Cranial Nerves part 4

**OLFCTORY**

- **Crista galli**
- **Olfactory bulb**

**SPECIAL SENSE**

- Medial
- **OLFACTORY TRACTS**
- Lateral

**NUCLEI**

- Anterior olfactory (in posterior bulb)
- Anterior perforating substance & Uncus (both in the brain)

**20 OLFACTORY NERVES**

- Under surface of cribriform plate
- Upper med & lat nose
II OPTIC NERVE
From the lateral geniculate bodies fibres pass in the optic radiations to the left and right occipital cortex where the images arrive inverted (upside down). To initiate rapid reflexes at brain stem level, the incoming fibres from the eye must connect to the mid brain which lies near the optic tracts. These fibres from each optic tracts synapse with both Edinger Westphal nuclei so that all reflexes are bilateral. Parasympathetics from the Edinger Westphal nuclei synapse in the ciliary ganglia and then supply the sphincter pupillae muscles for constricting the pupils.

III
Oculomotor
- Superior rectus
- Inferior rectus
- Medial rectus
- Inferior oblique

III, IV, VI
Somatic motor nerves to eye muscles

IV
Trochlear
(arises dorsally)
- Superior oblique

VI
Abducent
- Lateral rectus
**Va OPHTHALMIC DIVISION OF TRIGEMINAL**

5 SENSORY BRANCHES OF Va (TRIGEMINAL) N ON FACE

- Lacrimal
- Auriculotemporal
- Zygomatico-temporal
- Zygomatico-facial
- Buccal
- Supratrochlear
- Supra-orbital
- Infra-orbital
- Infra-nasal
- External nasal
- Mental

**Sensory:** Scalp, eye, upper face, sinuses (see above)

**Carries:** Parasympathetics via ciliary ganglion to eye for accommodation and pupil constriction (10 short ciliary nerves), via pterygopalatine ganglion for lacrimal gland.

**Sympathetics** via cavernous sinus to pupil for dilatation (2 long ciliary nerves)

**Main Branches:**
- Frontal
- Lacrimal
- Nasociliary

*V carries all parasympathetics to their end organs*
Vb MAXILLARY DIVISION OF TRIGEMINAL

3 SENSORY BRANCHES OF VB (TRIGEMINAL) N ON FACE

- Va-5
- Vc-3
- Vb-3

Sensory: Middle face, palate, sinuses, nasopharynx, nose (see above)
Carries: Parasympathetics via pterygopalatine ganglion to lacrimal gland, mucous glands of nose, palate, nasopharynx
Taste: Hard & soft palates
Main Branches:
- Zygomatic
- Infra-orbital
Other:
- Nasopalatine to nasal cavity
- Greater & lesser palatine to palate
- Pharyngeal to nasopharynx
- Alveolar to upper teeth

V carries all parasympathetics to their end organs
Vc MANDIBULAR DIVISION OF TRIGEMINAL

3 SENSORY BRANCHES OF VC (TRIGEMINAL) N ON FACE

Vertex
Lacrimal

Auriculotemporal
Supratrochlear

Zygomatico-temporal
Supra-orbital

Zygomatico-facial
Infraorbital

Buccal
External nasal

Vc-3
Infratrochlear

Vb-3
Infra-orbital

Mental

Sensory: Lower face, hair temple, anterior 2/3 tongue (see above)
Carries: Parasympathetics via submandibular & otic ganglia to submandibular & sublingual glands, & parotid gland
Taste: Anterior 2/3 tongue
Branchiomotor: Muscles of mastication, tensors tympani & palati
Main Branches:
Auriculotemporal
Buccal
Mental
Lingual
Muscular

V carries all parasympathetics to their end organs
**VII FACIAL NERVE**

**Branchiomotor:** Muscles of facial expression, stapedius, posterior belly of digastric, stylohyoid, occipitalis

**Carries:** Parasympathetic in greater petrosal nerve to pterygopalatine ganglion then via Vb to “hay fever” glands & via Vb and Va to lacrimal gland.

Chorda tympani to submandibular ganglion and then to submandibular and sublingual glands via Vc

**Taste:** Via nervus intermedius from palate in greater petrosal nerve & from anterior 2/3 tongue via chorda tympani

**Sensation:** Small area in external ear and tympanic membrane

**Main branches:**
As above
greater petrosal
chorda tympani

V carries all parasympathetics to their end organs
SPECIAL SENSE FOR HEARING & BALANCE

HEARING:
From organ of Corti in cochlea
Hair cells to cell bodies in spiral ganglion (in modiolus)
To 2 cochlear nuclei - ventral & dorsal

BALANCE:
From semicircular canals, utricle & saccule
Cell bodies in vestibular ganglion in outer part of internal acoustic meatus
To vestibular nuclei - medial, lateral, superior, inferior
IX GLOSSOPHARYNGEAL NERVE

Parasympathetic
Branchiomotor
General sensory
Special visceral sensory

LESSER PETROSAL
OTIC GANGLION
PAROTID GLAND
MIDDLE EAR
STYLOPHARYNGEUS
TONSIL
PHARYNX & TONGUE
TASTE (POST 1/3 TONGUE & OROPHARYNX)
BARIO- & CHEMORECEPTORS

SENSORY:
OROPHARYNX
POSTERIOR 1/3 TONGUE
TONSIL
MIDDLE EAR
**VAGUS NERVE 1**

**Superior vagal ganglion** - cell bodies:
1. Meningeal br. Sensory to posterior cranial fossa
2. Auricular br. Sensory to external auditory meatus & part of eardrum (communicates with VII)

**Inferior vagal ganglion** - cell bodies:
1. Special visceral afferent (baroreceptors & taste)
2. General visceral afferent (detects stretch in heart, lungs, abdominal contents, pharynx & larynx)

**Recurrent laryngeal n.**
1. Branchiomotor to muscles of larynx & upper oesophagus
2. Somatic sensory to larynx below cords
3. General visceral afferents from larynx & pharynx for stretch

**Vagus** arises from 8-10 rootlets on medulla. Associated nuclei are:
1. **Dorsal nucleus of vagus.**
   - General visceral efferent (parasympathetic) to smooth muscle of bronchi, heart, oesophagus, intestine to transverse colon.
   - General visceral afferent (sensory) from above organs.
2. **Nucleus ambiguus.** Branchiomotor supply to striated muscle of palate, pharynx, larynx & upper oesophagus (these fibres originate from the cranial root of accessory).
3. **Nucleus solitarius.** Sensory for baroreceptors and taste.
4. **Spinal nucleus of trigeminal nerve.** All somatic sensory fibres in vagus end here.

**PHARYNGEAL BRANCH OF VAGUS**

**Pharyngeal br of vagus.**
Branchiomotor to pharyngeal plexus for muscles of pharynx & palate (excluding tensor palatii).
**All these branchiomotor fibres arise in the nucleus ambiguus & are “dumped” onto vagus (See large arrow opposite)**

**Superior cardiac br** to deep cardiac plexus (parasympathetic - mixes with sympathetic)

**Inferior cardiac br** to deep & superficial cardiac plexuses (parasympathetic)

**Superior laryngeal n.**
1. Internal br. Somatic sensory above cords. Small amount of taste in valleculae
2. External br. Branchiomotor to cricothyroid
XI ACCESSORY NERVE
(Accessory to vagus)

BRANCHIOMOTOR
Cranial root of accessory

Foramen magnum

Jugular foramen

Spinal roots of accessory (C1-5)

SOMATIC MOTOR

Spinal roots to sternomastoid & trapezius

Vagus
XII HYPOGLOSSAL NERVE

SOMATIC MOTOR

Occipital artery
Int/ext carotid arteries
Lingual artery
Facial v
Hyoglossus
Tongue muscles
Superior root of ansa cervicalis
Thyrohyoid
Geniohyoid

Hypoglossal canal
10-15 rootlets
C1