

Cns#2

lab#4

(about 11th and the 12th, sections in pons).

Accessory nerve. Page 6

Has 2 parts:

1) **cranial**: it arises from the caudal part of nucleus ambiguus, passes near the spinal part through the jugular foramen, and then it joins the vagus.

It's an essential part of the vagus nerve, laryngeal branch or pharyngeal branch are **originally** cranial accessory but apparently vagus.

Remember vagus also passes through jugular foramen.

2) **spinal**: arises from accessory spinal nucleus in the spinal cord (from a special α), the roots pass **between**

the ventral and dorsal roots, enters the cranial cavity through foramen magnum, passes near the cranial part but then separates, leaves through jugular foramen, supplies 2 muscles: trapezius & sternocleidomastoid.

the spinal accessory is limited to the upper 5 cervical segments .

-Injuries to the spinal once it leaves the jugular foramen (it didn't innervate the trapezius or sternocleidomastoid yet) will result in paralysis of both.

-While injury to the posterior triangle of the neck by stabbing or through surgery when removing cancerous lymph node (here it supplied the trapezius already) will result in paralysis of sternocleidomastoid characterized by weakness in turning the head toward the opposite side.

-Remember that PICA is a branch from the vertebral artery, sometimes might be pushed downward pressuring the underlying spinal roots weakening it.

Hypoglossal nerve: page 7a 7b

its nucleus extends throughout the medulla except for most rostral and caudal, the root fibers pass between medial lemniscus and inf. Olive, leaves between inf. Olive and pyramid.

Contains **GSE only**, **doesn't** have any afferent proprioception fibers (GSA).

Injury to its nucleus or the nerve fiber will produce the same effect EPSILATERAL LMN,

Characterized by: early fasciculation of the affected half followed by atrophy.

When protruding the tongue it will deviate toward the side of paralysis under the effect of geniglossus.

Note: patients with injury to hypoglossal nucleus or nerve also might suffer from difficulty in swallowing and nasal regurgitation, and that's because **motor neuron diseases** (affect upper and lower motor neurons) might affect more nerves like vagus and nucleus ambiguus, so you can see patients with LMN lesions affecting pharynx, larynx in the same disease..

Medial medullary syndrome: page 8a

the **ant. Spinal artery** while going down to the spinal cord supplies parts of the medulla, as you can see in the picture in the handout (pyramids, medial lemniscuses, hypoglossal nucleus) are supplied by it.

any occlusion to this artery will be affecting them on one half.

the effect on each will be like:

Remember medial lemniscus is made of axons of gracile, cuneate and Z of the OPPOSITE side.
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- pyramid and the surrounding **RF** > **contralateral** spastic hemiplegia (UMN lesion).
- medial lemniscus > **contraleteral** loss of discriminative touch, stereognosis, kinesthesia..
- hypoglossal root or nucleus > **epsilateral** paralysis of one half of the tongue (LMN lesion) (fasciculation then atrophy).

Lateral medullary syndrome. Page 8A

PICA syndrome = Wallenberg's syndrome. . (ischemia to the upper lateral part of the medulla)

Due to obstruction of posterior cerebellar artery or vertebral artery you can see a section in the medulla (open medulla) there are vital structures near the inf. Peduncle, they will be affected:

- 1- spinal nucleus and tract of trigeminal > Ipsilateral loss of pain and temperature of half the face (its fibers didn't cross yet).
 - 2- Adjacent spinothalamic tract > Contralateral loss of pain and temperature of half the body (fibers already crossed in the spinal cord).
 - 3- Base of inf. Peduncle > Cerebellar ataxia with a tendency to fall towards the side of lesion & nystagmus.
 - 4- Nucleus ambiguus > paralysis of the muscles supplied by it (9+10+11) results in difficulty in swallowing and nasal regurgitation.
 - 5- Medial and inf. Vestibular nuclei > have the worst effects
- 2Vz: (vertigo & vomiting in **ACUTE** stage).

Vertigo: hallucination of turning.

Note: Other causes of vertigo are:

damage to vestibular nerve, nucleus and **Ménière's disease** (results from problem in the receptors of equilibrium in inner ear).

6- Sympathetic fibers descending from hypothalamus to spinal cord > hornor's syndrome (mild ptosis, myosis and anhydrosis).

Remember:
receptors of hearing are in cochlea.
receptors of equilibrium are 3
semicircular canals, saccule and utricle.

Note: in disk prolapsed surgeries in neck, might cause injury to vertebral artery that passes through the transverse foramen in the cervical vertebrae and results in vertigo, vomiting..

Basic structure of pons.

page 17

- the first picture shows a section in the pons, it consists of:
- dorsally tegmentum, ventrally basis pontis and lemniscus system in between.
- behind the tegmentum is the 4th ventricle, at the floor you can see the abducent **nucleus 6**, while **nucleus 5+7** migrated to the inside. Also notice large amount of RF.
- basis pontis consist of fibers going down vertically which are (corticoponto, cortico bulbar & cortico spinal), and fibers crossing horizontally are ponto cerebellar which form the middle cerebellar peduncle that carries information about intended movements.

Remember that the floor of 4th ventricle is pons and upper 1/3 of medulla.
Upper 3rd of medulla has nuclei 12+10+8 at the floor.

- The lemniscus system which is a continuation of the sensory pathways, it includes 4:
- 1 medial L. (continuation of dorsal system gracile+ cuneate+ Z)
- 2 spinal L. (continuation of spinothalamic tract).
- 3 lateral L. (continuation of the auditory pathway).
- 4 trigeminal L. (continuation of the trigeminal pathway).

Note about coma patients:
 first thing to do is make sure that the airways are opened, in order not to suffocate or swallow the tongue.
 Gag reflex is absent in these patients thus if vomitus occurs it will enter the airway pathway leads to suffocating.

Now there are 2 sections at 2 levels of pons:

1-Section in the pons (the lower 3rd) at level of Nuclei 6+7:

at this level you can see: (2nd picture page 17 + page 19 + 20)

-3 cerebellar peduncles:

sup. From cerebellum to mid brain at sides of 4th ventricle,

mid. The largest & the end of the Inf. can sometimes be seen.

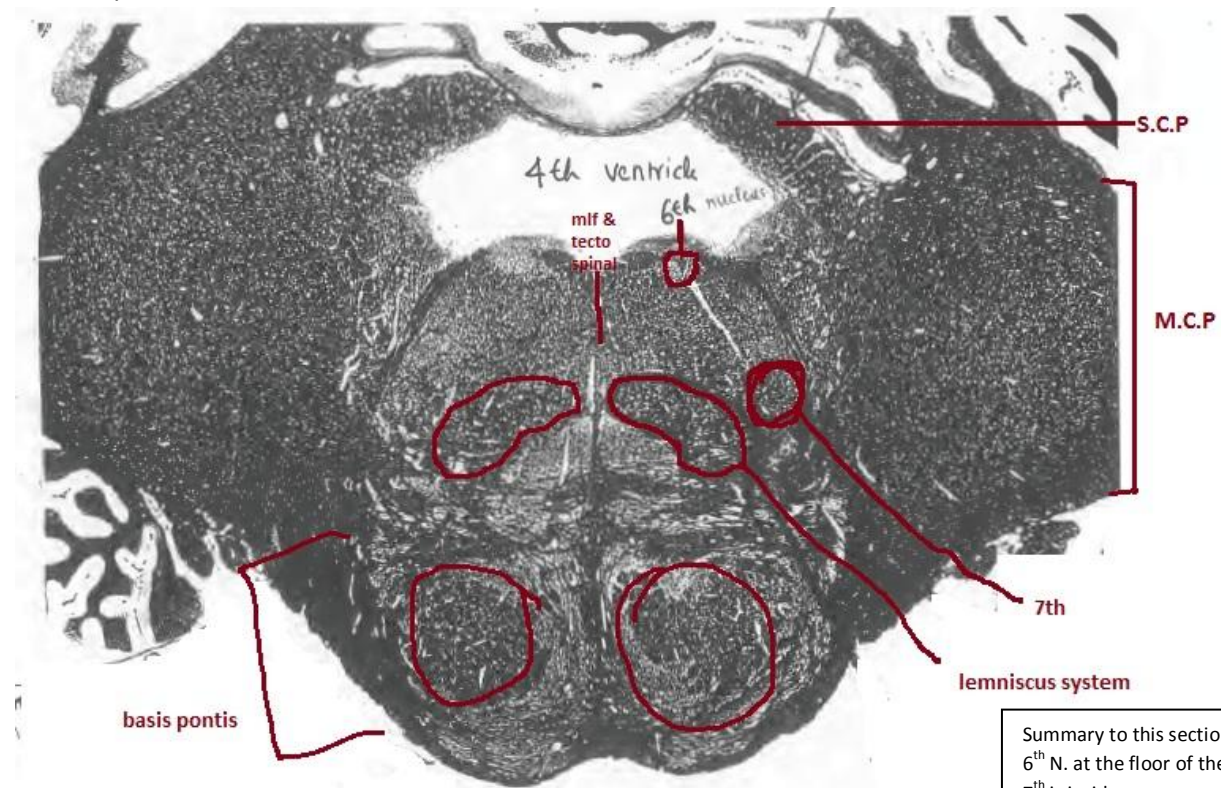
- 2 nuclei: 6+7, notice the black fibers from 7 wrapping around nucleus 6 to form the facial colliculus.

- Large amount of RF. – **MLF** & tecto spinal tract at midline.

- lemniscus system with other tracts in between:

medial L. dorsal to it ventral trigeminothalamic tract, more lateral rubrospinal tract and central tegmental tract(from cortex and sub cortical structures toward the cerebellum), more lateral spinal L., lateral L. with the superior olivary complex (sup. Olivary and trapezoid nucleus form the 3rd order neuron in their tract).

- On the sides you can see the (sup and lateral vestibular nuclei), spinal trigeminal tract and nucleus & ventral spinocerebellar tract.



Summary to this section remember 6th N. at the floor of the 4th ventricle 7th is inside lemniscus system MLF 2 vestibular nuclei S+L spinal trigeminal tract and nucleus. 3 peduncles. And effects of lesion in each part are important.

2- Section in the pons at the level of MOTOR and MAIN SENSORY NUCLEI of trigeminal.

Pages 18 +21 + 22

- 2 peduncles sup + mid.
- the 4th ventricle is now smaller it continues upward as cerebral aqueduct.
- **Motor** nucleus medially & the **Main sensory** nucleus laterally at sides of tegmentum.

- **MLF** and tecto spinal at midline.

- lemniscus system and others from medial to lateral:

medial L., ventral trigeminothalamic (notice here that the dorsal one

appears behind as ill-defined, both ventral and dorsal form the trigeminal L

tegmental, spinal L., and the lateral L (notice here it's with the nucleus of lateral lemniscus which is also a part of the auditory pathway located medial to it).

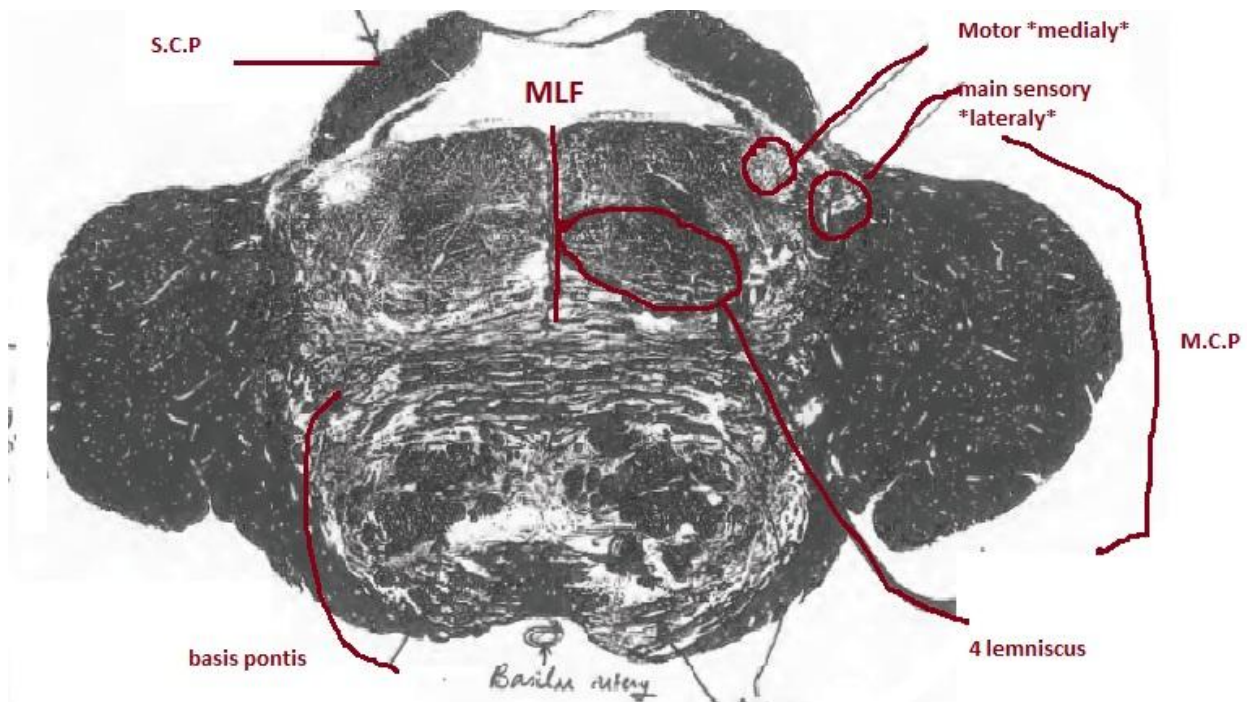
Injury to motor nucleus alone is rare (mandibular), and results in deviation of the jaw toward the side of injury.

Remember how to diagnose an injury of the MLF:
ex: if the Rt. Was injured ask the patient to look to the Lf.

the Rt. Eye won't move (because the connection mlf is damaged not the nucleus or anything).

while the Lf. One will suffer from abduction and nystagmus.

MLF injury is common in middle aged women with MS.



Summary for this section:

- motor and main sensory n.
 - MLF (very imp).
 - 4 lemniscus, remember here the dorsal trigeminal tract appears ill defined.
 - 2 peduncles.
 - Small 4th ventricle.
- note: effects of lesion in each part are important.
MLF is very important too.

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