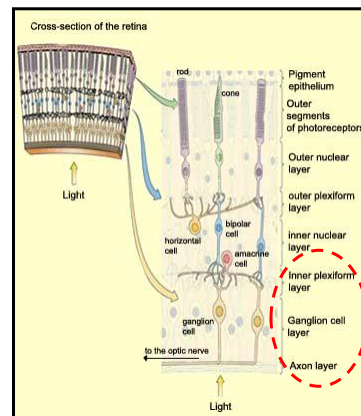


Role of Ganglion Cell Complex (GCC) in Evaluation of Glaucoma

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- **Retinal ganglion cells encompass three layers in the retina:**
 - **The retinal nerve fiber layer (NFL)**
 - Made up of the ganglion cell axons,
 - **The ganglion cell layer (GCL)**
 - Made up of the ganglion cell bodies,
 - **The inner-plexiform layer (IPL)**
 - Made up of a network of axons and dendrites from ganglion cells, bipolar cells, and amacrine cells

All three layers, collectively known as the ganglion cell complex (GCC)



- Loss of the retinal ganglion cells and their axons is known to occur in the posterior pole, where these cells may constitute 30% to 35% of the retinal thickness in the macular region

Zeimer et al., 1998

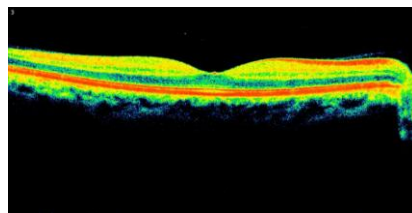
- Approximately 50% of retinal ganglion cells are located in the macular region 4 to 5 mm from the center of the fovea with the peak density occurring 750 to 1100 μm from the foveal center where the cell density may be 4 to 6 cell bodies thick

Wässle H et al., 1989

Curcio CA et al., 1990

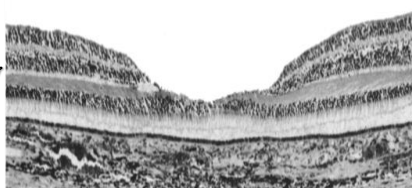
Normal Macular Architecture

**OCT
Section**



250 μm

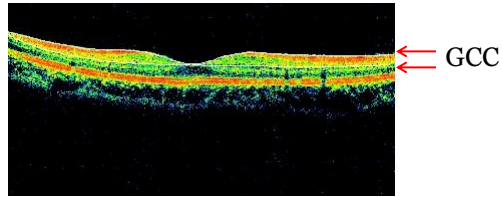
**Histopathology
Section**



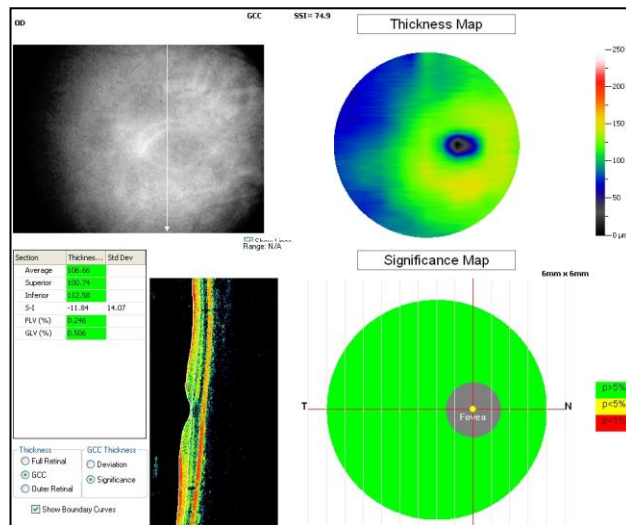
ILM / NFL
GCL
IPL
INL
OPL
ONL
IS/OS PR
PL
RPE
Choriocapillaris
and Choroida

Gass J.D.M., 1997

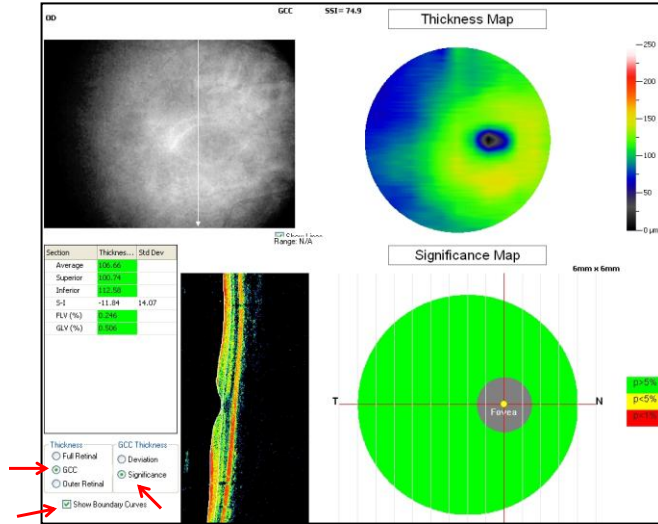
Area of Concern



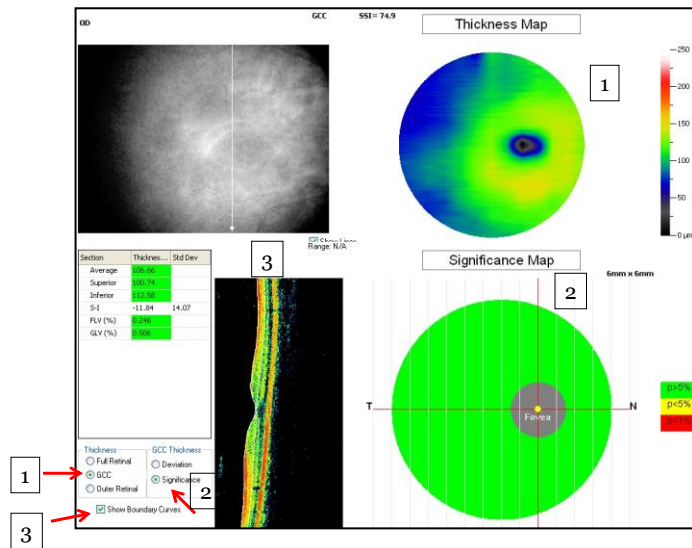
OCT and GCC



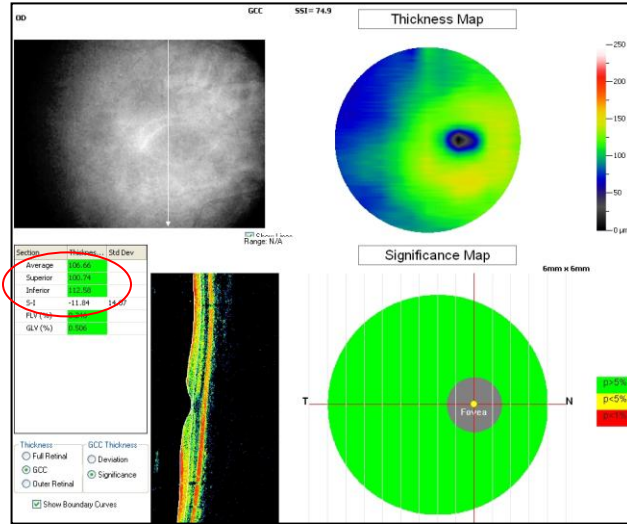
OCT and GCC



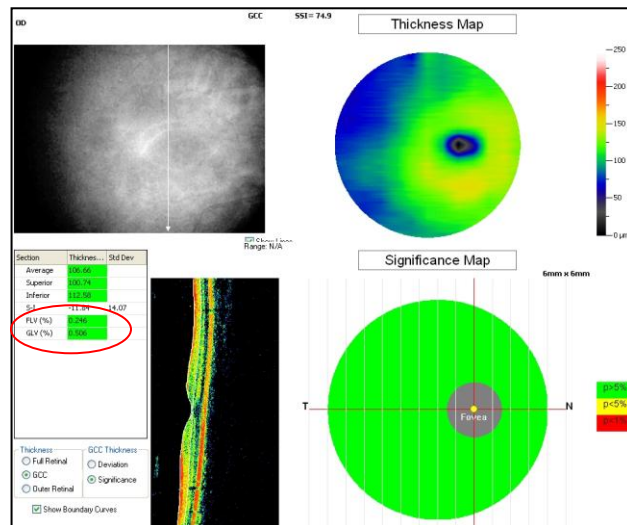
OCT and GCC



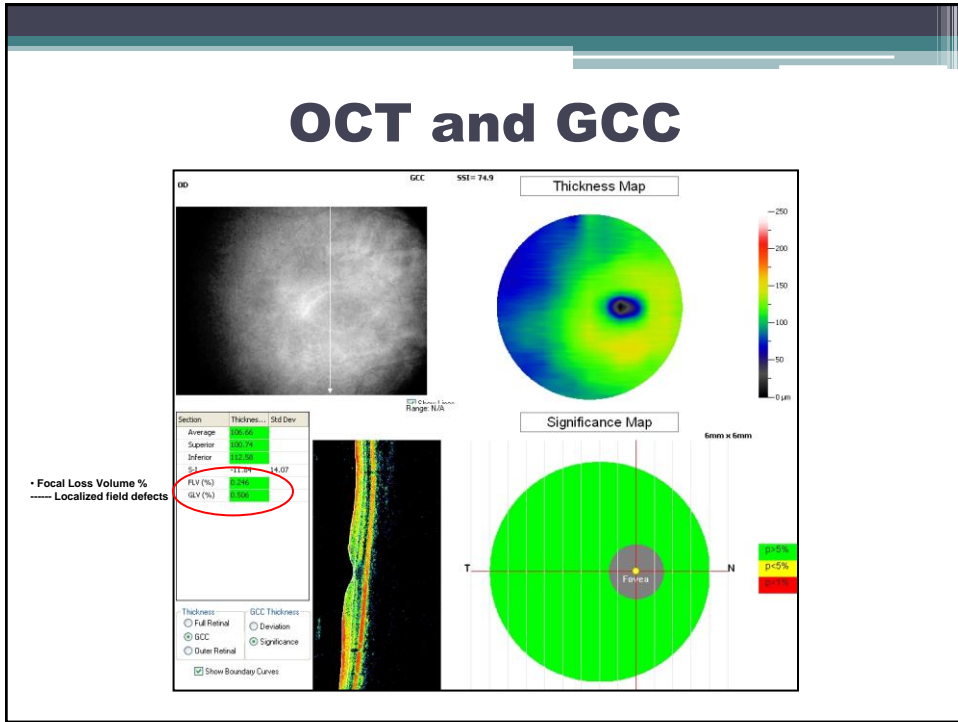
OCT and GCC



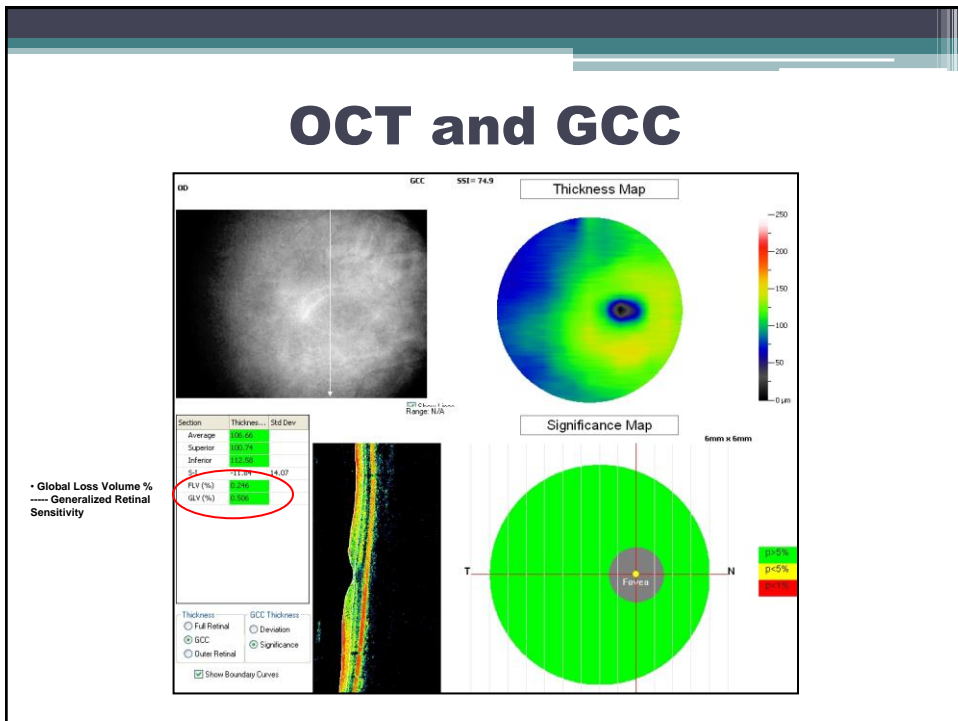
OCT and GCC



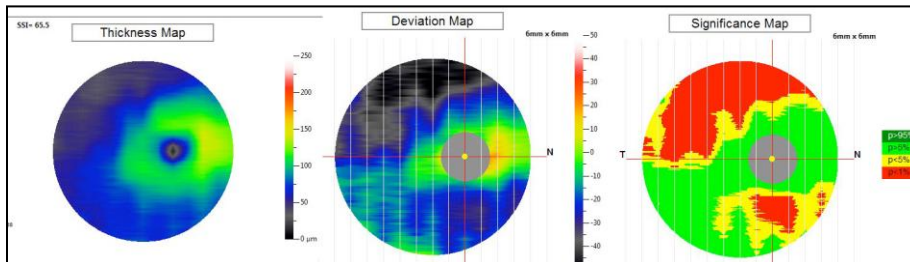
OCT and GCC



OCT and GCC



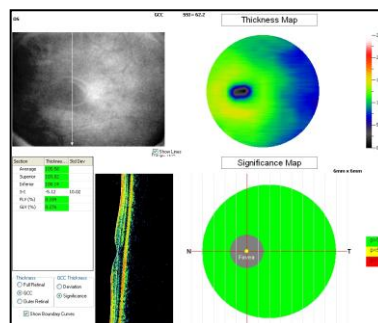
Maps obtained



The Deviation Map

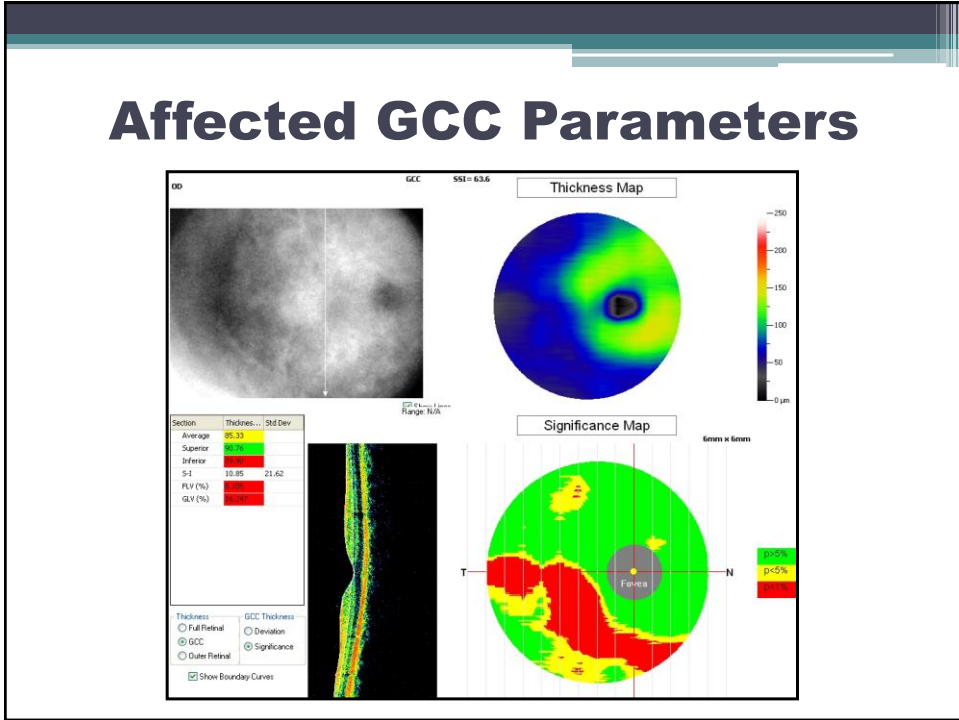
- Shows the **percent loss from normal** as determined by the normative database
- Map is calculated by taking the actual value from a scan at each pixel location in the map, subtracting the normal value, and then dividing that by the normal value
- The result is a **percent loss value at each pixel location** in the map
- The map is color coded where **blue** represents GCC thinning from **20-30%** relative to normal. **Black** coloring in the Deviation Map represent a **50%** loss or greater, relative to an age-matched normal

Normal GCC Parameters

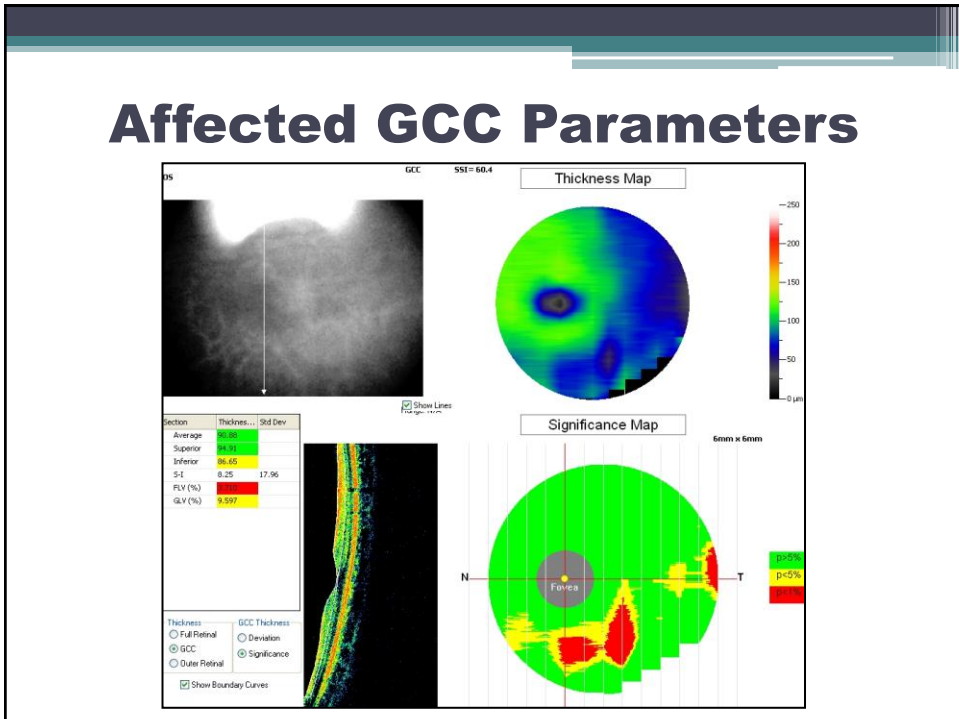


- The thickness map is color coded where thicker regions are displayed in hot colors (yellow & orange), and thinner areas are displayed in cooler colors (blue & green)
- The GCC map for a normal eye shows a bright circular band surrounding the macula representing a thick GCC from healthy ganglion cells

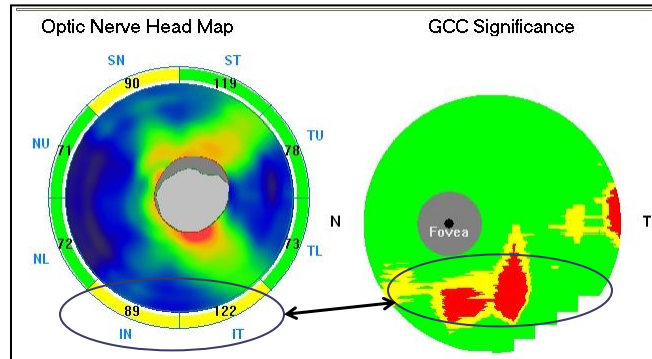
Affected GCC Parameters



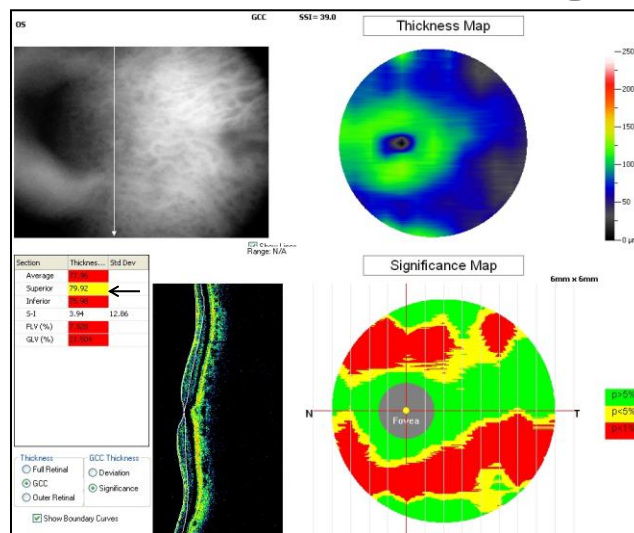
Affected GCC Parameters



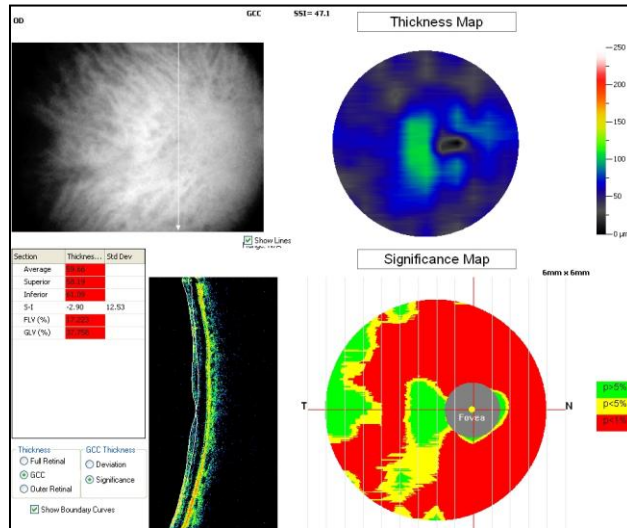
Relation between GCC thickness and RNFL thickness



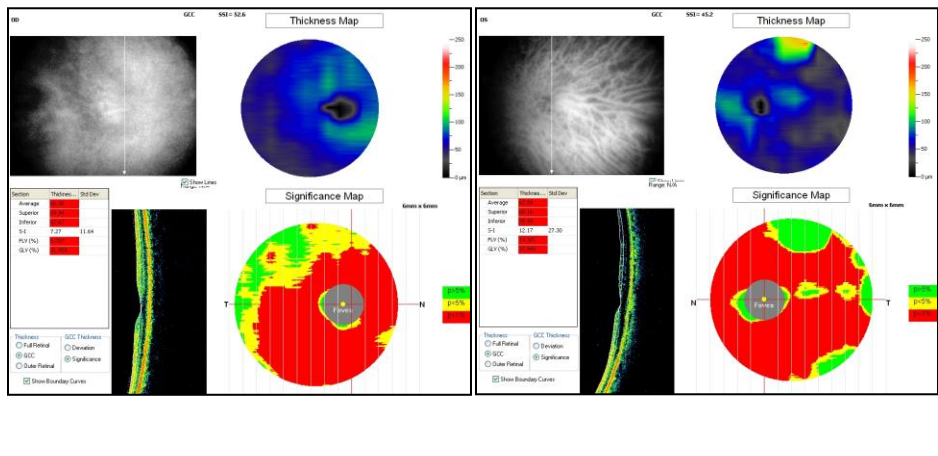
Severe GCC damage

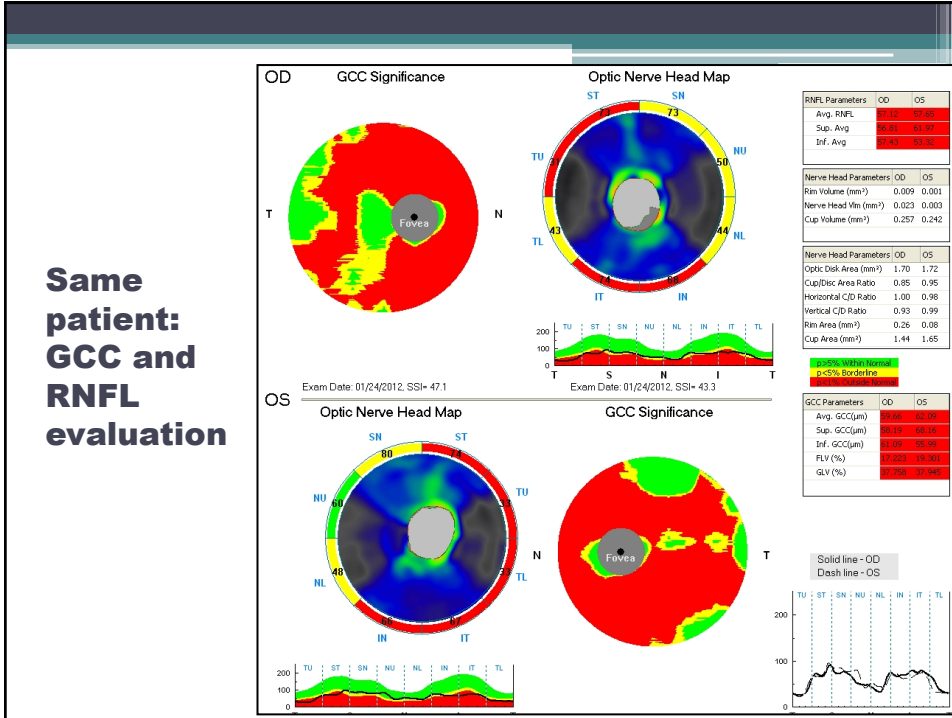


Severe GCC damage

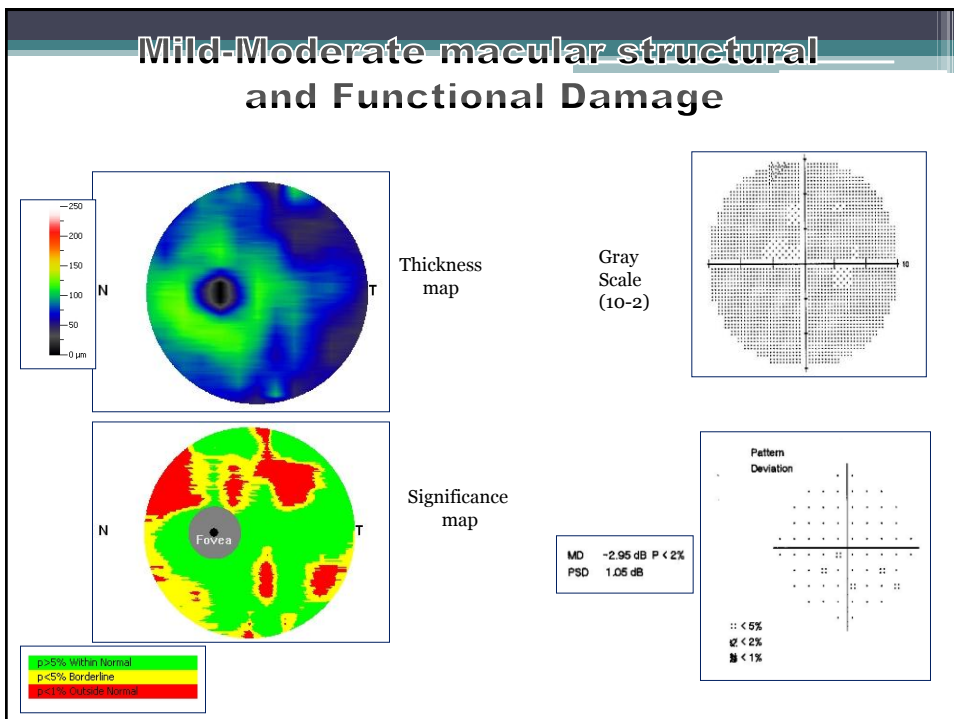
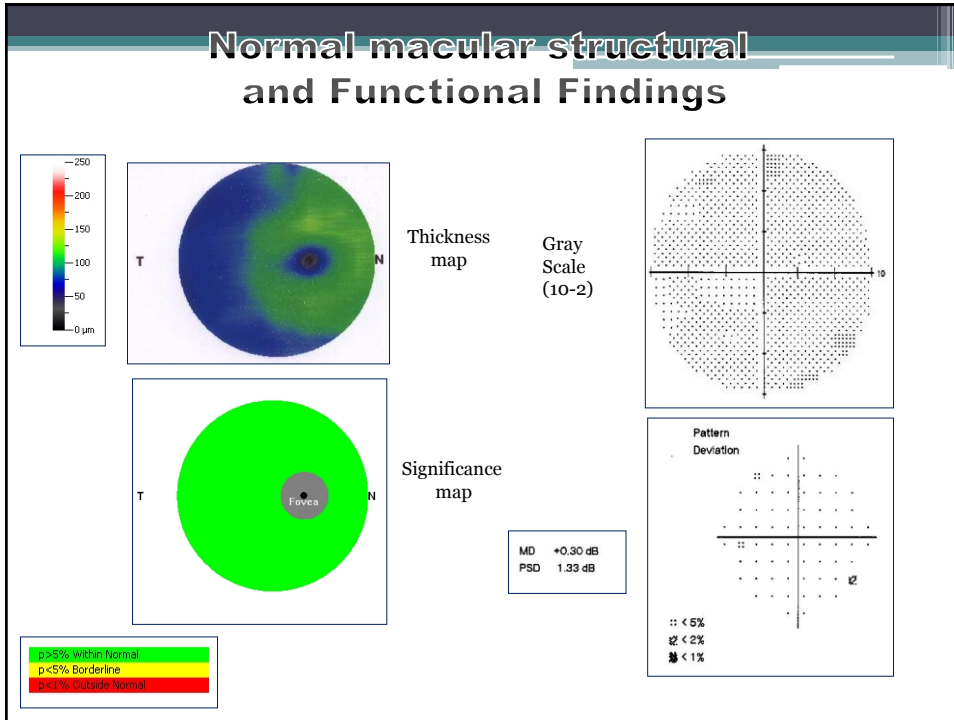


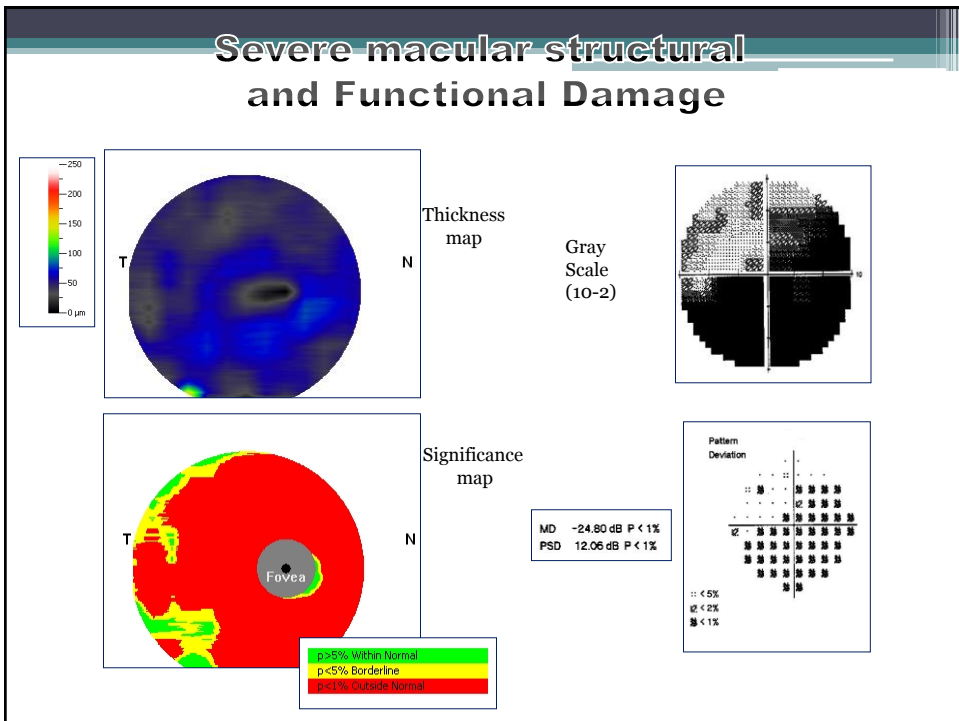
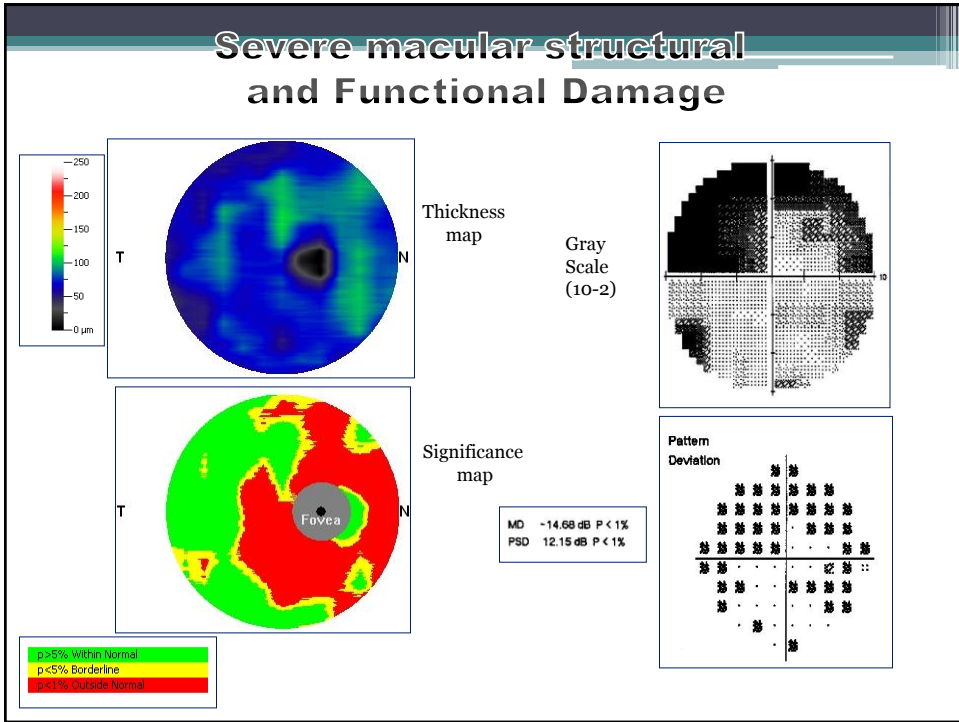
Severe GCC damage



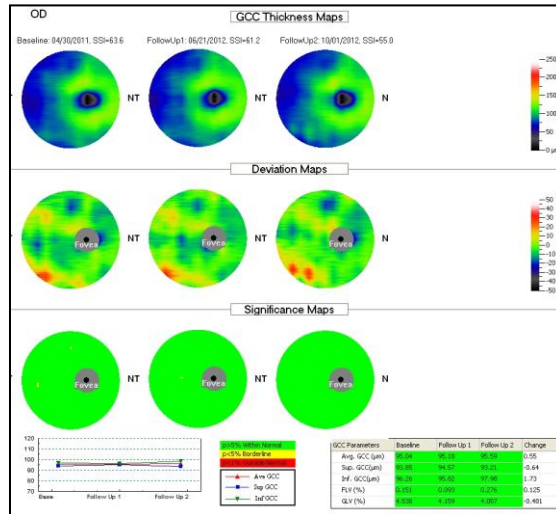


Verification of Structural Damage of GCC

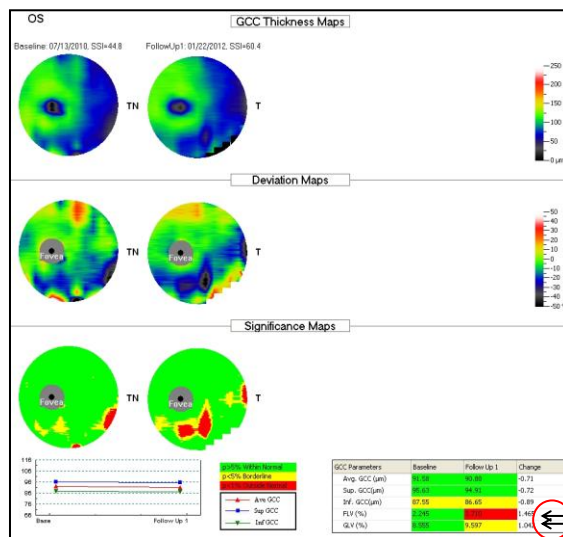




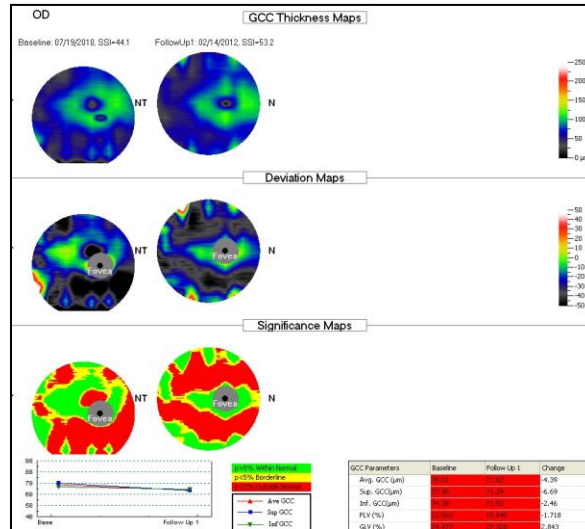
Follow-up of GCC parameters



Follow-up of GCC parameters



Follow-up of GCC parameters



Take-Home Message

- Ganglion Cell Complex status should be considered on evaluation of glaucoma patients
 - It would also explain the common complaint of the patient of un-satisfaction with the quality of BSCVA

- A significant correlation exists between GCC affection and RNFL findings
- The significant correlation between macular field affection and macular GCC thickness should drive the ophthalmologists' attention to the hazards of neglecting macular affection in glaucoma patients

Residual tubular field

