Visual pathways in the chiasm
Intracranial relationships of the optic nerve

- Optic nerve
- Anterior clinoid process
- Pituitary
- Optic chiasm
- Dorsum sellae

Measurements:
- 15 mm
- 10 mm

Angles:
- 45°
Fixation of the chiasm
Chiasmatic pathologies

- The function of the optic chiasm may be altered by the presence of:
  1) Tumors,
  2) Inflammatory lesions,
  3) Demyelinating lesions
  4) Arterio-venous malformations involving the sellar region.
• **Etiology:**

  1) **Tumors:** (25% of chiasmatic pathologies):
     - pituitary adenoma (50%): secreting (with endocrinological symptoms, Cushing’s disease, amenorrhea, infertility, acromegalia, impotence — prolactin in males) and non secreting
     - craniopharyngioma (25%): approximately 8% of brain tumors (13% in children)
     - meningioma (10%): (often Foster-Kennedy syndrome)
     - glioma (7%): astrocytoma grades 1 and 2

  • **Diagnosis:** MRI and CT

  • **Therapy:** surgical removal

  2) **Suprasellar aneurisms** (aneurismatic dilation of one of the vessels of Willis’s polygon)

  • **Diagnosis:** MRI, CT, brain angiography
3) Inflammation and infections
   - frontal sfenoidal sinus mucocele
   - sarcoidosis
   - tubercolosis
   - syphilis

4) Empty sell syndrome :
   - primary: extension of the subaracnoid space inside the sella turcica through a congenitally incomplete sellar diaphragm (2-4 % of the normal population)
   - secondary: after exeresis of pituitary adenoma or after pituitary apoplexy following optic chiasm prolapse.
• **Symptoms:**

1. Reduction in visual function, which often represents the first if not only symptom. The evolution is slow and may last months or years. Visual defects are almost never associated to pain.

2. The visual field defect is generally bitemporal but non characteristics defects may be present

3. Binocular diplopia secondary to paralysis of the 3rd, 4th, or 6th CN due to compression or invasion of the cavernous sinus by the lesion
• **Symptoms:**

4. Headache, which is never present as onset symptom except after pituitary apoplexia, is present in 13% of cases affected by chiasmatic syndrome.

5. Endocrinological dysfunctions, secondary to the presence of a secreting pituitary adenoma, and which vary depending on the hormone produced by the tumor (GH, prolactin, TSH or ACTH)
• The main sign of a chiasmatic syndrome is a visual field defect, which is generally bitemporal.

• However, when the size of the tumor is small (<10 mm), such as for a microadenoma, or if there is no suprasellar extension, it is difficult for a chiasmatic compression to show. Indeed, the distance separating the optic chiasm from the sellar diaphragm is equal to 10 mm.

**Anatomical variations** in the position of the optic chiasm with respect to the sella turcica and the different modalities of growth of expansive lesions in this region justify the heterogeneity of visual field defects. Indeed, it is possible to observe the presence of:
• 1. Central field defect, when the lesion determines compression at the level of the pre-chiasmatic visual pathways, generally monolateral.

• 2. Junctional field defect, or anterior chiasmatic syndrome, when the presence of a central scotoma in one eye is associated to a superior temporal defect in the contralateral eye, due to compression of the most anterior portion of the optic chiasm.
Junctional (Chiasmal) field defect
CT scan of a suprasellar meningioma producing junctional field defect
X-ray showing expansion of pituitary fossa
CT scan of a cystic chromophobe adenoma
3. **Bitemporal hemianopsia**, which may be complete or incomplete, symmetrical or asymmetrical; this represents the most typical visual field defect in the presence of lesions of the optic chiasm. It is the result of the involvement of crossed fibers, originating from the nasal retina, which are localized in the central part of the chiasm.

4. **Homonymous hemianopsia** secondary to the compression of the optic tract due to lesions which extend posteriorly with respect to the chiasm.
Bitemporal field defect
Optic disc pallor occurs in advanced stages

*Saw-nystagmus* is sometimes present in suprasellar tumors
Topographical arrangement of retinal nerve fibres with congenital homonymous hemianopsia
Grooves in retinal nerve fibre layer