بسم الله الرحمن الرحيم
GDx Interpretation
A.Kargozar.MD
Khatam Eye Hospital
MUMS
Introduction

Normal methods of detecting glaucoma:
1. IOP measurement
2. Optic disc observation
3. Functional assessment: Visual field assessment
4. Structural assessment: Assess the structure of optic nerve and/or RNFL: By Imaging Instrument:
   - **GDX**: TM, VCC: Scanning Laser Polarimetry.
   - **HRT**: Confocal Scanning Ophthalmoscopy: Heidelberg Retinal Tomography
   - **OCT**: Optical Coherence Tomography.
   - **RTA**: Retinal Thickness Analyzer.
Introduction

• Changes in RNFL and optic nerve head may precede the VFD.
• In advanced glaucoma:
  1- Scanning computerized ophthalmic diagnostic imaging play at least prominent role.
  2– VF testing is more appropriate to assess disease progression.
**GDx**

- GDX evaluates the **site of damage** before the patients experience any vision loss.
- GDX is:
  - Simple to use and easy for both the patient and operator.
  - Near infra-red wavelength.
  - Measurement time is 0.7 seconds.
  - Total chair time less than 3 minutes for both eyes.
  - Undilated pupils work best.
  - Painless procedure.
  - Doesn’t require any drops.
  - Completely safe.
GDx

- The GDx:
  - maps the RNFL and compares them to a database of healthy, glaucoma-free patients.
  - Analyses the RNFL thickness around the optic disc
- Sensitivity of 89% and a specificity of 98%.

- GDx VCC is not intended to replace the more traditional methods of a standard clinical examination: measuring IOP, assessing the optic disc, and visual field testing.

- GDx VCC should be added to the standard clinical examination to compliment the information from these other methods.
GDx Printout

- Quantitative RNFL evaluation is provided through five key elements of printout:
  1. Fundus Image
  2. Thickness Map,
  3. Deviation Map,
  4. TSNIT graph,
  5. Parameter Table:
     - TSNIT Average.
     - Superior Average.
     - Inferior Average.
     - TSNIT Std SD.
     - Inter-eye Symmetry.
     - Nerve Fiber Indicator (NFI).
**GDx Printout**

**Fundus Image**
- The fundus image is useful to check for image quality:
- Every image has a Q score representing the overall quality of the scan.
- The Q ranges from 1-10, with values 8-10 representing acceptable quality.
- This score is based on a number of factors including:
  - Well focused,
  - Evenly illuminated,
  - Optic disc is well centered,
  - Ellipse is properly placed around the ONH.
**Thickness Map**

- The thickness map shows the RNFL thickness in a color-coded format from blue to red.
- **Thick RNFL** values are colored: Yellow, Orange, and Red.
- **Thin RNFL** values are colored: Dark blue, Light blue, and Green.

![Thickness Map Diagram]
**GDx Printout**

**Thickness Map**
An example of a healthy and a glaucomatous eye:

1- A healthy eye has:
   - Yellow and red colors in the superior and inferior regions representing thick RNFL regions.
   - Blue and green areas nasally and temporally representing thinner RNFL areas.

2- In glaucoma: RNFL loss will result in a more uniform blue appearance.

![Thickness Map Image]
GDx Printout

**Deviation Map**
- The deviation map reveals the location and magnitude of RNFL defects over the entire thickness map.
- Dark blue squares represent areas where the RNFL thickness is below the 5 percentile of the normative database.
- This means that there is only a 5% probability that the RNFL thickness in this area is within the normal range.
- Light blue squares represent deviation below the 2% level, yellow represents deviation below 1%, and red represents deviation below .05%.
GDx Printout

**TSNIT Map**
- TSNIT stands for Temporal-Superior-Nasal-Inferior-Temporal.
- TSNIT displays the RNFL thickness values along the calculation circle (0.4 mm wide).
- In a normal eye the TSNIT plot follows the typical ‘double hump’ pattern, with thick RNFL measures superiorly and inferiorly and thin RNFL values nasally and temporally.
- In a healthy eye, the TSNIT curve will fall within the shaded area (represents the 95% normal range for that age).
- When there is RNFL loss, the TSNIT curve will fall below this shaded area, especially in the superior and inferior regions.
**GDx Printout**

**Parameters Table** (TSNIT parameters)
- The TSNIT parameters are summary measures based on RNFL thickness values within the calculation circle (0.4 mm wide).
- Normal parameter values are displayed in green,
- Abnormal values are color-coded based on their probability of normality (The same as the Deviation Map).
GDx Printout

Parameters Table

- **TSNIT Average**: The average RNFL thickness around the entire calculation circle.
- **Superior Average**: The average RNFL thickness in the superior 120° region of the calculation circle.
- **Inferior Average**: The average RNFL thickness in the inferior 120° region of the calculation circle.
GDx Printout

Parameters Table

**TSNIT SD**: This measure captures the modulation (peak to trough difference) of the double-hump pattern

- A normal eye will have high modulation,
- A glaucoma eye will typically have low modulation.
- As a result, high modulation will have a high TSNIT SD value while low modulation will have low TSNIT SD value

<table>
<thead>
<tr>
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<th>CS Actual Vol</th>
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<tbody>
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<td>TSNIT Average</td>
<td>64.13</td>
<td>63.62</td>
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<tr>
<td>Superior Average</td>
<td>83.24</td>
<td>81.51</td>
</tr>
<tr>
<td>Inferior Average</td>
<td>79.37</td>
<td>73.96</td>
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<td>TSNIT Std. Dev.</td>
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**Inter-eye Symmetry:**
- **Measures the degree of symmetry between the right and left eyes.**
- Values range from –1 to +1
- Values near one represent good symmetry.
- Normal eyes have good symmetry with values around 0.9.
Example of **Inter-eye Symmetry**

- In a healthy eye there is good symmetry between the TSNIT graphs of the two eyes and the two curves will overlap.
- In glaucoma, one eye often has more advanced RNFL loss and therefore the two curves will have less overlap.

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GDx Printout

Parameters Table

Nerve Fiber Indicator (NFI)
- The NFI is a global measure based on the entire RNFL thickness map.
- Output values range from 1 –100, with classification based on the ranges:
  - 1-30 -> normal
  - 31-50 -> borderline
  - 51+ -> abnormal
- Clinical research has shown that the NFI is the best parameter for discriminating normal from glaucoma.

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1. Fundus Image
   - Well focused
   - Evenly illuminated
   - Well centered

2. Thickness Map
   - RNFL thinning Superior OS
   - Wedge defects Inferior OU

3. Deviation Map
   - Extensive RNFL loss Superior OS
   - Wedge defects Inferior OU

4. TSNIT Graph
   - Falls outside shaded area in Inferior region OU
   - Falls below shaded area Superior OS

5. Parameter Table
   - Abnormal:
     - TSNIT Average and Inferior Average OU
     - Superior Average and TSNIT SD OS
     - IES value
     - NFI OS
     - NFI values abnormal OU
GDx Interpretation

GDx VCC Printout

Normal

Glaucoma

Fundus Image
Parameters
Thickness Map
Deviation Map
TSNIT Graph

Comparisons of each scan to the Normative Database allows accurate and rapid interpretation in one exam.