o Aggregates of macrophages on the endothelium in sarcoid produce characteristic “mutton-fat” keratic precipitates.

• Presence of exudate in the anterior chamber can facilitate the formation of adhesions between the iris and the trabecular meshwork or cornea (anterior synechiae) or between the iris and anterior surface of the lens (posterior synechiae)
  o Anterior synechiae → elevation in intraocular pressure → optic nerve damage
  o Prolonged contact between the iris and the anterior surface of the lens can deprive lens epithelium of contact with aqueous humor and can induce fibrous metaplasia of the lens epithelium: anterior subscapular cataract

• Endophthalmitis – inflammation within the vitreous humor
  o Suppurative inflammation in the vitreous humor is poorly tolerated by the retina → cause irreversible retinal injury
  o Exogenous (originating in the environment and gaining access to the interior of the eye through a wound) or endogenous (delivered to the eye hematogenously)

• Panophthalmitis is applied to inflammation within the eye that involves the retina, choroid, and sclera and extends into the orbit

Sequela of anterior segment inflammation. This eye was removed for complications of chronic corneal inflammation (not visible at this magnification). The exudate (e) present in the anterior chamber would have been visualized with a slit lamp as an optical “flare”. The iris is adherent focally to the cornea obstructing the trabecular meshwork (anterior synechia, arrow), and to the lens (posterior synechiae, arrowheads). An anterior subscapular cataract (asc) has formed. The radial folds in the lens are artifacts.

Figure 29-13 Exogenous Panophthalmitis.
  • Suppurative inflammation behind the lens that is drawn up to the right of the lens to the cornea, the site of the wound. The central portion of the vitreous humor was extracted surgically (by vitrectomy)
  • Adhesions to the surface of the eye at the 8 o’clock position, indicating that the intraocular inflammation has spread through the sclera into the orbit: panophthalmitis.

Uvea
Together with the iris, the choroid and ciliary body constitute the uvea. The choroid is among the most richly vascularized sites in the body.

Uveitis
• Any type of inflammation in one or more of the tissues that compose the uvea
  • Diverse group of chronic diseases that may be either components of a systemic process or localized eye
  • Manifest principally in the anterior segment (e.g., in juvenile rheumatoid arthritis) or may affect both the anterior and posterior segments.
  • May be caused by infectious agents (e.g., Pneumocystis carinii), may be idiopathic (e.g., sarcoidosis), or may be autoimmune in origin (sympathetic ophthalmia)
  • Granulomatous uveitis
    o Common complication of sarcoidosis
    o Anterior segment: exudate that evolves into “mutton-fat” keratic precipitates
    o Posterior segment: sarcoid may involve the choroid and retina
    o Granulomas in the choroid
    o Retinal pathology: perivascular inflammation; responsible for the well-known ophthalmoscopic sign of “candle wax drippings.”
    o Conjunctival biopsy
• **Malignant Hypertension** – vessels in the retina and choroid may be damaged
  o *Elschnig spots* – focal choroidal infarcts
  o Damage to the choriocapillaris (internal layer of the choroidal vasculature) → damage the overlying RPE and permit the exudate to accumulate in the potential space between the neurosensory retina and the RPE → retinal detachment.
  o Exudate from damaged retinal arterioles → accumulates in the outer plexiform layer of the retina
  o **Macular star** – a spoke-like arrangement of exudate in the macula in malignant hypertension—results from exudate accumulating in the outer plexiform layer of the macula that is oriented obliquely
  o Occlusion of retinal arterioles may produce **infarcts** of the nerve fiber layer of the retina
  o Axoplasmic transport in the nerve fiber layer is interrupted at the point of axonal damage, and accumulation of mitochondria at the swollen ends of damaged axons creates the histologic illusion of cells (**cytoid bodies**).
  o Collections of cytoid bodies populate the nerve fiber layer infarct, seen ophthalmoscopically as "**cotton-wool spots**".

• **Diabetes Mellitus**
  • Effects of hyperglycemia on the lens and iris
  • Thickening of the basement membrane (impede blood flow leading to DM retinopathy) of the epithelium of the pars plicata of the ciliary body
    o Reminiscent of similar changes in the glomerular mesangium
  • **Morphology:** Classified into non-proliferative and proliferative diabetic retinopathy.

  • Non-proliferative diabetic retinopathy includes a spectrum of changes resulting from structural and functional abnormalities of retinal vessels
    • Basement membrane of retinal blood vessels is **thickened**
    • Number of pericytes relative to endothelial cells diminishes
    • **Microaneurysms** – smaller than the resolution of direct ophthalmoscopes, findings customally described as microaneurysms by ophthalmoscopy may in fact be **retinal microhemorrhages**
    • Structural changes in the retinal microcirculation have been associated with a physiologic **breakdown in the blood-retinal barrier**
      • VEGF was initially called **vascular permeability factor**
      • Retinal microcirculation in diabetes may be leaky, giving rise to **macular edema**, a common cause of **visual loss in these patients**.
      • Vascular changes may also produce **exudates** that accumulate in the **outer plexiform layer**
        o Also subject to the effects of micro-occlusion
        o **Nonperfusion** of the retina due to the microcirculatory change described earlier is associated with up-regulation of VEGF and **intra-retinal angiogenesis** (located beneath the internal limiting membrane of the retina).
  • **Proliferative diabetic retinopathy** – appearance of new vessels sprouting on the surface of either the optic nerve head (termed "**neovascularization of the disc**") or the surface of the retina ("designated by the nebulous term neovascularization elsewhere")
    • More neovascularization, more prone to hemorrhage because of less integrity of the new blood vessels
    • "**Retinal neovascularization**" – only applied when the newly formed vessels **break the internal limiting membrane of the retina**.
    • Quality and location of the neovascularization guide the treatment.
    • **Neovascular membrane**: web of newly formed vessels

• **Silver**
• **Exudates and blood clots**
• **Blurring of macula**