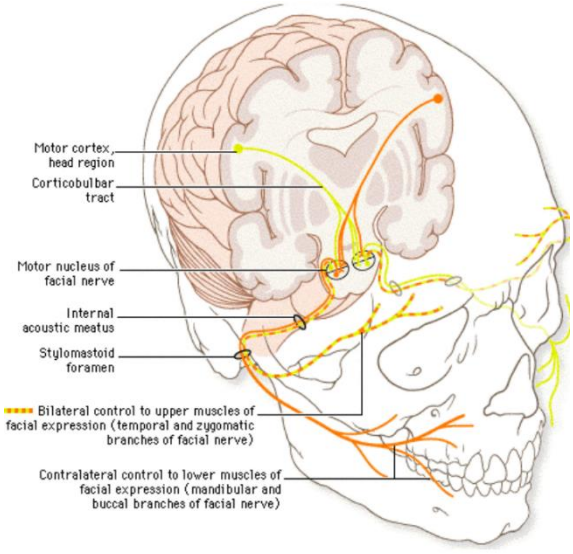
The 3 cranial nerves related to the eyeball movement:

	Oculomotor Nerve (III)	Trochlear Nerve (IV)	Abducent Nerve (VI)
Nuclei	**At the level of sup. colliculus:** **1-** Main oculomotor nucleus. **2-** Accessory parasympathetic nucleus (Edinger-Westphal nucleus)	- **In the midbrain at the level of the inf. colliculus:** Motor trochlear nucleus.	- **In the caudal part of the pons** beneath the floor of the fourth ventricle, close to the midline**:** Motor Abducent nucleus
Supplies	**1- Extrinsic muscles**: All except lateral rectus and sup. oblique. **2- Intrinsic muscles**: The constrictor pupillae of the iris and ciliary muscles.	- Superior oblique muscle.	- Lateral rectus.
Action	- Lifting the upper eyelid, turning the eye upward, downward, and medially, constricting the pupil (light reflex), and accommodating the eye.	- Turning the eye downward and laterally.	- Turning the eye laterally.
Lesion Symptoms	- External strabismus; unopposed lateral rectus pulls the eyeball laterally. - Diplopia (double vision). - Ptosis: drooping of the upper eyelid. - The pupil is widely dilated and nonreactive to light. - Accommodation of the eye is paralyzed. - **Incomplete lesions**: **a- Internal ophthalmoplegia** شلل: loss of the autonomic innervation of the sphincter pupillae and ciliary muscle. **b- External ophthalmoplegia**: paralysis of the extraocular muscles. ⇨ In cases of (diabetic neuropathy), usually the autonomic fibers are unaffected, whereas the nerves to the extraocular muscles are paralyzed.	- Diplopia. - Difficulty in turning the eye downward and laterally. - Difficulty in descending stairs. - Head tilt to the side opposite the paralyzed eye (**compensatory adjustment**).	- Diplopia. - Difficulty in turning the eye laterally. - Internal strabismus; unopposed medial rectus pulls the eyeball medially.

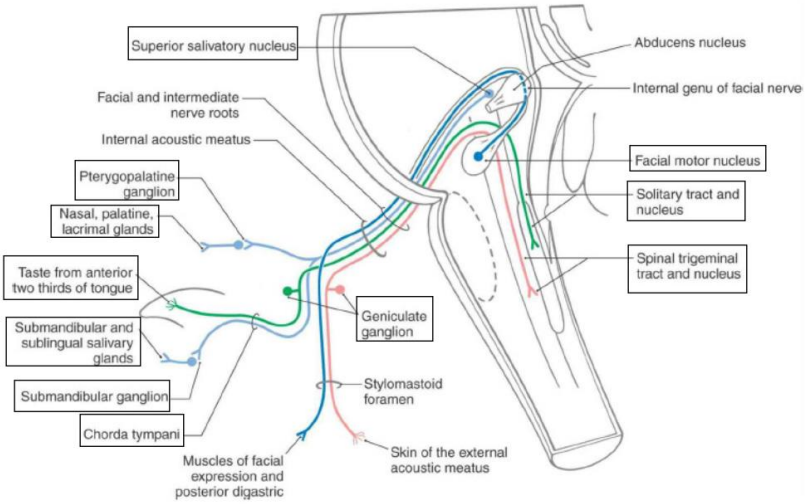
	Nuclei	Supplies	Lesions
Trigeminal Nerve (V)	**1- Spinal nucleus:** C2 – main nucleus (ALS modalities). **2- Main nucleus:** post. in the cranial part of the pons (PCML modalities). **3- Motor nucleus:** same as the main nucleus. **4- Mesencephalic nucleus:** lateral to the cerebral aqueduct in the midbrain (reflexes and impulses).	- **Motor**: muscles of mastication, tensor tympani, tensor veli palatini, mylohyoid, ant. belly of the digastric muscle	-
Facial Nerve (VII)	**1- Main Motor Nucleus**: caudal part of the pons. Fibers form facial colliculus. **2- Parasympathetic Nuclei:** posterolateral to the motor nucleus. ⇨ Superior salivatory and Lacrimal nuclei. **3- Tractus solitarius nucleus:** central grey matter at the level of the olives in the medulla (special sensory; taste of ant. 2/3). **4- Spinal nucleus of V** (general sensation). Cell bodies are in the geniculate ganglion.	- **Parasympathetic**: lacrimal, submandibular, and sublingual glands.	**Bell's Palsy**: - Usually **unilateral.** - **Lower motor neuron** type of facial paralysis. - Unknown cause; can be exposure of the face to a cold draft, complication of diabetes, or as a result of tumors / AIDS
Glossopharyngeal Nerve (IX)	**1- Main Motor Nucleus:** in the nucleus ambiguous at the level of the olives in the medulla. **2- Parasympathetic Nuclei:** Inferior salivatory nucleus. **3- Tractus solitarius nucleus:** (special sensory; taste of post 1/3). Cell bodies are in the inferior ganglion of IX. **4- Spinal nucleus of V** (general sensation). Cell bodies are in the superior ganglion of IX.	- **Motor**: Stylopharyngeus muscle. - **Parasympathetic**: parotid salivary gland. - **Sensory**: middle ear, auditory tube, and the pharynx -except nasopharynx.	- Loss of taste in the posterior third of tongue (Vallate papillae). - Loss of carotid sinus reflex. - Loss of pharyngeal reflex (gag reflex).
Vagus Nerve (VIII)	**1- Main Motor Nucleus:** in the nucleus ambiguous at the level of the olives in the medulla. **2- Parasympathetic Nuclei:** central grey matter at the level of the olives in the medulla. **3- Tractus solitarius nucleus:** lower part of it (special sensory; taste from epiglottis). Cell bodies are in the inferior ganglion of vagus. **4- Spinal nucleus of V** (general sensation). Cell bodies are in the superior ganglion of vagus.	- **Motor**: constrictor muscles of the pharynx and the intrinsic muscles of the larynx. - **Sensory**: outer ear, mucosa of the larynx, dura of post. cranial fossa.	-

Note 1: all motor cranial nerves efferent are received bilateral, except for the lower face and genioglossus muscle - they receive fibers from the contralateral side.



Note 2: fibers from the motor facial nucleus supply the face; upper part of the face receives corticonuclear fibers from both hemispheres, whereas the lower part of the face receives only corticonuclear fibers from the opposite cerebral hemisphere. Thus, cutting the LMN affects the lower face ipsilaterally, whereas cutting the UMN affects contralaterally.

Note 3: we need to know the nuclei, in which ganglia the synapse, and the target.



Trigeminal Nerve: