Computer-based digital imaging of the ONH, RNFL, and macula is routinely used to provide quantitative information to supplement the clinical examination of the optic nerve. Some patients demonstrate structural alterations in the ONH and the macular and parapapillary RNFL before functional change occurs. In many, but not all, cases, computerized imaging may be useful to distinguish between glaucomatous and nonglaucomatous RNFL thinning, based on the presence or absence of progression, respectively.[293-295] There are three types of computer-based optic nerve imaging devices that have been used to evaluate glaucoma: confocal scanning laser ophthalmoscopy, OCT, and scanning laser polarimetry. The versions of these devices that were studied in a systematic review were similar in their ability to distinguish glaucomatous eyes from control eyes.[242, 296-298]

Abnormal results (i.e., results outside of the normative range) from these devices do not always represent disease.[299] Criteria used to establish normative databases vary between different imaging devices, and a nerve or RNFL may fall outside normative ranges for reasons other than glaucoma. Their interpretation should include an evaluation of all components of the report and not just their summary statistics, after an adequate assessment of scan quality is performed. Some individual disc findings will not fall into the normative database that is used to establish abnormality, and results should be interpreted cautiously. Therefore, results from these tests must be interpreted in the context of the clinical examination and other supplementary tests in order to avoid falsely concluding that a statistically abnormal result on any quantitative imaging study represents true disease.[300] As these instruments continue to improve, they may become more reliable in helping the clinician diagnose glaucoma and to identify progressive nerve damage.[293-295] Furthermore, progression analysis programs for computer-based imaging devices are evolving to better detect optic nerve, RNFL, and macular imaging changes that may be secondary to glaucoma.[301, 302]

Because some patients show visual field loss without corresponding optic nerve progression,[8, 301-305] both structural and functional assessments remain integral to patient care. Even though quantitative imaging technology is approved as an adjunct to aid in glaucoma diagnosis, the clinician should include all perimetric and other structural information when formulating patient management decisions.[286] As device technology evolves (e.g., specific reference databases, higher resolution spectral domain OCT), the performance of diagnostic imaging devices is expected to improve accordingly.

Differential Diagnosis

Glaucoma is a chronic, progressive optic neuropathy associated with several risk factors, including IOP, that contribute to damage. The characteristic acquired atrophy of the optic nerve and loss of retinal ganglion cells and their axons can result in progressive visual field loss. Other entities associated with optic disc damage or abnormalities of the visual field should be considered prior to confirming the diagnosis of glaucoma. These nonglaucomatous diseases (and examples) are categorized as follows:

- Optic disc abnormalities
  - Anterior ischemic optic neuropathies
  - Optic nerve drusen
  - Myopic tilted optic nerves
  - Toxic optic neuropathies
  - Congenital disc anomalies (e.g., congenital pit, coloboma, periventricular leukomalacia in prematurity, morning glory syndrome)
  - Leber hereditary optic neuropathy and dominant optic atrophy
  - Optic neuritis
- Retinal abnormalities
  - Age-related macular degeneration