EVALUATING THE CRANIAL NERVES, PART VI

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INTRODUCTION

As mentioned in the previous articles, a thorough neurological examination includes evaluation of a patient's mental status and speech, motor system, sensory system, reflexes, and cranial nerves. Cranial nerves I–VIII have been discussed in the previous articles; this article will present Cranial Nerves IX–XII, closely grouped nerves that supply a variety of sensory and motor functions to structures around the head and even the viscera. Some cranial nerves contain only sensory fibers; those that contain both sensory and motor fibers are called mixed nerves.

Cranial Nerve IX

Glossopharyngeal Nerve (Mixed)

The glossopharyngeal nerve originates in the medulla, exits the skull in the jugular foramen and, as its name implies, travels to portions of the tongue and pharynx.

Its motor fibers innervate pharyngeal muscles that control swallowing and the parotid gland that secretes saliva.

Its sensory fibers supply the pharynx, the taste buds found on the posterior third of the tongue, the soft palate, and tonsils. (Figure 1) Some sensory fibers also originate from the carotid sinus to help regulate blood pressure and from proprioceptors in those swallowing muscles innervated by CN IX.

Lesions Affecting CN IX

Solitary involvement of CN IX is rare; trauma, inflammation, or compression generally also affects CN X and CN XI because of their proximity. One syndrome, glossopharyngeal neuralgia, is similar to trigeminal neuralgia (tic douloureux). The pain starts in the throat, radiates to the ear and is characterized by paroxysms of increasingly intense pain lasting up to 30 seconds, and is sometimes followed by a burning sensation for a couple

of minutes. The syndrome is often triggered by coughing, clearing the throat, or even just swallowing.

Some Symptoms of CN IX Involvement

1. Loss of gag reflex.
2. Difficulty in swallowing (dysphagia).
3. Loss of taste in posterior third of tongue.
4. Deviation of uvula to the well side.
5. Loss of sensation in pharynx and posterior tongue.
6. Loss of pharyngeal constriction while saying "ah."
7. Occasionally, tachycardia from carotid sinus involvement.

Clinical Tests

Cranial nerves IX and X are tested together. See CN X tests below.

CRANIAL NERVE X

Vagus Nerve (Mixed)

The vagus nerve, derived from the Latin "wandering," lives up to its name by innervating a large portion of the head, neck, thorax, and abdomen. It originates in the medulla and terminates in the pharynx, larynx, respiratory airways, lungs, heart, esophagus, stomach, small and large intestines, and gallbladder. Its motor fibers control skeletal, visceral, and cardiac muscles.

The sensory portion arises from the same structures innervated by the motor portion and terminates in the medulla and pons.

Lesions Affecting CN X

Disorders of the vagus nerve often also involve cranial nerves IX, XI, and XII because of their proximity. Lesions of the vagus nerve can be within the medulla or can be peripheral. They include such things as hemorrhages, thromboses, tumors, multiple sclerosis, syphilis, amyotrophic lateral sclerosis, and substance-induced neuritis, trauma, and aneurysms.

Some Symptoms of Vagus Nerve Involvement

1. Aphonia—loss of voice (vocal cord paralysis or hysteria).
2. Dysphonia—hoarseness or impairment of voice.
3. Dysphagia—difficulty in swallowing.

Figure 1. Taste zones of the tongue.

4. Paralysis of soft palate and loss of gag reflex.
5. Pain or paresthesia of pharynx, larynx, or external auditory canal.
6. Anesthesia of pharynx or larynx.
7. Constant coughing.
8. Salivary hypo- or hyper-secretion.

Testing CN X

1. The examiner listens for any hoarseness or nasal quality to the voice.
2. The patient is asked to say "ah," while the examiner observes the upward motion of the soft palate; lack of motion or any asymmetry of movement of the uvula or soft palate is noted.
3. After warning the patient, the gag reflex is tested by lightly stroking the back of the throat on both sides and noting the reaction.
4. If a taste test is performed, quinine would be used since CN IX innervates the posterior third of the tongue, which is sensitive to bitter substances.

CRANIAL NERVE XI

Accessory Nerve (Motor)

The accessory nerve is essentially motor. It is the only cranial nerve that originates from both the brain stem

and the spinal cord; both branches exit the skull through the jugular foramen. The bulbar (medullary) portion supplies the voluntary muscles of swallowing in the pharynx, larynx, and soft palate. The much larger spinal portion supplies the sternocleidomastoid and trapezius muscles to coordinate head movement.

Lesions Affecting CN XI

Various cerebral disorders such as multiple sclerosis, tumors, etc. may cause muscle spasms, while paralyzes may be from diseases such as meningitis or syphilis, or from trauma.

Some Signs of CN XI Involvement

A unilateral peripheral lesion prevents rotation of head to the healthy side, prevents shrugging of the ipsilateral shoulder, and demonstrates atrophy of the involved sternocleidomastoid muscle (SCM), drooping of the shoulder, and caudal displacement of the scapula. Central lesions show similar signs, but without atrophy.

Bilateral nuclear or peripheral lesions demonstrate difficulty in rotating or lifting head, and atrophy of trapezius muscles, resulting in a "squared-off" appearance of the shoulders where they join the neck.

Testing CN XI

1. The examiner notes any shoulder drop or muscle atrophy.
2. The examiner holds both shoulders and asks the patient to raise them against resistance.
3. The examiner places a resisting hand on the side of the patient's head while the patient tries to rotate the head. The examiner notes the force exerted by the corresponding SCM.

CRANIAL NERVE XII

Hypoglossal Nerve (Motor)

The hypoglossal nerve is essentially motor. Originating in the medulla, it leaves the skull through the hypoglossal canal, and supplies the muscles of the tongue involved with speech and swallowing.

Lesions Affecting CN XII

Various medullary disorders, such as hemorrhages, poliomyelitis, tumors, multiple sclerosis, or peripheral dis-

orders resulting from trauma, aneurysms, or poisoning may affect the hypoglossal nerve.

Some Signs of CN XII Involvement

1. Spastic paralysis of the tongue without atrophy or muscle fibrillation and paralysis contralateral to the lesion: The tongue deviates to the opposite side of the lesion upon protrusion.
2. Peripheral flaccid paralysis of the tongue with atrophy and paralysis of the tongue ipsilateral to the lesion: Upon protrusion, the tongue deviates to the same side of the lesion and fasciculations may be present.
3. Medullary flaccid paralysis, has the signs of #2 above plus sensory loss and, in the case of a bilateral lesion, a completely paralyzed tongue along with attendant difficulties in eating and speaking.

Testing CN XII

1. To test strength, the patient pushes the tip of the tongue on the inside of each cheek while the examiner's finger resists.
2. The examiner notes any deviation of the tongue upon protrusion.

Cranial Nerve Examination Flow

If testing all the cranial nerves, the following is a suggested examination flow:

1. CN I (Olfactory). Test sense of smell.
2. CN II (Optic). Test visual acuity, visual fields, and unilateral extinction of vision.
3. CN III, IV, VI (Oculomotor, Trochlear, and Abducens). Inspect and compare size and shape of pupils. Test pupillary reactions to light and accommodation.

Test movements in the 6 cardinal fields of gaze and note any nystagmus.

4. CN V (Trigeminal). Note strength of muscle contraction of temporal and masseter muscles while patient clenches teeth. Test sensation, with patient's eyes closed, using a pin on the forehead, cheeks, and jaw. Test with heat and cold, if abnormal. Test for light touch, using a wisp of cotton. Test the corneal reflex.
5. CN VII (Facial). Note facial asymmetry. Test facial muscles by having patient raise his eyebrows, frown, tightly close his eyes, show his teeth, smile, and blow out his cheeks.
6. CN VIII (Acoustic). Test for hearing. If abnormal, test for lateralization and compare bone and air conduction.
7. CN IX, X (Glossopharyngeal, Vagus). Note hoarseness or nasal quality. Look for any asymmetry of the soft palate or uvula when the patient says "ah." Test the gag reflex.
8. CN XI (Accessory). Note atrophy and fasciculations in the trapezius muscles. Test "shrugging" strength of the trapezius muscles. Test rotation strength of the head.
9. CN XII (Hypoglossal). Note any fasciculations of the tongue. Look for asymmetry, atrophy, or lateral deviation upon tongue protrusion. Note symmetry of movement when patient moves the tongue side-to-side.

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