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Human Anatomy Lab - Examination of the Cranial Nerves

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HUMAN ANATOMY LAB - EXAMINATION OF THE CRANIAL NERVES

The peripheral nervous system consists of twelve pairs of cranial nerves, 31 pairs of spinal nerves, and the nerves of the autonomic nervous system. The cranial nerves are the nerves that leave the brain directly. These nerves control various actions and sensations such as sight, smell, chewing, and swallowing, and will be the focus of this week's lab.

Of the twelve pairs of cranial nerves, two pairs arise from the forebrain, ten pairs arise from the midbrain and brain stem, and all but the Vagus nerve innervates the structures in the head and neck. Each cranial nerve pair is designated with a Roman numeral in reference to the order in which the nerves are positioned from the front to the back of the brain. The names given to the nerves indicate the structures innervated or the principle functions of the nerves.

This experiment will be conducted in pairs. Each student will test the other and record all data.

(I). OLFACTORY NERVE

The Olfactory nerve is a sensory nerve that carries nerve impulses related to smell. In severe injuries to the head the olfactory bulb may become separated from the olfactory nerves, thus producing loss of the sense of smell. This condition is referred to as anosmia. Often accompanying this condition is a considerable loss in the sense of taste since much of what we taste is accentuated by scent.

Testing the Olfactory Nerve:

To test the olfactory nerve, have your lab partner sit with eyes closed and smell several familiar substances --- use only one nostril at a time. The odors should be equally distinguishable by each nostril.

RESULTS: _____

*Note: If you have a cold or allergy, do not panic if odors cannot be distinguished.



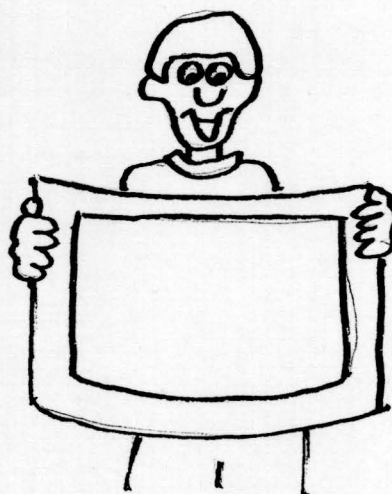
(II). OPTIC NERVE

The optic nerve is the special nerve of the sense of sight and is distributed exclusively to the eyeball. The left and right optic nerves run from each eye to the optic chiasma where fibers from the medial half of each retina cross over to the opposite side. The optic nerve may be affected in injuries of diseases involving the eye, fractures of the anterior fossa at the base of the skull, and in tumors within the eye itself or in neighboring areas. For instance, severing the optic chiasma would result in the loss of sight in the medial portion of each eye.

Testing the Optic Nerve:

To test the sensory function of the optic nerve, have your lab partner read a portion of a printed page using each eye. Then test visual acuity by having him/her read an eye chart from a distance of 20 feet.

*Note: Visual acuity must be tested with lenses on if your partner wears them.



(III). OCULOMOTOR NERVE

The oculomotor nerve is mainly a motor nerve which innervates the levator palpebrae (the muscle that raises the upper eyelid), four extrinsic eye muscles, the sphincter muscle of the iris, and the ciliary muscle that controls lens shape. Malfunctions of the oculomotor nerve can result in the following: drooping of the upper eyelid (ptosis), external strabismus (when the eyes have the same amount of deviation in whatever direction they are looking), abnormal dilation of the pupil, loss of power of accommodation, and slight bulging of the eyeball due to the relaxed eye muscles.

Testing the Oculomotor Nerve:

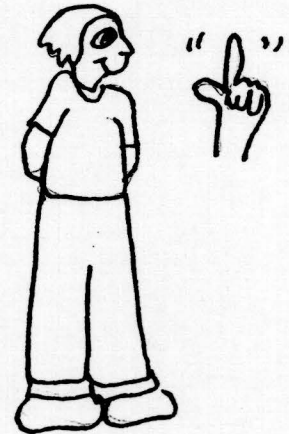
To test the oculomotor nerve, have your lab partner follow your finger (or a pen) with his/her eyes paying particular attention to cross-eyed movement.

OBSERVATIONS: _____

Move a penlight from one side of your lab partners face toward the front of the eye. Note the pupillary change. Observe your partner for signs of ptosis (drooping of the eyelids).

*Note: You should be aware of the rate of pupillary change and coordinated constriction of each eye.

OBSERVATIONS: _____



(IV). TROCHLEAR NERVE

The trochlear nerve innervates the extrinsic eye muscles and is the smallest of the twelve cranial nerves. The trochlear nerve, when paralyzed, can cause loss of function in the superior oblique so that one is unable to turn his eye outward and downward. A patient attempting to do this will experience double vision when going down hill or descending a flight of stairs. Irritation of this nerve may cause spasms of one of the muscles supplied by it.

Testing the Trochlear Nerve:

Have your lab partner sit, head still, and follow a pen with his/her eyes. Take particular notice of lateral and downward movements. Any signs of dizziness?

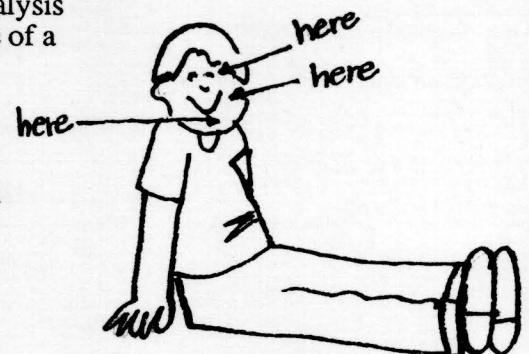
RESULTS: _____

(V). TRIGEMINAL NERVE

The trigeminal nerve is the great sensory nerve of the head and face, and is the motor nerve of mastication. It is the largest of the twelve cranial nerves, and is a mixed nerve due to its sensory and motor functions. The fifth nerve may be damaged in its entirety, or its sensory or motor root may be separately affected. In the case of an injury to the sensory root there is anaesthesia of the half of the face of the side of the damage, dryness of the nose, inability to rid the eye of foreign bodies by winking, loss of considerable amount of taste, and decreased secretion of the salivary glands. In injury to the motor root, there is impaired action of the lower jaw due to paralysis of muscles of mastication of the affected side. A good example of a malfunction of this nerve is Bell's Palsy.

Testing the Trigeminal Nerve:

a). Sensory: have your lab partner close his/her eyes. Whisk a dry piece of cotton over the mandibular, maxillary, and eye regions of the face. Repeat this process using the tip of a pencil to analyze pain response. Are all three areas equally



sensitive to stimulus?

OBSERVATIONS: _____

b). Motor: have your lab partner close his/her jaws tightly. Then, while holding your hand under your partners jaw for resistance, have him/her open the mouth.

Have your partner clench his/her teeth. Feel the flexing of the masseter muscle as he/she bites down.

*Note: the muscles of both sides of the jaw should show equal contractile strength.



(VI). ABDUCENS NERVE:

The abducens nerve supplies the external rectus muscle - it innervates the lateral rectus muscle of the eyeball. The sixth nerve is more frequently involved in fractures of the base of the skull than any other of the cranial nerves. When injured there is, in addition to the partial or complete paralysis of the external rectus muscle, a certain amount of dilation in one of the pupils. Such a condition is often indicative of swelling and pressure in the brain.

Testing the Abducens Nerve:

In testing the Oculomotor and Trochlear Nerves you also tested the Abducens.

(VII). FACIAL NERVE

The facial nerve is the motor nerve of all the muscles of expression in the face. Motor fibers are responsible for the innervation of the muscles of the scalp and of the face, the lacrimal glands, and the sublingual and salivary glands.

Sensory fibers arise from and innervate the anterior two-thirds of the tongue. The facial nerve is more frequently paralyzed than any of the twelve cranial nerves. Paralysis can be caused when blood-clots put pressure on this nerve, by middle ear disease, or upon exposure to cold or lesions. In such cases, individuals will not be able to frown, the eyelids cannot be closed, and the lower eyelid droops so that tears run down the cheeks, among other things.

Testing the Facial Nerve:

To test for the motor response of this nerve, have your lab partner bring the corners of his/her mouth straight back while showing the teeth. Then have your partner whistle, puff cheeks, raise and lower the eyebrows, close the eyes, and wrinkle the forehead. Check for asymmetry in the responses.

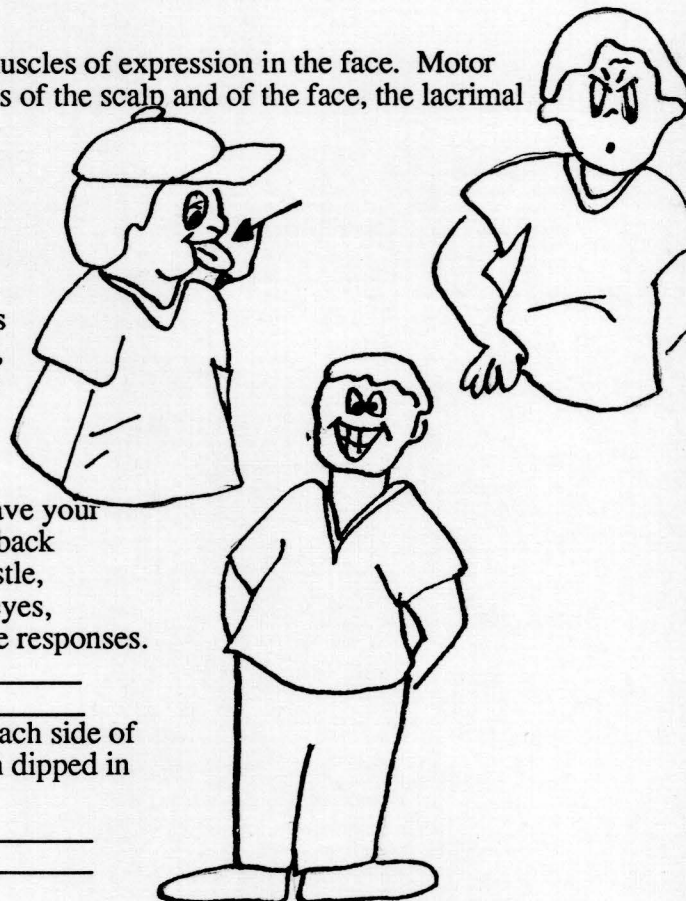
OBSERVATIONS: _____

To test the sensory function, touch the tip of each side of your lab partners tongue with a cotton tip that has been dipped in a sugar solution.

RESPONSE: _____

(VIII). VESTIBULOCOCHLEAR NERVE:

The vestibulocochlear nerve is the special nerve of the sense of hearing and equilibrium. It is distributed exclusively to the inner ear. The nerve may either be torn, producing permanent damage, or may be bruised or damaged due to loud noises, blows on the head, etc. resulting in temporary deafness and/or ringing in the ears.



Testing the Vestibulocochlear Nerve:

To test the sensory function of the vestibulocochlear branch of this nerve, have your lab partner sit on a swivel stool while you spin him/her around ten times (about one turn every two seconds).

RESPONSE: _____

*Note: A normal response includes:

- a). Vestibular Nystagmus = a rapid involuntary movement of the eyeballs.
- b). Vertigo = loss of equilibrium; dizziness.

To test the sensory function of the cochlear branch of this nerve, have your lab partner close his/her eyes and test for the ability to hear a watch ticking or the vibrations of a tuning fork.



(IX). GLOSSOPHARYNGEAL NERVE

The glossopharyngeal nerve is a mixed nerve. The motor fibers innervate the parotid salivary gland and, along with those of the vagus nerve, innervate the muscles of swallowing. Sensory fibers are responsible for the sense of taste to all areas of the tongue to which it is distributed.

Testing the Glossopharyngeal Nerve:

To test the glossopharyngeal, drop quinine (or other bitter substance) onto a cotton applicator and touch it lightly to the tips, sides, and back of the tongue of your lab partner. Which area of the tongue houses the receptors for bitter? _____



(X). VAGUS NERVE

The vagus nerve has a more extensive distribution than any other of the cranial nerves, passing through the neck and the thorax to the upper part of the abdomen. It supplies the organs of voice and respiration with its sensory fibers, and the pharynx, stomach, and heart with the motor fibers. When branches of this nerve are irritated or paralyzed a spasm of the muscles of the larynx may occur. Accompanying this is a hoarse voice that is weak in timbre, among other things.

Testing the Vagus Nerve:

Test the "gag" response of your lab partner by touching the uvula with a cotton applicator (carefully). Hold the tongue down with a tongue depressor and have your partner say "ah". Does the uvula move? _____

Are the movements the same on both sides? _____

Does swallowing occur easily? _____



(XI). ACCESSORY NERVE

The accessory nerve innervates the muscles of swallowing, as well as the sternocleidomastoid and trapezius muscles. Damage to this nerve can result in the inability to move the head from side to side, or the inability to shrug the shoulders.

Testing the Accessory Nerve:

To test the accessory nerve, have your lab partner shrug his/her shoulders while you gently push against them. Do they appear to be of equal strength? _____



Have your lab partner rotate his/her head against the resistance of your hand. Observe the sternocleidomastoid. Do both sides appear to flex? _____

(XII). HYPOGLOSSAL NERVE

The hypoglossal nerve is the motor nerve of the tongue. It is responsible for the motor impulses to the intrinsic and extrinsic muscles of the tongue. This nerve is not responsible for the innervation of the taste buds. Damage to this nerve may result in the loss of the ability to stick your tongue out at whoever you chose. (Bummer).

Testing the Hypoglossal Nerve:

To test the hypoglossal nerve, have your lab partner protrude his/her tongue. Does it appear to be symmetrical? _____

Have your partner move his/her tongue from side to side while you apply pressure from a tongue depressor. Do both sides appear to be equally strong? _____

*Note: The tongue should protrude straight; deviation to one side is indicative of ipsilateral nerve dysfunction. Asymmetry, atrophy, or lack of strength should be noted.

