

CRANIAL NERVE TESTING FOR THE PRIMARY CARE OPTOMETRIST

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The authors have no financial interest in any
industry relevant to this course

COURSE DESCRIPTION

Many ocular conditions can involve one or more cranial nerves. Knowing how to evaluate cranial nerves can lead to better diagnosis and patient management. This course provides a “how to” for cranial nerve evaluation.

LEARNING OBJECTIVES

- To identify when to do a cranial nerve evaluation
- To be able to name all the cranial nerves
- To understand how to evaluate each cranial nerve
- To recognize abnormal findings

WHY PERFORM A CRANIAL NERVE (CN) EVALUATION?

- Increased ability to make the correct diagnosis
- Increased ability to refer patient to the correct healthcare provider
- Possible health care cost containment

SOME INDICATIONS FOR CN SCREENING

- Headache
- Changes in or loss of consciousness
- “Dizziness”
- Ataxia
- Unexplained VF loss
- Unexplained VA loss
- Dysphasia
- TIA’s
- Change in personality
- Decreased cognition
- Weakness or Numbness
- Pain
- Tremor
- Gait disorders
- Nerve or Muscle Palsies
- Uveitis
- DM

EQUIPMENT

- Cotton swabs
- Tuning fork
- Tongue depressor
- Substance of recognizable smell:
coffee, peppermint

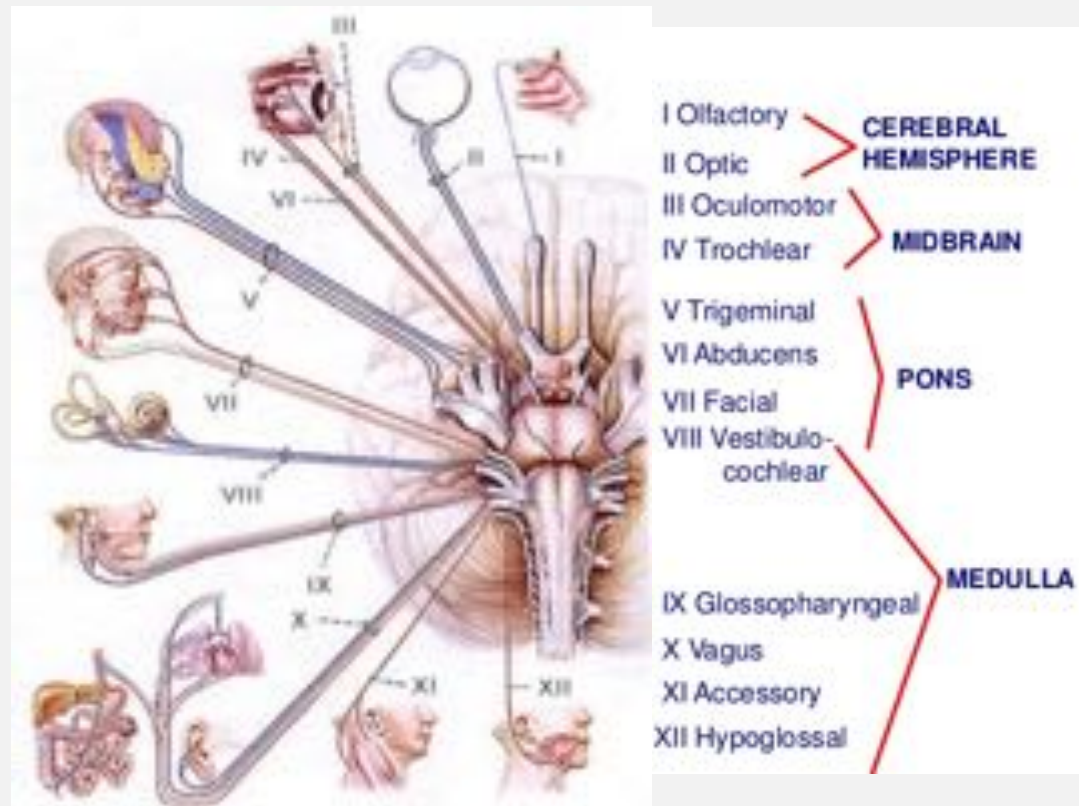


CRANIAL NERVE TESTING

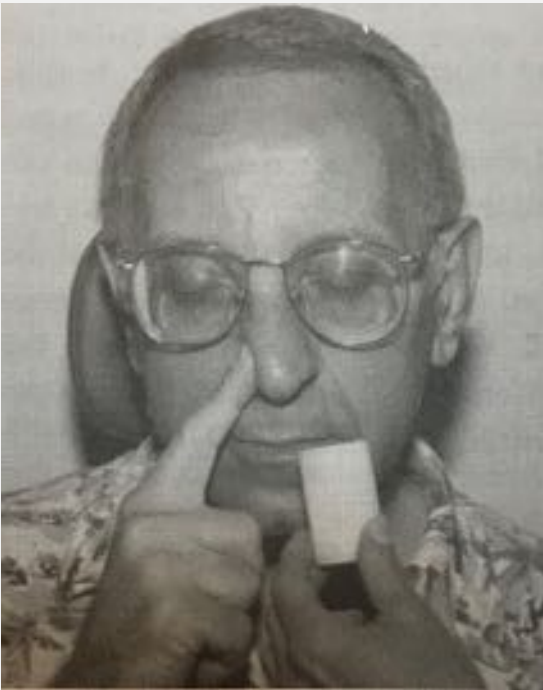
These are nerves that branch from the brain or brainstem, not spinal cord

May not test all nerves if there is a specific concern, but most of the time you will be testing all of them. **It only takes a few minutes!**

We are also testing symmetry



CN I: OLFACTORY



Have the patient close his/her eyes and occlude one nostril

Present the patient with a substance and ask the patient to identify it

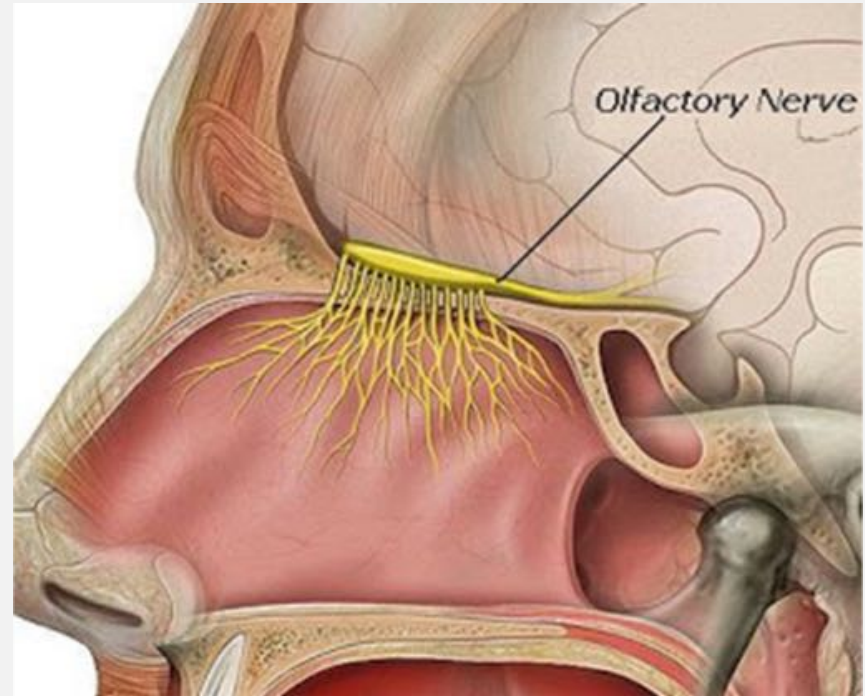
Present a different substance to the opposite nostril and ask the patient to **compare** intensity

Don't use noxious smell



COMMON CAUSES OF DECREASED FUNCTION OF CN I

- Rhinitis due to allergies
- Common cold
- Trauma to nose
- Trauma to frontal lobe
- Frontal lobe lesions
- Dementia, old age



CN II, III, IV, AND VI

Testing in a routine eye exam

CN II: Optic nerve

- Visual acuity, visual fields, ONH examination, pupils

CN III: Oculomotor nerve


- Pupils, EOM

CN IV: Trochlear nerve

- EOM

CN VI: Abducens nerve

- EOM



CNIII innervates:
SR, IR, IO, MR
Levator
Iris sphincter
Ciliary muscle

CN V: TRIGEMINAL (MOTOR)

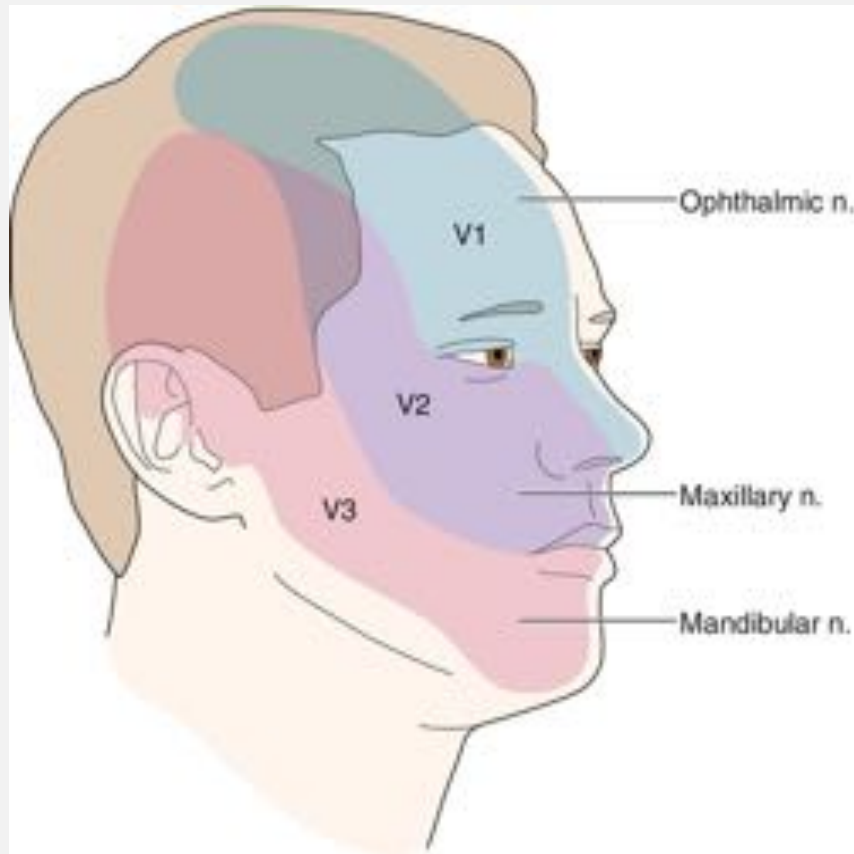
The motor fibers of the CN V innervate the muscles of mastication.

- Check the muscle tone by palpating the masseter muscle when the jaws are clamped tightly together
- Check the muscle strength by trying to pull the jaw apart

Unilateral weakness causes the jaw to deviate towards the side of the lesion



CN V: TRIGEMINAL (SENSORY)



Distribution

Ophthalmic

- Upper lids, forehead, cornea, top of nose

Maxillary

- Lateral surface of the nose, cheek area, lower lids

Mandibular

- Lower jaw, side of face

CN V: TRIGEMINAL (SENSORY)

Is the ability to sense a light touch equal?

- Take a swab and stretch out a strand of fiber
- Lightly brush against face with patient's eyes closed
- Ask patient to report where they feel the fiber
- Check each of three branches
- Compare sides for symmetry



CN V: TRIGEMINAL TESTING (SENSORY)

The the ability to sense pain
equal on both sides?

- Take a broken cotton swab and touch the patient with either the sharp or dull side
- Ask the patient to report if it feels dull or sharp
- Check each of the three branches
- Compare sides for symmetry



COMMON CAUSES OF DECREASED FUNCTION OF CN V

Decreased sensation and strength on
the same side

Common causes of poor function:

- Herpes simplex
- Herpes zoster
- Carotid artery aneurysm
- Craniofacial trauma

CN VII: FACIAL (MOTOR)

Do the facial muscles work equally well?

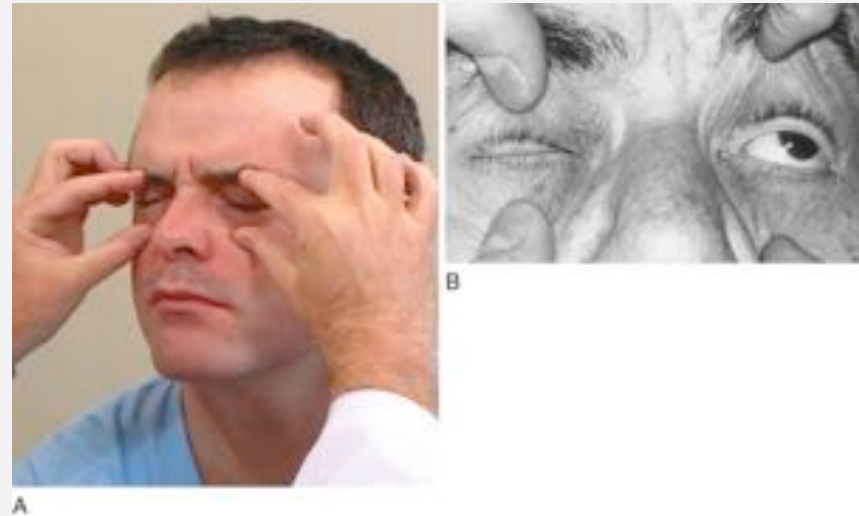
- Look at the patient. Is there symmetry?
- Ask the patient to do what you do:
 - Wrinkle forehead
 - Raise eyebrows
 - Smile
 - Frown
 - Puff out the cheeks



CN VII: FACIAL (MOTOR)

Test the strength of the orbicularis muscles

- Ask the patient to squeeze the eyes shut
- Doctor tries to open them
- May be sensitive for early loss of function



Sensory portion of CN VII typically not tested



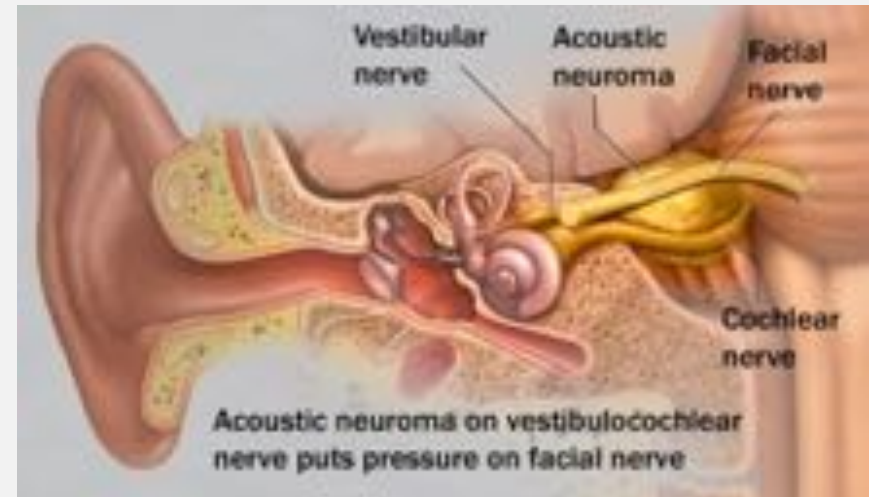
COMMON CAUSES OF DECREASED FUNCTION OF CN VII

Paralysis and decreased muscle strength on the affected side

Bell's palsy

Acoustic neuroma

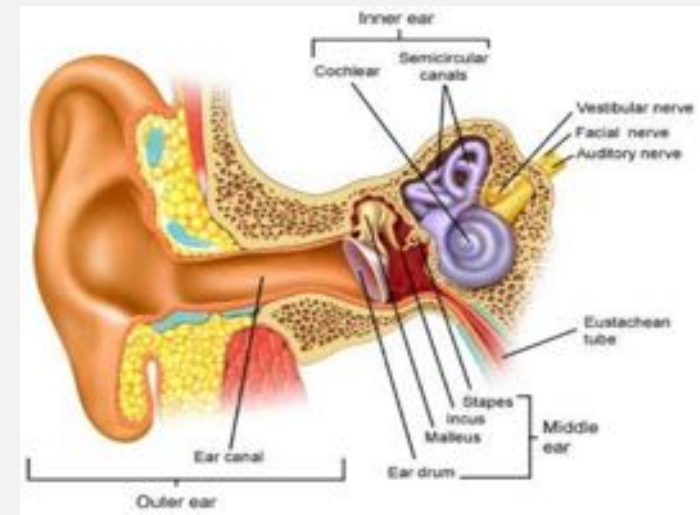
Sarcoidosis, vasculitis, parotid gland tumor, Lyme disease, mononucleosis



CN VIII: VESTIBULOCOCHLEAR

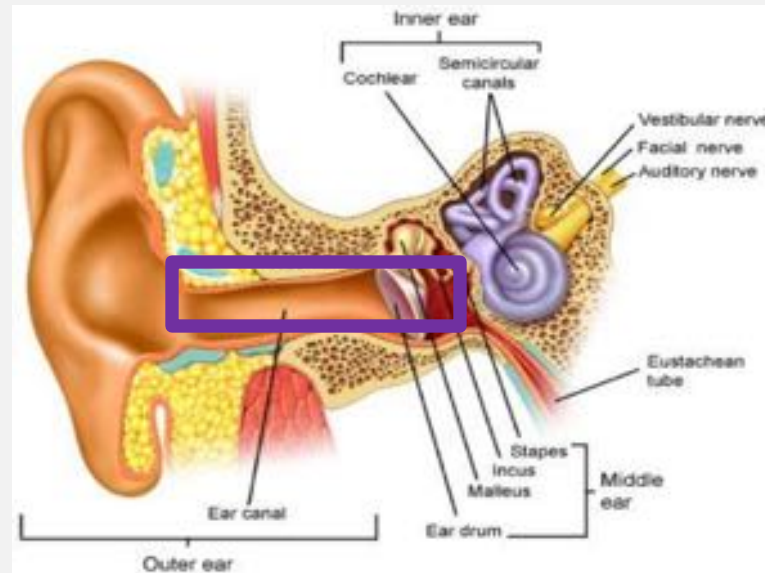
Controls hearing and equilibrium

- Hearing tests:
 - Have patient plug one ear
 - Can use finger rubbing or tuning fork to test the ability on each side
 - Move object away from ear until patient can no longer hear it and compare distance on each side, OR
 - With tuning fork, measure time on each side and compare



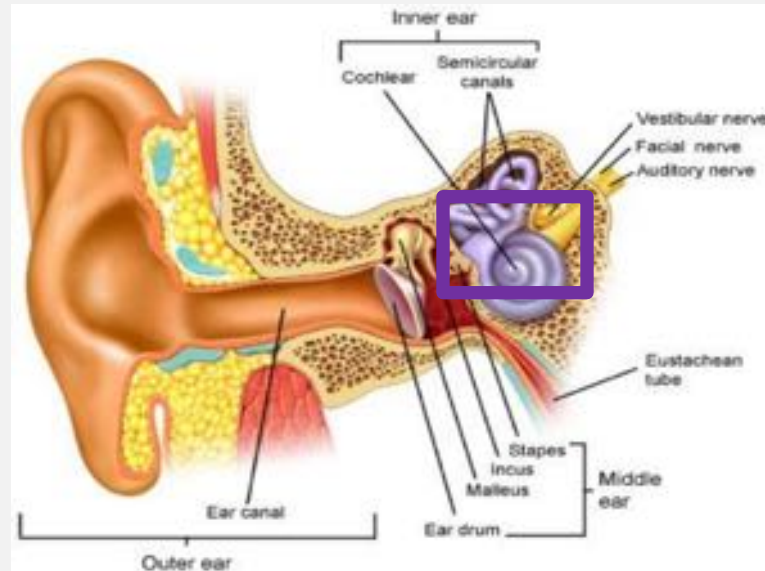
CN VIII: VESTIBULOCOCHLEAR

- Tuning fork also used to differentiate between **conductive** and **sensorineural** hearing loss
- **Conductive**: Disturbance in external or middle ear
 - Commonly caused by cerumen impaction
 - Also possible from perforation of tympanic membrane, infection, or scarring



CN VIII: VESTIBULOCOCHLEAR

- Tuning fork also used to differentiate between **conductive** and **sensorineural** hearing loss
- **Sensorineural**: Defect in cochlea or auditory nerve
 - Often a result of trauma from noise insult or temporal bone injury
 - Also possible from tumor, metabolic disorders, medications



AIR VS. BONE CONDUCTION

Air conduction: Measures the function of the total auditory system

Bone conduction: Measures the function of the inner ear

Normal: Air conduction is heard twice as long as bone conduction

CN VIII WEBER TEST

The Weber test helps assess unilateral hearing loss

- Place the vibrating tuning fork on the midline of the patient's head
- Ask the patient if the sound is heard equally in both ears or is better in one ear
- Avoid giving the patient a cue as to the best response



WEBER TEST INTERPRETATION

Expected response: sound is heard equally in both ears

If there is conductive hearing loss, sound will be better on the side with the conductive hearing loss

Sensorineural hearing loss will cause the sound to be localized to the ear without sensorineural loss

Weber test cannot determine if both conductive and/or sensorineural damage is present

CN VIII RINNE TEST

The Rinne test compares air conduction with bone conduction

Step 1:

Place the base of the vibrating tuning fork against the patient's mastoid bone and ask the patient to tell you when the sound is no longer heard (bone conduction)



CN VIII RINNE TEST

Step 2

Quickly position the still vibrating tines 1-2cm from the auditory canal, and ask the patient to tell you when the sound is no longer heard (air conduction)

Step 3

Compare left and right side



RINNE TEST INTERPRETATION

Expected results

- Bone conduction should be equal AU
- Air conduction should be better than bone conduction so patient should report hearing the sound when the tuning fork moves to the external ear
- Air conduction should be equal AU

RINNE TEST INTERPRETATION

Pathological results:

- If bone conduction is not equal AU, expect nerve damage on the shorter side (sensorineural hearing loss)
- If air conduction is not $>$ bone conduction or air conduction is not equal, there is conductive hearing loss

WEBER AND RINNE EXAMPLE I

Weber: Lateralization to the right ear

- What 2 things could this indicate
 - Conductive loss AD
 - Sensorineural loss AS

- Rinne timed results (seconds):

Conduction	Right	Left
Bone	10	10
Air	2	10
Total	12	20

- Likely problem: Conduction loss AD

WEBER AND RINNE EXAMPLE 2

Weber: Lateralization to the right ear

- What 2 things could this indicate
 - Conductive loss AD
 - Sensorineural loss AS
- Rinne timed results (seconds):

Conduction	Right	Left
Bone	10	5
Air	8	4
Total	18	9

- Likely problem: Sensorineural loss AS

CN IX: GLOSSOPHARYNGEAL CN X: VAGUS

Sensory and motor for each

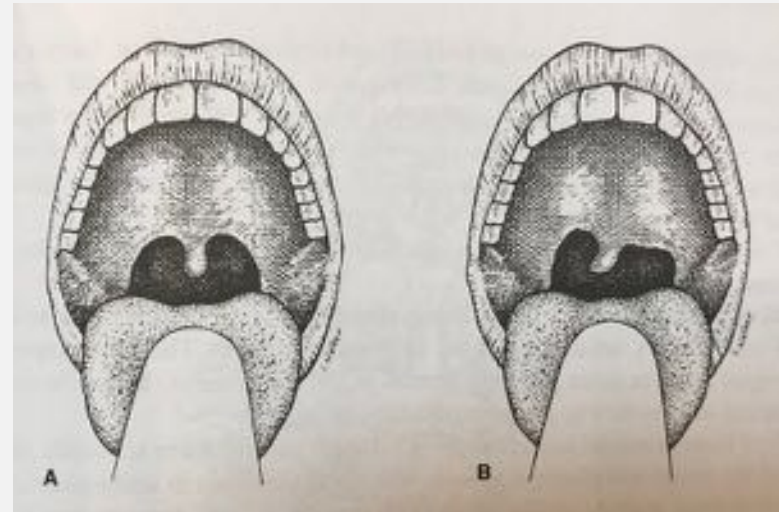
- Interconnected so tested together
- Ask about swallowing difficulty and changes in voice
- Check the gag reflex on each side by touching the posterior 1/3 of the tongue, soft palate, or posterior pharyngeal wall with a cotton swab
- Decreased sensation on involved side



SENSORY

CN IX: GLOSSOPHARYNGEAL CN X: VAGUS

- Use the tongue blade to control the tongue and ask the patient to say “Ah”
- Observe the elevation of the soft palate and uvula
- Expect symmetry on each side
- Uvula deviates towards the normal side



MOTOR

CN IX and CN X can be affected in brain stem infarcts, space occupying lesions, vertebral artery aneurysms

CN XI: ACCESSORY

Motor to trapezius muscles and sternocleidomastoid muscles

Trapezius

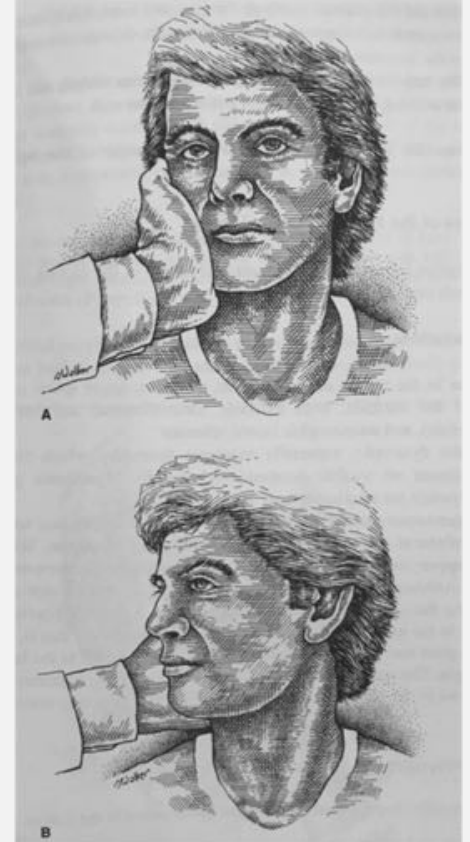
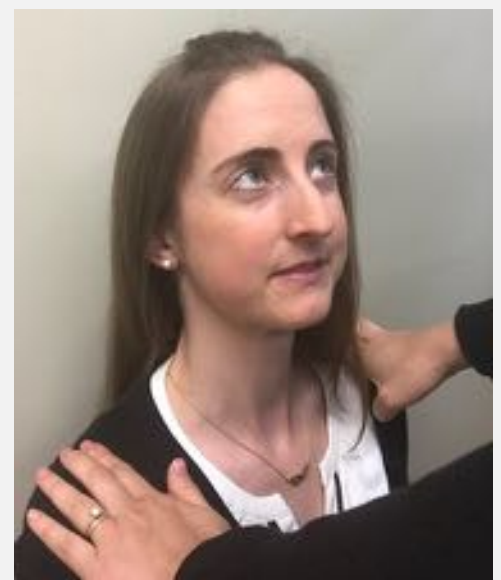
Ask patient to shrug shoulders against resistance and note strength

Sternocleidomastoid (SCM)

Have the patient turn upright head each direction against the resistance of your hand

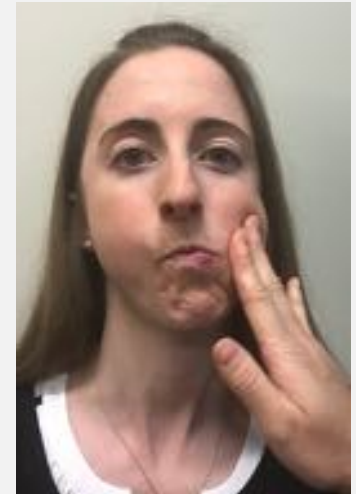
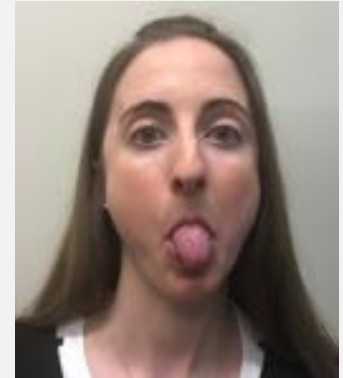
Look for symmetry

Decreased strength on affected side



CN XII HYPOGLOSSAL

- Have the patient stick the tongue straight out and look for deviation
 - The tongue deviates towards the affected side
- Have the patient move the tongue to the left and the right
- Have patient push tongue into cheek when you push from the outside. Note strength.
 - Decreased strength on the affected side



VIDEO

THANK YOU

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