

Examination of the living human retina provides a unique opportunity for the direct study of nervous, vascular, and connective tissues. Many systemic disorders have retinal manifestations that are valuable for screening, diagnosis, and management of these conditions. Furthermore, retinal involvement in systemic disorders, such as diabetes mellitus, is a major cause of morbidity. Early recognition by ophthalmoscopic screening is a key factor in effective treatment. Ophthalmoscopy has the potential to be one of the most “high-yield” elements of the physical examination. Effective ophthalmoscopy requires a basic understanding of ocular structures and ophthalmoscopic techniques and recognition of abnormal findings.

OVERVIEW OF OCULAR STRUCTURES

The eye consists of a shell (cornea and sclera), lens, iris diaphragm, ciliary body, choroid, and retina. The anterior chamber is the space between the cornea and the lens, and it is filled with aqueous humor. The space between the posterior aspect of the lens and the retina is filled by vitreous gel. The choroid and the retina cover the posterior two-thirds of the sclera internally. The cornea and the lens form the focusing system of the eye, while the retina functions as the photoreceptor system, translating light to neuronal signals that are in turn transmitted to the brain via the optic nerve and visual pathways. The choroid is a layer of highly vascularized tissue that nourishes the retina and is located between the sclera and the retina. The retinal pigment epithelium (RPE) layer is a monolayer of pigmented cells that are adherent to the overlying retinal photoreceptor cells. RPE plays a major role in retinal photoreceptor metabolism.

NORMAL FUNDUS

The important areas that are visible by ophthalmoscopy include the macula, optic disc, retinal blood vessels, and retinal periphery (Fig. 40e-1).

THE MACULA

The macula is the central part of the retina and is responsible for detailed vision (acuity) and perception of color. The macula is defined clinically as the area of the retina centered on the posterior pole of the fundus, measuring about 5 disc diameters (DD) (7–8 mm) and bordered by the optic disc nasally and the temporal vascular arcades superiorly and inferiorly. Temporally, the macula extends for about 2.5 DD from its center. The fovea, in the central part of the macula, corresponds to the site of sharpest visual acuity. It is approximately 1 DD in size and appears darker in color than the surrounding area. The center of the fovea, the foveola, has a depressed pit-like configuration measuring about 350 μm .

THE OPTIC DISC

The optic disc measures about 1.5 mm and is located about 4 mm (2.5 DD) nasal to the fovea. It contains the central retinal artery and vein as they branch, a central excavation (cup), and a peripheral neural rim. Normally, the cup-to-disc ratio is less than 0.6. The cup is located temporal to the entry of the disc vessels. The normal optic disc is yellow/pink in color. It has clear and well-defined margins and is in the same plane as the retina (Fig. 40e-2). Pathologic findings include pallor (atrophy), swelling, and enlarged cupping.

THE EQUATOR AND PERIPHERAL RETINA

The equator of the fundus is clinically defined as the area that includes the internal opening of the vortex veins. The peripheral retina extends from the equator anteriorly to the ora serrata.

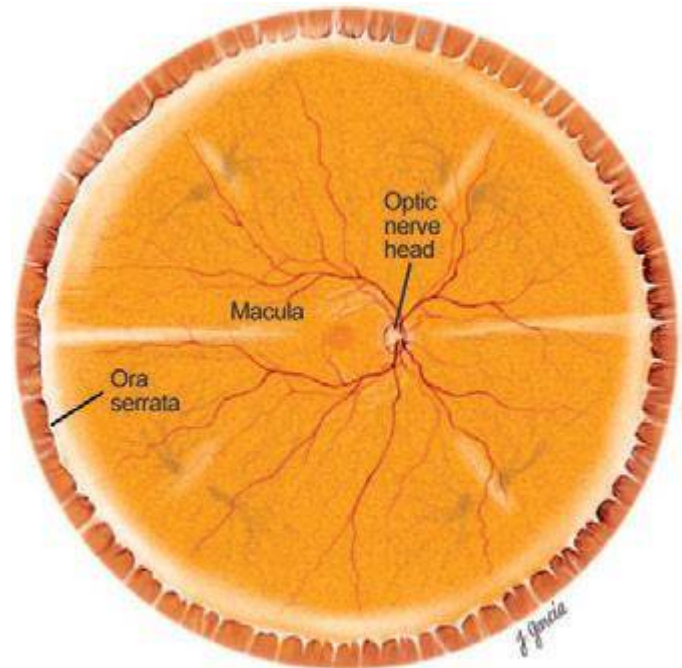


FIGURE 40e-1 Diagram showing the landmarks of the normal fundus. The macula is bounded by the superior and inferior vascular arcades and extends for 5 disc diameters (DD) temporal to the optic disc (optic nerve head). The central part of the macula (fovea) is located 2.5 DD temporal to the optic disc. The peripheral fundus is arbitrarily defined as the area extending anteriorly from the opening of the vortex veins to the ora serrata (the juncture between the retina and ciliary body). (Drawing courtesy of Juan R. Garcia. Used with permission from Johns Hopkins University.)



FIGURE 40e-2 Photograph of a normal left optic disc illustrating branching of the central retinal vein and artery, a physiologic cup, surface capillaries, and distinct margin. The cup is located temporal to the entry of the disc vessels. (From H Tabandeh, MF Goldberg: *Retina in Systemic Disease: A Color Manual of Ophthalmoscopy*. New York, Thieme, 2009.)