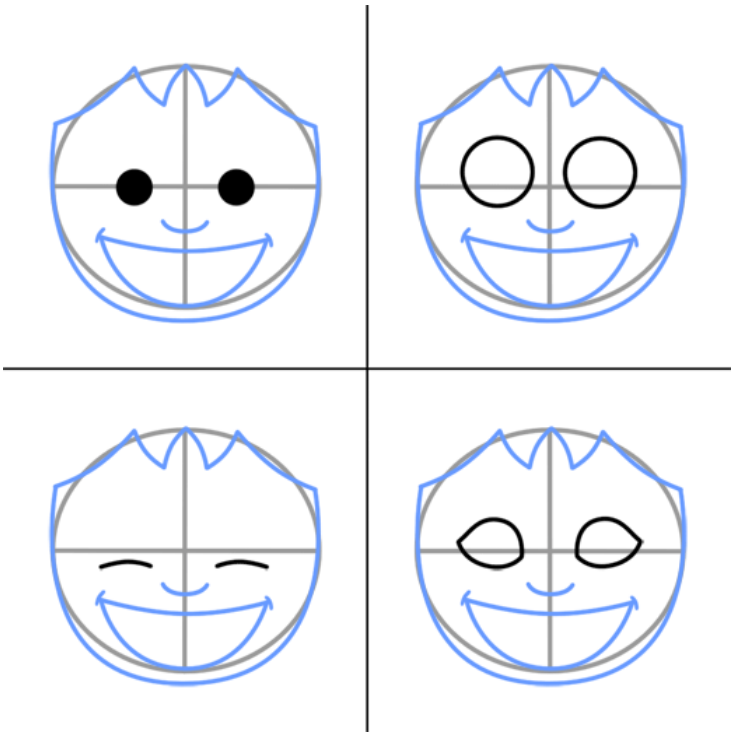
First edition

Brain stem function



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First Version

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First of all :

Lets talk anatomy

- It connects between cerebral hemisphere & the spinal cord
- It is connected to cerebellum by 3 cerebellum peduncles .
- Brain stem is 2.5 inches long
- It's essential for life

Components of brain stem :

❶ mid-brain :

- Substantial nigra divides the mid brain into 2 parts , crura cerebri & tegmenti
- Red nucleus is the motor tract

The Deference between red nucleus (rubrospinal) & corticospinal :

- Red nucleus begins from mid-brain , corticospinal begins from cerebral cortex
- Substantia nigra is rich in dopamine & it controls the motor activing

❷ Pons :

- It has got transverse fibers between them ..
- The cranial nerve hooks around the 6th cranial nerve nucleus . The importance from that , it will help knowing where the lesion is.
- Vestebulocochlear : the 8th nerve for balance (vestibule) & hearing (cochlea)
- It the we cut the pones : the temperature will increase + construction of the pupil

❸ medulla oblongata :

- There are 4 elevations : 2 pyramids & 2 olives (cause of elevations ? back to anatomy)
- Upper part of pyramid contains upper limb fibers
- Lower part of pyramids contains lower limb fibers
- CVS & Respiratory system are placed in the pons & medulla
- Superior & inferior coliculi are found at the dorsal midbrain

What if ?

I cut the right pyramid ?

Paralysis on the left side of the body (vise versa)

Now , lets get to the physiology stuff :

We should know one important equation :

Cut brain stem = death

Function of the brain stem

It contains the **reticular formation :**

- Middle portion of the brain stem
- Reticulated fibers
- Keeps the person active & alert
- Essential for sleep cycle
- All motor inputs go into it

Motor Activity

Any damage to it will cause paralysis

Forms cranial nerves

Consciousness

Vomiting center

Conjugate movements of the eye : eye movement at the same time . Types :

- Static : moving the eye with fixed head .
- Pursuit : following a moving object with fixed head .

Integrity of brain stem :

- Papillary reflex :

When you X light on pupil , it will constrict

- Vestibulocochlear reflex :

Injection of iced water inside the ear :

If the person moves his eye , we know he stills alive , opposite when he doesn't .

- Oculo-cephalic reflex – eyes will be fixed when head is moved in one or another directions
- Gag reflex :
  Touch several places in the soft palad , Uvula .. if the person show any reaction , you'll know he's a life , cause he'll throw at you or at least show some rejection moves
- Cough reflex

Brain stem function test :

- To test reticular formation
  Alertness, Consciousness ,& Sleep.

- Corticospinal tract
  Motor power, reflexes

- Pain response
  Facial grimacing on firm pressure over the supra orbital ridge.

- To test respiratory center
  look for the normal pattern of respiration

- To test cardiovascular center
  Look for normal circulatory function

Brain death :

1st sign : fixed & dilated pupil

2nd sign : no spontaneous breathing

3rd sign : fixed eye movement with moving the head

Brain death means loss of cortical functions , loss of spontaneous breathing & no brain stem function

You don't have to memorize this table , at least you should know what to do when ..

Cranial nerves

Cranial nerve	Component fibres	Structures innervated	Functions
I Olfactory	Sensory	Olfactory epithelium via olfactory bulb	Olfaction
II Optic	Sensory	Retina	Vision
III Oculomotor	Motor	Superior, inferior and medial rectus, inferior oblique, levator palpebrae muscles	Movement of the eyeball
	Parasympathetic	Pupillary constrictor and ciliary muscle of the eyeball, via ciliary ganglion	Pupillary constriction and accommodation
IV Trochlear	Motor	Superior oblique muscle	Movement of the eyeball
V Trigeminal	Sensory	Face, scalp, cornea, nasal and oral cavities, cranial dura mater	General sensation
	Motor	Muscles of mastication Tensor tympani muscle	Opening and closing the mouth Tension on tympanic membrane
VI Abducens	Motor	Lateral rectus muscle	Movement of the eyeball
VII Facial	Sensory	Anterior two-thirds of tongue	Taste
	Motor	Muscles of facial expression Stapedius muscle	Facial movement Tension on bones of middle ear
	Parasympathetic	Salivary and lacrimal glands via submandibular and pterygopalatine ganglia	Salivation and lacrimation
		Cochlea	Hearing
IX Glossopharyngeal	Sensory	Pharynx, posterior third of tongue	General sensation and taste
		Eustachian tube, middle ear Carotid body and carotid sinus	General sensation Chemo- and baroreception
	Motor	Stylopharyngeus muscle	Swallowing
	Parasympathetic	Parotid salivary gland via otic ganglion	Salivation
X Vagus	Sensory	Pharynx, larynx, oesophagus, external ear	General sensation
		Aortic bodies, aortic arch Thoracic and abdominal viscera	Chemo- and baroreception Visceral sensation
	Motor	Soft palate, pharynx, larynx, upper oesophagus	Speech, swallowing
	Parasympathetic	Thoracic and abdominal viscera	Control of cardiovascular system, respiratory and gastrointestinal tracts
XI Accessory	Motor	Sternomastoid and trapezius muscles	Movement of head and shoulder
XII Hypoglossal	Motor	Intrinsic and extrinsic muscles of the tongue	Movement of the tongue