Quadrant II – Transcript and Related Materials

Programme: Programme: Bachelor of Science (Second Year)

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Paper Title: Anatomy of Animal Body System.

Unit: 02

Module Name: Axial Skeleton (Skull) Part I

Module No:17

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Notes

Axial Skeleton (Skull) Part I

The endoskeleton of vertebrates has an axial skeleton made up of skull, vertebral column, ribs, sternum and hyoid bone. It is subjected to wide superficial difference, which are associated with each class and with adaptation. The skeletal framework of vertebrate head is called as skull**.**

The skull of vertebrate is derived from three embryonic components:

1. **Neurocranium (also called endocranium or chondrocranium**
   It includes cartilaginous brain case along with cartilaginous capsules of olfactory, optic, and otic sense organs. This will be replaced by bony structure in most of vertebrates.

2. **Splanchnocranium(or visceral skeleton)**
   It is the derivative of visceral or pharyngeal skeleton which will be further replaced by bones in higher forms. It aids in gill support and jaw suspension.

3. **Dermatocranium (membrane bones)**

It consists of dermal bones which fuses with chondrocranium and splanchnocranium in bony fishes and tetrapods.

Cyclostomes and Elasmobranchs, show cartilaginous skull.

1. CHONDROCRANIUM

Development of chondrcranium

Once the central nervous system is formed, mesenchyme cells form a membrane covering brain and anterior regions of notochord. Two pairs of cartilage develops from this membrane namely, Parachordal cartilage plate developed just below the midbrain and hindbrain. Infront of the Parachordal lying just below the forebrain is another pair of cartilaginous plates named as Prechordal/ trabeculae. At the same time cartilaginous capsules develops around sense organs. Olfactory capsule develops around organ of smell, optic capsule around eyes and otic capsule around internal ears.

As the development proceeds further the parachordals grow and fuse in midline to form basal plate and similarly the two trebaculae grow and fuse in midline to form ethmoid plate. Further the plates formed grow towards each other and fuse to form single plate called basal plate.

The basal plate show presence of Hypophyseal fenestra to lodge in pituitary gland. Olfactory and otic capsule fuse to the basal plate giving rise to cartilaginous chondrcranium. Optic capsules remain separate to form sclerotic coat of eye , thus permitting mobility to eyeball.

The floor of brain, thus starts growing laterally on both side forming encasement around CNS and resulting structure is termed as Neurocranium.

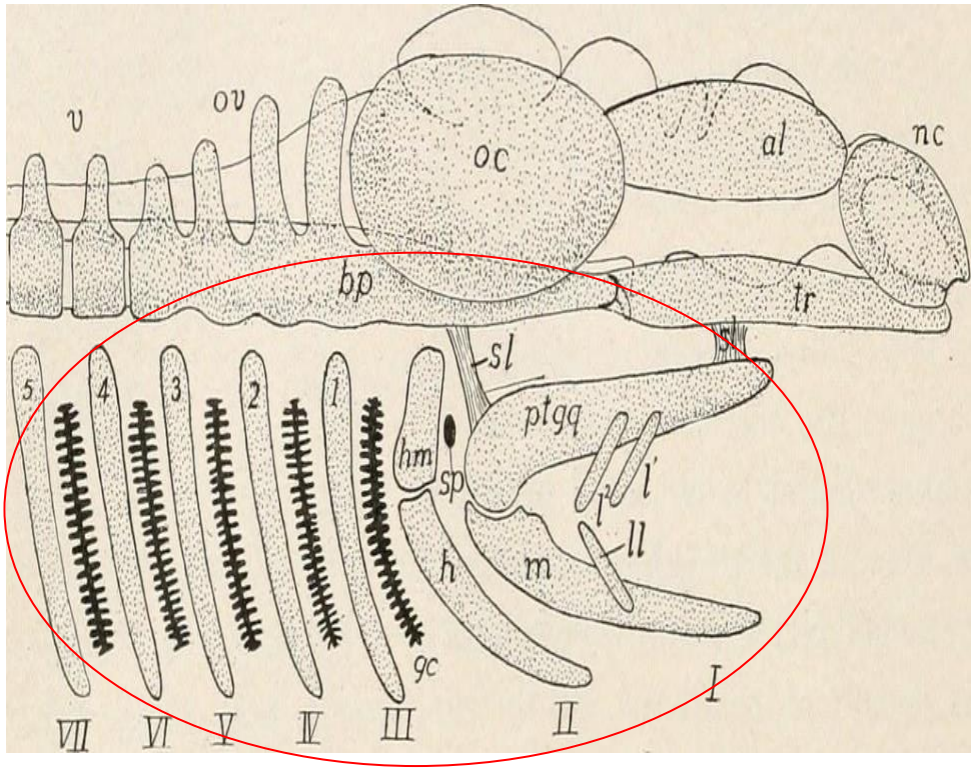
2.SPLANCHNOCRANIUM

Development of splanchnocranium

It is mesodermal in orgin and develops around pharynx region. It consists of series of paired visceral bars , usually seven in number. They unite ventrally via single median cartilage to form visceral arches. It encircles pharynx entirely except in dorsal region. Typically fishes have seven visceral arches but number may vary from anywhere between four to nine.

The first visceral arch is called as Mandibular arch , the second is called as Hyoid arch and the rest from third onwards typically referred to as Branchial arches.

In all vertebrates, except Agnatha , the mandibular arch forms jaws for supporting the mouth. The arch is divided into dorsal Platoquadrate / platoterygoquadrate cartilage and ventral Meckel's cartilage . The paltoquadrate forms upper jaw whereas, Meckel's cartilage develops into lower jaw. The second or hyoid arch has dorsal region made up of Hyomandibular, which connects jaws to chondracranium and ventral portion made up of hyoid/ ceratohyal forming Hyoid apparatus to support tongue. Remaining branchial arches supports gills and larynx in fishes and in tetrapods they are much reduced or form hyoid apparatus and cartilage of larynx.



Ptgq: Palatoquadrate

m: Meckel's cartilage

hm: Hyomandibular

h: Hyoid /Ceratohyal

III toVII:Branchial arch

Comparative anatomy of vertebrates by Kingsley, John Sterling

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Visceral arch	Parts of arch	Function
1. Mandibular arch	1.a. Palatoterygoquadrate bar(dorsal)	Forms upper jaw
	1.b. Meckle's cartilage(ventral)	Forms lower jaw
2. Hyoid arch	2.a. Hyomadibular(dorsal)	Supports and connects jaws to chondrcranium
	2.b. ceratohyal(ventral)	Forms hyoid apparatus

3.DERMATOCRANIUM

Development of Dermatocranium

The skull formation stops at cartilaginous stage in cyclostomes and chondricthyes , but from bony fish upwards cartilage bones and dermal or membrane bones become incorporated in skull.

Dermatocranium is strictly formed of dermal bones. They appear in head region of fish as scales. These dermal scales are actually parts f exoskeleton which sink inward and fuse with the roof of chondrocranium. The resulting dermal bones may remain independent or may fuse with cartilage or cartilage bones of skull.

The End