

Organogenesis of Eye in chick Embryo

The eye develops from the three different sources. These are the epidermis of the embryo.

- The sclerotic coats and choroid coats are formed by the mesenchyme.

- The pigmented and nervous layers of the retina are formed by the optic cup. It is outgrowth of the prosencephalon.

- The Iris develops from the free edges of optic cup.

- The lens develops from the ectoderm.

- The Ciliary body develops ~~partly~~ partly from the choroid coat, partly from the edge of optic cup and partly from the mesenchyme.

Development of Eye can be divided into two phases -

[A] Development of optic cup.

The brain becomes differentiated at 27 hours of incubation into prosencephalon, mesencephalon and rhombencephalon. The development of optic cups initiated at about 33 hours of incubation in the form of lateral outgrowths from the prosencephalon. These outgrowths are called optic vesicles.

- The cavity of optic vesicle is optocoel.

- The optic Vesicle extends outward and its lateral surface touches the ectoderm and induces a thickening in it at the place nearest to the optic Vesicle.
- Fully formed optic Vesicle retains connection with brain by a narrow optic stalk.
- Now the wall of optic Vesicle, which almost touches the ectoderm is flattened gradually and invaginates.
- As a result of invagination the single walled optic Vesicle is converted into double walled cup like structure called optic cup.
 - upper layer of optic cup develops into pigmented epithelium of retina & inner layer develops into neurosensory layer of Retina.
- The opening of the optic cup initially large, but reduced gradually by inward bending of the rims of cup.
 - These inward bending of cup with some mesenchyme cells forms iris and Ciliary process.
- The remaining opening in its centre after the formation of iris is called 'Pupil'.
- The ventral gap in the optic cup is called choroid fissure.
 - The choroid fissure continues into ventral side of the optic ~~cup~~ stalk as a groove. Artery and vein enter the eyeball along the choroid fissure.
 - The optic nerve fibres also travel to brain along this choroid fissure.

- When all these changes are going on, the inner ~~nerve~~ neurosensory layer of retina differentiates into various layers -

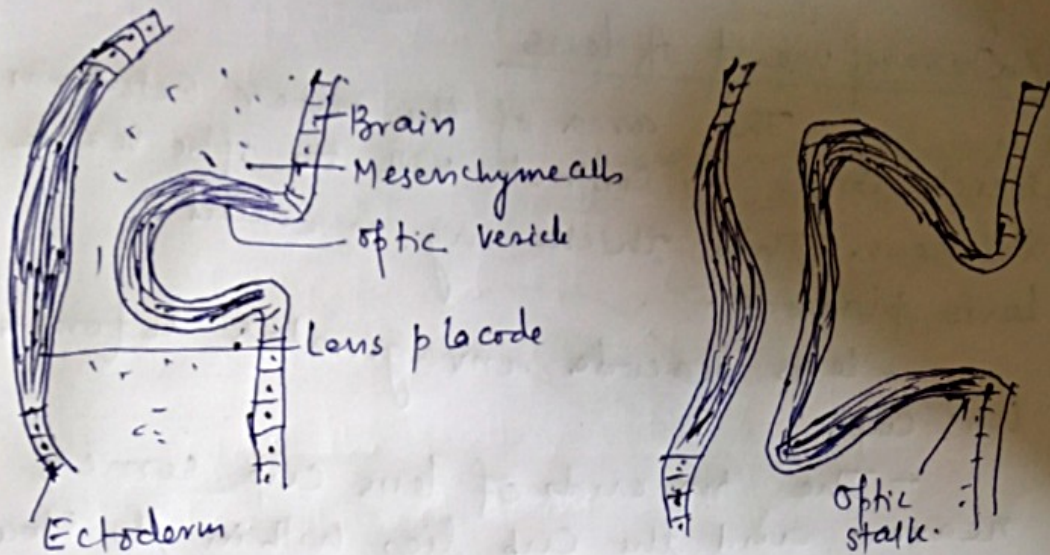
- (a) The outermost cells of the neurosensory layer differentiate into visual cells called Rods & Cones.
- (b) The innermost cells of this layer lying beneath the internal limiting membrane form nerve cells. These send out axons which proceed towards the optic stalk and form optic nerves ~~to~~ lying within it. The optic nerves enter the brain.

The outer densely fibrous sclerotic coat and inner vascular choroid coat around the optic cup are formed by the mesenchyme cells.

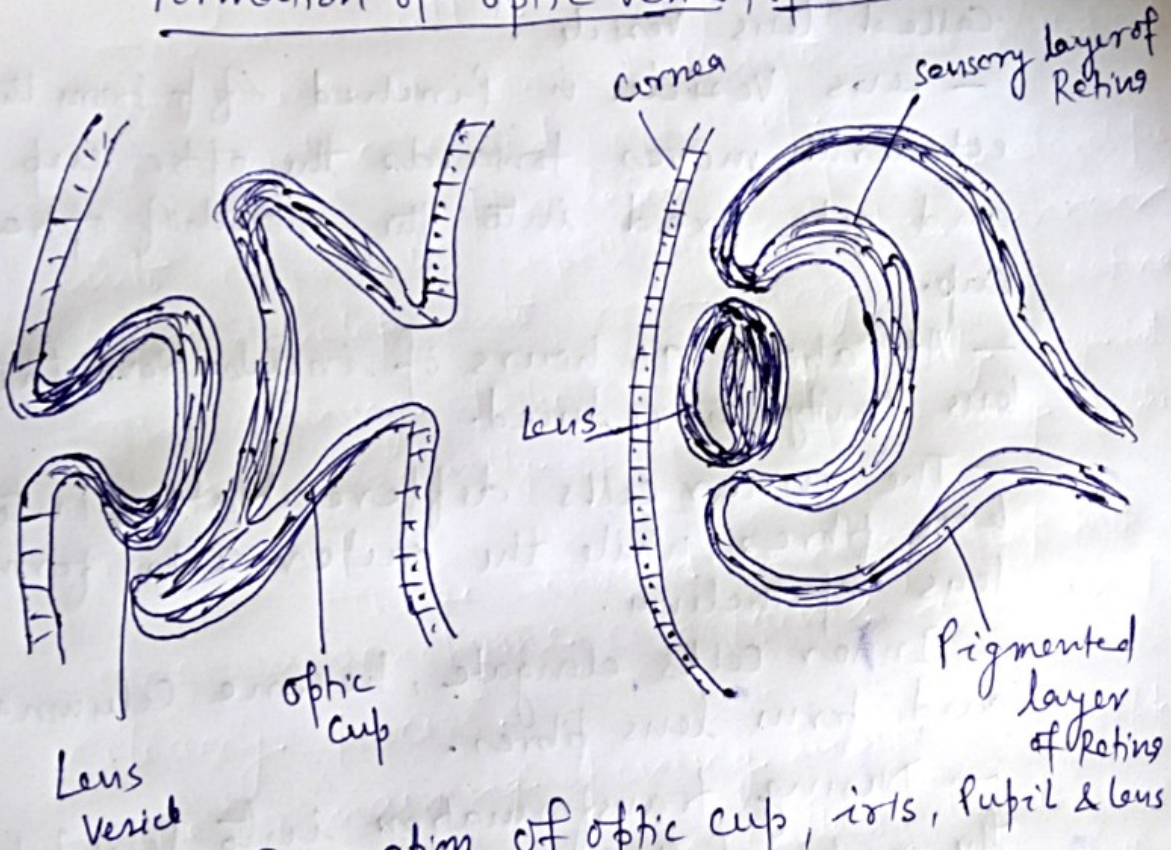
Ectodermal cells along with some mesenchyme cells ~~lying~~ in front of pupil become transparent. The outer epidermal part is called conjunctiva, while its inner mesenchymal part continuation with sclerotic coat is called cornea.

The eye muscles which rotate the eye ball in its orbit are formed by the condensation of mesenchyme cells.

Mesenchyme cells ~~lying~~ lying inside the vitreous chamber differentiate into a fan like structure called pecten.



formation of optic vesicle, optic stalk & lens placode



Formation of optic cup, iris, pupil & lens

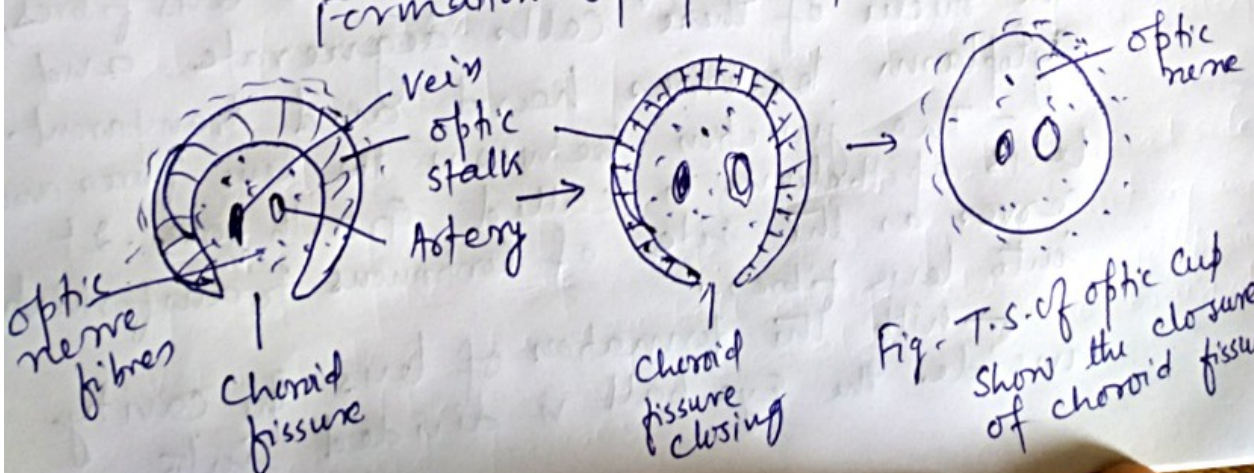


Fig. T.S. of optic cup show the closure of choroid fissure

Q.7. Development of lens

The area of the outer Ectoderm which comes in contact with the optic vesicle thickens. This thickening is called lens placode.

- lens placode invaginates to form a lens cup.

- The two ends of lens cup comes nearer and the cup lies within the space between the optic cup and outer ectoderm called lens vesicle.

- lens vesicle is pinched off from the ectoderm, moves towards the optic cup and gets fixed into the mouth of optic cup.

- At about 96 hours of incubation, the lens cavity is reduced.

- The inner cells differentiate into lens fibres, while the outer cells forms lens epithelium.

- Inner cells elongate, become columnar and form lens fibres.

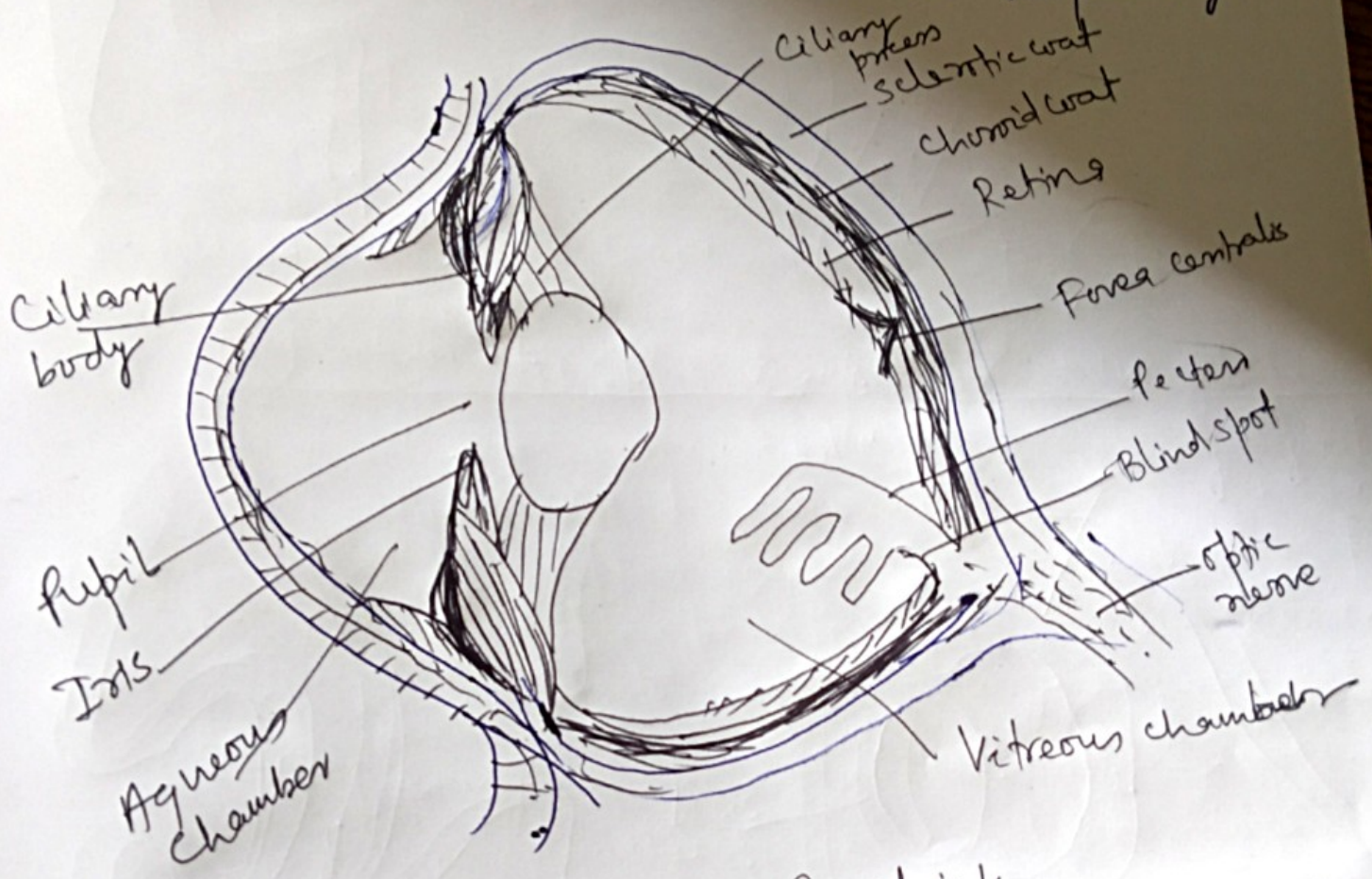
- During transformation into lens fibres, the nuclei of these cells degenerate and cytoplasm becomes hard and transparent.

- The junction between the lens fibres and lens epithelium is called growth zone. It serves as the site of continuous transformation into lens fibres.

- with the formation of lens the cavity inside the eye ball is divided into -

<I> Anterior aqueous chamber and
<II> posterior vitreous chamber.

These chambers contains aqueous
humour and Vitreous humour respectively.



Eye of chick.