4.15.1. Optic Nerve (I)

Topography

- embryology: from optic stalk → continuation of optic tract
- portions
  - intraocular: 0.7-1.0 mm
  - intraorbital: 25-30 mm
  - intracanalicular: 4-10 mm
  - intracranial: 10 mm
- retinal ganglion cell layer axons
- myelinated posterior to lamina cribrosa
- glial cells
  - oligodendrocytes: myelin production
  - astrocytes: support & nutrition
  - microglial cells: phagocytic function
- meningeal coat
  - dura mater: merges with sclera
  - arachnoid layer: subarachnoid space
  - pia mater: pial vessels extend into the optic nerve

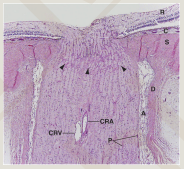

Figure 15-1 (© 2020 American Academy of Ophthalmology)

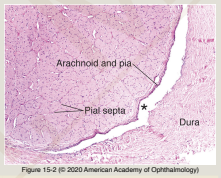

Figure 15-2 (© 2020 American Academy of Ophthalmology)

Optic atrophy

- retrograde degeneration of axons

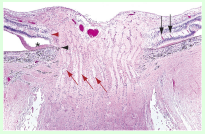
Figure 15-8 (© 2020 American Academy of Ophthalmology)

- optic disc edema → axonal swelling → retinal ganglion cells → peripheral optic nerve axons → injury to
- types
  - ascending atrophy
  - descending atrophy: optic nerve pathologies in intracranial cavity or orbit
- histology
  - axonal degeneration
  - loss of oligodendrocytes/myelin
  - proliferation of astrocytes/fibroconnective tissue in pial septa
  - optic nerve shrinks

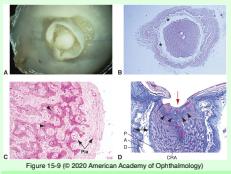

Figure 15-9 (© 2020 American Academy of Ophthalmology)

- Cavernous optic atrophy of Schnabel
  - alcian blue stain → contain mucopolysaccharide material → large cystic spaces posterior to lamina cribrosa
  - etiology
    - acute intraocular pressure elevation
    - elderly with arteriosclerotic disease

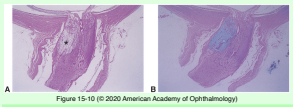

Figure 15-10 (© 2020 American Academy of Ophthalmology)

Congenital anomalies

- Coloboma
  - defective closure of embryonic fissure → inferonasal → associated with colobomas of retina/choroid/ciliary body/iris
  - atrophic/gliotic retina lines the defect
  - ectatic sclera
  - wall may contain
    - adipose tissue
    - smooth muscle

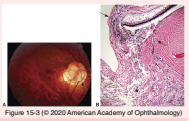

Figure 15-3 (© 2020 American Academy of Ophthalmology)

Optic disc drusen

- ← dominantly inherited
- clinical
  - bilateral
  - small crowded discs
  - abnormal vasculature
  - location
    - superficial
      - round
      - refractile, pale yellow/white
    - deep
      - pseudopapilledema
      - most common
      - otherwise normal eyes
- etiology
  - angioid streaks
  - papillitis
  - optic atrophy
  - chronic glaucoma
  - vascular occlusions
- pathogenesis: mitochondrial calcification, abnormal axonal metabolism
- histology
  - basophilic
  - calcific
  - acellular
  - anterior to lamina, posterior to Bruch membrane
  - contain
    - mucopolysaccharide
    - amino acids
    - DNA/RNA
    - iron
    - calcium

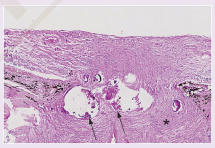
Figure 15-11 (© 2020 American Academy of Ophthalmology)

Infections

- origin
  - secondary to infections of adjacent anatomical structures
  - systemic infection → immunocompromised patient
- organism
  - bacterial
  - fungal
    - mucormycosis → from sinus infection
    - cryptococcosis → from CNS infection → multiple foci of necrosis → little inflammation
    - coccidiomycosis → necrotizing granulomas
  - viral → associated with CNS lesions

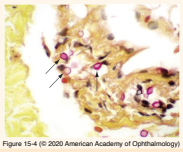
Figure 15-4 (© 2020 American Academy of Ophthalmology)

Noninfectious inflammatory disorders

- multifactorial with autoimmune and infectious causes
  - multiple sclerosis
    - damaged myelin removed by macrophages
    - astrocytic proliferaton
    - plaque
  - acute disseminated encephalomyelitis

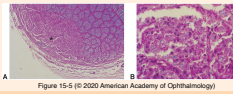

Figure 15-5 (© 2020 American Academy of Ophthalmology)

- giant cell arteritis
  - granulomatous inflammation
  - multinucleated giant cells
  - occlusion of posterior ciliary vessels
  - liquefactive necrosis
  - temporal artery biopsy
    - skip lesions
    - 2 cm

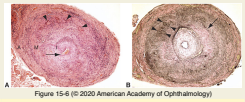

Figure 15-6 (© 2020 American Academy of Ophthalmology)

- sarcoidosis
  - associated with lesion of
    - retina
    - vitreous
    - uvea
  - optic nerve lesions feature necrosis

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