

Anatomy

Edition 8.5

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GENERAL ANATOMY

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Hybrid Muscles

00:01:40

- AKA **composite muscles**.
- Single muscle having dual innervation (From **2 different nerves**).

muscles		Innervation
Sternocleidomastoid & trapezius		• Spinal accessory (CN XI) • C3 & C4 nerves : Proprioception
Digastric	Anterior belly	Nerve to mylohyoid (From CN V ₃)
	Posterior belly	Facial N. (CN VII)
Inferior constrictor	Thyropharyngeus	Vagoaccessory complex
	Cricopharyngeus	Recurrent laryngeal N.
Pectoralis major & pectoralis minor (Occasionally)		• medial pectoral N. • Lateral pectoral N.
Subscapularis		• upper subscapular • Lower subscapular } From posterior cord of brachial plexus
Brachialis		• musculocutaneous : motor • Radial : Proprioception
Flexor digitorum profundus	Lateral half	Anterior interosseous N. (Branch of median nerve)
	medial half	ulnar N.
Flexor pollicis brevis	Superficial head	median N.
	Deep head	ulnar N.
Pectineus		• Femoral N. • Obturator N. (Anterior division)
Piriformis (Occasionally)		• Nerve to piriformis (From sacral plexus) • Superior gluteal N.
Biceps femoris	Long head	Tibial N.
	Short head	Common peroneal N.
Adductor magnus	Adductor part	Obturator N.
	Hamstring part	Tibial N. (Branch of sciatic N.)

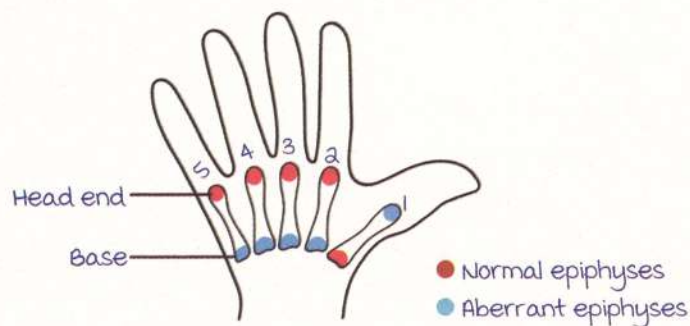
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Bones

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Types of Epiphyses :

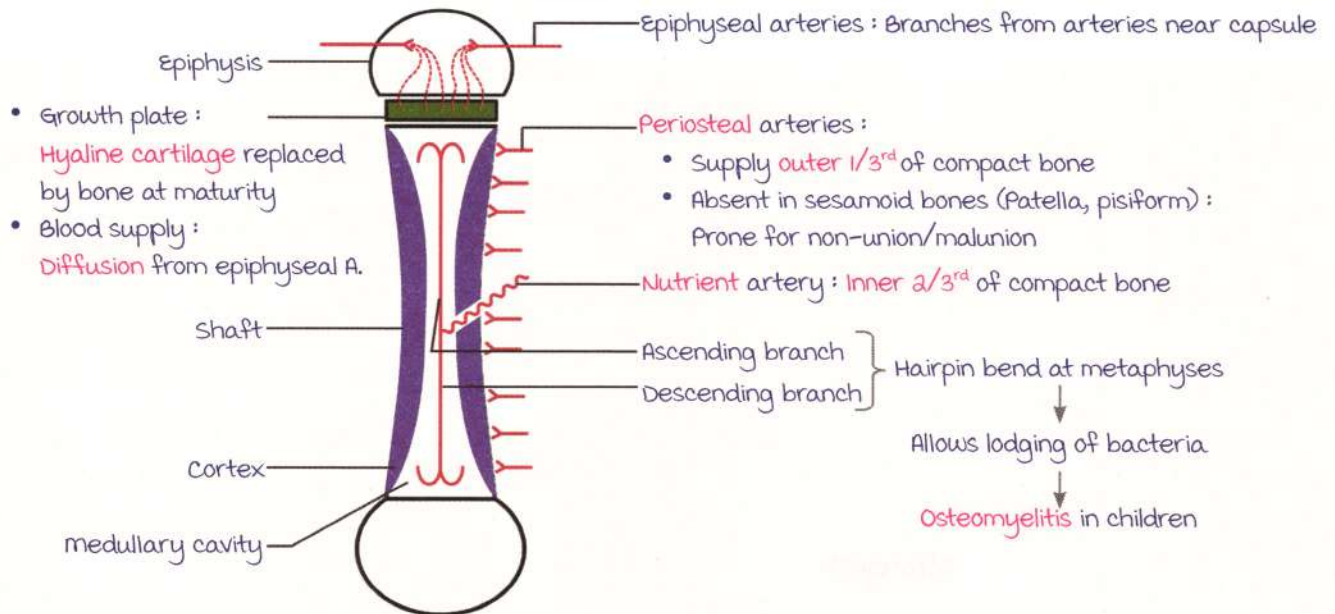
	Examples
Pressure : Articular surface transmitting weight	• Heads of : Humerus, femur, talus etc. • Condyles
Traction : • Non-articular • Bony projections • muscle/ligament attachments	• Tubercles of humerus • Trochanters of femur • Epicondyles • Tuberosities • mastoid process • malleoli
Atavistic : Remnant of individual bone present in other animals	• Coracoid process of scapula • Os trigonum (Posterior tubercle) of talus
Aberrant : Unusual in nature	metacarpals (miniature long bones : Only 1 epiphysis) : • Head of 1st • Base of 2, 3, 4, 5th

**Note :**

1st metacarpal : Developmentally similar to phalanges (Epiphysis at base).

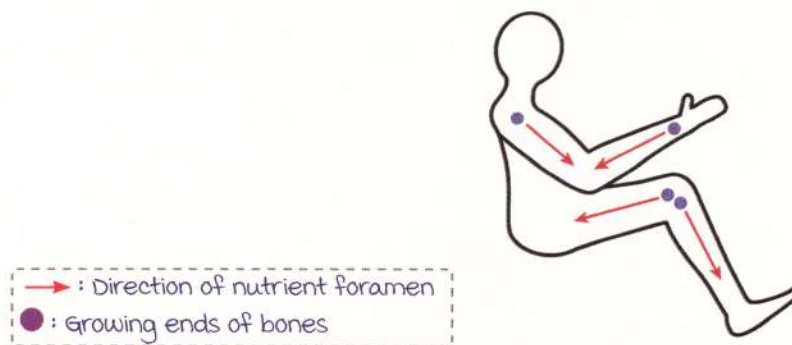
Blood Supply of Long Bones :

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Direction of nutrient foramen :

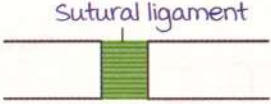
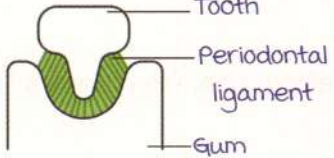
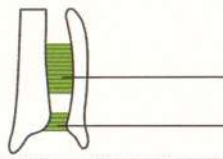
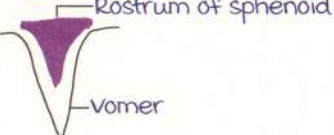
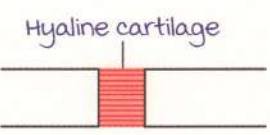
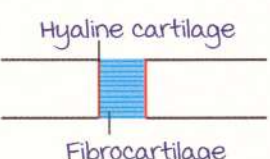
Opposite to growing end (To elbow I go, from knee I flee).



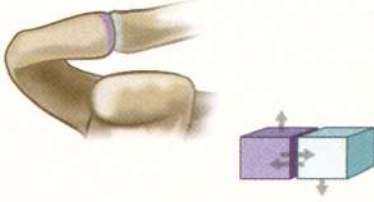
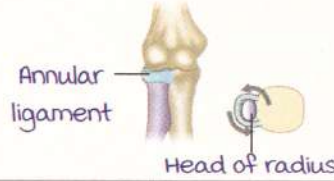
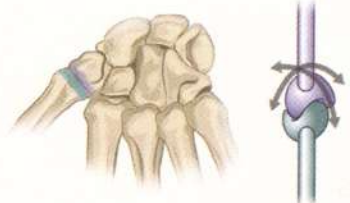
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Types of Joints

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Joint		Structure	Example
Fibrous	Sutural	Plane 	• Internasal suture • Intermaxillary suture • Interpalatine suture
		Squamous (Oblique) 	Temporoparietal suture
		Serrate 	• Sagittal suture • Coronal suture
		Denticulate (Strongest sutural joint) 	Lambdoid suture
	Gomphosis (Peg & socket) 		Tooth & gum
	Syndesmosis 		• middle radioulnar • middle tibiofibular • Inferior tibiofibular
	Schindylesis (Wedge & groove) 		Rostrum of sphenoid & vomer (Either schindylesis or sutural)
Cartilaginous	Primary (Synchondrosis ↓ ossify Synostosis) 		• Epiphyseal/growth plate • Costochondral joints
	Secondary (Symphysis)  Permanent		Midline joints : • manubriosternal • xiphisternal • Pubic symphysis • Sacrococcygeal • Intervertebral discs

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Synovial	Plane		• Intercarpal • Intermetacarpal • Intertarsal • Intermetatarsal • Acromioclavicular • Superior tibiofibular • Subtalar • Costovertebral • Costotransverse • Chondrosternal (Except 1st joint : Fused) • Zygapophyseal (B/w facets of vertebrae)
	Hinge		• Humeroulnar • Interphalangeal • Ankle joint (modified)
	Pivot	 Annular ligament Head of radius	• Superior & inferior radioulnar • Atlantoaxial ('No' movement)
	Condylar		• Knee • Temporomandibular
	Ellipsoid	• made of condyles • Articular surface : Ellipsoid shape	• metacarpophalangeal • metatarsophalangeal • Radiocarpal (Scaphoid & lunate) • Atlantooccipital ('Yes' movement)
	Saddle		• Incudomalleolar • Sternoclavicular • 1st carpometacarpal • Patellofemoral • Calcaneocuboidal
	Ball & socket		• Shoulder • Hip • Incudostapedial • Talocalcaneonavicular

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CRANIAL NERVE NUCLEI & COLUMNS

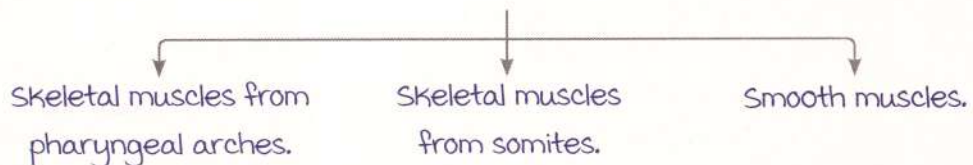
Nuclei vs. Column :

	Nuclei	Column
Definition	Supplying any muscle	Arrangement of embryologically similar nuclei in one line
Example	- Abducens nucleus ↓ - Lateral rectus muscle • Facial motor nucleus ↓ - Facial muscles	Column : III, IV, XI nuclei ↓ Extraocular muscles

Muscles of the Head, Neck, & Face

00:01:01

Types :



Skeletal muscles from pharyngeal arches :

Pharyngeal arches	Nerve supply	muscles supplied
I	CN V ₃ (mandibular nerve)	mastication
II	CN VII (Facial nerve)	Face
III	CN IX (Glossopharyngeal nerve)	• Palate
IV	CN X (vagus nerve)	• Pharynx
VI		• Larynx

.....
 Note :

5th pharyngeal arch disappears.

Skeletal muscles from somites/somatic muscles :

- Extraocular muscles.
- Tongue muscles.

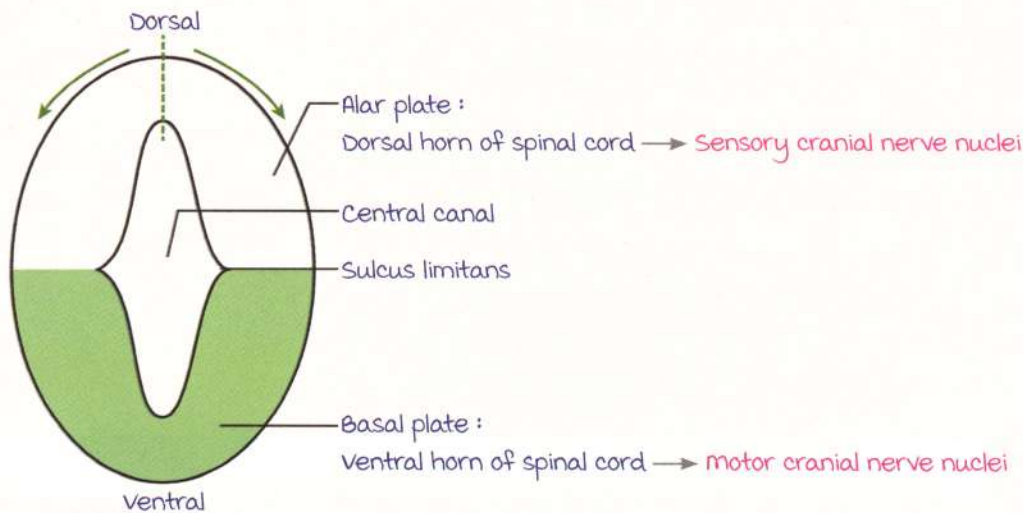
Columns

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Embryological Development :

Neural tube :

Progression :

- Alar plate : Each half moves laterally

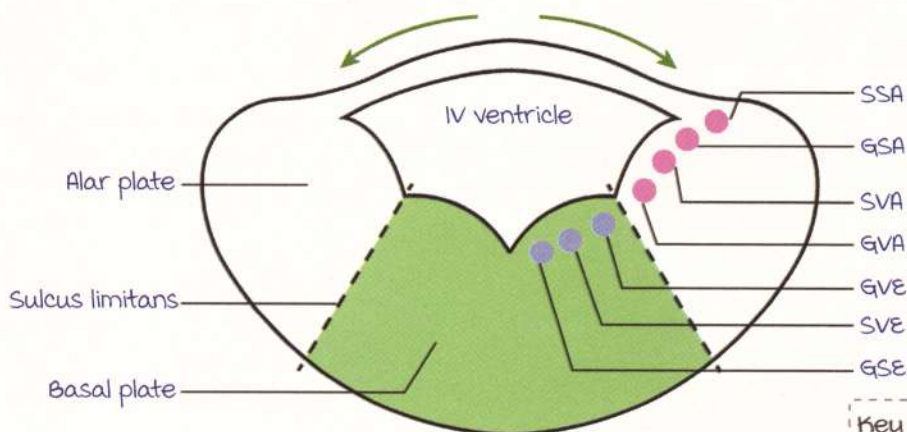
Sensory cranial nerve nuclei lie laterally

Lateral brainstem syndromes : Generally sensory loss.

- Basal plate : Stays medially

motor cranial nerve nuclei lie medially

medial brainstem syndromes : Generally motor loss.



Key :

- : Efferent : motor
- : Afferent : Sensory

----- Active space -----

Types :

efferents :

Columns	motor supply
GSE : General somatic efferent	• Extraocular muscles • Tongue muscles
SVE : Special visceral efferent/ branchial efferent	muscles from pharyngeal arches
GVE : General visceral efferent	• Smooth muscles • Glands

Afferents :

Columns	Sensory input
GVA : General visceral afferent	General sensations from viscera
SVA : Special visceral afferent	Taste : Only special sensation from viscera (Endoderm)
GSA : General somatic afferent	General sensations from body wall
SSA : Special somatic afferent	Special sensations from somatic structures : Olfaction, vision, hearing

Special sensations arising from somatic structures :

Sensation	Site	Derived from	Nerve	Nuclei
Olfaction	Olfactory mucosa	Neuroectoderm	I	-
Vision	Retina	Neuroectoderm	II	-
Hearing & balance	Internal ear	Otic capsule (Ectoderm)	VIII	Vestibular & cochlear nuclei

Nuclei in Each Column

00:33:00

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Layout :

	GSE	SVE	GVE (Parasympathetic column)	GVA/SVA	GSA	SSA
midbrain	● III ● IV	-	Parasympathetic cranial nerves : ● Edinger Westphal nucleus → III → Sphincter pupillae ● Ciliaris	-		-
Pons	● VI	● V ₃ ● VII	● Superior salivatory nucleus → VII → Glands : • Submandibular • Sublingual • Nasal • Lacrimal ● Inferior salivatory nucleus → IX → Parotid gland	-	Trigeminal nucleus (V)	At ponto-medullary junction
medulla oblongata	● XII	Nucleus ambiguus : ● IX ● X ● XI	● Dorsal nucleus of vagus → X → Smooth muscles & glands in thorax & abdomen	Nucleus : IX Tractus : X Solitarius : VII ● SVA ● GVA		Vestibular & cochlear nuclei

C_a level of spinal cord

Nucleus Ambiguus :

motor supply :

muscles of palate & pharynx : Supplied by cranial accessory nerve (XI) via vagus nerve (X) (Vagoaccessory complex).

Lesion :

- Lateral medullary/Wallenberg syndrome.
- I/L bulbar paralysis (Palate, pharynx, larynx).
- Loss of gag reflex.

Note :

- Parasympathetic outflow : Craniosacral outflow

III, VII, IX, X ← S₂, S₃, S₄

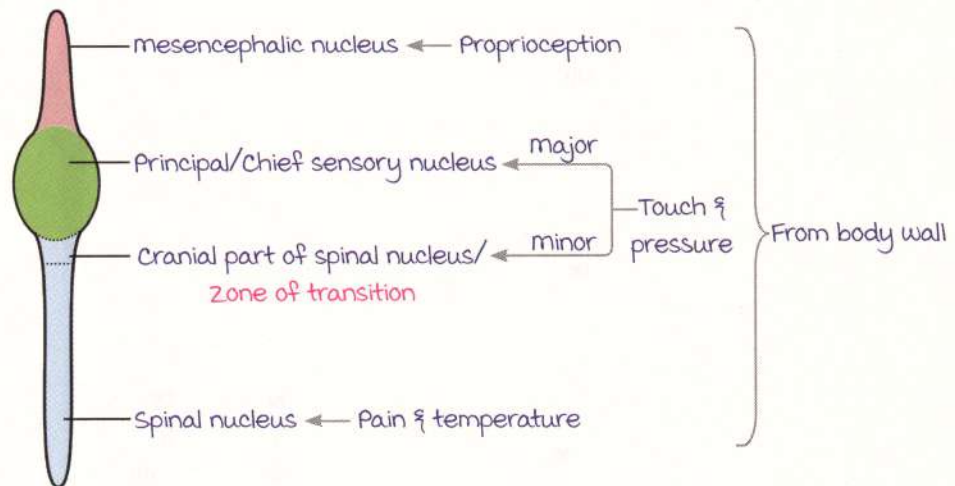
- Sympathetic outflow : Thoracolumbar outflow

T₁-T_{1a} ← L₁-L_a

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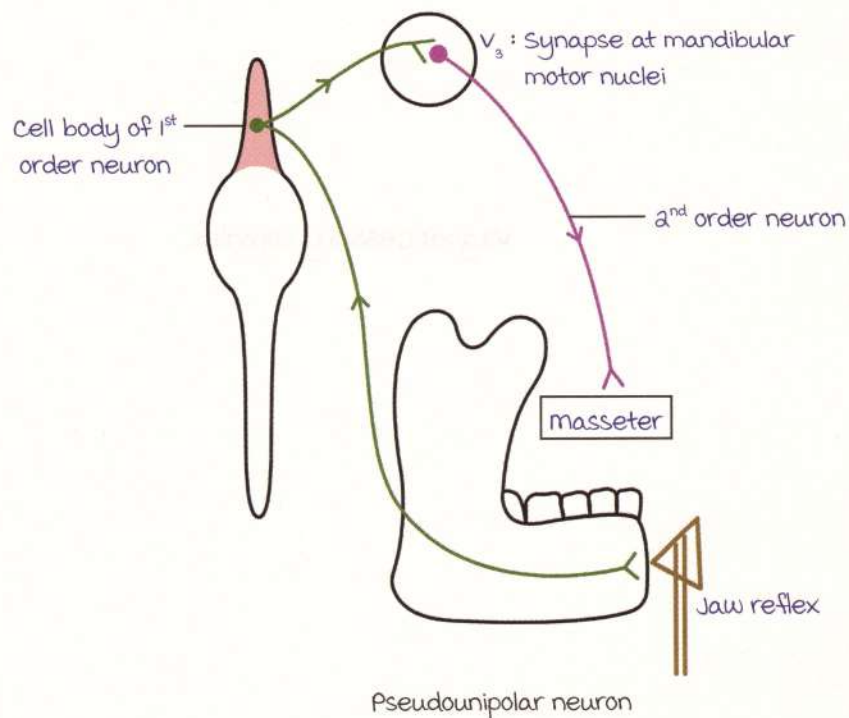
- Innervation of tongue for taste sensation :
 - Anterior 2/3rd : **Facial** nerve (VII).
 - Posterior 1/3rd : **Glossopharyngeal** nerve (IX).
 - Posterior pharyngeal wall : **Vagus** nerve (X).

Trigeminal Nucleus :



mesencephalic nucleus :

- Center for **jaw reflex**.
- Only site for **pseudounipolar neuron** in CNS.



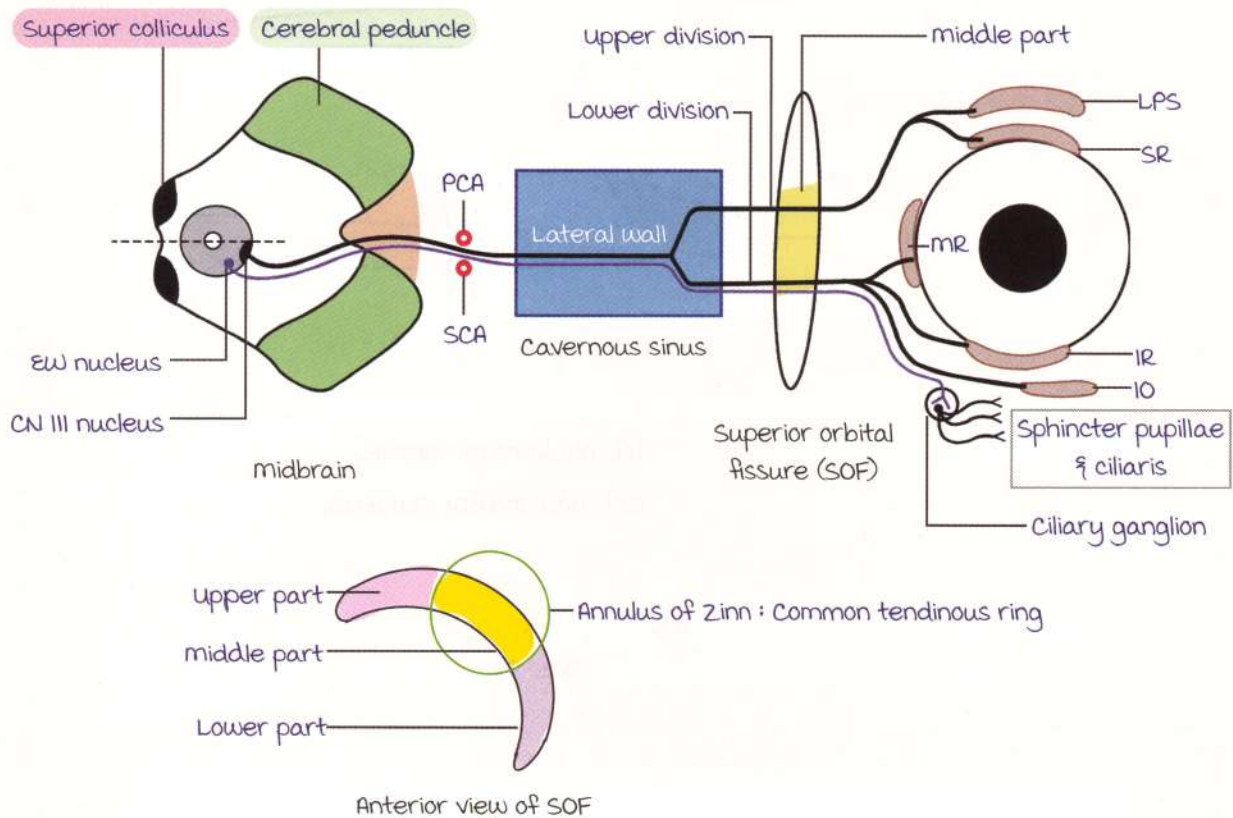
3RD, 4TH & 6TH CRANIAL NERVES

----- Active space -----

Oculomotor Nerve (CN III)

00:00:46

Course :



- EW nucleus : Edinger-Westphal nucleus
 - LPS : Levator palpebrae superioris
 - SR : Superior rectus
 - MR : medial rectus
 - IR : Inferior rectus
 - IO : Inferior oblique
- Extraocular muscles (EOM)

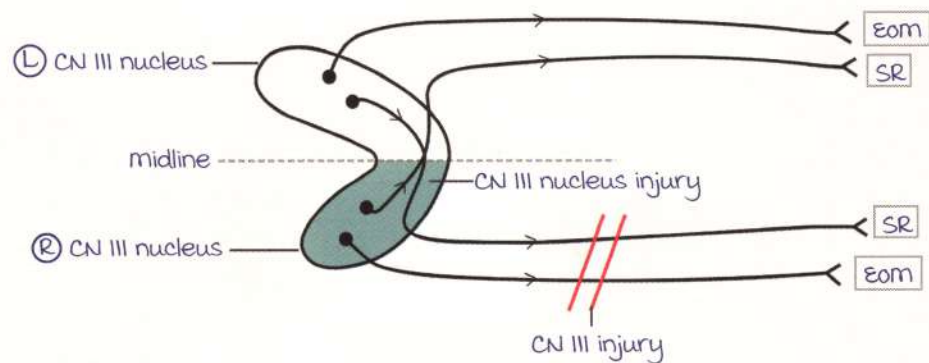
Features :

- Content of **interpeduncular fossa**.
- Runs b/w the two branches of **basilar A.**
 - Posterior cerebral artery (PCA).
 - Superior cerebellar artery (SCA).
- **Nerve to IO** carries fibres to ciliary ganglion.

----- Active space -----

Note :

- Cerebral peduncle :
 - AKA **crus cerebri**.
 - Contains descending tracts from cerebrum.
- Dilator pupillae : Supplied by sympathetic nerve.

Decussation :

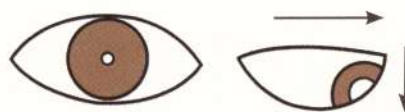
- Decussation of oculomotor nerve : Within the nucleus.
- SR muscle is supplied by
 - I/L oculomotor nerve.
 - C/L oculomotor nucleus.

Clinical significance :

- CN III injury : I/L Eom palsy + I/L SR palsy.
- CN III nucleus injury : I/L Eom palsy + B/L SR palsy.

Injury :

muscles involved	manifestations
LPS	I/L ptosis
MR	I/L divergent squint
SR/IO	I/L depressed eyeball (Downward rotated)
Sphincter pupillae	I/L dilated pupil + I/L loss of pupillary light reflex
Ciliaris	I/L loss of accommodation

Columns :

- main motor nucleus : **GSE** (Supplies Eom).
- EW nucleus : **GVE** (Supplies smooth muscles & glands).