

CRANIAL NERVES
with a focus on swallowing and voicing

Cranial Nerve	Nucleus	Location	Muscles	Function	Test	Potential Signs of Damage
I Olfactory	Anterior Olfactory	Olfactory Tract		Smell		Anosmia
II Optic	Lateral geniculate nucleus	Thalamus		Vision		Blindness
III Oculomotor	Oculomotor Edinger-Westphal	Midbrain Midbrain		MOTOR: Eyelid opening, eyeball movement, pupil constriction	- Look for eyelid droop - Move eyes up/down/inward - Shine light into eye	Ptosis, diplopia
IV Trochlear	Trochlear	Midbrain	Superior Oblique	- Eye movement (depression of adducted eye)	Look in towards nose and up and down.	- Diplopia, weakness of downward eye movement - Affected eye drifts upward
V Trigeminal	Principle Spinal Mesencephalic Motor <u>3 Branches:</u> 1. Ophthalmic (sensory) 2. Maxillary (sensory) 3. Mandibular (sensory and motor)	Pons Extending midbrain through medulla (i.e., upper medulla for pain and temperature sensation of cheeks, lips, nose).	- Masseter - Temporalis - Pterygoid - Tensor Veli Palatini (soft palate) - Mylohyoid	1,2. SENSORY: Face, cheeks, lips, jaw, forehead, eyes, eyebrows, nose (pain, temperature, touch, proprioception) 3. SENSORY: Interior/exterior jaw and TMJ. Sensation to superficial and deep structures of face, mucous membrane of upper mouth, palate, tongue. Sensation of shape and texture in mouth. Sensation to palate and pharynx. MOTOR: Mastication, jaw lateralization and closure. <u>Assists with:</u> a) Upward/anterior movement of larynx b) backward movement of tongue to soft palate c) palatal elevation (tenses soft palate) d) posterior pharyngeal wall constriction	- Cold sensation, cotton swab and/or pinprick, light touch. - Cotton swab or pinprick light touch to lower gum and mandible - Touch anterior tongue on both sides - Observe contours of masseter at rest. Observe chewing. "Bite down" and palpate masseter muscles - "Keep mouth closed and don't let me open it." - "Open mouth and don't let me close it." - "Jut out your jaw" - Observe soft palate upon phonation. - Palpate laryngeal elevation	- Facial anesthesia - Loss of temperature/pain sensation - Loss of sensation of superficial and deep structures - Loss of sensation (anterior 2/3 of tongue) - Note any weakness, asymmetry, tremors or fasciculations in jaw - Weakness in jaw lateralization and closure - Loss of or weak mastication - Jaw will deviate to weak/paralyzed side - Flaccid soft palate - Decreased hyolaryngeal excursion
VI Abducent	Abducent	Pons		Eye movement (abduction)		Medial eye deviation
VII Facial	- Motor - Solitary - Super Salivatory	Pons	- Obicularis Oculi - Obicularis Oris - Zygomatic minor - Zygomatic major - Levators - Depressors - Mentalis - Buccinator - Platysma - Stylohyoid - Posterior Belly of Digastric	- Facial expression - Taste - Salivation (submandibular and sublingual glands) - Lacrimation - Mandibular depression - Contributes to hyoid elevation	- Observe at rest and during facial expressions - "Don't move your head and look way up at ceiling" "Wrinkle your forehead" "Raise your eyebrows" - "Close your eyes tightly" - "Smile" "Pout" "Blow me a kiss" "Show me your teeth" - "Puff up your cheeks and don't let me push out the air" - Cotton swab with taste (lemon juice/sugar/salt) on front of tongue.	- Paralysis of facial nerve muscles (hyperacusis) - Poor labial retraction and pursing - Poor lip seal - Upper Motor Neuron (UMN): contralateral lower face - Lower Motor Neuron (LMN): ipsilateral upper and lower face, eye closure - Reduced hyoid elevation - Dry mouth, loss of lacrimation - Diminished jaw opening/closing - Loss of taste (anterior 2/3 of tongue)

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VIII Vestibulo-cochlear	- Vestibular - Cochlear	Medulla		- Balance - Hearing		- Vertigo, disequilibrium, nystagmus - Hearing
IX Glosso-pharyngeal	- Nucleus ambiguus - Solitary - Inferior salivatory	Medulla	- Stylopharyngeal - Contributes to palatoglossus - Portion of middle pharyngeal constrictor - Parotid salivary gland	- Elevation of the larynx and pharynx & dilation of pharynx via stylopharyngeus, contributing to epiglottic excursion - Taste/sensation posterior 1/3 of tongue and sensation to tonsils, soft palate, upper pharynx - Sensory portion of pharyngeal gag - Salivation (parotid gland)	- Contributes to cough reflex (test cough) - Cotton swab vs tongue depressor touching posterior tongue and ask which feels soft and which feels hard - Cotton swab with taste (lemon juice/sugar/salt) on back of tongue - Evaluate salivation	- Weak cough reflex - May see weakness on instrumental exam - Loss of taste and sensation (posterior 1/3 of tongue) - May reduce gag due to reduced sensation (look for hyper and hyposensitivity)
X Vagus	- Nucleus ambiguus - Dorsal-motor-vagal - Solitary	- Lateral medulla - Medulla - Medulla	- Muscles of soft palate (except Tensor Veli Palatini) - Superior, middle and inferior pharyngeal constrictors - Intrinsic muscles of larynx: cricothyroid, thyroarytenoid, posterior cricoarytenoid, lateral cricoarytenoids, interarytenoids - Muscles of esophagus	SENSORY: to palate, pharynx, larynx, trachea, lungs, epiglottis. Taste receptors in posterior oral cavity Recurrent Laryngeal Nerve (RLN): sensation below true vocal cords Superior Laryngeal Nerve (SLN): posterior tongue and larynx above true vocal cords. Taste in epiglottis and pharynx. MOTOR: - Elevation/depression of soft palate. - Elevation of posterior tongue - Elevation/closure of larynx. Lowering of larynx after swallow. RLN: muscles of intrinsic larynx (except cricothyroid) and Cricopharyngeus muscle SLN: - cricothyroid - Movement of pharynx (pharyngeal contraction) - Relaxation of cricopharyngeal muscle - Esophageal peristalsis - Cardiac, GI tract, respiration	- Observe soft palate and test gag, as in CN IX - Listen for problems in resonance of voice - "Cough hard" and test for glottic closure - Listen for problems in the voice: gurgly, wet, breathy, hoarse, stridor, monopitch, diplophonia, tremors - Test /k, g/ sounds - Observe swallowing, and palate for reduced laryngeal elevation and delay in the swallow response.	- Loss of gag reflex. Soft palate and uvula will deviate to non-damaged side. - Loss of cough reflex (larynx/pharynx) - Loss of taste (hard palate, base of tongue) - Hypernasality - Dysphonia (hoarse, breathy, wet, etc) - Inability to vary pitch (due to damage of SLN branch which innervates cricothyroid) - Difficulty swallowing (dysphagia) - Impaired laryngeal closure - Impaired true vocal cord adduction

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XI Cranial Accessory	Nucleus ambiguus	Medulla	Contributes to: - Levator veli palatini - Palatoglossus - Palato-pharyngeus - Salpingo-pharyngeus	Assists with: a) raises soft palate b) narrows and elevates of lateral pharyngeal wall c) narrows and elevates posterior tongue		Not significant contribution
Spinal Accessory	Spinal accessory	Cervical cord	- Sternomastoid, trapezius	- Neck & shoulder movement	Turn head, and raise shoulders against force	Head turning/shoulder shrugging weakness
XII Hypoglossal	Hypoglossal	Medial medulla	- All intrinsic muscles of tongue - Some extrinsic muscles of the tongue: Superior longitudinal, inferior longitudinal, transverse, verticalis, genioglossus, hyoglossus, styloglossus - Geniohyoid with Cervical (C1 and C2)	ALL MOTOR Intrinsic muscles: - Shortening, cupping, narrowing, elongating, flattening Extrinsic muscles: - Drawing tongue upward, forward, backward, retraction, and depression. - Backward movement of tongue to soft palate - Draws hyoid bone up and forward and depresses mandible	- Observe tongue (atrophy, tremor, fasciculations) "Stick out your tongue" - Use tongue depressor to resist movement. "Stick out your tongue and don't let me push it back in your mouth." - Use tongue depressor and check lateral resistance. "Stick out your tongue and don't let me push it over." Or press tongue against inside of cheek to resist you pushing against cheek. - Test range of motion. Side to side. - Retract tongue back to roof of mouth with mouth open.	- Atrophy of tongue muscles, fasciculations - Deviation of tongue to weak side. LMN lesion: weakness of ipsilateral tongue UMN lesion: weakness of contralateral side

References:

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