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GDx Guide

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GDx Guide

Description
A basic guide of GDx images and analysis of various optic nerve conditions including glaucoma. This guide serves as a reference for interns and doctors, and well as a resource for students.

Keywords
GDx, glaucoma, nerve fiber layer, retina, NFI, polarimetry

Disciplines
Optometry

Comments
This guide was a student Master of Science in Vision Science project by Pacific University College of Optometry (COO) students David Glabe (2012) and Brandon Reed (2012), under the supervision and contributions/edits of COO faculty Dr. Lorne Yudcovitch.

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GDx

A Clinician’s Guide to Scan Interpretation

by

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The GDx is unique among instruments utilized in the diagnosis and management of glaucoma and other nerve fiber disorders. This device takes advantage of the polarization properties of retinal nerve fiber layer (specifically the microtubules within each retinal nerve fiber) to acquire an indirect measure of the thickness of the retinal nerve fiber layer. The GDx is termed a scanning laser polarimeter due to its use of lasers and specialized receptors to determine polarization of retinal tissues.

To the clinician, the GDx offers a powerful tool in managing a variety of conditions that affect the nerve fiber layer, including glaucoma, multiple sclerosis (M.S.), and optic disc drusen. The instrument offers statistical analysis based on a normative database of an individual’s relative nerve fiber layer thickness. In addition, comparisons may be made between eyes of the same individual, and on the same eye over a period of time by incorporating data from different scans termed serial analysis.

A standard GDx scan gives a fundus image, a nerve fiber thickness map, and a deviation map from normal, as well as TSNIT parameters that allow comparison of NFL quadrants within an eye and a measure of inter-eye asymmetry. A graph is created affording visualization of the patient’s nerve fiber thickness compared to a normal thickness distribution. Color coding is used to indicate thicker or thinner areas of the NFL.

This guide is intended to give a brief overview of some common conditions for which GDx imaging may prove useful, as well as examples of scans characteristic of the conditions.
A normal nerve fiber layer (NFL) on GDx scan appears similar to the image below, with no statistically significant thinning of the NFL and a Nerve Fiber Indicator (NFI) number less than 30. The NFI ranges from 0 (thick NFL) to 99 (severely thin NFL).
Advanced glaucoma is characterized by statistical significance of nerve fiber layer thinning on GDx scan, often accompanied by a Nerve Fiber Indicator number of >30 in either eye and poor inter-eye asymmetry. Both are seen in this scan of a patient with severe visual field loss secondary to advanced glaucoma.
Optic Disc Drusen

NFL thinning on GDx scan may be seen secondary to optic disc drusen, and can prove difficult to distinguish from glaucomatous NFL thinning based on GDx imaging alone. GDx scans are helpful in following progression of NFL loss that may correlate to visual field abnormalities in patients with optic disc drusen.
A malinserted optic nerve head, as seen on the right eye of this scan, may cause artificially false readings on GDx analysis due to abnormal heaping of the nerve fibers exiting the eye. A more normal appearance is often achieved if the bottom image is visually "shifted" to the right or left by the clinician. (OS removed for clarity)
Myelinated Nerve Fibers

Myelination of the nerve fibers, as seen in the left eye of this patient, may result in abnormal NFL estimates on GDx analysis due to polarization effects of light incident on myelinated vs. unmyelinated nerve fibers. Use caution when interpreting these scans. (OD removed for clarity)
Chronic Optic Neuritis

Optic neuritis secondary to diseases such as M.S. as seen in this scan, may result in thinning of the NFL, as evident on GDx scan. GDx is a powerful tool in monitoring the nerve fiber layer of these patients, particularly in chronic or recurrent cases.
The ability of the GDx to perform serial analysis of images taken over a period of time is one of the most useful features of the instrument. Serial analysis allows statistical comparison between readings for a more complete view of changes in the nerve fiber layer and is indispensible for following patients with chronic or recurrent disease. In the example below, the patient has remained stable for over seven years.