Retinitis and Endophthalmitis

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Anatomy of the Eye

The anterior globe consists of the transparent cornea, which is comparable in size and structure to the crystal of a small wristwatch and corresponds to the lens in a camera. The cornea inserts into the sclera at the limbus. The sclera is the white, collagenous outer layer of the eye, which is continuous with the cornea anteriorly and the dural sheath of the optic nerve posteriorly (Figure 1).

The vascular, middle compartment of the eye, the uveal tract, consists of the iris, ciliary body, and the choroid. The iris is the anterior extension of the ciliary body. It has a flat surface with a central round aperture, the pupil. The crystalline lens is suspended by fine zonules and rests within a capsular 'bag'; the lens is positioned immediately posterior to the iris within the eye. The anterior chamber of the eye is the anatomic space between the anterior surface of the iris and the posterior surface of the cornea. The anterior chamber is filled with aqueous humor a secretory product of the ciliary body. Situated in the iris stroma are the dilator and sphincter muscles of the iris that control the size of the pupil (Figure 2).

The ciliary body extends from the anterior choroid to the root of the iris. It consists of a corrugated anterior portion, the pars plicata, and a flattened posterior portion, the pars plana. The choroid is the posterior portion of the uveal tract, sandwiched between the retina and the sclera. The choroid consists of a rich vascular network known as the choriocapillaris.

The retina is a thin multilayered sheet of neural tissue that lines the inner wall of the posterior eye; it is comparable to the film in a camera. Retinitis refers to inflammation of the retina (Figure 3). The outer surface of the retina is apposed to the retinal pigment epithelium, while the inner surface is apposed to the vitreous. There are nine anatomically defined layers of neurosensory retina. The outer retinal layers receive blood from the choriocapillaris (ie. the choroid), while the inner retina receives its blood supply from branches of the central retinal artery. The retina contains rods and cones that are photoreceptor cells that respond to light. Neural signals from the retina are transmitted to the CNS by the optic nerve.

The vitreous is a transparent, avascular, gelatinous structure that occupies two-thirds of the volume and weight of the eye. It is attached to the anterior peripheral retina and around the optic nerve by a fine scaffolding of collagenous fibers. The vitreous is 99% water and 1% collagen and hyaluronic acid which give the vitreous its gel-like consistency. The vitreous provides structural support to the eyeball while offering a clear path to the retina. Phagocytic cells in the vitreous serve to remove debris in the visual field.

Ureitis is inflammation of the uveal tract is referred to as uveitis, and may involve one or all three portions of the uvea (iris, ciliary body, choroid). Infections involving uveitis include bacteria (brucellosis, leptospirosis, Lyme disease, syphilis, tuberculosis), parasites (toxomplasmosis, toxocaria viruses, (Herpesviruses) and fungi (histoplasmosis). In most intraocular infections the uveal tract is involved.

Endophthalmitis is reserved for describing a panophthalmic infectious or inflammatory process. Infectious endophthalmitis can be caused by either exogenous or endogenous microbial contamination of intraocular tissues. Exogenous endophthalmitis usually occur from penetrating injury to the eye. This includes trauma or surgical procedures in which microorganisms are introduced into the eye during surgery by instruments, fluids and foreign materials.

In contrast, endogeneous endophthalmitis is principally the result of hematologic dissemination of microorganisms from a distant focus of infection into the eye. Endogenous endophthalmitis likely starts by hematogenous spread of the microorganism to the choroid followed by contiguous spread to the adjacent retina. The high blood flow to the choroid and outer retinal layers (150 mm/s), compared to a lower flow to the inner retinal layers (25 mm/s), make this tissue vulnerable to both infections.

Diagnosis

The definitive diagnosis of endophthalmitis is established by culture of the aqueous and/or vitreous fluids. Aqueous fluids can be obtained at the bedside or in the examining room using the slit lamp. With the use of topical anesthetic, a 27 or 30-gauge needle can be passed through the peripheral cornea at the limbus into the anterior chamber to withdraw aqueous fluid.

Vitreous fluid sample can also be obtained in the examining room or in the operating room using a 27- gauge needle introduced at the pars plana to withdraw vitreous fluid. The pars plana is the anatomic region of the choroid without overlying retina. A needle passed through the pars plana should not perforate retina thereby avoiding risk of retinal puncture and retinal detachment. A vitreous sample is routinely obtained during pars plana vitrectomy when surgical intervention for endophthalmitis is indicated. Vitrectomy has the advantage of producing a larger sample volume, debulking the vitreous of toxic inflammatory and microbial products, and releasing traction on the retina.

Aqueous and vitreous fluid samples should be plated on blood agar, chocolate agar, Sabouraud dextrose agar, thioglycollate broth, and anaerobic medium. In addition, Gram and Giemsa stains should be performed routinely on clinical samples. The remainder of the specimen, should be mixed with an equal volume of 95% alcohol and submitted for pathological study. When available, the PCR methods can provide rapid identification of the infecting organism in these samples.

Figure 1. Anatomy of the eye.

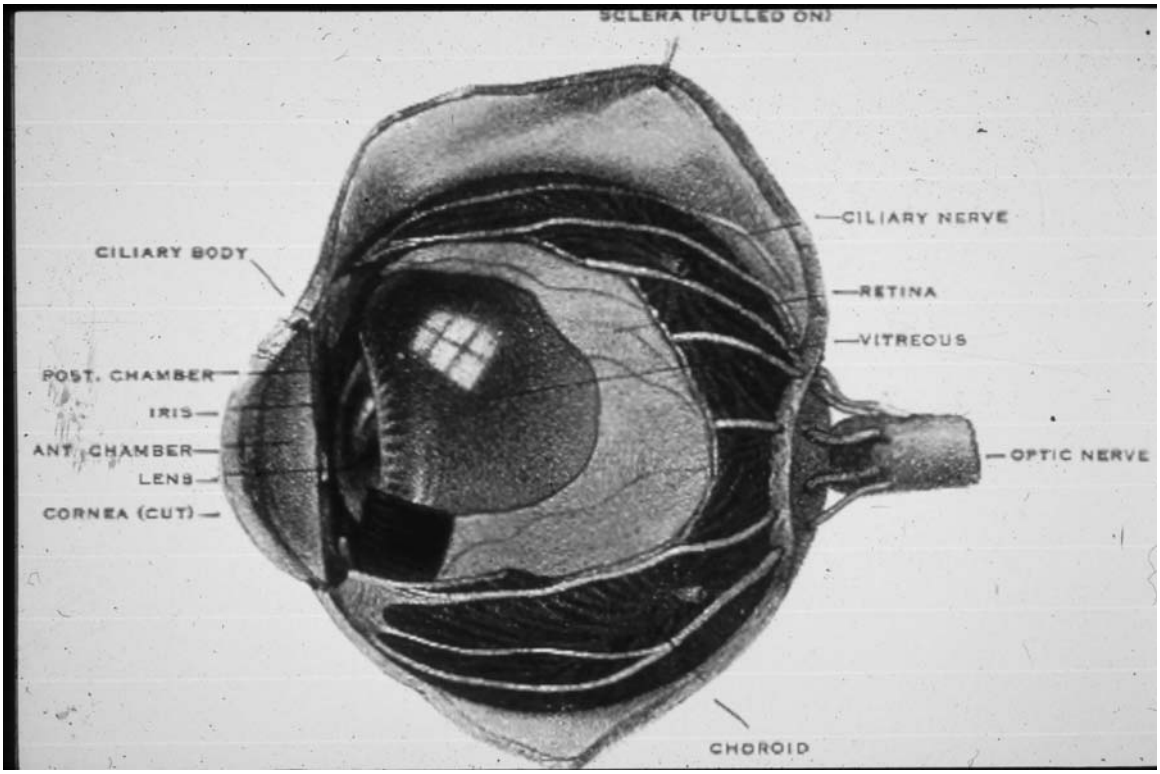

Figure 2. Anatomy of the eye

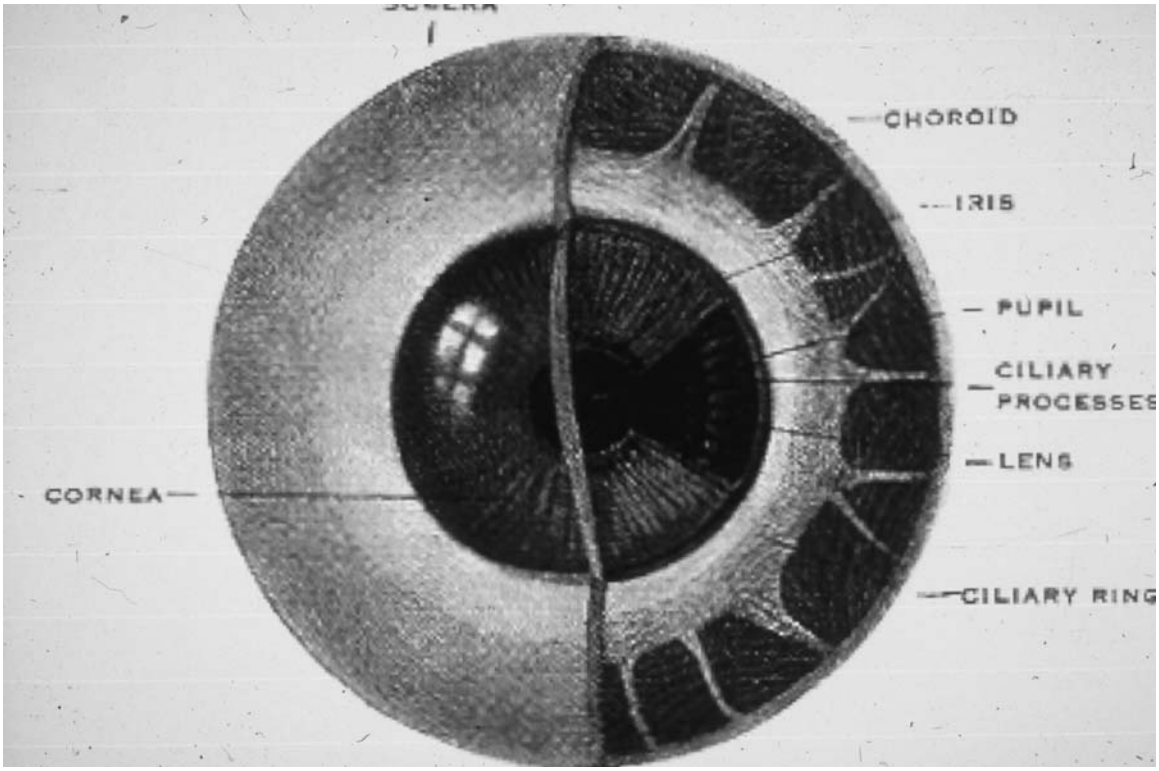

Figure 3. *Candida* chorioretinitis. Note the creamy white appearance of the retinal infiltrate. Loss of retinal vasculature indicative of retinitis. No vitritis is present in this case.