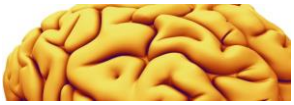
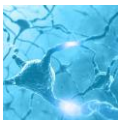
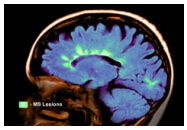




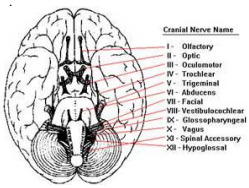
My Last nerve

Lynn E. Lawrence, CMSgt (ret) USAF,
CPOT, ABOC, COA, OSC



Objectives

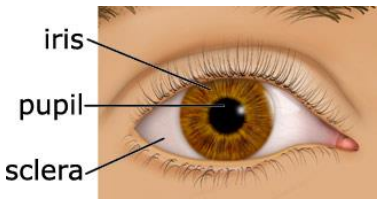
- Identify the nerves of the ophthalmic sy
- How many cranial nerves are there
- What do they do (innovate)?
- What functions do they impact?
- What happens when they do not work?
- Diseases impacting optic nerves



Vision – an important part of your health

- Vision is an early warning sign for many disease
- Pain when moving eyes left to right could indicate optic nerve swelling

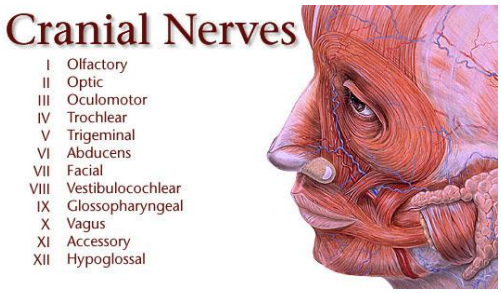
Anatomy



What function does the pupil have?

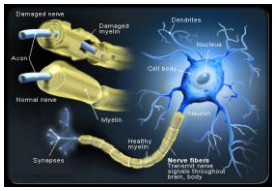
How many cranial nerves are there

- How many total cranial nerves are there?



Which cranial nerve controls the superior oblique muscle?

What are nerves and what do they do

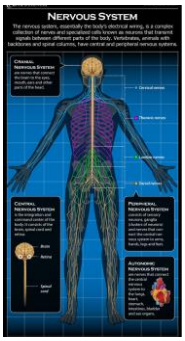


- Nerves help us to respond to the world around us
- The nervous system has two major parts: **the central nervous system (CNS) and the peripheral nervous system (PNS)**. The central system is the primary command center for the body, and is comprised of the brain and spinal cord. The peripheral nervous system consists of a network of nerves that connects the rest of the body to the CNS

Our electrical system – must be plugged in

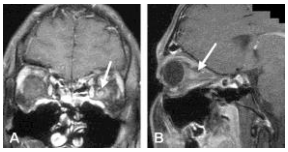
- The nervous system is a complex collection of nerves and specialized cells known as neurons that transmit signals between different parts of the body. It is essentially the body's electrical wiring.

http://www.livescience.com/27975-human-body-system-the-nervous-system-infographic.html



Why are nerves important?

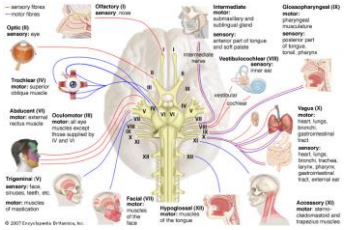
- The central nervous system transports critical signal information throughout the body
- How many cranial nerves do you have?



Cranial Nerves LR_6SO4_3

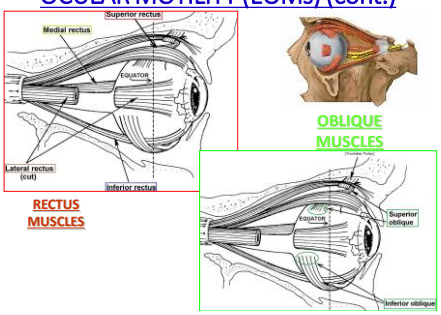
Muscles

- Lateral rectus muscles #6 …abducens nerve
- Superior Oblique #4 …trochlear nerve
- All other muscles are controlled by #3 … oculomotor nerve



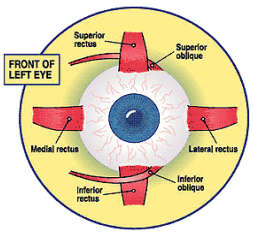
Name the 3 chambers of the internal eye?

OCULAR MOTILITY (EOMs) (cont.)



Extraocular Muscles

- **Medial Rectus**
  - Most powerful, adduction, CN III
- **Inferior Rectus**
  - Primary is depression, CN III
- **Lateral Rectus**
  - Abduction, CN VI
- **Superior Rectus**
  - Primary is elevation

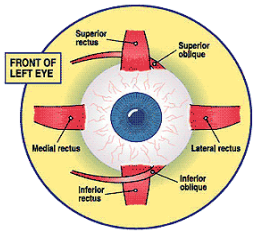


Which muscle close the eye lid and is innervated by cranial #7?

Muscles and Function

- LR6…SO4…3
  - Rectus
  - Obliques

- Intorsion
- Extorsion
- Elevation
- Depression
- Adduction
- Abduction



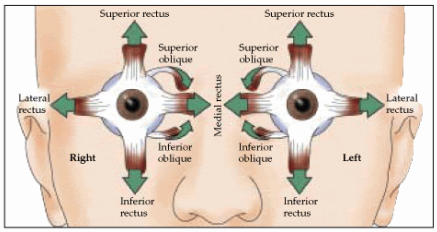
An obvious upward/superior deviation of the eye is called?

Extraocular Muscles

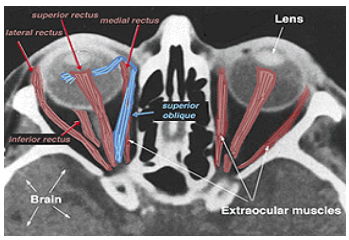
- **Superior Oblique (SO)-** has 3 functions; intorsion, depression and abduction; innervated by the 4th (trochlear) cranial nerve
- **Inferior Oblique (IO)-** 3 functions; extorsion, elevation, and abduction; innervated by the 3rd (oculomotor) cranial nerve

Proper alignment and muscle balance of the eyes is called?

Extrinsic Ocular Muscles Functions



Extra Ocular Muscles



What is the name of the point where the muscles come together?

COVER TESTING (cont.)

COVER TESTING has 'two' parts:

1) ALTERNATING test

2) COVER/UNCOVER test

3) Do them in this order! (Please?)

4) Done at DISTANCE then NEAR

5) Pt wears the "correct" Rx for test distance

ALTERNATING tells you DIRECTION of DEVIATION (if any)

- **ESO**, **EXO**, **HYPER**/HYPO
- No movement? Pt is ***ORTHO***! Yea! (Don't have to do COVER/UNCOVER test ☺)

COVER TESTING (cont.)

COVER/UNCOVER test

Only done if ***MOVEMENT*** during the ALTERNATING test!

- Observe LEFT EYE as you **COVER** RIGHT EYE
  - Did it move? (Yes = **TROPIA**; No = **PHORIA**)

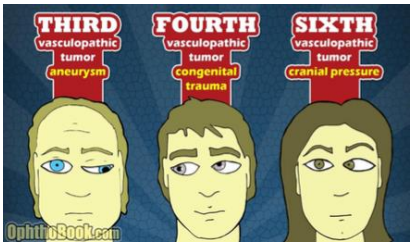
Repeat for other side…

- Observe RIGHT EYE as you **COVER** LEFT EYE
  - Did it move? (Yes = **TROPIA**; No = **PHORIA**)

UNCOVER only matters if you saw ***MOVEMENT*** when you **COVERED**! (i.e., had a TROPIA)

- Do you see ***movement*** AGAIN when you **UNCOVER**?
  - **UNILATERAL** TROPIA!
- No ***movement*** when you **UNCOVER**?
  - **ALTERNATING** TROPIA!

Pre-testing Can reveal serious conditions

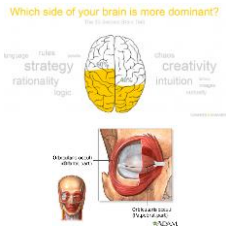


COVER TESTING (cont.)

WHAT DOES THIS CHILD HAVE?

What do they Do (innovate)?

- Nerves trigger organs to operate and this triggering is called innervation
- It is important to identify if you are dealing with a nerve, muscle, or organ issue



What ocular functions do they impact?

- Eye alignments
- Lid positions
- Transmission of signals to and from the eye

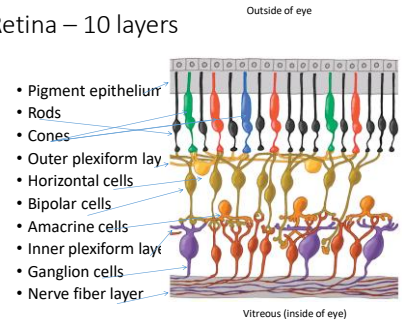
Testing

- Pupil Response
- Muscle H Testing
- Dilated Fundus
- Visual Field Testing
- Optic Nerve Scan
- Reflex Testing
- MRI Testing
- Spinal Fluid Testing

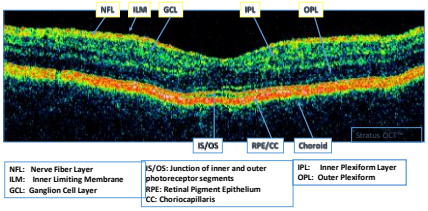
Optic Neuritis

- The optic nerve carries visual information from your eye to the brain. Sudden swelling of this nerve can damage the insulation (myelin sheath) surrounding each nerve fiber. This can result in permanent visual loss

Retina – 10 layers



Identification of Retinal Layers



NFL: Nerve Fiber Layer
ILM: Inner Limiting Membrane
GCL: Ganglion Cell Layer

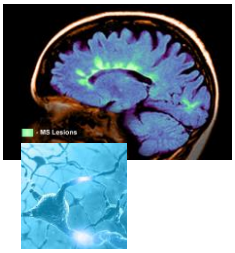
IS/OS: Junction of inner and outer photoreceptor segments
RPE: Retinal Pigment Epithelium
CC: Choriocapillaris

IPL: Inner Plexiform Layer
OPL: Outer Plexiform

Cross-sectional image of live tissue; a virtual biopsy

What happens when they do not work?

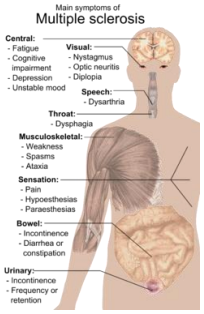
- It is like having a bad wire on a lamp. Whatever it is attached to doesn't work or it works intermittently
- Testing must be done correctly and attention to detail is a must



Bodily Effects

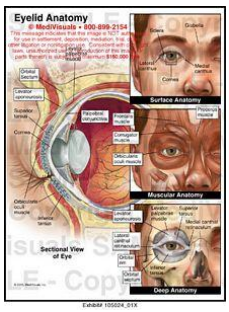
Listen to your patients

- Major Depression
- Unstable Moods
- Cognitive Impairment
- Fatigue
- Physical Impairment
- Weakness
- Dysarthria (speech disorder)
- Pain



Early Symptoms of MS

- Diminished brain function
- Blurred or double vision
- Thinking problems
- Clumsiness or a lack of coordination
- Loss of balance
- Fatigue and Numbness
- Tingling
- Weakness in an arm or leg.
- No two people have exactly the same symptoms of MS
- Swallowing issues



Ophthalmoplegia

Internuclear ophthalmoplegia is a disorder of conjugate lateral gaze. The affected eye shows impairment of adduction. The partner eye diverges from the affected eye during abduction, producing diplopia; during extreme abduction, compensatory nystagmus can be seen in the partner eye. Diplopia means double vision while nystagmus is involuntary eye movement characterized by alternating smooth pursuit in one direction and a saccadic movement in the other direction.

Trauma

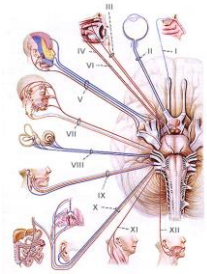
- Damage to eyelid

Ptosis (Toe-SIS)

- Ptosis is a drooping or falling of the upper eyelid. The drooping may be worse after being awake longer, when the individual's muscles are tired.
- Can be disease or trauma related

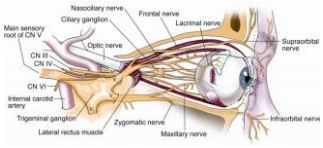
Nerves of the eye lids

- In humans, the sensory nerve supply to the upper eyelids is from the infratrochlear, supratrochlear, supraorbital and the lacrimal nerves from the ophthalmic branch (V1) of the trigeminal nerve (CN V). The skin of the lower eyelid is supplied by branches of the infratrochlear at the medial angle, the rest is supplied by branches of the infraorbital nerve of the maxillary branch (V2) of the trigeminal nerve.



Eyelid nerves… cont

- The facial nerve (CNVII) innervates the obicularis oculi, frontalis, procerus, and corrugator supercilii muscles, and supports eyelid protraction. The temporal and zygomatic branches of the facial nerve supply the obicularis oculi, the main eyelid protractor. The facial nerve also supplies the corrugator supercilii and the procerus, both of which secondarily contribute to upper eyelid protraction



http://eyewiki.aao.org/File%3AAA0_54181.jpg

Lid Positions

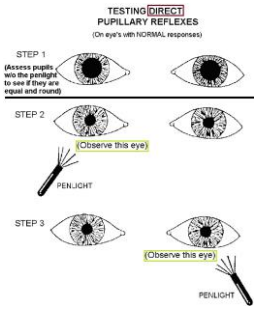
- The oculomotor nerve (CNIII) innervates the main upper eyelid retractor, the levator palpebrae superiorus, via its superior branch. Sympathetic fibers contribute to upper eyelid retraction by innervation of the superior tarsal muscle, also known as Müller's muscle. Sympathetic fibers also innervate the inferior tarsal muscle, contributing to lower lid retraction.

Lagophthalmus Gold Weights

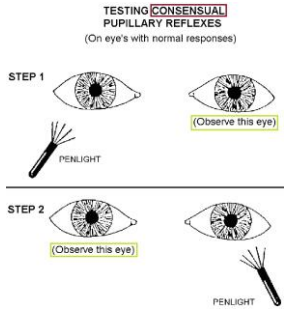
PUPILLARY ASSESSMENT (cont.)

WHAT DO YOU THINK ABOUT THESE PUPILS?

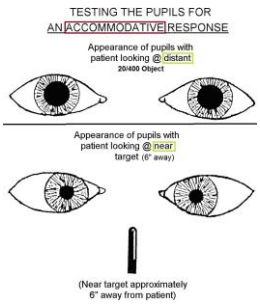
PUPILLARY ASSESSMENT (cont.)



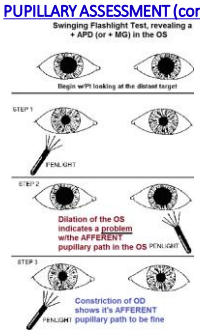
PUPILLARY ASSESSMENT (cont.)



PUPILLARY ASSESSMENT (cont.)



PUPILLARY ASSESSMENT (cont.)

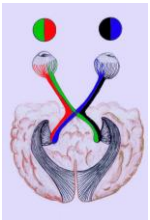


Watch your test speed

Visual Pathway

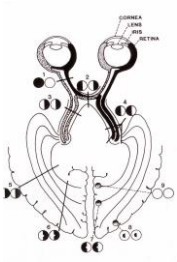
- Physical
- Physiological
- Psychological

What causes your physiological blind spot?



Visual Pathway

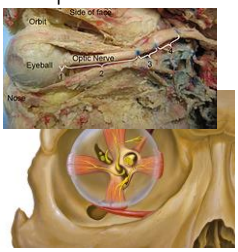
- Visual pathway has seven structures
  - Retina
  - Optic Nerve
  - Optic Chiasm
  - Optic Tract
  - Lateral Geniculate Body (LGB)
  - Optic Radiations
  - Visual Cortex …where vision occurs



Aniseikonia occurs when an object viewed by one eye is _____?

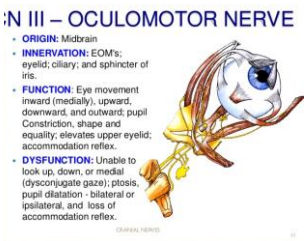
Cranial Nerve #2 – The Optic Nerve

- **The Optic Nerve, or Second Cranial Nerve, lies just Posterior and Inferior to the Medial Olfactory Tract. It carries information from the Eye for Vision and Ocular Reflexes.**

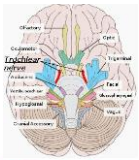


By Patrick J. Lynch, medical illustrator - Patrick J. Lynch, medical illustrator, CC BY 2.5, https://commons.wikimedia.org/w/index.php?curid=1498027

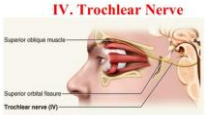
The Oculomotor Nerve - #3



- **It supplies all the Intrinsic Ocular Muscles and all Extrinsic Ocular Muscles except for the Lateral Rectus and Superior Oblique. The ParaSympathetic Fibers from this Nerve innervate the Ciliary Muscle of the Lens and the Sphincter**
- **Muscle of the Pupil. The Third Cranial Nerve, or Oculomotor Nerve arises at the Ventral aspect of the MesenCephalon and transverses through the Cavernous Sinus to the Orbit**



IV. Trochlear Nerve



-Eye movement (superior oblique muscle)
-Damage causes double vision and inability to rotate eye inferolaterally

Cranial Nerve #4 - Trochlear Nerve

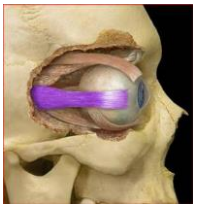
- The trochlear nerve, also called the fourth cranial nerve or cranial nerve IV, is a motor nerve that innervates only a single muscle: the superior oblique muscle of the eye, which operates through the pulley-like trochlea.

Trigeminal Nerve #5

- **The Fifth Cranial Nerve, or Trigeminal Nerve, is the Largest Cranial Nerve, and it carries Fibers that give Sensation to the Face and Motor Fibers to the Muscles of Mastication. It exits from the BrainStem through the AnteroLateral surface of the Pons.**
- Sensation to the eyelids is supplied by terminal branches of the ophthalmic and maxillary divisions of the trigeminal nerve. The cell bodies of the terminal branches originate in the trigeminal ganglion.

6th Cranial Nerver – Abducens - abduction

- **The Sixth Cranial Nerve, or Abducent Nerve,** supplies the Lateral Rectus Muscle **of the Eyeball and issues from the Brain at the Inferior border of the Pons, just above the Pyramid of the Medulla Oblongata.**



Facial Nerve #7

- **The Seventh Cranial, or Facial Nerve, consists of two parts:**
- **The Motor Root, which supplies the Superficial Muscles of the Scalp, Face, and Neck**
- **A smaller Sensory Root, which contains the Afferent Taste Fibers for the Anterior two thirds of the Tongue and the Afferent ParaSympathetic Fibers for supply of the Lacrimal and Salivary Glands**
- **The Facial Nerve arises from the Lateral aspect of the Ponto-Medullary junction.**

- Somatomotor innervation of the obicularis oculi, frontalis, procerus, and corrugator supercili is supplied by the facial nerve (CNVII). The motor neurons originate in the pons. Their fibers hook medially around the abducens nucleus in the medial pons before exiting at the cerebellopontine angle near the anterior inferior cerebellar artery

Referral Sources

- Ophthalmology
- Neuro-ophthalmology
- Neurology

http://www.nationalmssociety.org/What-is-MS/MS-FAQ-s

Ocular Nerves and Muscle Innervation

2nd Optic Nerve	3rd Oculomotor	4th Trochlear	5th Trigeminal	6th Abducens	7th Facial
Retina	Medial Rectus	Superior Oblique	Cornea	Lateral Rectus	Lids
Macula	Superior Rectus		Upper and lower eyelids	One muscle is innervated by this nerve	Levator Palpebrae
Optic Nerve	Inferior Rectus		Conjunctiva		Orbicularis Oculi
	Inferior Oblique				
	Pupils constriction/ Accommodation		Cheek and tip of nose…		
	Levator muscle		Larger nerve		

Eyelids have nerve innovations from cranial nerves 3, 5, 7

Question You Should Be able to answer

- How many cranial nerves impact eye functions
- Name the nerves that control eye movement
- What CN controls the superior oblique muscle
- What cranial nerve impacts the levator life function
- What cranial nerve causes abduction of the lateral rectus muscle
- What cranial nerve is the optic nerve
- How many total cranial nerves area there

Thank you

martralyn@msn.com