Oculomotor Nerve

Ocularmotor Nucleus
- Nucleus is located in the mesencephalon at the level of the superior colliculi, in front of the periaqueductal gray matter.

Innervation
- Medial, Superior, Inferior rectus muscle. Inferior Oblique. Levator palpevrae superioris

Edinger-Westphal Nucleus
- Parasympathetic fibers -->cillary ganglion-->sphincter of the pupil & cillary muscle

Perlia Nucleus
- Located between the EW nucleus -->Convergence of the eyes

Intersititал nucleus of Cajal
- Intergrates vertical gaze

Oculomotor Nerve Lesions

Symptoms
- Dialation of Pupil, No direct or indirect pupilary light reflex, no accomidation refex, ptosis

Nuclear Lesion
- Midbrain lesions

Nerve Lesion
- Supratentorial space occupying lesion causes transtentorial herniation of the medial temporal lobe (uncus) and Compresses the ocularmotor nerve

Argyll-Robertson Pupils
- Bilateral loss of pupliary light reflex, but no loss of accomidation --> Tertiary Syphilis, MS, Diabetes, Syringobulbia, Pineal Tumor

Adie Syndrome
- Very slow constriction and accomodation --> widespread autonomic disturbance or neuropathy (effects young women)

Visual Acuity Exam

Visual acuity is tested with Snellen charts - 6 lines at 6 meters away.
If the patient normally wears glasses/lenses, then this test should be assessed both with and without their vision aids.
If there is marked loss of acuity, examiner should determine distance at which patient is able to count fingers.

Visual Field Exam

The field of vision is the space in which an object can be seen while the eye remains fixed at one point.

Lateral: 90-100 Medial: 60 Upward: 50-60 Downward: 60-75

Confrontation Method
- Cover one of the patients eyes, ask patient to fix sight on your nose, bring your finger into the field of vision from all four directions, asking them to respond when they see it. --> Detects Hemianopias

, Two Eye Confrontation Method
- Using both eyes, ask patient to fix sight on your nose, out strech your arms and ask pacient to grab your finger when hands come into visual field. --> Temporal field defect if doesnt grab finger until crosses midline --> can also detect visual neglect

Visual Field Defects

Concentric Contraction
- Narrowing of the range of vision on all sides -->Optic Atrophy

Homonymous Hemianopia
- Loss of vision on temporal half of one eye (ipsilateral to lesion) and nasal half of the other eye --> Lesion posterior to optic chiasm

Visual Field Defects (cont)

Wernicke's Hemianopia Phenomenon
- Also loss of pupilary light reflex in the effected side of the retina because lesion is after ocular motor nucleus

Heteronymous Hemianopia
- Loss of vision in either both nasal, or both temporal fields --> Damage to the optic chiasm (Superior visual field effected first)

Bitemporal Hemianopia
- Caused by pituitary adenomas, or any other parasellar/suprasellar tumors-meningiomas, craniopharyngiomas. Also aneurysms, trama, and hydrocephalus.

Binasal Hemianopia
- Rare, caused by atherosclerosis, or bilateral aneurysms of the internal carotid, and in demyelinating disorders.

Horizontal Hemianopias
- Very rare, Unilateral loss of the lower half of the visual field -->Anerior lesion of the optic nerve in ischemia of the optic nerve head.

Quadrantanopia
- Loss of one quadrant in the field of vision. Lower quadrant-->Damage to fibers radiating through parietal lobe and terminate on upper lip of the calcarine fissure. Upper quadrant -->Damage to fibers radiating through temporal lobe (Meyers loop) and terminate on lower lip of calcarine fissure.

Cortical blindness
- Bilateral lesions of the primary visual cortices

Scotomas
- Blind spots in the field of vision. (+) are seen as dark spots by patients. (-) are not noticed by the pacient. --> Disease of retina or optic nerve

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Not published yet.
Last updated 15th October, 2014.

Examination of Ocular Movements

Position of eyes when looking straight ahead
- Note any deviation

Verbal Commands
- Ask patient to look L R U D

Pursuit Movements
- Fix patients head and ask them to follow your finger as it moves the 9 cardinal positions of gaze.

- Is the gaze conjugate, are there restricted movements, nystagmus, or diplopia?

Vergence Movements
- Have the patient focus on your finger 60cm away, then as its gradually brought closer.

Vestibulo-Ocular Reflex
- Have patient fix eyes on a target while you passively move their head side to side and up and down. The gaze should remain stable. Can also preform the calorisation test.

Caloric Reflex Test
- Introduce warm water (44°C or above) into the external auditory canal. It will cause the endolymph in the ipsilateral horizontal canal rises, causing an increased rate of firing in the vestibular afferent nerve. This situation mimics a head turn to the ipsilateral side. Both eyes will turn toward the contralateral ear, with horizontal nystagmus (quick horizontal eye movements) to the ipsilateral ear if brainstem intact.

Saccasdes
- Ask the patient to fix their gaze, then alternate it between objects. What is the accuracy and velocity? Are there corrective saccades?

Trochlear Nerve

Trochlear Nucleus
- Located in the midbrain at the level of the inferior colliculli in the periaqueductal grey matter directly below the ocularmotor nerve. Its fibers cross and leave the midbrain dorsally. (only one)

Innervates
- Superior Oblique (contralateral due to crossing)

Nuclear/Nerve Lesion
- Most common--> direct facial trama. Also brainstem contusion, MS, rupture of posterior cerebral aneurysms or superior cerebellar artery, cavernous sinus disorders.

Bielschowsky sign
- Symotoms - Head tilted to normal side, upon tilting the head to the abnormal side, diplopia becomes prononced

Abducens Nerve

Abducens Nucleus
- Is located in the midline of the tegmentum of the lower pons beneath the floor of the IV ventricle. The internal knee of th facial nerve wraps around it. The nerve leaves the pns and runs up the clivus and joins the III and IV nerve in the cavernous sinus.

Innervation
- Lateral Rectus Muscle

Nuclear Lesion
- Bilateral paralysis due to paramedial pontine infraction due to basilar artery stenosis with ipsilateral paralysis of conjugate gaze because the abducens nucleus also innervates via the medial longitudinal fasciculus the contralateral medial rectus muscle.

Abducens Nerve (cont)

Nerve Lesion
- Bilateral paralysis due to increased ICP. Ipsilateral paralysis due to Wernicke-Korsakow syndrome, Miller Fisher syndrome, neuroborreliosis (lymes disease) and botulism toxicity.

Voluntary Vertical Eye Movements

Cortical Center
- Dorsolateral Prefrontal Cortex->anterior limb of the internal capsule->rostral interstitial nucleus of MLF

Parinaud Syndrome
- Unable to look upward -->Pineal Tumor compressing the posterior commisure

Voluntary Horizontal Eye Movements (Sarccades)

Cortical Center
- Fibers leaving the Frontal Eye Field (Broadman 8) cross at the midbrain/pons border and terminate in the Pontine Reticular Formation -> Abducens Nucleus -> Medial Longitudinal Fascicle to the contralateral Oculomotor Nucleus.

Internuclear Opthalmoplegia

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