Aging is accompanied by not only a decrease in visual function but also an increase in the incidence of ocular disease. The lens becomes yellow and increases in translucency, and the pupil becomes smaller. The decrease in vision with age, however, is due to more than just a decrease in the intensity of the light reaching the retina. Quantitative decreases in the various visual functions have been demonstrated, including dark adaptation and visual fields.

The increase with age in many disease processes includes cataracts, parasites, and trachoma; in advanced societies, blindness is primarily due to diabetes, glaucoma, and age-related macular degeneration (AMD). We do not know the pathogenesis of these latter three diseases or, for that matter, the real cause of cataracts.

The Aging Eye

There are a number of changes that take place as the eye ages, in addition to the serious diseases that affect the eye as it grows older. Functionally, as one becomes elderly, one’s vision decreases. This is due to a decrease in the translucency of the human lens and a decrease in the size of the pupil so that less light enters the eye. It is interesting to note that a decrease in the size of the pupil (miosis) to some degree compensates for the loss of near vision (accommodation) that accompanies aging. It is not known if the aged eye is less efficient, but some patients with clear artificial lenses and dilated pupils do have a decrease in their visual acuity. Indeed, about 15% of people over age 70 will have slightly reduced visual acuity. This may be due to central processing problems, but there are no definitive studies. The visual field appears to constrict as one becomes elderly. Further, contrast sensitivity, which is tested with alternating light and dark bars of various widths and contrast, also appears to decrease.

The elderly experience a loss of their accommodation, thus requiring reading glasses. It is beyond the scope of this chapter to discuss the various theories of this loss of accommodation, but the cause is still being debated after hundreds of years of study.

There are a number of structural changes that take place as the eye ages. The orbital fat decreases, resulting in slightly sunken orbits (enophthalmos). Although there is less orbital fat, what there is may prolapse, creating “bags” that are especially prominent beneath the eyes (Fig. 45.1). The skin of the lids loses its firmness and, in the case of the upper lid, may hang over and rest on the lashes and cause the lid to fall (pseudoptosis), decreasing the size of the palpebral fissure (Fig. 45.1). Because the lids are flaccid, they may turn in (entropion) and the lashes may touch the cornea, causing irritation. The lids may also turn away from the globe (ectropion) contributing to the dryness of the eye that is normally present in the elderly. Moreover, the flaccid lids no longer help remove the tears from the eye, so that although there is less fluid, what there is may run out of the eye resulting in tearing. The skin of the lids shows wrinkles at the temporal margin (crow’s feet). The elderly also have difficulty looking up, although the reason is not known.

The cornea may acquire a ring of peripheral lipid deposits (arcus senilis), identified by a clear area between the ring and the sclera (Fig. 45.2). Corneal sensation decrease, and the cornea loses some of its transparency. The corneal curvature changes, with the irregularity shifting from a positive vertical axis of 90° to a horizontal axis of 180°. The conjunctiva thins and may develop folds and, together with the underlying sclera, takes on a yellowish hue. The anterior chamber, demarcated by the back of the cornea and the iris, becomes shallow. As will be seen later, this may be one of the precipitating elements in the development of angle closure glaucoma. The iris stroma atrophies and there is a loss of pigment. The pupil dilates less well with pharmacologic agents.
The lens develops a yellowish color in its center (nucleus). There is also an increase in myopia caused by the lens changes. The vitreous body contained in the vitreous cavity behind the lens undergoes degenerative changes and develops floating bodies that may be noticed by the patient. The vitreous liquefies and detaches from the optic disk and retina, moving forward (Fig. 45.3). The vitreous may tug on the retinal periphery, and the patient experiences bright flashes of light. The glistening sheen of the young retina disappears and is replaced by a dull reflection. The arteries lose their bright light reflex, and the choroidal vessels are more easily seen as the surrounding pigment atrophies. Small deposits appear deep in the retina that herald the beginning of retinal degeneration.

Presbyopia

Usually by 45 years of age, individuals find it increasingly difficult to focus on near objects. Although their distant vision is entirely normal, they report a blurring of their vision. The problem is that their lenses no longer adapt for close vision, and thus they are optically blurred. This loss of lens power or accommodation for near vision is called presbyopia and increases with advancing age. Indeed, it is possible to determine an individual’s age quite precisely by measuring their amplitude of accommodation. The symptoms first become apparent during reading and worsen gradually with advancing age. By age 60, there is only about one diopter of accommodation left. This means that a patient with otherwise normal vision for distance must hold material at least a meter away to see it clearly. The treatment is straightforward with the use of a convex lens, but many patients still complain because they have lost their amplitude of accommodation. This means that for clear vision they must hold material a precise distance from their eyes and any variation in position results in blurring. Indeed, it is this loss of amplitude that seems to irritate the elderly patient more than the fact that they require spectacles to see near objects.

There are many causes of loss of accommodation besides aging. The main one is probably the administration of a cycloplegic drug. Other causes include trauma, brain-stem lesions, III nerve involvement, ocular inflammation, and glaucoma.

Treatment of these conditions is directed to the cause. There have been many theories about how the lens ac-