Oral Biology
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Lecture - 02
Craniofacial anatomy - Part 2

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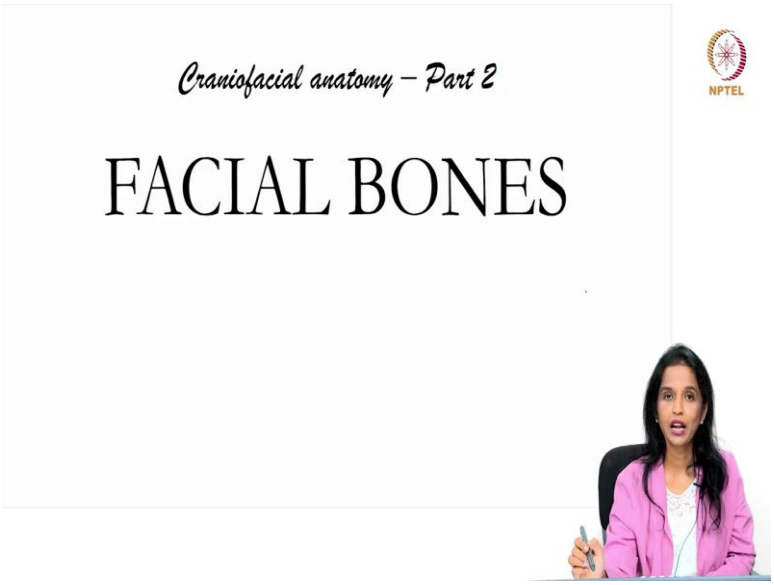

Now, we move on to Craniofacial anatomy part 2. So, in this craniofacial anatomy part 2 we have Facial Bones. we will read about facial bones a quick recap about what we read about the number of bones, we know that cranium is made of 8 bones and facial bones are totally 14 in number. Additionally, we will also be reading about the sutures the foramina and your sinuses. So, the first one is about the nasal bone.

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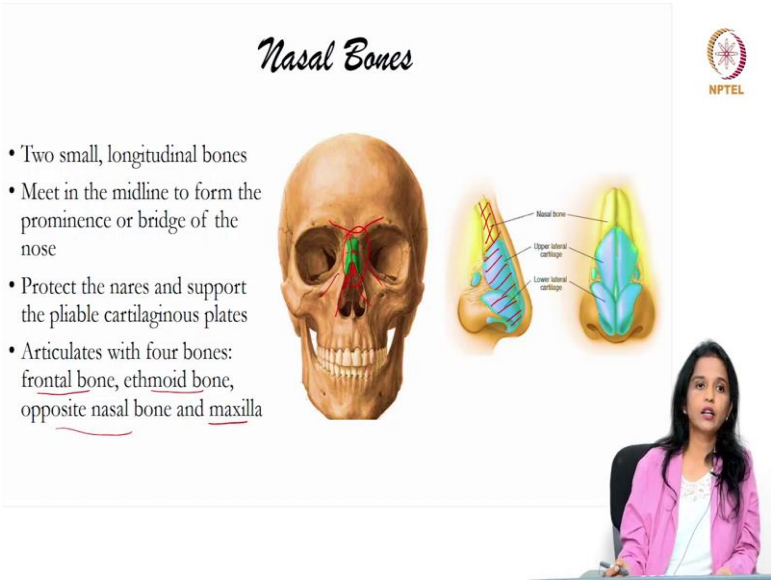

So, we all know that we have a very prominent nose, but in this particular region is made of the bony structure whereas, the other part is actually cartilaginous.

All these blue color shaded area is actually the cartilage, you can see that this fluorescent yellow colored area is actually the nasal bone whereas, the blue shaded one is cartilage.

So, the bony part of the nose is nasal bones containing two in number. They meet in the midline to form the prominent part of the bridge of the nose.

So, this particular region is bridge of the nose and it protects the openings of the nares and supports the pliable cartilage area. nasal bone articulates with four bones that is frontal bone, the ethmoid bone, opposite nasal bone and the maxilla.

So, we can see that in the picture here as well. it articulates on top with the frontal bone and on the inner aspect with your ethmoid bone. So, there are four bones which actually are articulating with the nasal bones that is your frontal, the adjacent nasal, ethmoidal and your maxilla.

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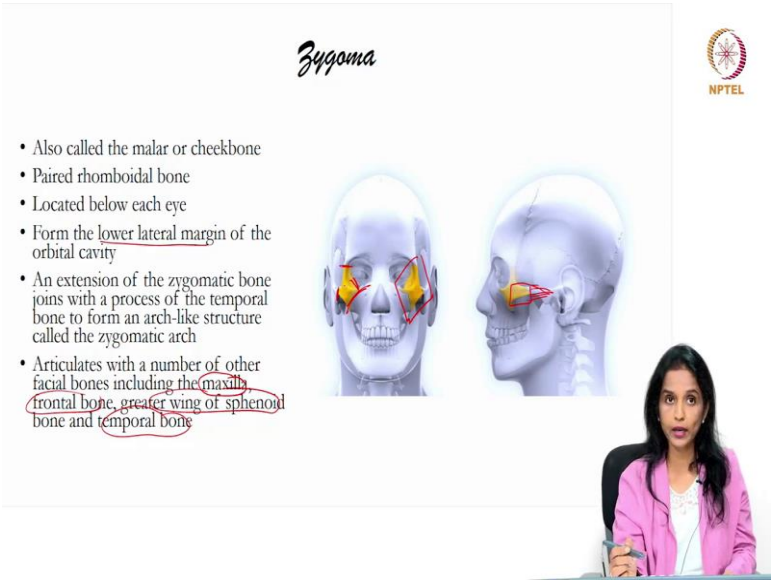

And now we move on to a very interesting bone of the face that is your zygoma. So, this zygoma is also called as the malar bone or the cheekbone. So, this is your malar bone or cheekbone. So, it is very beautifully represented in this particular picture. It is also called as cheekbone and it is said to have lot of aesthetic value if you have a very prominent cheekbone. The face looks more aesthetically pleasing.

The shape of zygoma is rhomboidal. So, you can see the rhomboidal placed over there and it is located below each eye. And then it forms the lower lateral margin of the orbital cavity. We saw earlier that the frontal bone actually formed the supraorbital margin.

Whereas, then we have the lower lateral part of the orbit being formed by the zygoma and then the extension of the zygomatic bone with a process of the temporal bone attaches to form arch like structure called as the zygomatic arch. So, this is very important here it actually attaches with your temporal bone.

where all does this zygoma articulate with? it attaches with your maxilla, frontal bone, the greater wing of sphenoid and the temporal bone.

Similar to what we saw earlier about the nasal bones this bone also articulates with your four bones that is the first one is your maxilla, greater wing of sphenoid at the centre at the midline.

And then we also have the frontal bone attachment and then the temporal bone attachment. it is a very relevant important bone because in maxillofacial trauma whenever there is a trauma zygoma gets fractured very frequently.

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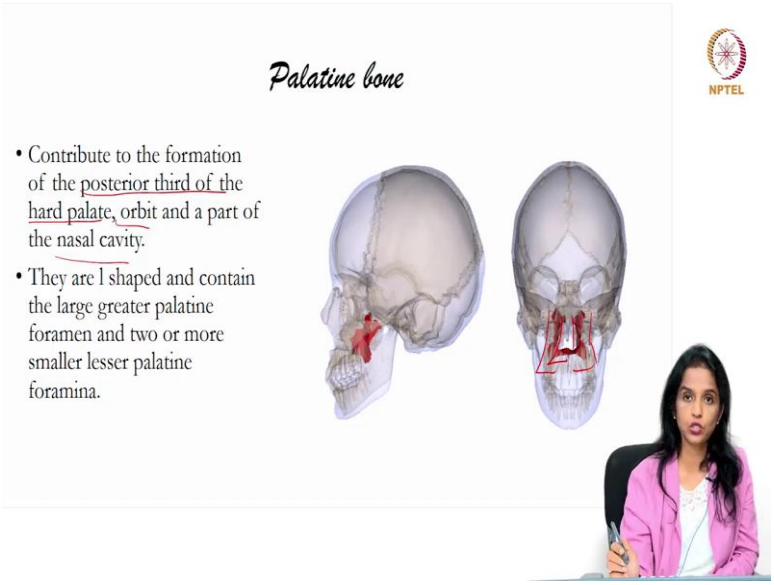

It forms a very important part of the facial architecture. Now, we move on to the palatine bone. we all know that the palate is bounded by the palatine bone and this contributes to formation of the posterior third of hard palate.

Having mentioned palate please do remember that palate is formed by the hard palate and the soft palate. And it also contributes to the posterior formation of hard palate the orbit and part of the nasal cavity.

this palatine bone is actually l shaped and contain the greater palatine foramen and two or more smaller lesser palatine foramen. The foramen are actually small holes which are helping to allow the exit of some nerves and blood fibers.

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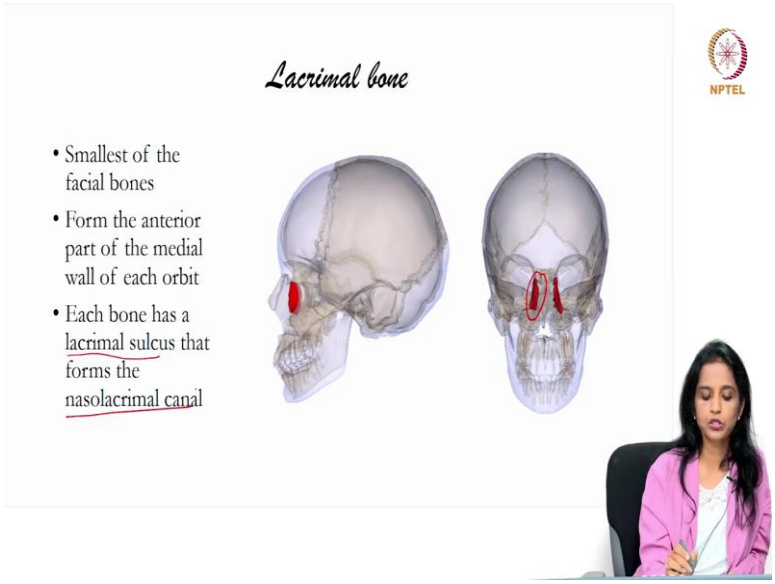

And then we move on to lacrimal bone, which is one of the smallest facial bone and forms the anterior part of the medial wall of each orbit. So, far we saw the supraorbital margin formed by the frontal bone and then the lateral lower lateral being formed by a zygomatic bone.

And now we have come into the midline part where the medial part anteromedially is formed by lacrimal bone and each bone has a lacrimal sulcus that forms the nasolacrimal canal.

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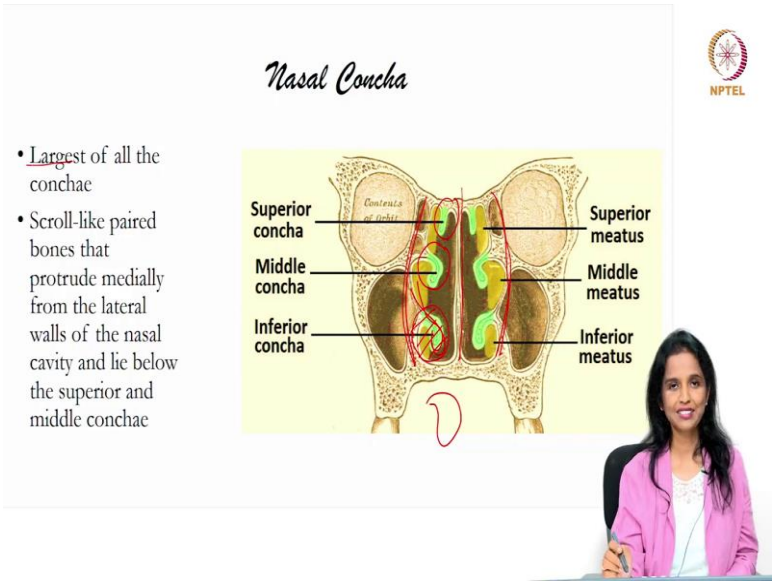

The next one is about the nasal concha. So, far we saw that there are three concha, we had already looked upon the superior concha and the middle concha, which were actually part of the perpendicular plate of your ethmoidal bone. And now we move on to see about the lower nasal concha.

lower nasal concha is scroll shaped and it is actually protruding medially from the lateral walls. So, this is a nasal septa at the midline. So, on the sides we have the lateral nasal walls and below lie your superior and middle concha.

So, concha are three in number among them the lower nasal concha are largest, the upper and middle are smaller and they are actually forming a part of the ethmoid bone, the lower concha is actually lying slightly at a lower position and it is large in shape. Actually they form part of lateral nasal wall.

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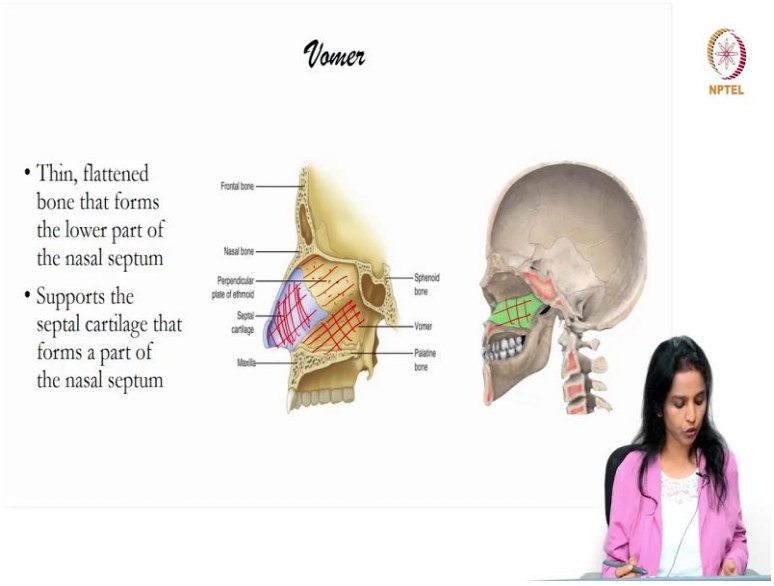

And then we have vomer bone, vomer is actually a flat bone forming the posterior part of the nasal septa or the lowest part of the nasal septa.

The perpendicular plate of ethmoid bone is actually forming the upper part of the nasal septa. Whereas, a lower part of the nasal septa is formed by vomer and this supports the septal cartilage. So, that it is supported by two bony process one is your vomer and the other is your perpendicular plate of ethmoidal bone.

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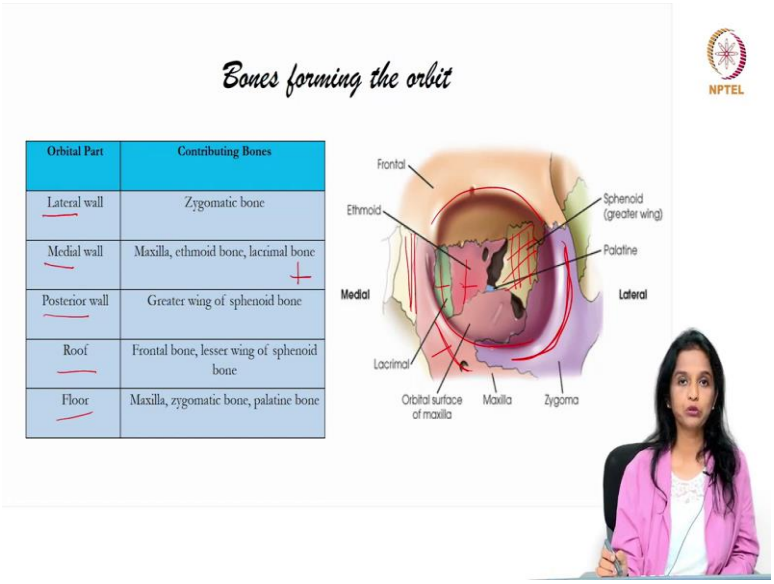

And now we go on to quickly look into the main area the orbit which contains the most important sense organ that is our eyes which is responsible for vision. The orbital part is being made of a lateral wall, a medial wall, a posterior wall, a roof and the floor.

So, what forms the lateral wall? The zygoma forms the lower lateral portion of the orbit. And then we have the medial wall here. The medial wall is actually formed by the maxilla the ethmoid bone and the lacrimals.

So, I am marking it as plus. These three bones actually go into forming the medial wall of the orbit. And then we have the posterior wall. The posterior wall is actually being formed by the greater wing of sphenoid. So, we have your greater wing of sphenoid present at the back and that is actually helping to form the posterior wall of the orbit. further we have the roof of the orbit and floor of the orbit.

Roof of the orbit is formed by a frontal bone and lesser wing of sphenoid whereas floor of the orbit is formed by maxilla zygomatic bone and palatine bone. These are very important because it houses your eye balls which is very important for vision. So, it is actually divided into five zones. So, the first one is your lateral part, your medial part and then we have the posterior part, roof and the floor.

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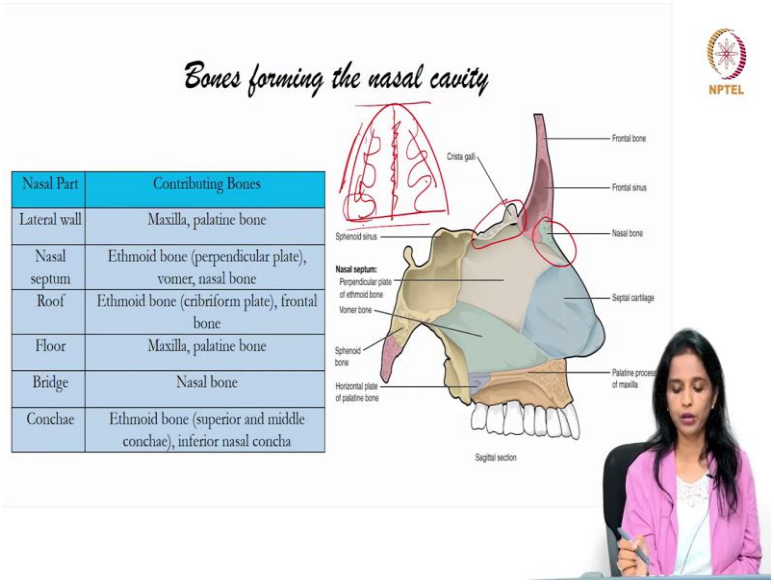

And now we move on to bones forming the nasal cavity.

So, these are the lateral nasal walls and then you have the midline septa.

So, you can see a imaginary a picture over here which is hand drawn over here and this forms the lateral aspect and this forms the medial aspect with an overview like that now we will go on to see what are the parts. So, we have the lateral wall the nasal septa and then we have the roof the floor and the bridge and from here you know that there are three concha projecting from the lateral wall.

The palatine bone forms the lateral wall. Nasal septum is formed by your perpendicular plate of ethmoid bone which we have just completed. And additionally nasal septa is contributed by vomer; we know that it forms the lower part of the nasal septum and the nasal bone and further we have the roof formed by ethmoid bone or cribriform plate and frontal bone.

And further there is floor which is formed by the maxilla and the palatine bone bridge is formed by your nasal bone at this particular region. So, you can see the nasal bone at this particular region.

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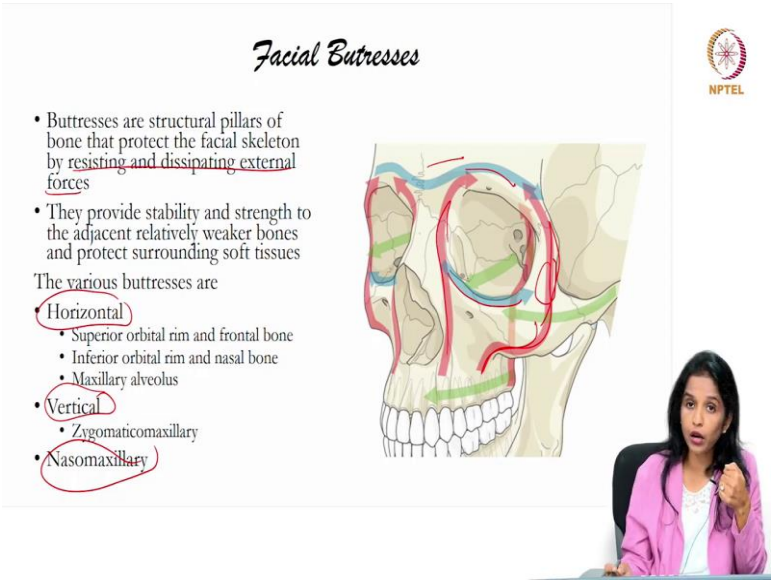

And then we have the facial buttresses. So, what I mean by buttress is actually a kind of area where that particular part of the bone is more stronger good enough to withstand any kind of external forces more than any other part of the body.

So, buttress is a region where there is some kind of reinforced structural element present. The bone is more structurally stronger at that place and it can resist and dissipate external forces.

They are structural pillars and they provide stability and strength of the adjacent relatively weaker bones and protects the surroundings soft tissues. So, there are three buttresses; horizontal , vertical and then we have the nasomaxillary.

So, the horizontal contains your supra orbital rim , the frontal bone and then we have the infraorbital rim. The vertical buttress is inclusive of the zygomatic component and the maxillary component as such.

And then we have the nasomaxillary component forming another important buttress. These particular buttress are helping to resist and dissipate external forces which can happen at any time due to a physical assaulting force or it can be due to a maxillofacial trauma.

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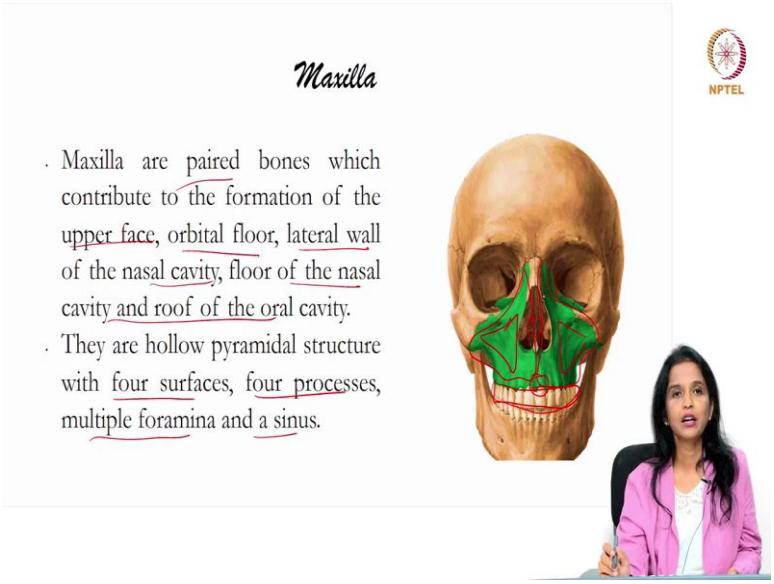

And then now we move on to maxilla. So, maxilla is actually a paired bone. This is a very important bone of the facial system because they are housing the most important part of the masticatory apparatus like how we said for orbital bone that houses the most important sense organ. Maxilla is the one which carries the upper part of the masticatory apparatus that is the teeth structures.

Maxilla are paired to a number and then it contributes to the formation of the upper face, the orbital floor, lateral wall of the nasal cavity, floor of the nasal cavity and floor of the oral cavity as well. And also at the posterior region it gives rise to or it forms the roof of the oral cavity again separating the nasopharynx and oropharynx.

it actually has a floor and then we have hollow pyramidal structures with four surfaces four process multiple foramina and a sinus. the entire thing houses a very large sinus that is your maxillary sinus and then it is made of four surfaces four process like extension multiple foramina at the back.

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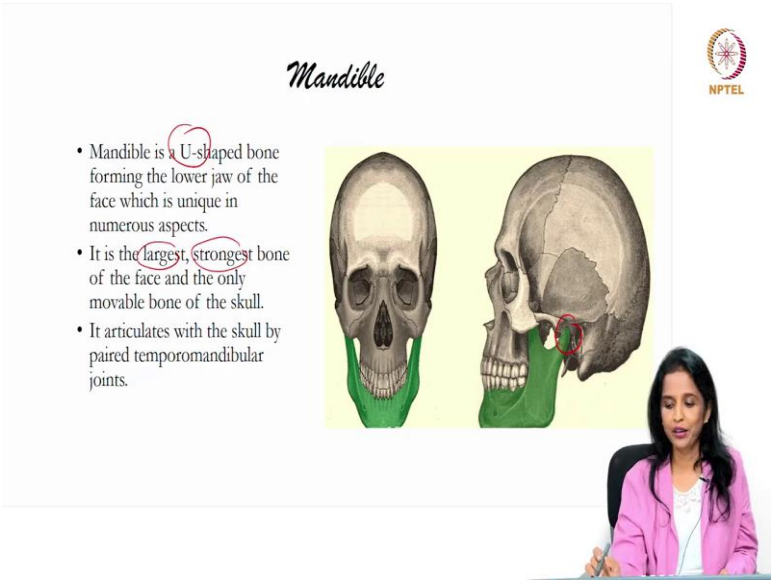

The next important in the facial bone is your mandible, both the maxilla and mandible are the ones which gives your shape of the face and determine the appearance of your face. And they are also important because they carry the masticatory apparatus with them.

mandible is an unpaired bone and it is U-shaped structure forming the lower jaw bone and it is very unique in many structural aspects considered as the largest and strongest bone of the face. And the only movable facial bone in the skull. It articulates with the skull by pair of joints called as temporomandibular joint.

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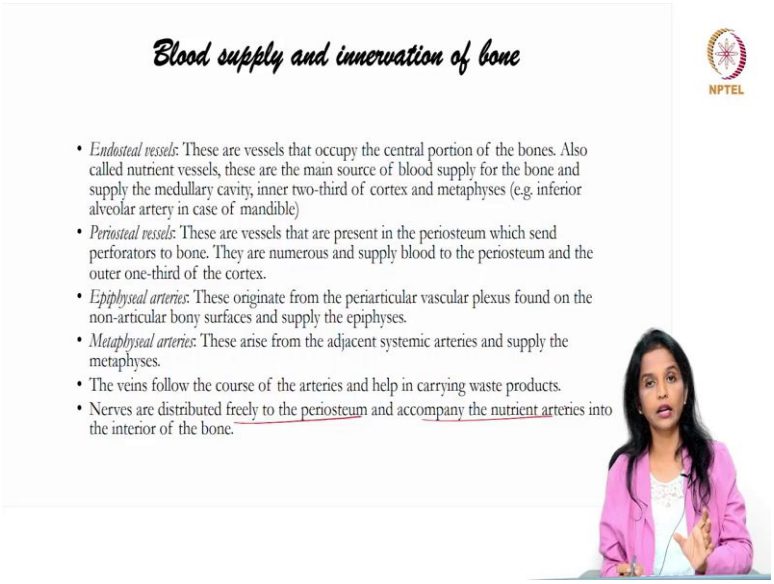

And now how are these structures taken care of. So, the blood supply is actually taken care of by presence of blood vessels at the centre that is your endosteum. the blood vessels at the interior aspect are called as the endosteum and those at the periphery are your periosteum.

And then we also have epiphyseal arteries. The epiphyseal arteries are the ones which are present at the articular or the non-articular surface of the bone or at the and then we have metaphyses or metaphyseal arteries taking care of the other parts of the bones which are the longer parts of the bone.

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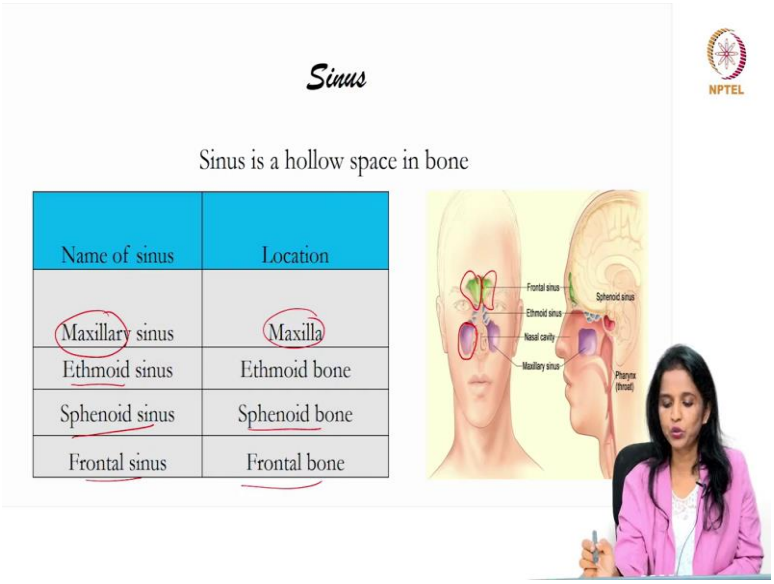

And then we have nerves which are distributed freely to the periosteum and accompany the nutrient arteries. So, there are four categories of arterial supply that is a blood supply what is there on the inside? What is there on the periphery? What is there on the articulating surface and what is there at the longitudinal axis part of the bone?

And then we have the sinus. So, sinus is a hollow shape space in the bone which is very important. So, the hollow space in the bone as already said is there to give more resonance and it also helps in reducing the weight of the craniofacial system.

So, wherever possible most of the bones will have a sinus like space. what are these sinus like space contain? they are actually hollow and empty and they contain only air. Rarely they might get infected or inflamed, at that particular time there might be some inflammatory fluid inside them.

Otherwise normally if they are healthy they will only contain air inside them. So, the functions being they lighten the weight of the skull and they also help in resonance of the sound which is being produced by the voice apparatus.

So, how many sinuses are present? The maxillary sinus is the largest of them as paired. So, there will be two sinuses present and then we have ethmoid sinuses. Ethmoid sinuses are present on either side of the perpendicular plate of the ethmoid bone.

We know that it is present exactly here and it contributes to the upper part of the nasal septa and then we have the sphenoid sinus present below your sella turcica which houses your pituitary gland and then we have the frontal sinus which is inside the frontal bone and it is two in number. So, these are about the sinuses.

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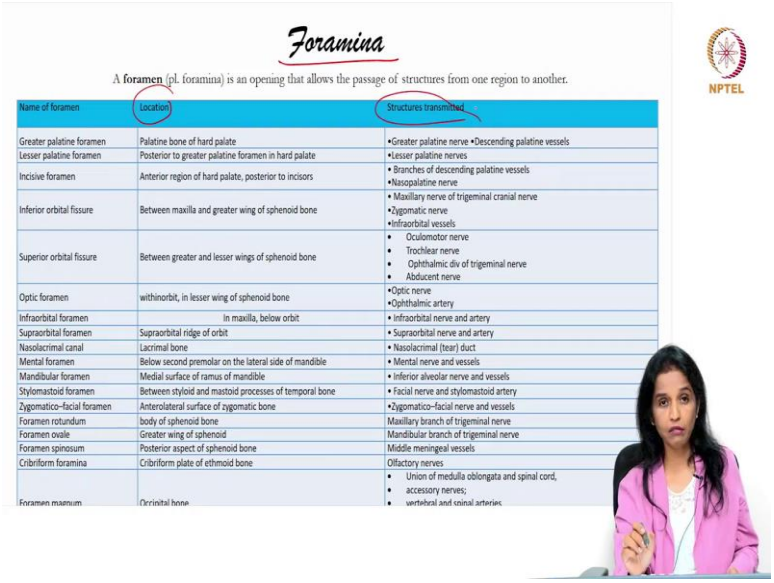

Name of foramen	Location	Structures transmitted
Greater palatine foramen	Palatine bone of hard palate	•Greater palatine nerve •Descending palatine vessels
Lesser palatine foramen	Posterior to greater palatine foramen in hard palate	•Lesser palatine nerves
Incisive foramen	Anterior region of hard palate, posterior to incisors	• Branches of descending palatine vessels •Nasopalatine nerve
Inferior orbital fissure	Between maxilla and greater wing of sphenoid bone	• Maxillary nerve of trigeminal cranial nerve •Zygomatic nerve •Infraorbital vessels
Superior orbital fissure	Between greater and lesser wings of sphenoid bone	• Oculomotor nerve • Trochlear nerve • Ophthalmic div of trigeminal nerve • Abducent nerve
Optic foramen	withinorbit, in lesser wing of sphenoid bone	•Optic nerve •Ophthalmic artery
Infraorbital foramen	In maxilla, below orbit	• Infraorbital nerve and artery
Supraorbital foramen	Supraorbital ridge of orbit	• Supraorbital nerve and artery
Nasolacrimal canal	Lacrimal bone	• Nasolacrimal (tear) duct
Mental foramen	Below second premolar on the lateral side of mandible	• Mental nerve and vessels
Mandibular foramen	Medial surface of ramus of mandible	• Inferior alveolar nerve and vessels
Stylomastoid foramen	Between styloid and mastoid processes of temporal bone	• Facial nerve and stylomastoid artery
Zygomatico–facial foramen	Anterolateral surface of zygomatic bone	•Zygomatico–facial nerve and vessels
Foramen rotundum	body of sphenoid bone	Maxillary branch of trigeminal nerve
Foramen ovale	Greater wing of sphenoid	Mandibular branch of trigeminal nerve
Foramen spinosum	Posterior aspect of sphenoid bone	Middle meningeal vessels
Cribriform foramina	Cribriform plate of ethmoid bone	Olfactory nerves
Foramen magnum	Occipital bone	• Union of medulla oblongata and spinal cord, • accessory nerves; • vertebral and spinal arteries

And now we are going into more in depth about the holes in the craniofacial system. So, these holes are spaces which are very important and it is your foramen. These openings or holes allow the passage of structures from one region to another region. So, we can see a very huge list over there where you can see the location and the structures transmitted through it.

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So, we have a diagrammatic representation to show this in a better format. So, how do we go about reading this and understanding the foramina. the number of foramens are categorized based on presence in the anterior cranial fossa, the middle cranial fossa and the posterior cranial fossa.

So, if you see that these this is the base of the cranium. So, this is divided into anterior middle and posterior. in the anterior cranial fossa frontal bone and the ethmoidal bone are present.

And then what forms the middle cranial fossa, we have your sphenoidal bone and part of the temporal bone. we have your posterior cranial fossa which is contributed by again temporal bone and then we have your parietal and occipital bone.

So, in this there will be lot of foramina. So, that is what was given as a tabulated form and as a diagrammatic form. As already mentioned, the most largest foramina here in the skull and not only in the skull the entire body is your foramen magnum that is why it's given the name magnum mean the largest. As already said the foramen magnum is large because it has to allow the exit of your spinal cord.

And then we have the cribriform plate which actually transmits the olfactory nerve fibers. And then we have an oval shaped foramen ovale and then we have foramen rotundum foramen.

Foramen ovale is for mandibular nerve, foramen rotundum is for maxillary nerve and then there are other foramens we have your jugular foramen, which is slightly larger and so on.

Many structures pass within and outside because the cranium houses the most vital part of the human body that is your brain, the neural center of the craniofacial system.

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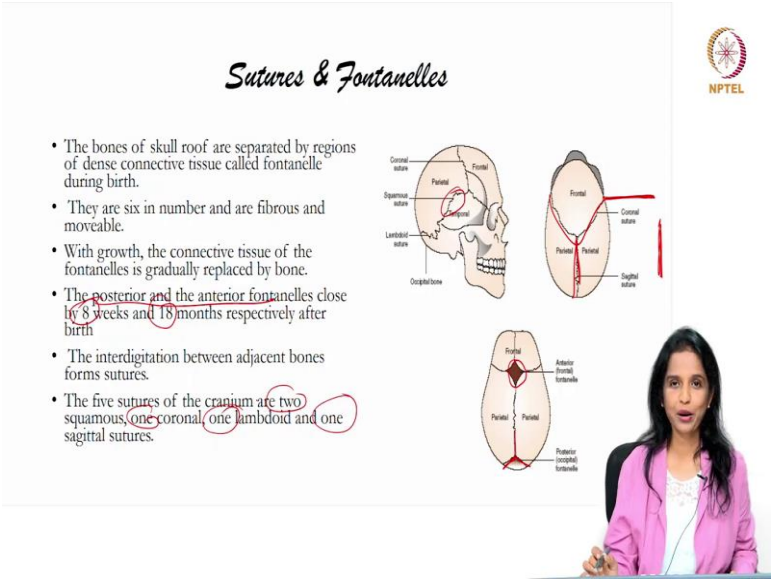

It is a very important area and that is why we have lots of foramina like that. And now we move on to another very interesting area ,the sutures.

We know that the sagittal suture is actually connecting both your parietal bones and then we have your coronal suture connecting the frontal bone with your parietal bone. this is your sagittal suture and this is your coronal suture in the coronal plane. this is the coronal plane and this is the sagittal plane.

And then we have other sutures which was already mentioned that was lambdoid suture. the lambdoid suture is the one which is actually connecting the parietal bone with your occipital bone. So, these are the most important sutures and then there is other important thing, which is actually called as a squamous suture connecting your parietal and temporal bone.

Additionally, what happens is during birth these sutural joints are actually the very soft connective tissue like areas and those are called as fontanelles. Fontanelles are softened

areas in between two bones and these particular fontanelles are very important to allow the expansion of the bony skull.

As the brain mass increases as the child ages the fontanelles allow that particular space for growth and when it is required those fontanelles are closed in a particular sequence. So, the posterior and the anterior fontanelles closes by 8 weeks and then we have eighteen weeks closure for anterior fontanelle.

8 weeks being 2 months of the lifetime of a newly born child and 18 months is one and a half years in the lifetime of the newborn child and then the sutures which we already saw was two squamous, one coronal suture, one lambdoid and one sagittal suture.

Therefore, we have quickly seen the craniofacial anatomy in two parts the first part went on to discuss about the cranium bones. And the second part went on to discuss about the facial bones, additionally we also touched upon the sinuses, the sutures, the fontanelles and the foramina.

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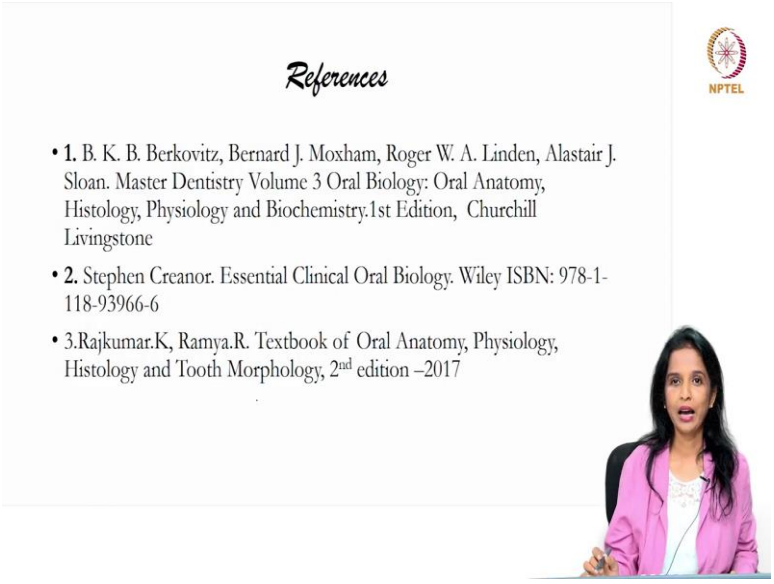

And these are the references which can give you a very clear picture of this craniofacial anatomy. So, that you can browse upon these references.

Thank you for your patient listening. Thank you.