Development of eye

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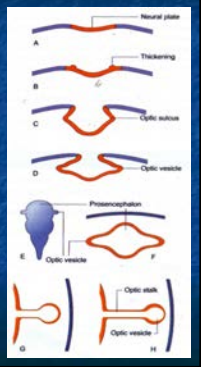
Development of eye

- Starts from around day 22 when the embryo has 8 pairs of somites and is around 2 mm in length
- The eyes develop from:
  - 1) optic vesicle, an outgrowth of prosencephalon (neuroectoderm)
  - 2) Lens placode (surface ectoderm)
  - 3) Mesenchyme surrounding the optic vesicle
  - 4) Visceral mesoderm of maxillary process

- Neurectoderm gives rise to the retina, epithelium of the ciliary body/iris, and optic nerves
- Surface ectoderm gives rise to the lens and anterior surface of the cornea
- The surrounding mesenchyme is of neural crest origin and contributes to the sclera, part of the cornea, choroid, ciliary body/ iris, and blood vessels of the eye

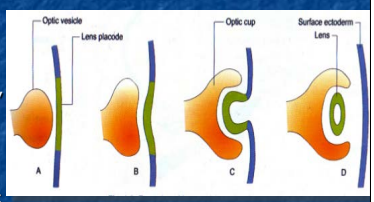
Formation of optic vesicle and optic stalk

- Formation of optic sulcus –
  - The area of neural plate which forms the prosencephalon develops a linear thickened area on either side which becomes depressed to form the optic sulcus
- Meanwhile the neural plate gets converted into prosencephalic vesicle
- Formation of optic vesicle- walls of prosencephalon overlying the optic sulcus bulge out to form optic vesicle
- Formation of optic stalk- proximal part of optic vesicle becomes constricted and elongated to form optic stalk



Formation of lens vesicle

- Meanwhile, a thickening called the **lens placode** develops in the surface ectoderm as a result of induction by the adjacent optic vesicle.
- While the optic cup forms, the lens placode invaginates, forming a **lens pit**, and then pinches off from the surface ectoderm to form the **lens vesicle**, sitting within the rim of the optic cup
- It is soon separated from the surface ectoderm at 33rd day of gestation



Formation of optic cup

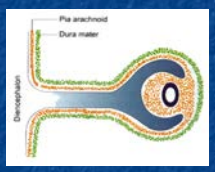
- As the optic cup develops, an asymmetric invagination forms and leaves a groove, the choroid fissure, in the optic stalk
- The primary optic vesicle becomes a double walled optic cup
- With continued invagination the original lumen of the optic vesicle is reduced to a slit between 1) inner neural layer and 2) outer pigment layer of the optic cup

Development of the retina

- Nervous retina -Inner wall of optic cup
- Pigment epithelium-Outer wall of optic cup

Changes in the associated mesenchyme

- Mesenchyme around the optic vesicle will contribute to the fibrous coats of the eye (sclera/ cornea) externally and the choroid layer adjacent to the pigment layer
- Mesenchyme also forms the hyaloid vessels which pass in the choroid fissure, across the vitreous chamber, to supply the lens



Development of individual structures

Retina

- Developed from walls of optic cup
- Inner wall develop into nervous retina.diff. into three layers
  - Matrix cell layer
  - Mantle cell layer
  - Marginal cell layer
- Outer wall develop into pigment epithelium of retina

cornea

- Epithelium from surface ectoderm
- Bowmans,descements,endothelium derived from fibrous layer of mesenchyme

Sclera

- Is developed from fibrous layer of mesenchyme

Iris

- Anterior epithelial layer & post.pigmented epi layer is derived from optic cup
- Sphincter and dilator pupillae are deived from anterior epithelial layer
- Stroma and blood vessels from vascular mesenchyme

Ciliary body

- Epithelial layers are derived from optic cup
- Ciliary body, blood vessels, stroma from vascular mesenchyme

Choroid

- Is derived from vascular layer of mesenchyme

Eye lids & conjunctiva

- Are formed by the reduplication of surface ectoderm as a result eye lids are formed
- These eye lids cut of a space from cornea called conjunctival sac.
- The conjunctiva is thus of ectodermal in origin