The Optic Nerve
• The **optic nerve** (2nd pair of cranial nerves) is not a nerve in the common use of the term, but, morphologically and functionally, a diencephalic projection.

• It is made up of the **axons of retinal ganglion cells**, it extends from the retina to the optic chiasm enveloped in its sheath, the dura mater, arachnoid and pia mater, in continuation with the meninges.

? The **optic nerve** originates from the eye bulb, 1 mm below and 3-4 mm medially to its posterior pole; the length considerably varies (between 35 and 55 mm) even among the two eyes of the same individual; in the intraorbital tract its diameter is 3-4 mm and in the intracranial tract it is 4-7 mm.
The optic nerve may be divided in 4 parts:

- **Intraocular (or optic nerve head):** inside the walls of the eyebulb (1 mm);
- **Intraorbital:** (20-25 mm);
- **Intracanalicular:** in the optic canal (4-10 mm);
- **Intracranial:** (10-20 mm).
Blood supply of a normal optic disc
Vascularization of the optic nerve

- Intraocular part:
  - **laminar portion** (lamina cribrosa):
    branches of the brief posterior ciliary arteries (**Zinn-Haller**): these do not constitute a precise anatomical structure, but when present, are a functional circular (incomplete) anastomosis between different posterior ciliary arteries which enter the sclera and supply the choroid and the optic nerve head.
Vascularization of the optic nerve

- **Intraorbital portion**: it may be divided in an anterior and a posterior tract in relation to the entrance of the central retinal artery; the anterior is double: axial (intraneural) derived by recurrent branches of the central retinal artery and superficial from branches of the pial plexus; the vascularization of the posterior tract is only of pial origin.

- **Intracanalicular and intracranial parts** supplied by the pial plexus (ophthalmic artery and collateral arterties for the first part; cerebral and anterior communicating arteries for the second part).

The **venous system** of the optic nerve repeats the arterious system (venous pial plexus).
The optic disc

- Approx. 1.5 mm diameter, a round contour, often slightly oval with greatest vertical axis.
- The small central depression due to the convergence of the fibers giving origin to the nerve is often crater-like (physiological excavation), sometimes funnel-shaped, small or slightly hinted.
- It is often symmetrical in the two eyes and tends to increase with age.
- The scleral canal may be cylindrical, but is often conical (posterior base); its amplitude, in relation to the scleral diameter, influences the physiological excavation in the sense that the more ample the canal, the greater the excavation.
The layers of the retina and choroid end at the edge of the optic disc; sometimes the pigmented epithelium and the choroid leave a white, more or less complete *scleral ring* or a semilunar formation with greatest temporal side
• In other cases the pigmented epithelium extends beyond the edge of the optic disc giving rise to a more or less complete *pigmentated ring*; in other cases the pigmented epithelium stops long before the choroid forming a temporal semilunar area in which the choroid is visible.

• The optic disc has an anterior portion, formed by the sole nerve fibers, which give rise to a deviation when leaving the eyebulb, an intermediate portion in which the astrocytes form cylindrical columns for the passage of the nerve fibers, and a posterior portion, constituted by the optic fibers and the *lamina cribrosa*: the latter is *connective trabeculate*, which crosses the scleral canal in its middle or posterior portion and includes optic fibers: it has a variable thickness, between 0.3-0.7 mm.
Congenital abnormalities of the optic disc
Glial and hyaloid artery remnants on the optic nerve
Foetal fissure

- Lens vesicle
- Optic cup
- Hyaloid vessels
- Optic stalk
Small coloboma of the optic disc
Large coloboma of the optic disc
“Morning glory” optic disc
Congenital pit of the optic nerve
Hypoplastic optic disc
Visual field defects with tilted disc
Septo-optic dysplasia (de Morsier)
Septo-optic dysplasia: CT scan with absence of septum pellucidum
Congenital myelinating nerve fibers
Drusen of the optic disc
Drusen of the optic disc: autofluorescence and axial CT scan
Anomalous discs with congenital vascular tortuosity
Congenital abnormalities due to refractive defects
Hypermetropic optic disc
Myopic optic disc
Myopic optic disc: histology