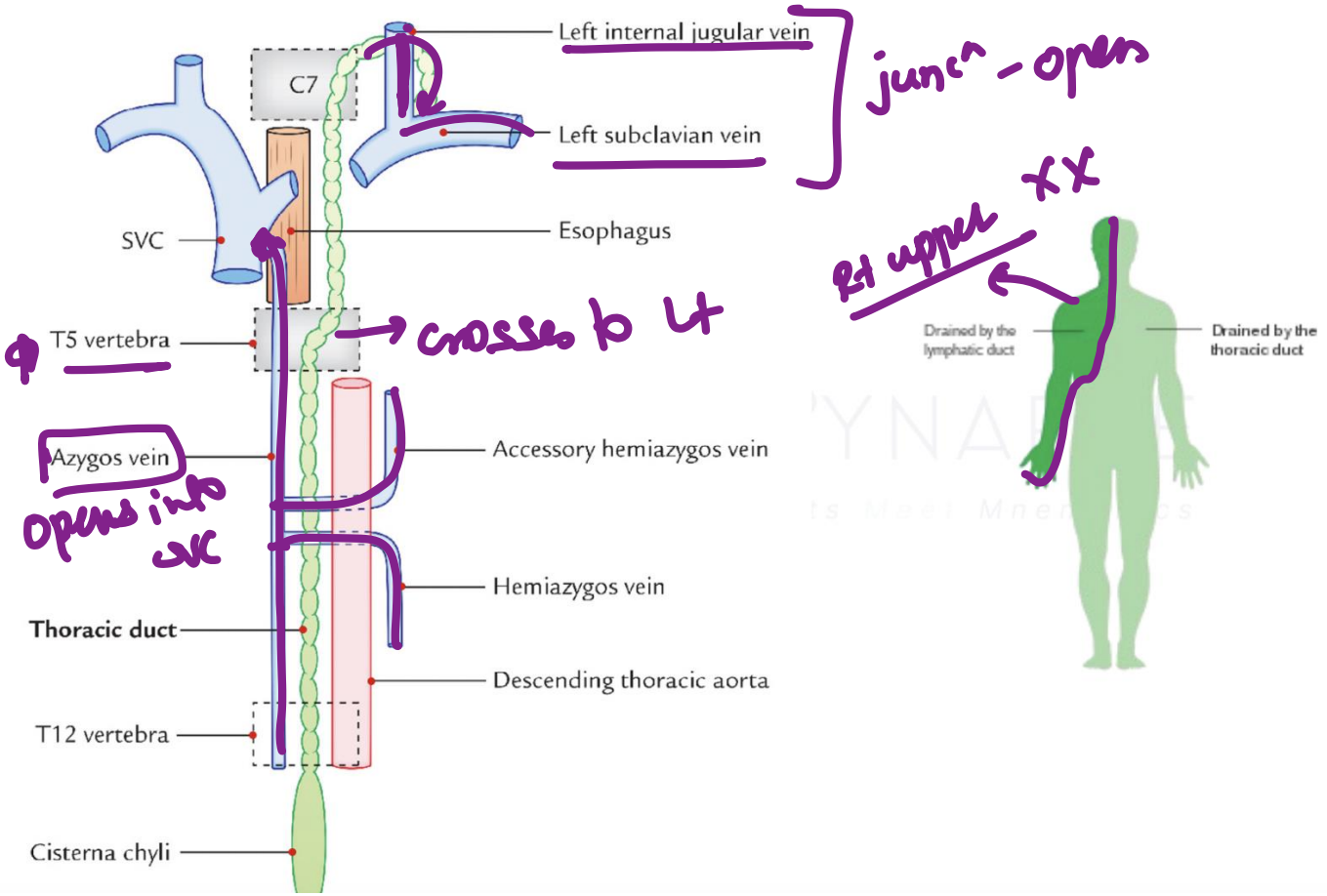
Sup most lt hilum PA

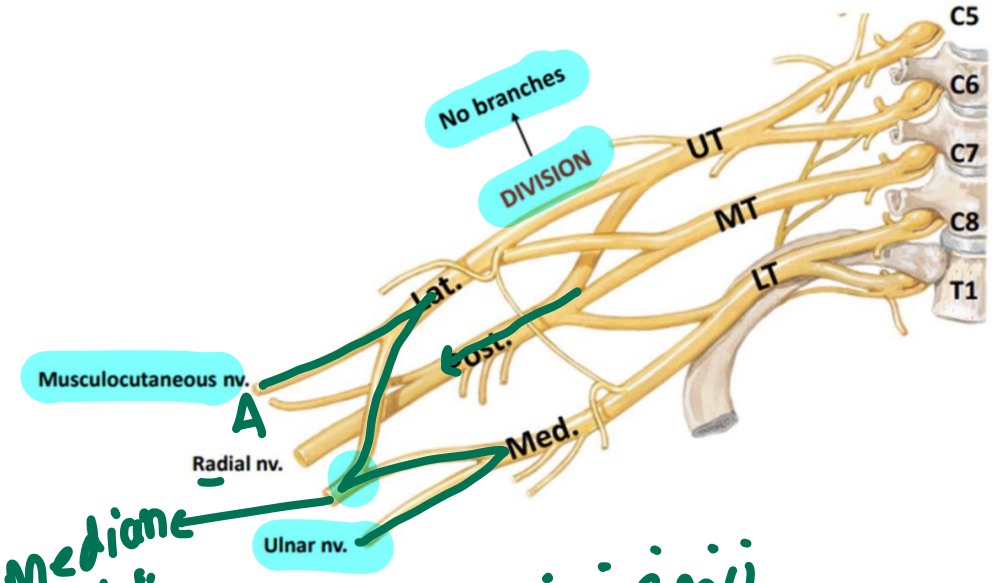
Rt 2 bron

phrenic = front

vague = post



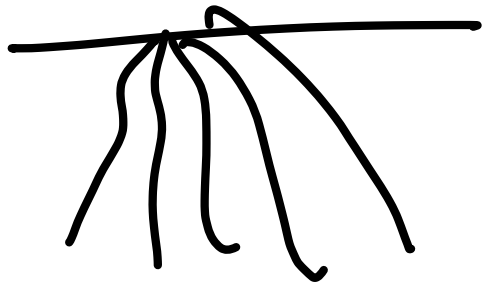




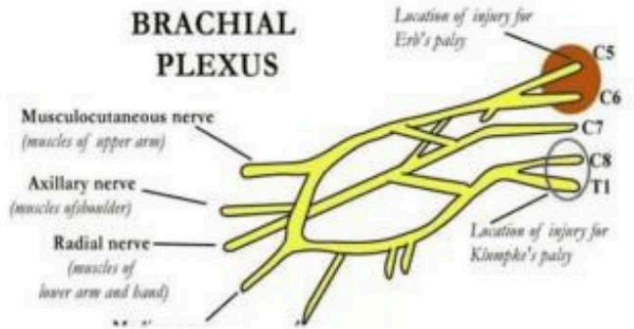
MARMU (5)

Serratus ant → long - LTN

. Roots →



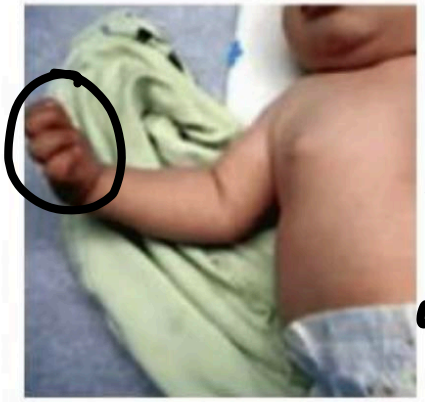
down Dorsal scap N.
↳ C.S. Rhomboid



(LSD) - wings

medial wing → .LTN
.Serratant

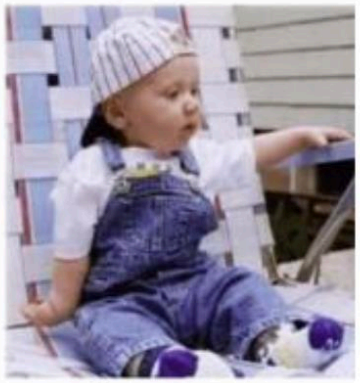
• lat → Trapezius



lower Klumpke

.Klaw hand

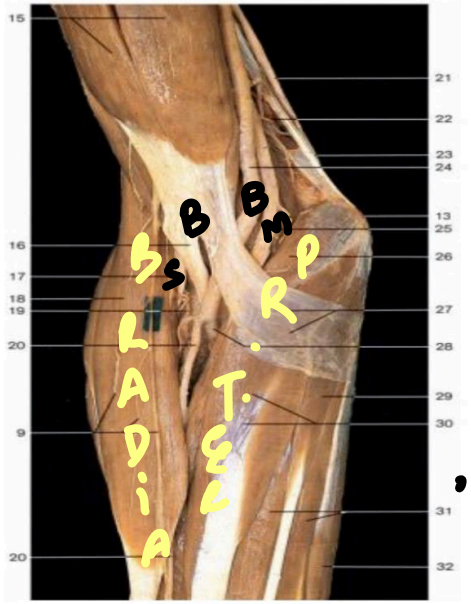
.animal → Horns Horner



URbi = support

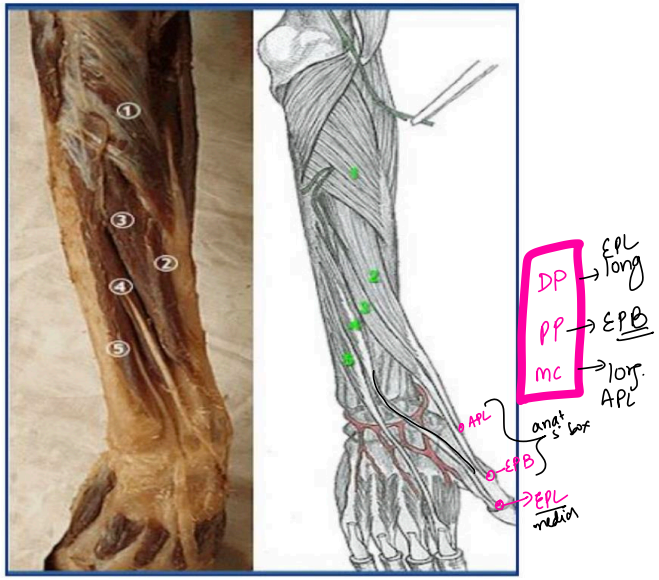
cs

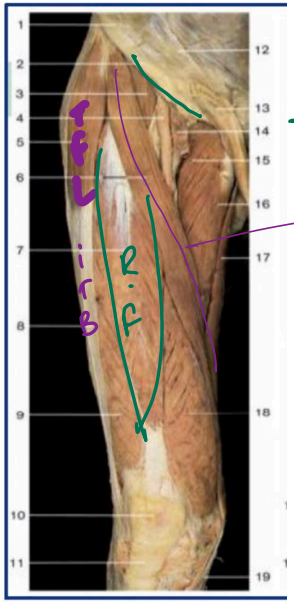
tip → top trunk



mBBS
↓ ↓
BA BB

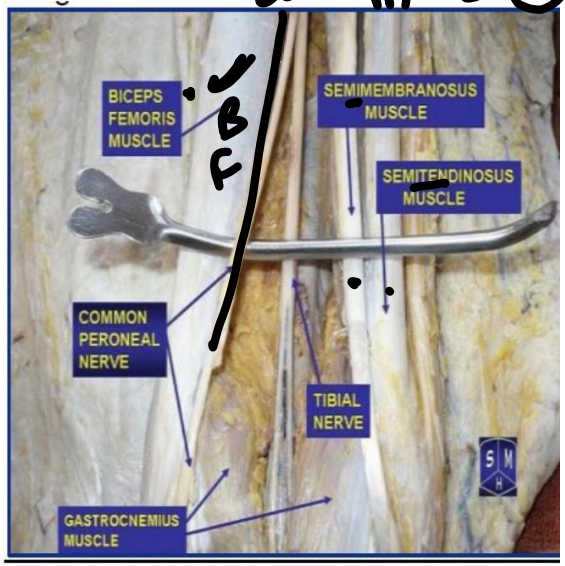
• cubital
ulnar n





• med lat
-lymph nodes V A N

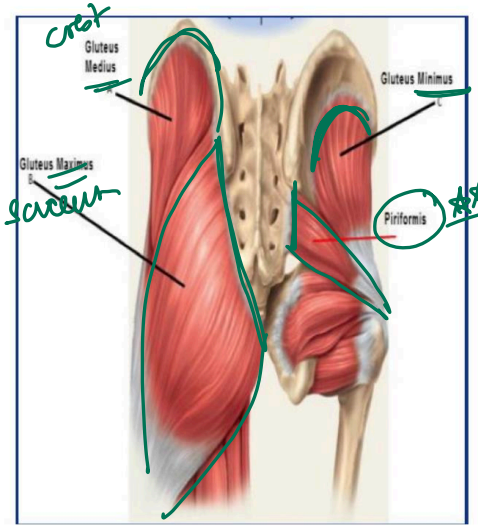
Lat m- sem



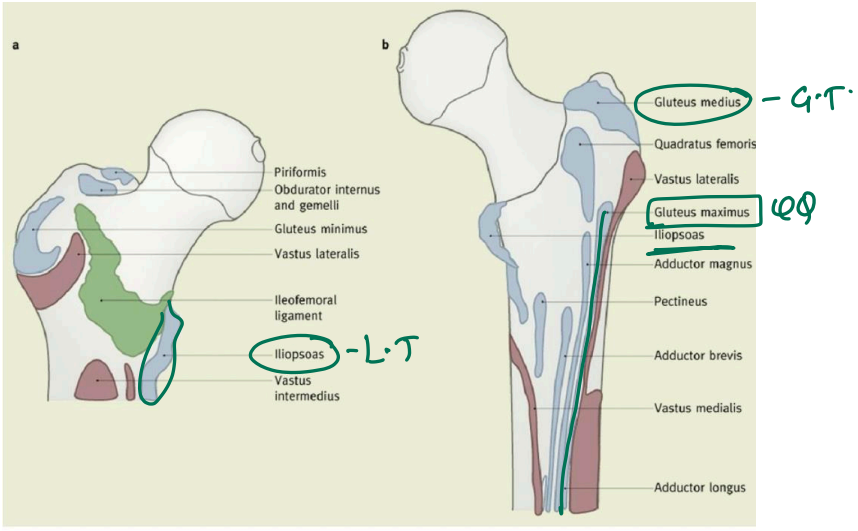
• Through → Tibial
• periph → peroneal

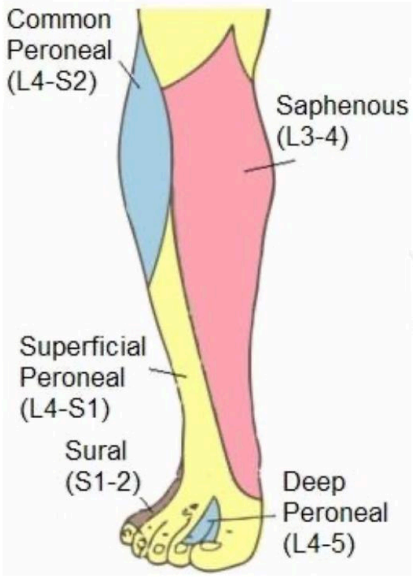
deepest → pop. a.
sup → Tibial n

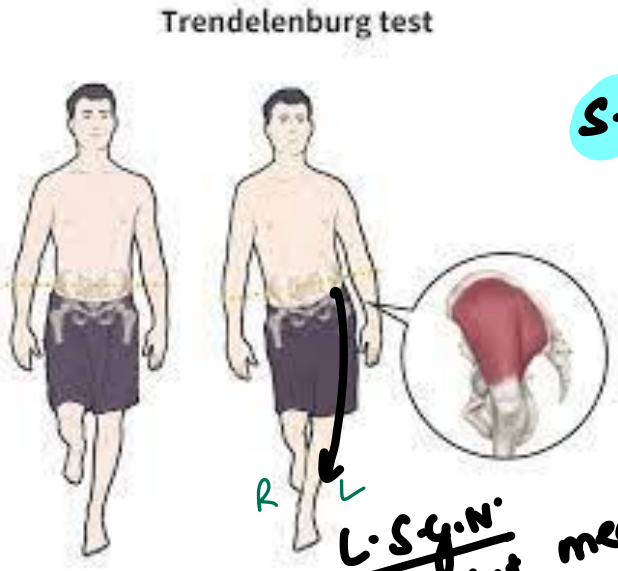
G. maximus
↓
• ax tensor
• inf glut n.
• xxx G. troch



MEDSYNAPSE
Where Concepts Meet Mnemonics





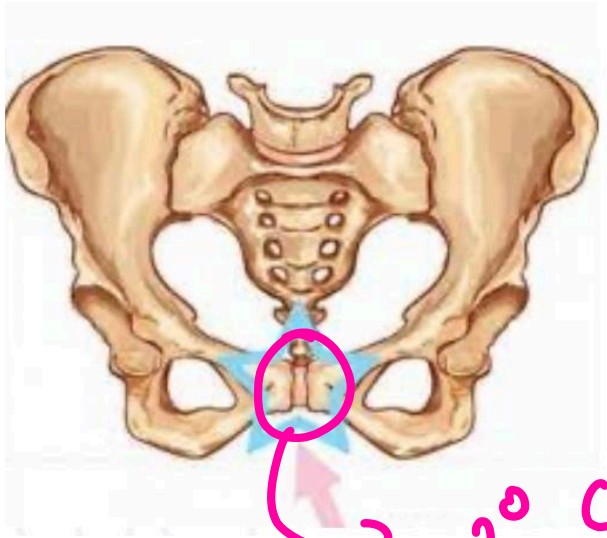


Lurching gait

stands
↳ abn
- same side
- sup glut n.
-

L. Sup. N.
↳ glut med/ min
abductors

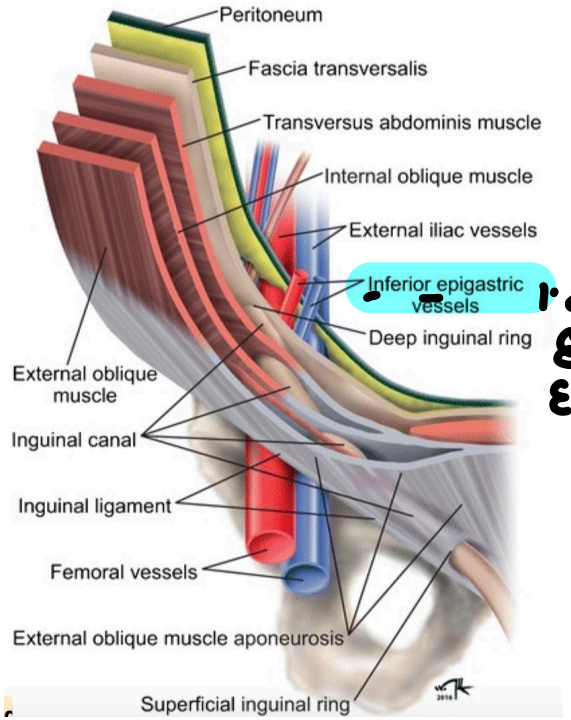
OP → Dr OPS



2° cartilg jt | symphysis
↳ midline
↓
fibrocartilage

Joints
BSS: 0

M i S
mi THis
sad BS:

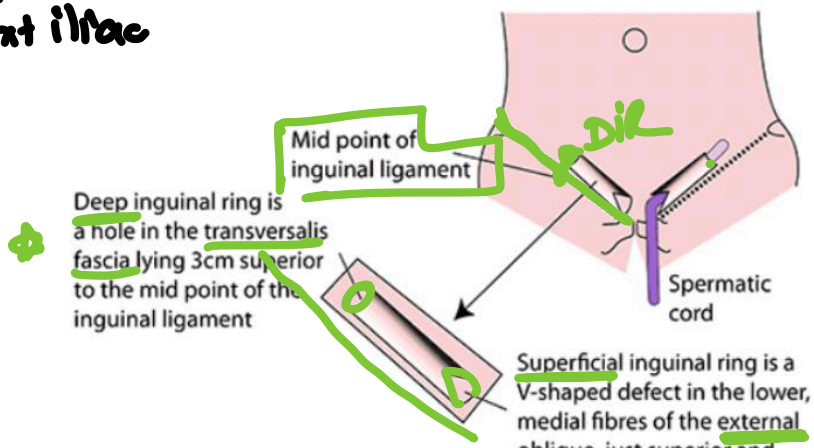


I.E → E.i Ext iliac

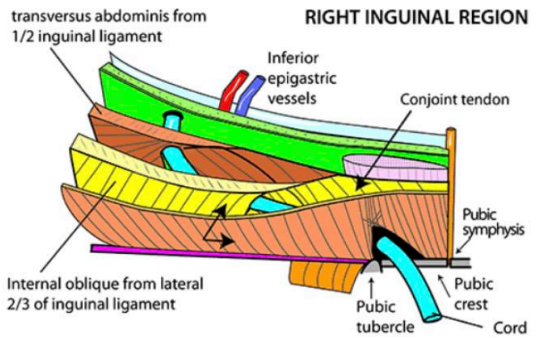
INGUINAL CANAL

A 4cm tunnel in the lower, anterior abdominal muscles that runs downwards and medially between the deep and superficial inginal rings

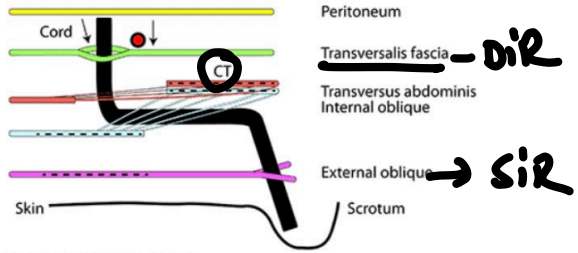
Anterior wall: external oblique, & internal oblique for lateral 1/3
Roof: Arching fibres of internal oblique & transversus
Posterior wall: transversalis fascia & conjoint tendon
Floor: inguinal ligament



Indirect hernia → . in . ing canal
. in scrotum

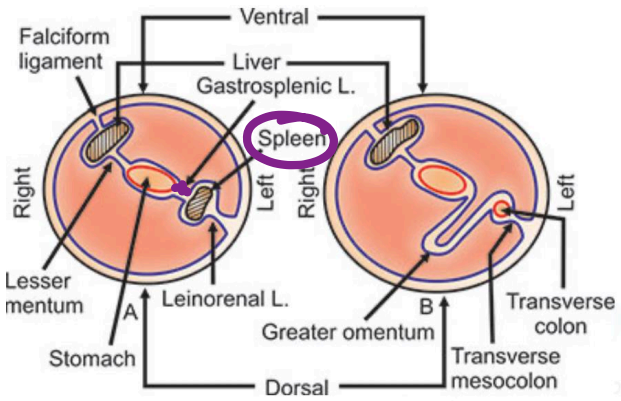


Arrows show 2 areas of "reinforcement" for superficial and deep ring



EXPLODED INGUINAL CANAL

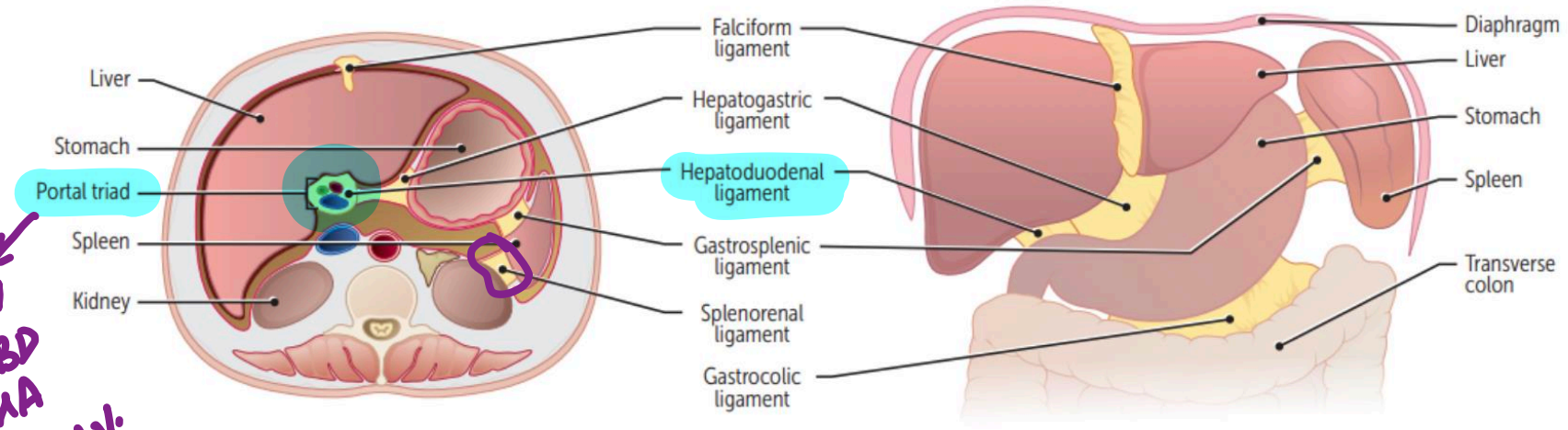
- Arrows indicate sites of weakness at deep ring (indirect hernia) and at transversalis fascia lateral to conjoint tendon (direct hernia).
- Dotted lines indicate the 2 layers that support both the deep and superficial inguinal rings.



Dorsal Mesentery Derivatives	Ventral Mesentery Derivatives[a]
Greater omentum (gastrocolic, gastrosplenic, and gastrophrenic ligaments)	Lesser omentum (hepatogastric and hepatoduodenal ligaments)
Splenorenal ligament	Falciform ligament
Mesentery of small intestine	Coronary ligament (right and left triangular ligaments)
Mesoappendix	
Transverse mesocolon	
Phrenicocolic ligament	
Sigmoid mesocolon	

Liver = ventral.

Lesser

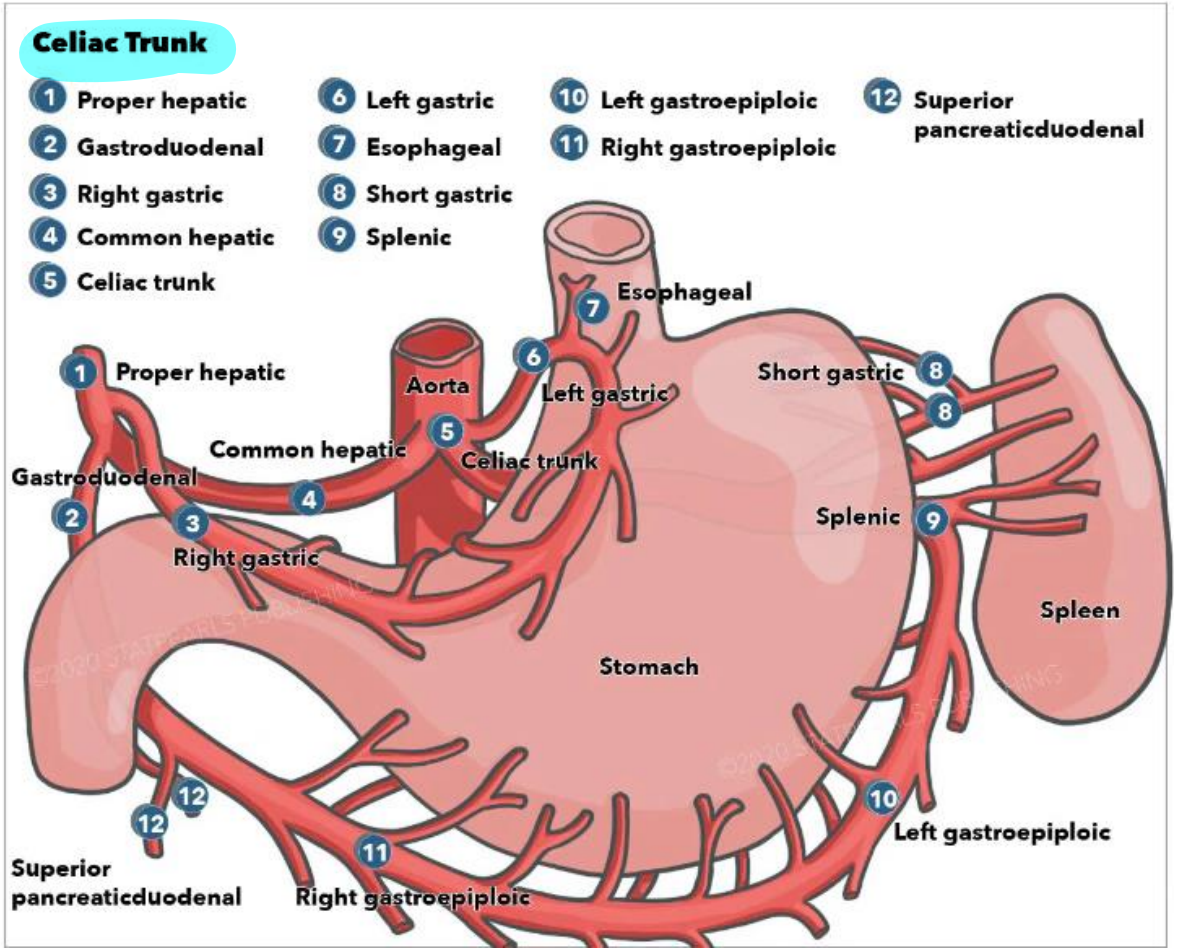


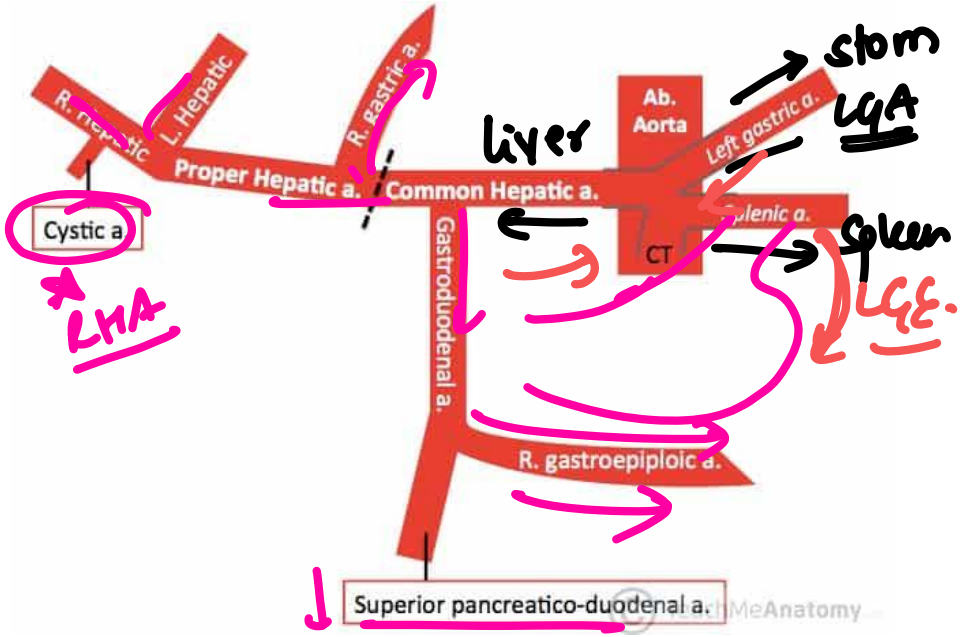
·PV
·EBD
·HA
xxx HV.

- **PANCREATIC TAIL –** / splenic artery → lienorenal ligam
- **PORTAL TRIAD –** Hepatoduod (lesser om)
- **LIGAMENTUM TERES HEPATIS –** falciform lig
- **SPLEEN DEVELOPS IN -** DORSAL MESOGASTRIUM xx endod

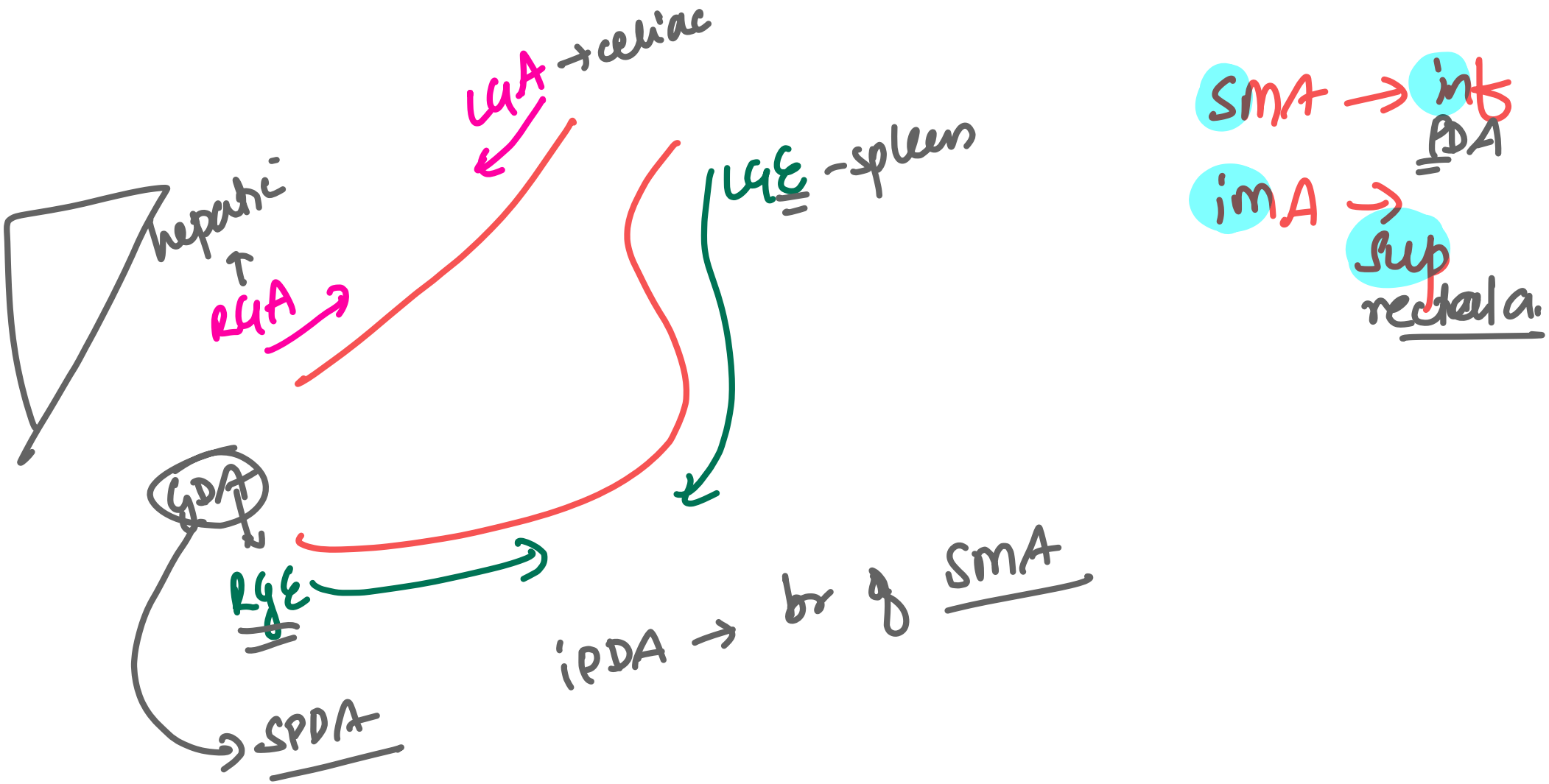
* Gastrosplenic → short gastric & L. G.E. vessels

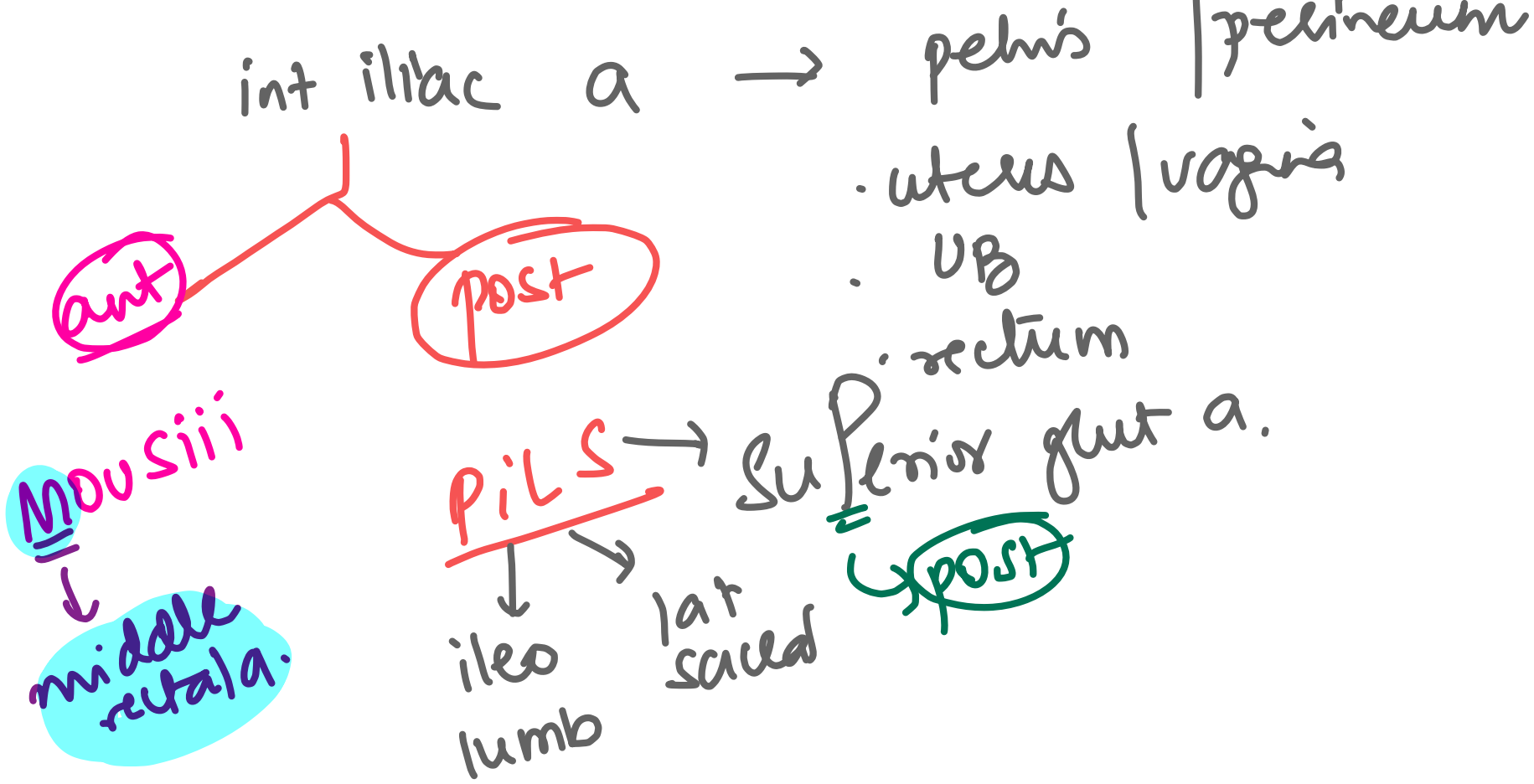
= Lt umb vein

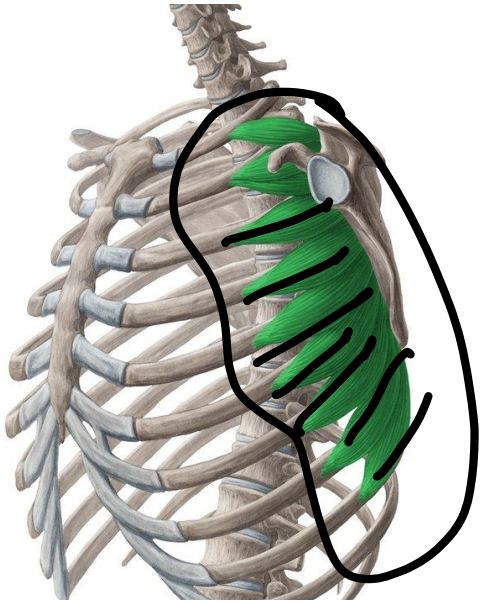




MEDSYNAPSE
Where Concepts Meet Mnemonics


LHA → celiac
hepatic
↑
RHA
LHE - spleen
GDA
RHE
SPDA
iPDA → br of SMA
SMA → int
PDA
imA →
sup
rectal a.


int iliac a
ant
post
Mousiii
middle rectal a.
PILS
ileo lumb
lat sacral
Superior glut a.
post
pelvis | perineum
. uterus | vagina
. UB
. rectum



Serrat. ant-

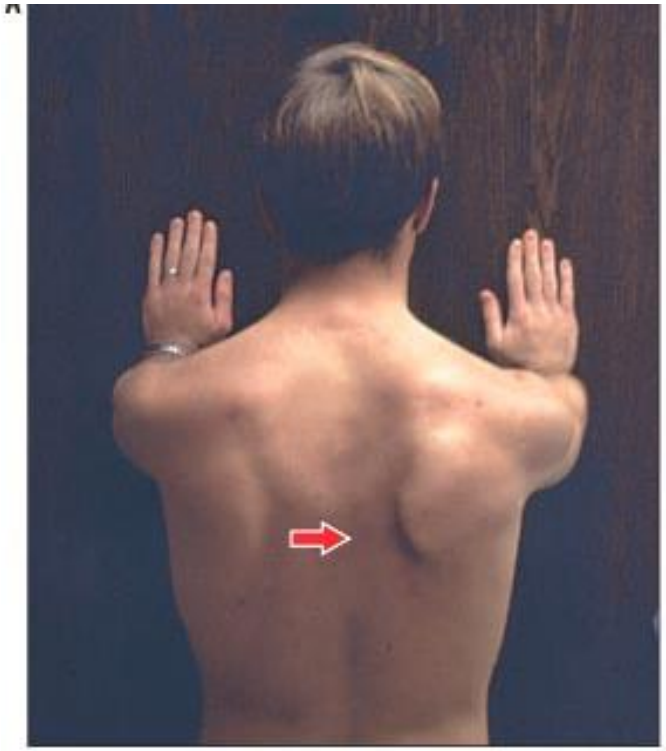


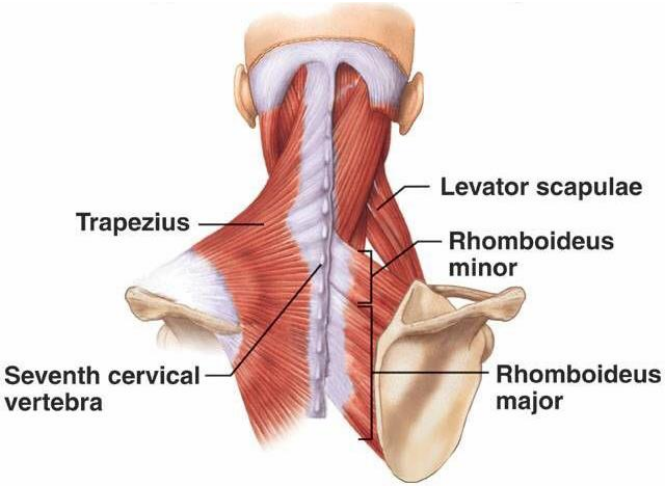
FIGURE 3. In medial scapular winging (A), the medial scapular border displaces from the thoracic cage most prominently when the patient engages in humeral flexion (arrow). In lateral scapular winging (B), the lateral border of the scapula (arrow) is prominent during humeral abduction, and the superior trapezius is flattened (arrowhead).

Muscles of the shoulder joint			
Movement	**Prime Mover**	**Origin**	**Insertion**
Flexion	Anterior deltoid	Clavicle, scapula and acromion process	Humerus
	Upper part of pectoralis major	Clavicle, sternum and ribs	Humerus
	Coracobrachialis	Scapula	Humerus
	Serratus anterior	Side of ribs	Scapula
Extension	Posterior deltoid	Clavicle, scapula and acromion process	Humerus
	Latissimus dorsi	Ilium, lumbar and thoracic vertebrae	Humerus
	Teres major	Scapula	Humerus
Horizontal flexion	Pectoralis major	Clavicle, sternum and ribs	Humerus
Horizontal extension	Trapezius	Cervical and thoracic vertebrae	Scapula
Abduction	Medial deltoid	Clavicle, scapula and acromion	Humerus
	Supraspinatus	Scapula	Humerus
Adduction	Lower part of pectoralis major	Clavicle, ribs and sternum	Humerus
	Latissimus dorsi	Ilium, lumbar and thoracic vertebrae	Humerus
	Teres major	Scapula	Humerus
	Teres minor	Scapula	Humerus
Medial rotation	Pectoralis major	Clavicle, sternum and ribs	Humerus
	Subscapularis	Scapula	Humerus
	Latissimus dorsi	Ilium, lumbar and thoracic vertebrae	Humerus
	Teres major	Scapula	Humerus
	Anterior deltoid	Clavicle, scapula and acromion process	Humerus
Lateral rotation	Infraspinatus	Scapula	Humerus
	Teres minor	Scapula	Humerus
	Posterior deltoid	Clavicle, scapula and acromion process	Humerus
	Lower trapezius	Cervical and thoracic vertebrae	Scapula

* Prime movers shaded grey are the principle muscles causing the movement.

Muscles of the shoulder girdle			
Movement	**Prime Mover**	**Origin**	**Insertion**
Elevation	Trapezius	Skull	Clavicle
	Rhomboids	Cervical and thoracic vertebrae	Scapula
	Levator scapulae	Cervical vertebrae	Scapula
Depression	Trapezius (lower)	Thoracic vertebrae	Base of spine
	Pectoralis minor	Ribs	Scapula
	Serratus anterior (lower)	Side of ribs	Scapula
Upward rotation	Trapezius (upper)	Ligaments of the neck	Acromion process
	Serratus anterior	Side of ribs	Scapula
Downward rotation	Rhomboids	Cervical and thoracic vertebrae	Scapula
	Levator scapulae	Cervical vertebrae	Scapula
Protraction / Abduction	Serratus anterior	Side of ribs	Scapula
Retraction / Adduction	Trapezius	Cervical and thoracic vertebrae	Scapula

* Prime movers shaded grey are the principle muscles causing the movement.



acn g pect major →

↓

insert → pectoralis

lat up

acn - . flexn

. adducn

. med rotn.

- elem | downward nm → · Trap
  · LS
  · Rhom
- dup | upward nom
  ↳ · Trap lower
  · serrat ant

Trap - Trapez
(all)

Movement	Muscle
Flexion	Psoas major, iliacus, pectineus, rectus femoris and Sartorius
Extension	Gluteus maximus and hamstrings (semitendinosus, semimembranosus and bicep femoris)
Abduction	Gluteus maximus, medius and minimus, and tensor fascia lata
Adduction	Adductor magnus, logus and brevis, gracilis, and pectineus
Internal rotation	Gluteus medius and minimus, tensor fascia lata, psoas major, and iliacus
External rotation	Gluteus maximum, piriformis, obturator internus, gemellus superior and inferior, quadrates femoris and obturator

Deep → membranous urethra.