Theoritical part...

Slide 33...figure 2

• This figure represents midsagital section in the midbrain, pons, and medulla of brainstem and vermis of cerebellum

Note 1: the only parts of vermis that we have to recognize are superior vermis and inferior vermis

- 4th ventricle is located in between these structures
- CSF gets in the 4th ventricle through cerebral aqueduct, then passes to the subarachnoid space through median aperture of magendie and 2 lateral apertures of luschka
- Roof of 4th ventricle>>> cerebellum indirectly + neuroglial tisse called superior and inferior medullary velum

Note 2: there is coroid plexus in the roof of the 4th ventricle but in this figure it is not drawn

- Floor of 4th ventricle>>> posterior part of pons + posterior part of upper 1/3 of medulla
- The lower 2 thirds of medulla contain central canal just like spinal cord
- Posterior to central canal of the spinal cord is dorsal column with its two parts (gracile and cuneate), this feature apply for medulla, too.
- So the upper 1/3 of medulla is part of the 4th ventricle's floor structures, in contrast to the lower 2/3s which contain central canal with posterior structures similar to gracile and coneate of spinal cord

Slide 33... figure 1

- This figure represents section of brain stem from behind
- We can see posterior aspect of brain stem with "4 colliculi" or " tectum" or "corpora quadrigemina">>> 3 names
- From each superior colliculus emerges tectospinal tract (part of extrapyramidal pathway), this tract is responsible of moving the neck towards light
- Inferior colliculus is substantial part of auditory pathway, if lesioned hearing is severly affected
- Superior colliculus is part of the visual pathway (but not as integral in visual system as inferior colliculus is in auditory one) so if lesioned the patient will not become blind
- We can see Posterior parts of pons and upper third of medulla (these parts actually are formed of gray matter>>> nuclei of some cranial nerves)
- notice superior cerebellar peduncle from cerebellum to midbrain, more laterally middle cerebellar peduncle from cerebellum to pons
- two facial colliculi (bulgy structures) are located on the posterior part of pons

Note 3: facial colliculus is not the facial nucleus, it is the nucleus of cranial nerve number 6 (Abducent nerve) with some facial FIBRES around.***

- more laterally in pons we can see superior vestibular area which contains two nuclei of vetibular, the medial and superior nuclei
- in fact, there are 4 vestibular nuclei 2 in pons and 2 in medulla
- now coming to the upper third of medulla, we can see three triangles or triagones (hypoglossal, vagal, and inferior vestibular)
- when we say "hypoglossal triangle" this means gray matter of hypoglossal nucleus
- more laterally, vagal triagon is one of the four nuclei of vagus nerve (also is named "dorsal nucleus of vagus")
- more laterally, inferior vestibular area that contains both lateral and inferior vestibular nuclei
- now coming to the lower two thirds of medulla, as these 2/3s have central canal passing through them, in the posterior aspect of both we can see gracile and cuneate tubercles (terminations of gracile and cuneate columns) that contain gracile and cuneate nuclei of second order neurons of dorsal column system>>> here the second order neurons cross and form medial lemeniscus bundle to thalamus, because of that dorsal column system is called dorsal column medial lemeniscus system

The doctor started talking about hippocampus but the corresponding slides are not found in the handout

- we saw hippocampus (ammon's horn... the doctor said it is an old name) in the coronal sections of temporal lobe in the floor of inferior horn of lateral ventricle
- hippocampus gyrus is located inside (inward folding of cortex), parahippocampus gyrus is located outside
- parahippocampus gyrus is also called "entorhinal cortex", this name was given to it as they believed that it has something to do with olfactory sensation
- Returning back in history, anatomists thought that limbic system's main function has to do with olfaction, nowadays it is proved that it has wide range of functions like (emotions, sexuality, behavior, recent memory, preserving of human beings, reproduction...)
- If we dissect a brain and remove the roof of inferior horn, we will see the hippocampus gyrus, medial to it is dentate gyrus which follows hippocampus functionally.
- Axons of hippocampus will form fornix –always an exam question- which is located below septum leucidum and corpus callosum
- The junction of hippo and parahippo is called subiculum which is part of the limbic system

Slide number 35

- Cingulated gyrus' posterior part called isthmus then parahippocampus and terminating as uncus
- The 4 structures (cingulate, isthmus, parahippo, uncus) all together form the limbic lobe which is part of the limbic system>>> uncus is the only structure that has function in olfaction
- There are 2 limbic lobes on both sides of the brain surrounding the brain stem (midbrain)
- Limbic system previously was known as rhinencephalon (brain of olfaction)

- Parts of limbic system :
 - 1. Limbic lobe
 - 2. Mammillary body which is part of hypothalamus
 - 3. Anterior nucleus of thalamus
 - 4. Parts of reticular formation
 - 5. The insula
 - 6. Subcallosal gyrus (inferior to the rostral part of corpus callosum)

Figure 2:

- in the anterior part of temporal lobe is the amygdale posterior to it is hippocampus
- If you tried to follow up the hippocampus axons, they will form fornix below corpus callosum, then pass to the mammillary body of hypothalamus, from the hypothalamus through a tract called mammillo-thalamic tract they pass to anterior nucleus of thalamus, then to cingulate gyrus, then to parahippocampus, and finally returning back to hippocampus
- Before 100 years ago, a scientist came up with new theory about limbic system circuits, he assumed that these circuits can signal BIDIRECTIONALLY, in other words, limbic system link thoughts with emotions & emotions with thoughts

هون الدكتور أعملي مثال كيف المشاعر بتأثر على الأفكار, المثال كان عن طالب توجيمي جاب معدل 56 فكان كثير فرحان (الشعور) و فرده أعماله (فكرة) التشديم بالسيارة, توزيع البقلاوة, ****الخ

المثال الثاني كان عن كيف الافكار بتأثر على المشاعر. المثال كان عن طالب بدرس امتحان و مش ملحق و مش عارف شو يدرس فكثرة التفكير بالامتحان أثربت على مشاعره

- How do emotions produce thoughts?((signals from, to)) Hippo >>> fornix >>> mammilary body of hypothalamus >>> anterior nucleus of thalamus >>> cingulate gyrus >>> using association neurons cingulate gyrus sends signals to the whole cortex of the same side >>> so all the cortex become involved, thoughts are produced
- How do thought produce emotions? ((signals from, to)) association cortex >>> using association fibers to cingulate >>> parahippocampus >>> hippocampus >>> fornix >>> mammilary of hypothalamus (head of autonomic system), from here hypothalamus starts sending signal to the heart (tachycardia), to lungs (hyperventilation)>>> so this is how thoughts produce emotions
- So this theory clarifies the pathways between hypothalamus and cortex and vice versa
- Abnormalities of limbic system includes: schizophrenia, depression, anxiety, phobias, amnesia
- In the past, schizophrenic patients used to take dopamine receptor blockers, BUT unfortunately these blockers inactivate receptors of both basal ganglia and limbic system, so the patients start showing Parkinson disease signs (extrapyramidal side effect), because of that they were given another medicine to ameliorate this side effect (artain & stalazen) ... not sure about the names!!!

- Always remember if you give dopamine blockers without giving anti-extrapyramidal effect medicines the patient will develop Parkinson signs
 - **ODNE BY : AHMAD AL-ARMOUTI.**

Lab 6 practical part



- the left side of this X-ray are coronal sections and they are T1 weighted (as the ventricle is black) while the right side horizontal and T2 weighted (as the ventricle is white).
- Now we will talk about the left side:

The upper three sections>>

This is a coronal section passing in the body of lateral ventricle, why? Because the brain stem is visible and above the brain stem is the thalamus.

Boundaries of the body of lateral ventricle : above it is body of corpus callosum below it is the body of caudat.

We can see the third ventricle (the black area between the two thalamus), then mid brain and pons (notice the middle cerebellar peduncle appear as projections on both sides of pons).

The lower two sections>>

As we go backward, the brainstem starts to disappear being replaced by the cerebellum. as we go backward further ,the parietal lobe become occipital, below it is the cerebellum. So whenever you see cerebellum you should know that the occipital lobe is located above

it. The black area in the occipital lobe \rightarrow posterior horn of lateral ventricle.

What is located between the cerebellum and cerebrum? tentorium



These are sagittal sections: we begin with parasagittal sections then sagittal then again parasagittal.

The upper first picture on the left shows the lateral surface of the brain which have an important fissure called the lateral fissure .

As we go deep in the lateral fissure we see the insula. When we go deep to insula , do we see extreme capsule , claustrum and external capsule ?? no , we see white matter then we see the first large nucleus from outside \rightarrow the lentiform nucleus.

When taking a section medial to lentiform we don't see the internal capsule. We see caudait and thalamus (we know it is the thalamus as we can see the brainstem)

Then we see the thalamus of the other side then >>lentiform >>insula >>lateral fissure >> lateral surface of the brain.



This is lateral view of the lumbar spine.

L5 is located above the sacrum.

The intervertebral space seems to be old, this is highly suggestive of disk prolapse.

In the exam the doctor will ask about the number of lumber vertebrae.

Which nerve will be affected if there was disk prolapse between L4/5 (the lower arrow in the above picture)?? L5

Disk herniation mostly occurs posteriolaterally .when it is posteriolateral, it is close to the intervertebral foramen so it might compress the two roots together. if it was more posterior, it will compress the ventral root more than the dorsal root.



Notice the following parts:-

- Corpus callosum(rostrum, genu, body and splenium)
- > The fornix (it may come in the exam)
- > Then the dark area represents the CSF
- ➢ We don't see the internal capsule
- Below the fornix are the thalamus and hypothalamus>>midbrain(tectum of midbrain)>>pons>>medulla
- 4th ventricle. Its floor is the posterior surface of pons, facial colleculus, 6 with 7 spinning around it then we see on the posterior surface of medulla 12,10,8. Hypoglossal triangle, vagal and vestibular.
- > This is T1 weighted MRI.
- > Cingulate gyrus \rightarrow above it there is cingulate sulcus which runs posteriorly to become marginal.
- > On the occipital lobe calcarine sulcus , cuneus visual gyrus.
- > This x ray will come in the exam.
- Mammillary body has afferent and efferent >>input from cortex while the output is mamillothalamic tract (output from the mammillary body to the anterior thalamus)
- Genioglossus muscle of the tongue, it is important when diagnosing injury to the hypoglossal nerve.



- > This is a coronal section.
- The brain stem is present >>so there are the body of lateral ventricle, the body of corpus callosum and the body of caudate.
- ▶ We have the third ventricle between the two thalamus then >>midbrain>>pons.
- > Temporal and parietal lobes.
- In the temporal there is the inferior horn and we can see the hypocampal gyrus and from outside we see parahypocampus, at the junction between them we can see subiculum and the medial part of the hypocampus is called dentate gyrus.
- > The inferior horn of lateral ventricle.
- the amigdala is always in front of hypocampus, in the anterior margin of temporal pole, it extends to the roof of inferior horn but main part is located in front of hypocampus.



- as you can see both genu and splenium>> so it must be horizontal section (we call it angle horizontal)
- it is said that the best horizontal section is from ear to orbit (it is called orbitomeatal plane, meatal = external ear)
- > two anterior horns of lateral ventricle between them septum lucidum and fornix.
- Posterior horn.
- ➢ Frontal and occipital lobes.
- ➢ 2 head of caudate
- Anterior horn boundaries : genu of splenum and genu of corpus callosum form the roof and laterally bulging is the head of caudate.(there was a question about the head of caudate in the previous year's exam)
- Posterior horn in the occipital lobe.
- ➤ Lentiform nucleus. Between lentiform and head of caudate → anterior limb of external capsule, at the corner → genu, between the thalamus and lentiform → posterior limb then we have retrolentiform part and we can't see sublentiform part in this section.
- Retrolentiform part is an important part of the optic tract (optic radiation), so any injury to this part will affect vision.
- Insula which is part of limbic system. The limbic system occupies large parts of the brain , all disorders of mood , scheizophrenia , depression , anxiety , amnesia (loss of memory) and phobias (fear).
- Scheizophrenia (increase in dopamine) is the opposite of parkinson's disease(decrease in dopamine) . a drug called **stelazine** which block dopamine receptors on the limbic system <u>used in schizophrenia</u> meanwhile it blocks dopamine receptors in the basal ganglia so the patient administering this drug will develop symptoms of parkinson's disease. Another drug called **obtain**, it is a drug to reduce extrapyramidal effects , the patient will appear to be paralysed because of having excessive tone just like Parkinson disease , it is an old drug and the patient may become addicted to it.

DONE BY: YAZAN HALASEH