Neural Science for Engineers
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Lecture - 18
Brain Anatomy: Skull

So, I will just revise some of this stuff which we have learnt in the skull. The problem with describing things on a model or on a demo as that you do not know what are the labels which you would need to remember and recollect. So, in that context I thought I will describe some of the things. So, the most important stuff which I have discussed is the cranial nerves.

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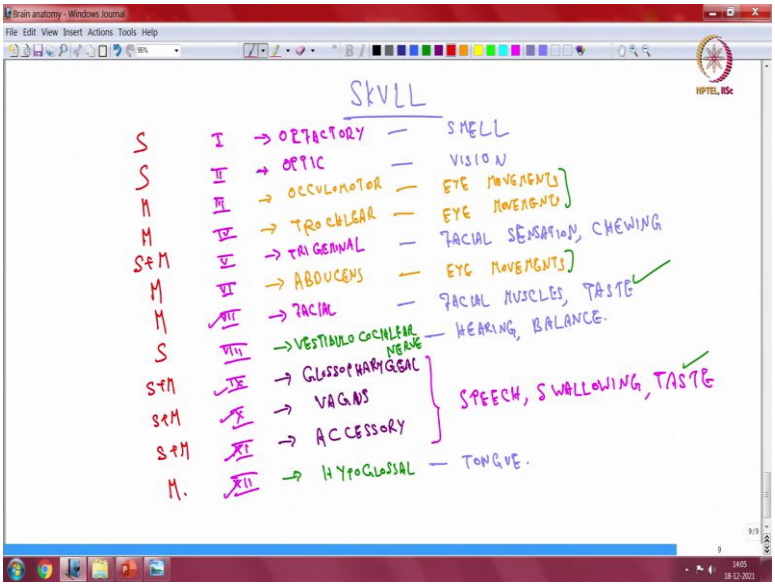

So, it is like this I, II, III, IV, V, VI, VII, VIII. Because this is relevant even for subsequent discussions X, XI. So, I have already talked about the actual nomenclature of the nerves. So, what is important is in remembering how they are related to each other and what are their functions? Each cranial nerve is fairly specific for a set of activities, but there is of course an overlap and that is what is makes it tricky and important. Spinal segments on the on contrary are according to what is called as spinal segments I will discuss that in greater detail.

So, first nerve is olfactory, this is smell, second nerve is optic vision, IIIrd IVth VIth are oculomotor, trochlear, abducens, these are for eye moments. Vth nerve is both for

chewing and sensations. Trigeminal and what this thing does is facial sensation chewing. VIIth nerve is facial nerve, facial muscles and taste. VIIIth nerve is hearing, there are two components of this.

So, vestibulo cochlear nerve, two functions hearing, balance. IXth is glosso pharyngeal. Xth is vagus basically named as it is a wanderer a long nerve it goes all the way from the head up to the heart. XIth is accessory. XIIth is hypoglossal. These are for speech, swallowing and hypoglossal is for the tongue. So, this is just the list of the cranial nerves, their function on the skull. I had shown you the organization of this nerves as they exit from the skull which also forms the basis of why we name from I to XII.

And the nerves are important because as I told you they serve important functions very specific functions unlike spinal nerves in which the architecture is fairly common. So, c1 up to s5 is similar in pattern. There are some differences between some levels, but overall, they have the same thing. So, they have got an anterior root, posterior root which forms one single spinal nerve, and that spinal nerve gives branches to different parts of the body and that continues monotonously across.

But if we look at the cranial nerves which exit from the skull, we notice that these are very specific nerves which sub serve very specific tasks, some of the nerves are very highly specific. So, for example, optic nerve is only for vision, olfaction is only for smell they do not do anything else. But vestibule and cochlear are grouped together. If you look at it function wise, balance and hearing do not seem to have any kind of similarity.

But somehow sensory apparatus for detecting both are very closely connected to each other with having common physical channels and the nerves which supply in the sense, they have a get the information back into the brain about hearing and balance, come out through same anatomical foramen. So, that is the connection. Some general-purpose nerves such as say for example, facial nerve is for all the muscles in the face excluding some exceptions and trigeminal nerve for all the sensations of the face.

So, these are the kind of mixes which are happening. IX, X, XI also sub serves taste over here which I have not mentioned. So, if we look at function wise, we can see that some parts of the apparatus are very highly evolved. So, for example, eye moments are very highly evolved, taste has two places, then balance is one, speech, speech is something

which is very interesting because speech has a lot of places where this facial, the lower cranial nerves hypoglossal. So, there was the large number.

So, there are large number of nerves which sub serve this function. So, damages to any one of this is responsible for kinds of diseases which is why it forms an important medical topic, but for this audience also I would like you to have an understanding of that there exists cranial nerves. These cranial nerves as specific functions they are very different from spinal nerves.

And the mapping is not very uniform. So, that is another thing which I can highlight here is this is sensory, sensory, motor, motor, sensory plus motor, motor, motor, sensory, sensory plus motor, sensory plus motor, sensory plus motor and motor. So, sensory is only afferent; afferent in the sense something coming from the periphery into the center and efferent is something going out from the brain to the periphery.

So, that is the afferent and efferent story. Now before proceeding with the brain anatomy there was something else which I had to. So, far I have been discussing anatomy, I spoke about bounds as to how much I have to describe.

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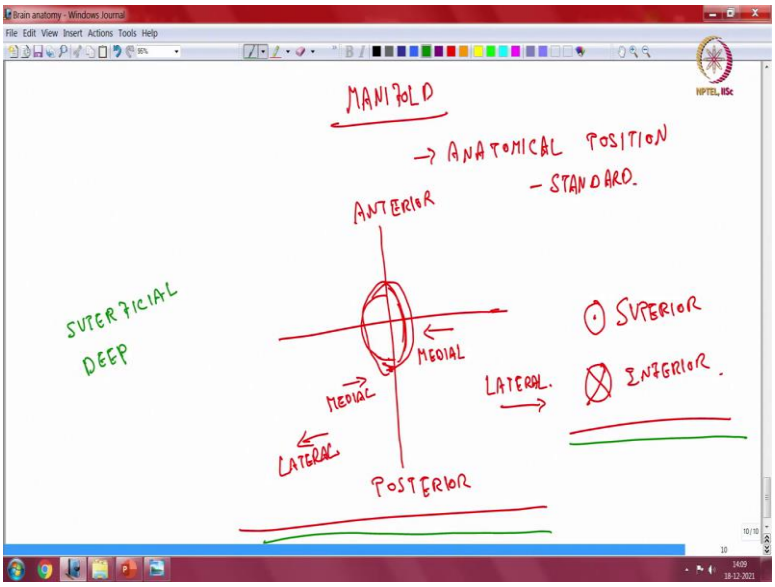

But one thing which I have not described is the manifold in which the descriptions are made. Now, that is important because as I expressed earlier, all of anatomy is relational anatomy. So, we need to relate something in some context and fortunately or

unfortunately we do not use navigational methodology like starboard or whatever other things. So, in medical terminology it is important to note that there is something called as an anatomical position.

So, this is standard, by convention we agree what is an anatomical position which is basically a person standing straight with the hands like this. So, standing straight with the hands like this is the standard anatomical position and it is with this frame of reference there is a which is why use the term manifold instead of a coordinate system, we do not use co-ordinates.

So, manifold is a more appropriate term for the descriptions which we follow. So, in that context if we have a person standing straight. So, looking down from above and if this is the head, sorry I think I should have drawn the head a little more oblique. So, this would be anterior as in front, posterior behind, the next set of relations are interesting because it is called medial and lateral. So, lateral means towards outside medial means towards inside.

So, that is something which is important, and we can have combinations, anteromedial posterolateral and things like that. Now it should be remembered that we are bilaterally symmetric and the reference is to both sides. So, even this is medial, and this is lateral. So, this particular coordinate system is the standard. Now this can be extended to very small areas say for example, in the skull when we say that the cochlea is anteromedial to the semicircular apparatus.

So, or to the anteromedial to the internal acoustic meatus. So, that is an anatomical method of saying. Now there are two more things, one is towards the head it becomes superior, that would be I think the nomenclature would be this one and towards the opposite direction it is inferior. So, that describes the complete set of the basis of anatomical nomenclature. So, you have medial, lateral, anterior, posterior, superior, inferior. There is also this terminology of superficial and deep.

So, superficial is something towards the surface and deep is obviously, deep. So, I have used these terms earlier, but I had to say this particularly because if we are going to serious anatomy there may be places where I would tell these terms without thinking too much and you may wonder as to what these things actually mean. So, that is the point of explanation. So, arteries and veins we will be dealing with later, the CSF I have

described, the ventricular anatomy something which I will be dealing with later. We now proceed to the actual surface architecture of the brain.

So, surface architecture of the brain is something surface, surface in the sense gross anatomy. I would not say surface because I would even be dealing with some of the deep things in the cerebrum especially and let us see how we can understand this particular topic. I will stop at this.