

## 1: Olfactory "Anosmia", Causes:

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| <ul style="list-style-type: none"> <li>- Head injury = shearing of olfactory neurons at the skull base</li> <li>- Tumors of olfactory groove "meningioma"</li> </ul> | <ul style="list-style-type: none"> <li>- Parkinsons (precedes motor sx by yrs but pts don't notice)</li> <li>- URTI (temporary mostly, sometimes permanent)</li> </ul> |
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## 2: Optic n

<p>Fibers from the nasal retina cross at the optic chiasm and join the uncrossed temporal fibers then pass through the temporal and parietal lobes to reach the visual cortex of the occipital lobe.</p> <p><b>Optic Chiasm:</b> Compression (due to meningioma or pituitary t.) will lead to bitemporal hemianopia /quadrantanopia</p>	<p>Lesions will cause scotoma, Unilateral blindness &amp; Loss of pupillary reflex</p> <p><b>Examination will show:</b></p> <ul style="list-style-type: none"> <li>- Scotoma</li> <li>- Decreased acuity</li> <li>- Impaired color vision</li> <li>- Affrent pupillary defect (no direct reflex)</li> <li>- Optic atrophy</li> </ul> <p><b>Papilloedema causes are:</b></p> <ul style="list-style-type: none"> <li>- Raised ICP</li> <li>- Optic n. disease</li> <li>- Leukemia (infiltration)</li> <li>- Brain tumor, abscess or hemorrhage</li> <li>- Vasculitis (e.g. SLE)</li> </ul>	<p><b>Optic neuritis:</b></p> <ul style="list-style-type: none"> <li>- One of the most common causes of subacute visual loss</li> <li>- Pain on eye movement &amp; normal optic disc</li> <li>- A plaque of demyelination within optic n.             <ul style="list-style-type: none"> <li>o High risk for MS</li> </ul> </li> <li>- Causes? Infections / other inflammatory conditions</li> </ul> <p><b>Optic tract:</b> contralateral homonymous hemianopia</p> <p><b>Optic radiation:</b> homonymous quadrantanopia</p>	<p><b>Horner Syndrome: Miosis, ptosis and anhidrosis</b> Sympathetic neuron eye supply is a 3 neuron pathway originating in the hypothalamus -&gt; Brain stem &amp; Cervical cord -&gt; T1 -&gt; paravertebral sympathetic chain, by way of carotid a. wall &gt; eye</p> <p><b>Causes:</b></p> <ul style="list-style-type: none"> <li>- Massive cerebral infarction</li> <li>- Brainstem demyelination</li> <li>- Cervical cord tumors / syringomyelia</li> <li>- Apical lung tumors / TB</li> <li>- Brachial plexus trauma</li> <li>- Post thyroid, carotid or laryngeal s.</li> <li>- Carotid a. dissection</li> <li>- Congenital / idiopathic</li> <li>- Cervical sympathectomy</li> </ul>
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## 3,4,6: Oculomotor n., Trochlear n. & Abducens n.

<p>Supply extraocular muscles, lesions lead to abnormal eye movement and diplopia (local lesion or MG).</p> <p><b>Conjugate lateral gaze:</b> Conjugate lateral eye movement is coordinated from the paramedian pontine reticular formation via the medial longitudinal fasciculus.</p> <p><b>Damage to MLF:</b> Internuclear ophthalmoplegia, if bilateral, think of MS.</p>	<p><b>Upon examination:</b></p> <ul style="list-style-type: none"> <li>- Nystagmus, overshooting on saccadic m. or jerky pursuit +saccadic intrusion -&gt; Brainstem or cerebellum</li> <li>- A lesion in one side will cause the eye to deviate to that side</li> <li>- <u>Right</u> INO (LL gaze):             <ul style="list-style-type: none"> <li>o R. eye fails to adduct</li> <li>o L. eye develops nystagmus on abduction</li> </ul> </li> <li>- A <u>Left</u> frontal lesion:             <ul style="list-style-type: none"> <li>o Failure of CLG to right</li> <li>o Contralateral hemiparesis</li> </ul> </li> </ul>	<p><b>Nystagmus:</b> Pendular: vertical + ocular causes Jerky:</p> <ul style="list-style-type: none"> <li>- Horizontal / rotatory:             <ul style="list-style-type: none"> <li>o Peripheral (vestibular), acute transient</li> <li>o Central (8<sup>th</sup> n, cerebellum (long-lasting))</li> </ul> </li> <li>- Vertical (central causes)</li> <li>- Down-beat: foramin magnum lesion "meningioma"</li> </ul> <p><b>Complete external ophthalmoplegia:</b> Thiamine deficiency (wernicke's encephalopathy), mets, meningioma, cavernous sinus thrombosis</p>	<p><b>3<sup>rd</sup> n palsy:</b> Ptosis, downward, outward gaze, fixed dilated pupil (DM is usually pupil sparing)</p> <p><b>4<sup>th</sup> n palsy:</b> Torsional diplopia upon looking down &amp; head is turned away from that side</p> <p><b>6<sup>th</sup> n palsy:</b> Horizontal diplopia when looking at the distance or towards the side of the lesion (think of MS, raised ICP &amp; DM)</p>
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## 5: Trigeminal n

Complete lesion: unilateral sensory loss on face, anterior 2/3 of tongue & buccal mucosa, jaw deviates toward that side + no corneal reflex

**Causes:** Brainstem (damage to nucleus), Cerebellopontine angle tumors  
**Sjogren s.:** trigeminal sensory neuropathy

## 7: Facial n.

Unilateral Facial weakness:

**UMN:** forehead sparing, contralateral side.

**LMN:** ipsilateral, all facial expressions

### Causes

#### Stroke

#### Pons:

- 7<sup>th</sup> loops around the 6<sup>th</sup> = LR palsy
- PPRF & CS tract are sometimes involved: failure of CLG & contralateral hemiparesis

#### CPA:

- 5<sup>th</sup>, 6<sup>th</sup> & 8<sup>th</sup> are compressed along with 7<sup>th</sup>
- Acoustic neuroma, meningioma or mets.

**Skull base, parotid or within the face:** tumors or pagets d., sarcoidosis or trauma

### Bell's palsy:

Due to viral infection (herpes simplex)

- Unilateral LMN facial weakness develops over 24-48 hrs
- Sometimes there's altered taste / hyperacusis
- Vague altered sensation (but examination is normal)
- Exclude other causes like choleastatoman, malignant otitis externa & parotid tumors, look for vesicles
- Recovery happens within 3-8weeks
- Pt might develop exposure keratitis (inability to close the eye) so we give them lubricant eye drops and advise them to tape the eyes prior to sleep
- Tx: Steriods

### Ramsay Hunt Syndrome:

- Shingles (Herpes Zoster)
- Identicle to Bell's + Vesicues (in ear and palate)
- Deafness and unsteadiness may occur
- Tx: Steriods + Antiviral

### Bilateral Facial weakness:

Rare, occurs due to infections (HIV or Lyme for e.g.), neuromuscular d. (GBS & MG) or sarcoidosis.

## 9 & 10: Glossopharyngeal n. and Vagus n.

- **Isolated** lesions of either is rare.
- Unilateral 9<sup>th</sup> lesion: Diminished sensation of same side of pharynx
- A 10<sup>th</sup> nerve palsy produces ipsilateral failure of voluntary and reflex elevation of soft palate (drawn to opposite side) & ipsilateral vocal cords.

### Recurrent Laryngeal n. lesion:

Left loops beneath the aorta and is more prone to injury.

#### Causes:

Mediastinal 1° tumors, aortic aneurism, trauma or surgery  
 2° spread from bronchial carcinoma

#### Symptoms:

Hoarsness, vocal cord paralysis (seen endoscopically) & No palatal weakness + Failure of forceful, explosive part of cough (bovine cough)

Bilateral lesions of 9<sup>th</sup> & 10<sup>t</sup>:

- Palatal weakness
- Reduced paltal sensation
- Absent gag reflex
- Dysphonia
- Choking
- Nasal regurgitation

## 8<sup>th</sup> Vestibulo-occhlear n.

- Deafness & Tinnitus
- Use tuning fork test to differentiate between sensorineural & conductive deafness
- Vertigo & the vestibular system:

### Investigations:

- Pure tone audiometry & auditory thresholds
- Auditory evoked potentials

### 1<sup>o</sup> functions:

- Stabilize gaze during head movements (e.g. looking ahead while running) (the vestibulo-ocular reflex)
- Control posture and balance
- Facilitate perception of orientation and motion

### Balance is maintained by three systems:

- Vestibular s.
- Visual s.
- Somatosensory s. (proprioception from limbs, trunk and neck)

### Vertigo:

- Illusion of movement
- Vomiting usually follows acute vertigo of any cause.
- Always made worse by head movement
- Nystagmus
- **Causes of vertigo:**
  - o Peripheral (vestibular s.):
    - Deafness or tinnitus = Ear / cochlear n.
  - o Central (brainstem & connections):
    - Diplopia, weakness, cerebellar signs or CN palsies will help in localization
    - Infarcts
    - Demyelination
    - CPA mass lesions
    - Drugs: anticonvulsant toxicity & Alcohol.

### Vestibular disorders:

- **Benign positional vertigo**
  - o Frequent attacks
  - o Triggered by specific movements
  - o Lasts seconds
- **Meniere's disease:**
  - o Recurrent attacks
  - o Lasts minutes to hours
  - o + hearing loss, tinnitus & feeling of fullness in the ear
- **Investigations:**
  - o Examine eyes for nystagmus
  - o Assess hearing & examine the ear
  - o Head impulse (thrust test) – to assess VOR
  - o Hallpike maneuver – to trigger BPPV
  - o Pure tone audiogram
  - o MRI

## 11<sup>th</sup> nerve lesions:

Weakness of sternomastoid (rotation of head and neck) and trapezius (shoulder shrugging)

## 12<sup>th</sup> nerve lesions:

Unilateral tongue weakness, wasting and fasciculation (deviates to weaker side when protruded)