

Optic Nerve Head Changes In Glaucoma

By
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Paris
19 – 21 September
2003

How to Prevent Blindness in Glaucoma “Training Course for Trainers”

Remo Susanna Jr, MD
University of São Paulo - Brazil



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Hamilton Eye Center
University of San Diego, California
February 14, 2004

How to Look at the Optic Nerve

Remo Susanna Jr, MD
University of São Paulo - **Brazil**

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Nervo Óptico no Glaucoma

WORKSHOP

Prof. Remo Susanna Jr

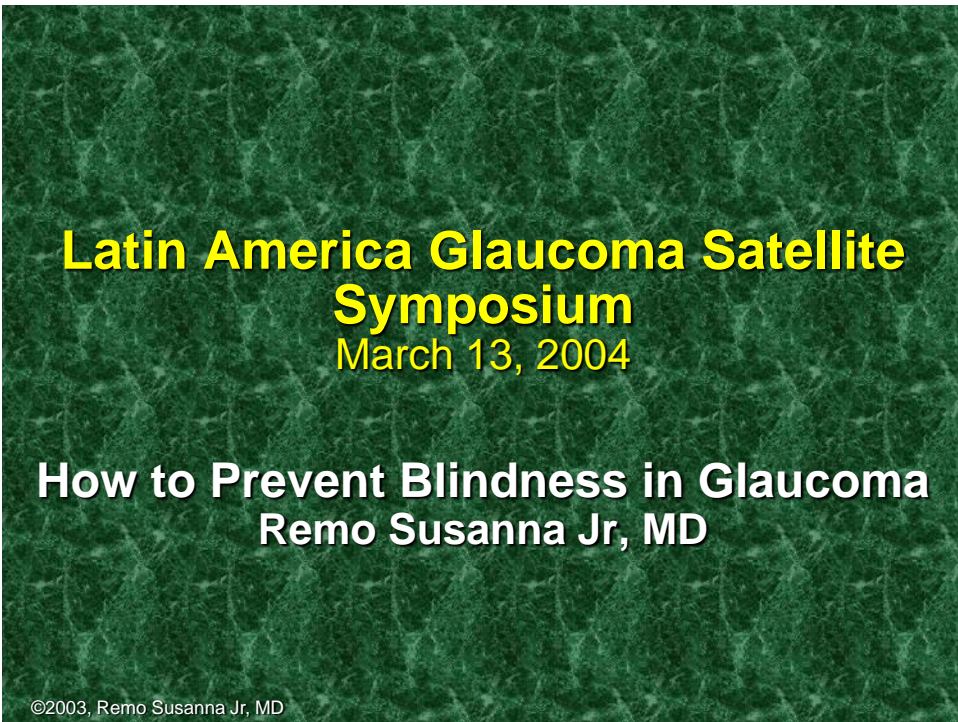
Sintra, 21 de Fevereiro de 2004

Portugal

Caeser Park – Penha Longa



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Latin America Glaucoma Satellite Meeting
March 2004

Brazil Argentina Chile
Colombia Equador Mexico Peru Venezuela



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**Optic Nerve Head Changes
In Glaucoma**

Jedda
SAUDI ARABIA
2008



OPTIC NERVE HEAD CHANGES
IN
GLAUCOMA
(Remo Susanna)
presented by

PROF. DR. ALI KHALIFA
AL AZHAR UNIVERSITY

EGYPTIAN SOCIETY FOR THE GLAUCOMAS
2007-2012

**Why Do People Go Blind From
Glaucoma?**

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The Probability of Blindness From Open-Angle Glaucoma

- 20 years of follow-up: 1965-1985
- Timolol, pilocarpine, epinephrine, acetazolamide, phospholine iodide, etc
- Glaucoma: 54% blind in one eye
22% blind in both eyes
- Ocular hypertension (OHT):
14% blind in one eye
4% blind in both eyes

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Hattenhauer, et al. *Ophthalmology*. 1998.

Patients Blind From Glaucoma

- 25 (27%) blind at the first visit
- 84 (73%) blind under treatment
 - 42.5% no compliance
 - 57.5% good compliance

Glaucoma Is Underdiagnosed

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Grant and Burke. *Ophthalmology*. 1982.

Glaucoma Diagnosis

- In 2000, 2.2 million Americans were diagnosed with glaucoma¹
- 50% of individuals with glaucoma are undiagnosed²
- Many are undiagnosed despite having an eye exam

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¹Friedman, et al. AGS. 2003.
²Mitchell, et al. *Ophthalmology*. 1996.

Glaucoma Diagnosis in Clinical Practice

- Intraocular pressure (IOP)
- Optic nerve head (ONH) assessment
- Standard visual fields (VFs)
- Retinal nerve fiber layer (RNFL)

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Limitations of IOP

- Corneal thickness affects accuracy¹
 - Thin Cornea–IOP underestimated
 - Thick Cornea–IOP overestimated
- IOP fluctuates²
- IOP damage threshold varies
 - OHT
 - Normal tension glaucoma (NTG)

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¹Doughty and Zaman. *Surv Ophthalmol*. 2000.
²Liu, et al. *Invest Ophthalmol Vis Sci*. 2003.

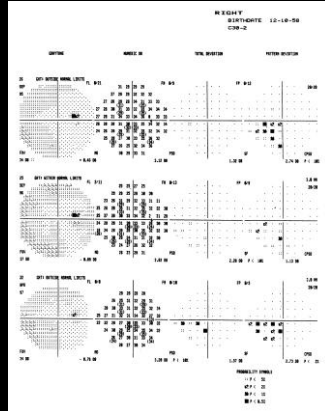
Limitations of Visual Fields

- Subjective
- High variability
- Poor sensitivity

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Visual Fields: Highly Variable

- OHTS
 - VF* abnormality not replicated 86% of the time¹



First VF abnormal
(GHT outside normal limits)

Second VF normal
(GHT within normal limits)

Third VF abnormal
(GHT outside normal limits)

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*VF defect defined as GHT outside normal limits, CPSD $< .05\%$, or both.
¹Keltner, et al. *Arch Ophthalmol.* 2000.

Visual Fields: Poor Sensitivity

- 50% of optic nerve fibers lost prior to VF defect^{1,2}
- By the time there is a 5 dB loss, there is a corresponding 25% loss of RGCs²

A Large Number of RGCs Are Lost Prior to Detectable VF Abnormalities

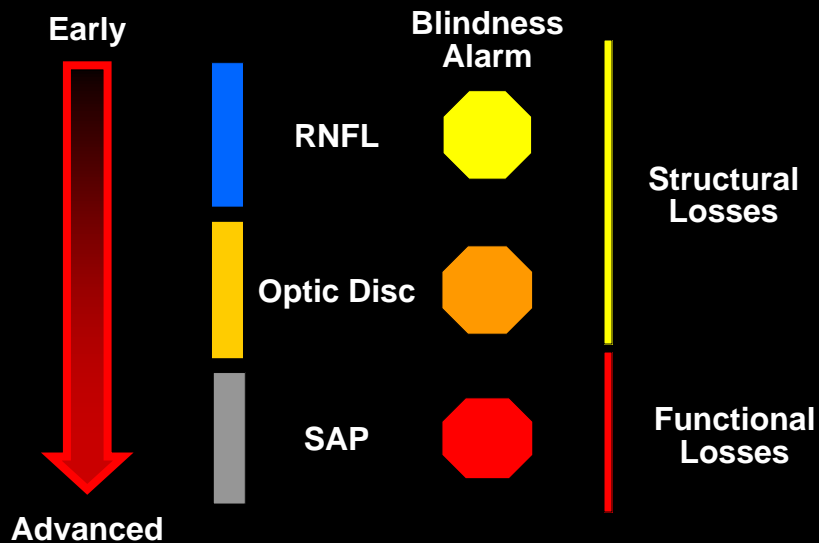
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¹Quigley, et al. *Arch Ophthalmol.* 1982.
²Quigley, et al. *Am J Ophthalmol.* 1989.

- Early glaucoma can be missed if a clinician relies mainly on the visual field and IOP
- Glaucoma is an optic neuropathy
- The assessment of ONH and RNFL are needed for early glaucoma diagnosis

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Glaucoma Damage Detection



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Five Rules for the Assessment of the Optic Nerve Head in Glaucoma

Remo Susanna Jr, MD

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This course was developed by:

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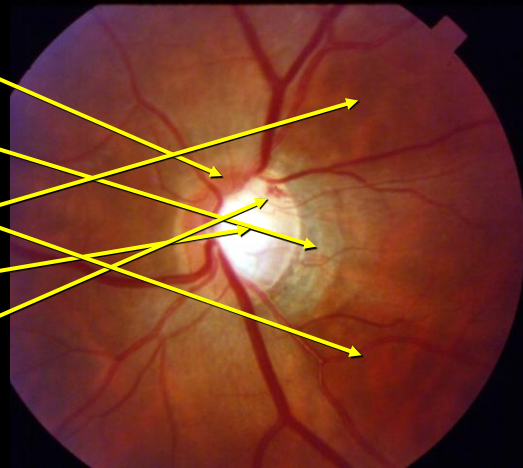


Prof. Ali Khalifa

Prof. Remo Susanna

Five Rules for the Assessment of the Optic Nerve Head in Glaucoma

1. Look first at the rim (and not at the cup)
2. Look at the peripapillary region
3. Look at the retinal nerve fiber layer
4. Look at the lamina cribrosa
5. Look for optic disc hemorrhage



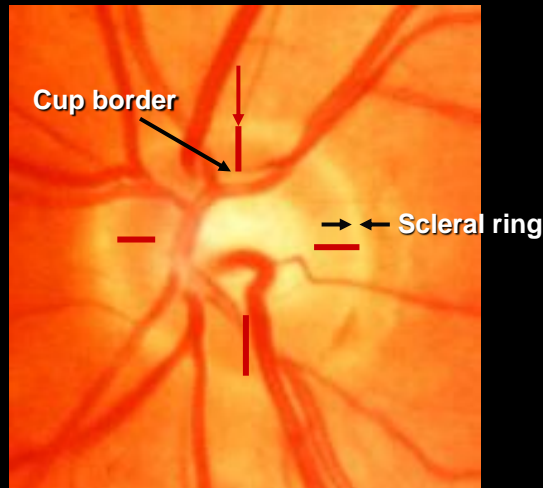
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Rule #1

Identify the Rim: Look at the Scleral Ring and Cup Border

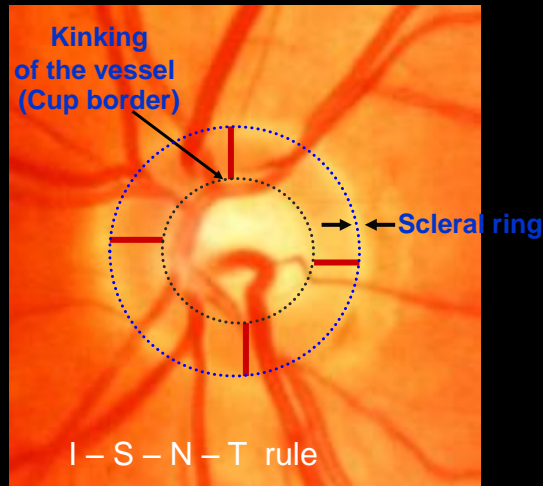
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Rim width = distance between the scleral ring and the location where the vessel is bent (cup border)



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Rim width = distance between the scleral ring and the location where the vessel is bent (cup border)



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Clinical Importance of Glaucomatous Signs

Weak



Moderate

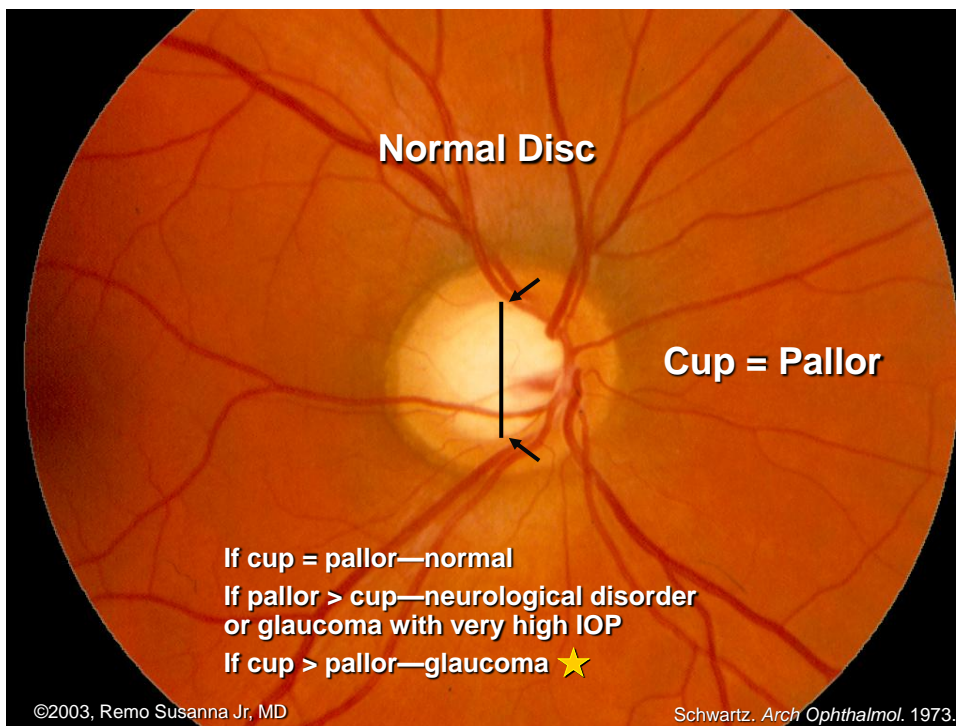


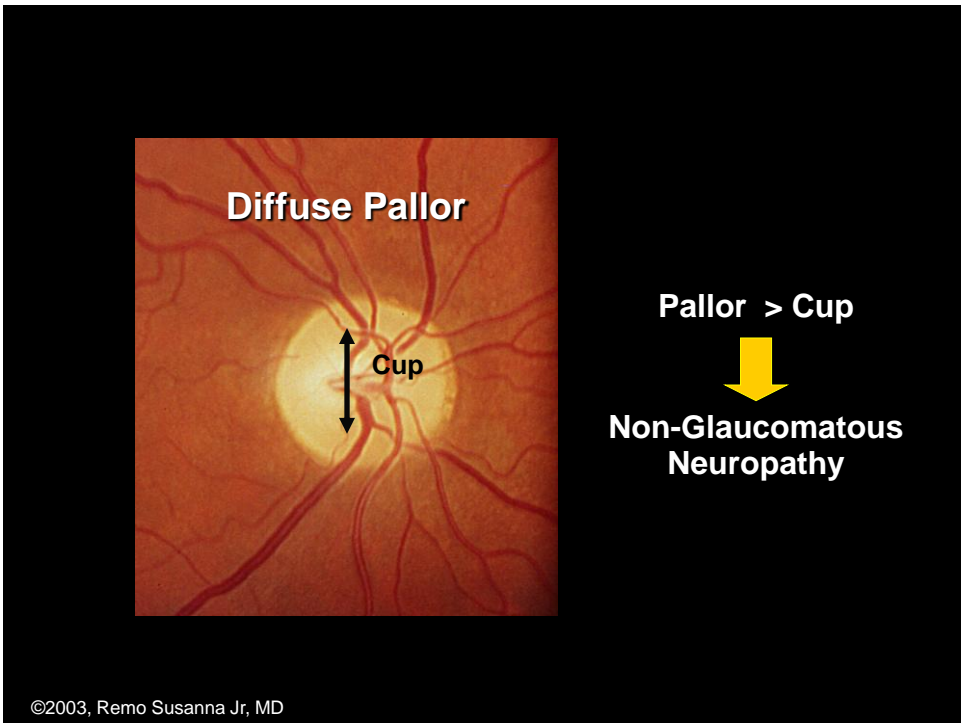
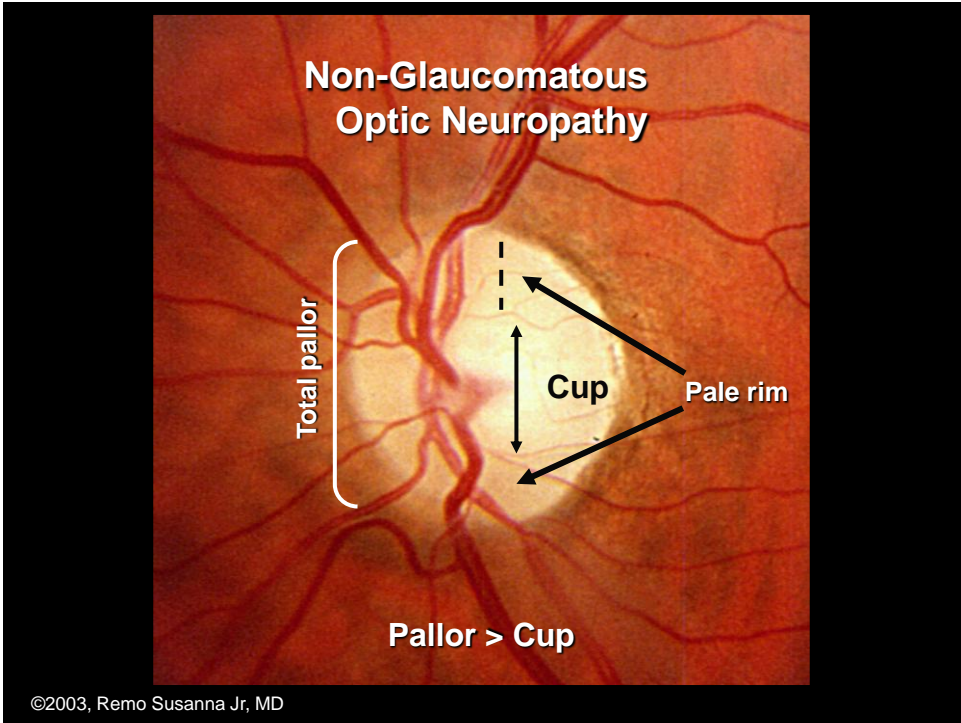
Strong

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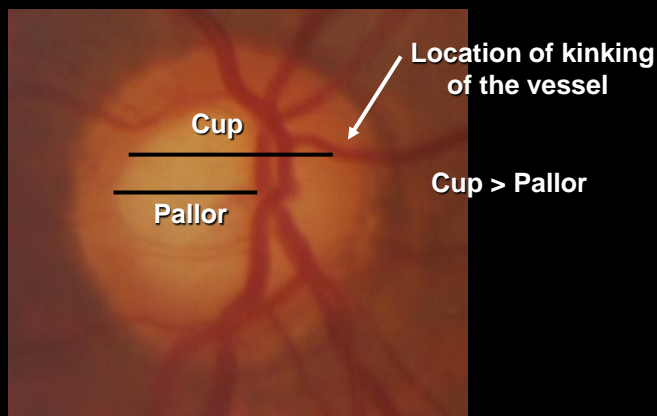
The Color of the Rim

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Glaucoma



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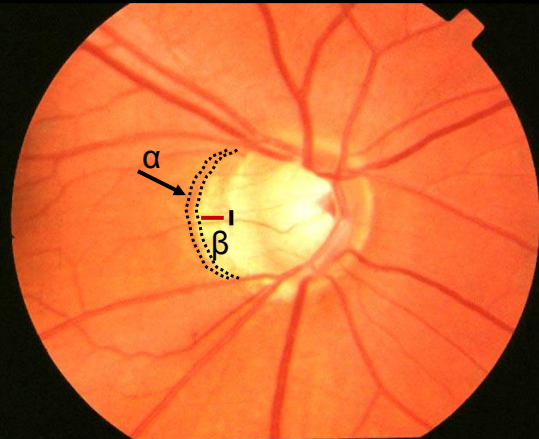
Rule #2
Look at the Peripapillary Region

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Peripapillary Halo

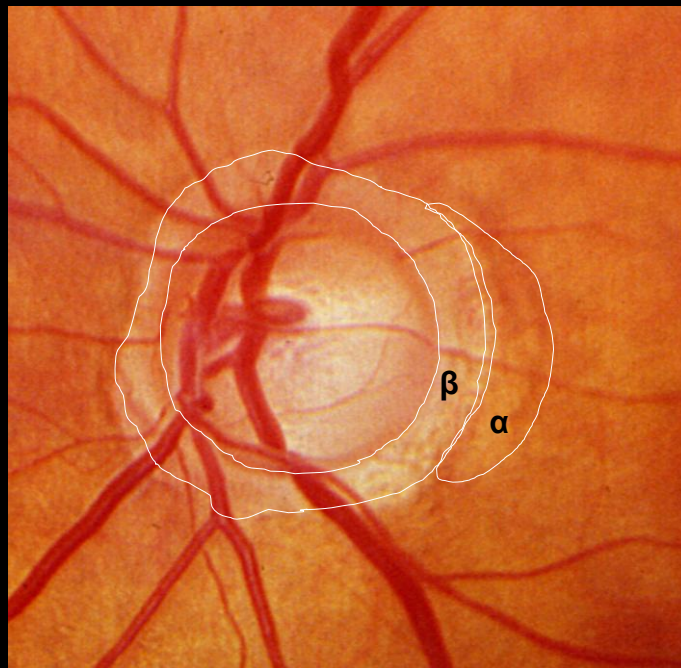
Alpha Zone
Beta Zone ★

Sensitivity 20% to 30%
Specificity 80%
360°-normotensive
senil-sclerotic glaucoma



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Jonas, et al. *Invest Ophthalmol Vis Sci*. 2000.

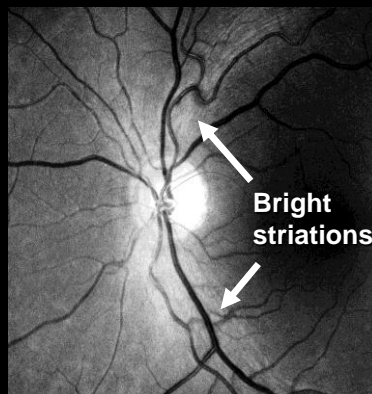
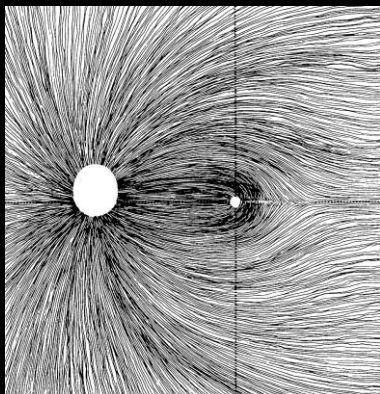


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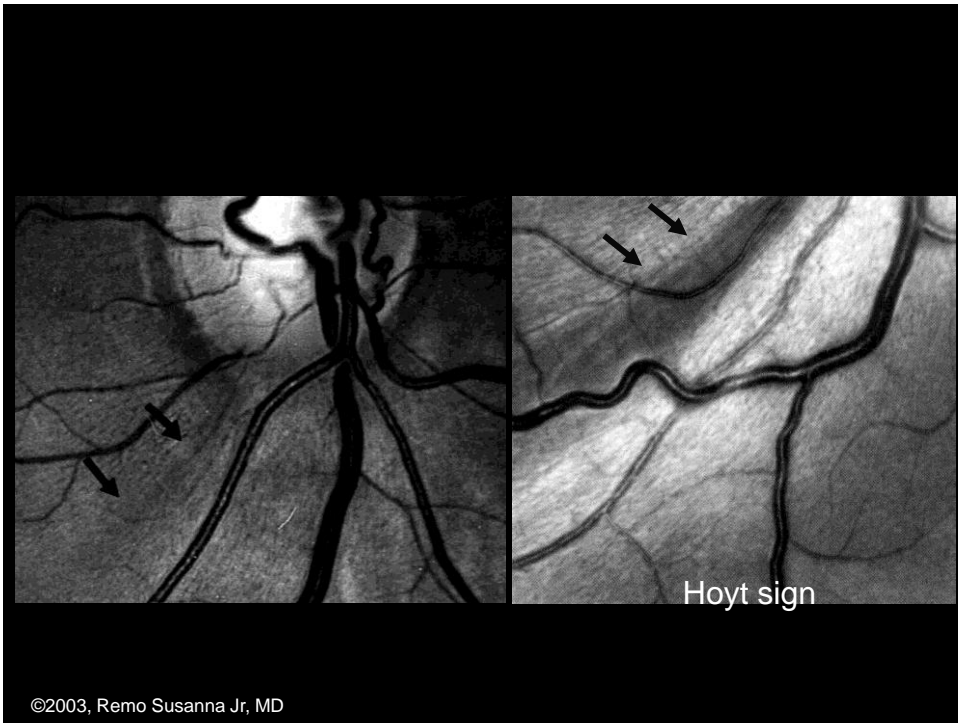
Rule #3 Look at the Retinal Nerve Fiber Layer

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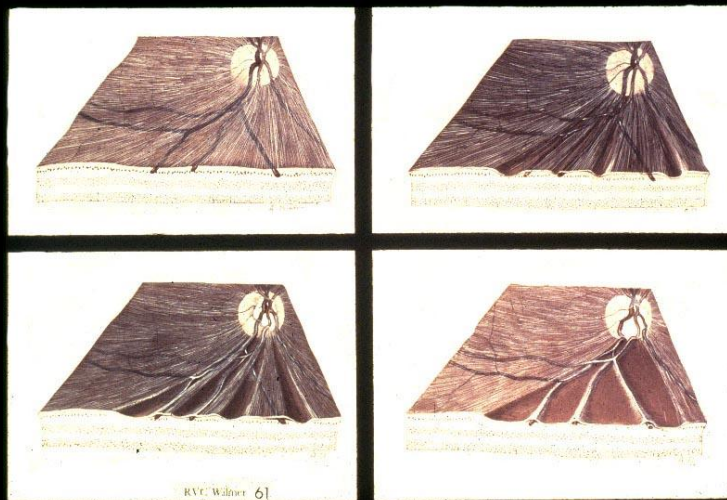
RNFL *Red-Free* Photographs



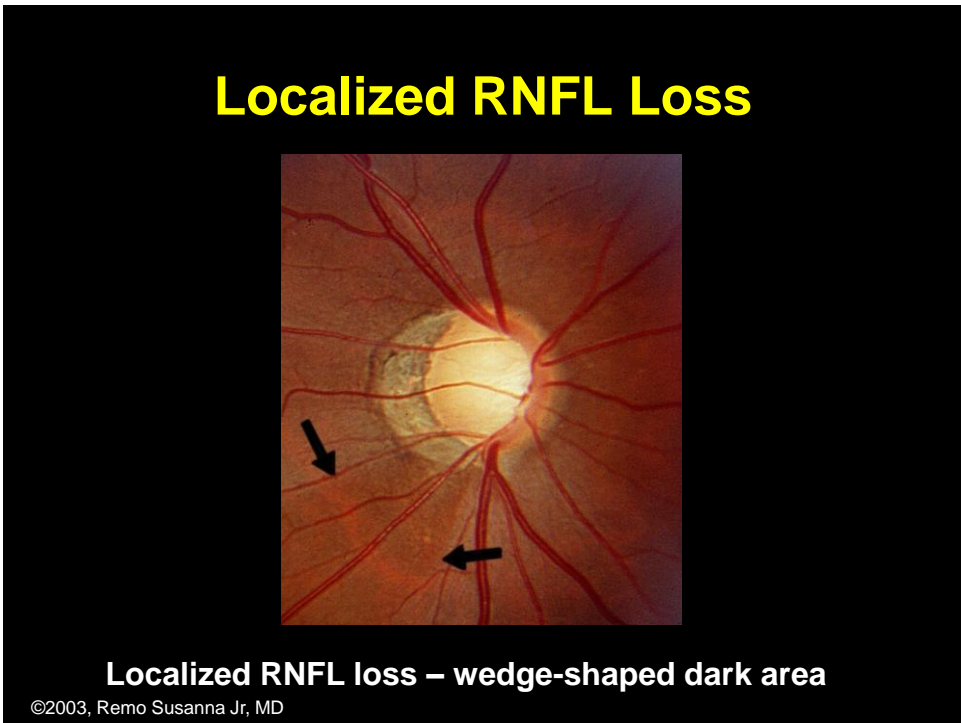
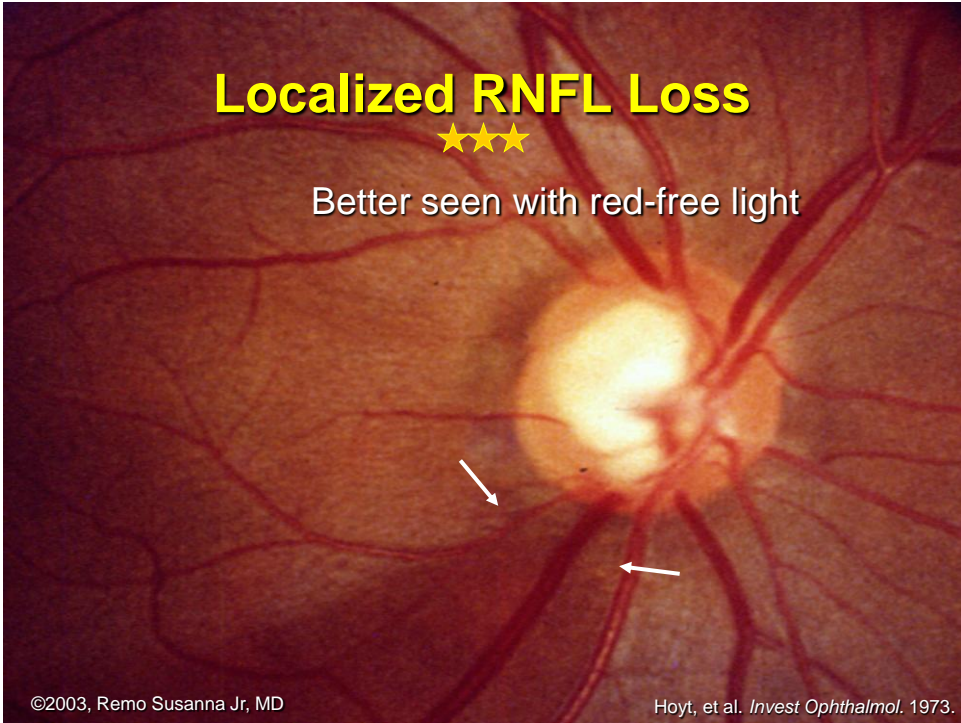
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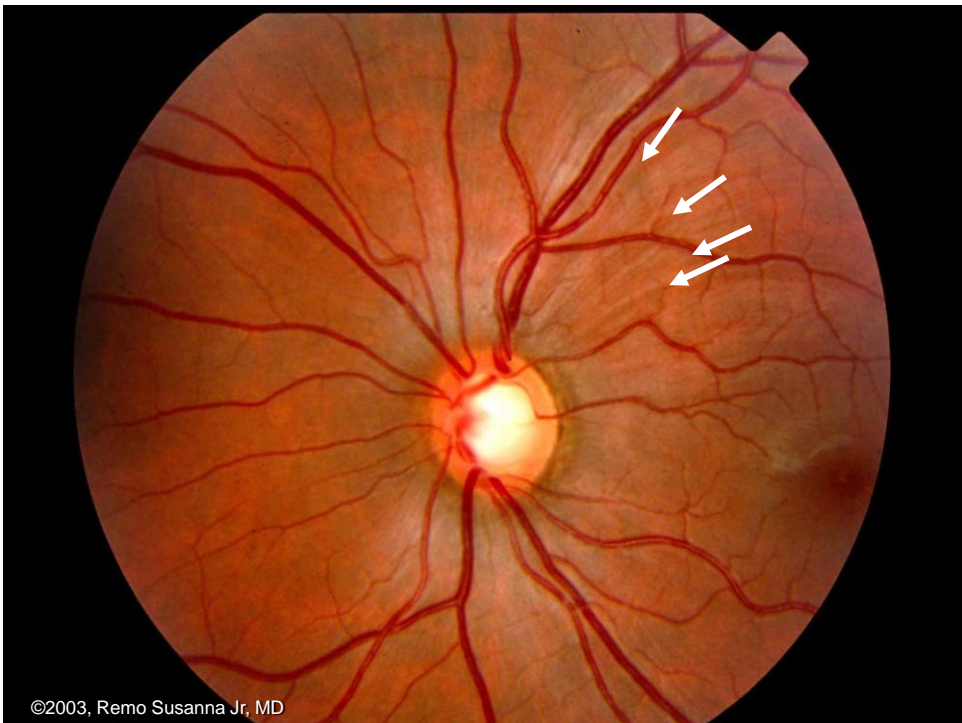


Localized RNFL Loss

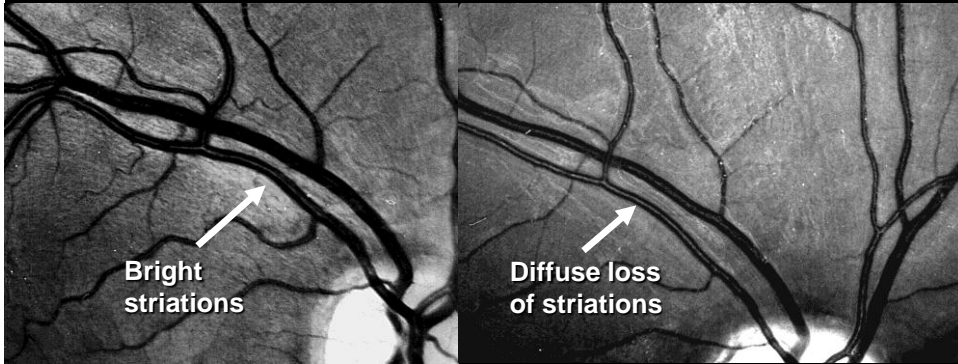


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Diffuse RNFL Loss



Diffuse RNFL loss – diffuse loss of the striate pattern + increased visibility of retinal vessel borders

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Normal RNFL

Diffuse RNFL Loss



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Rule #4

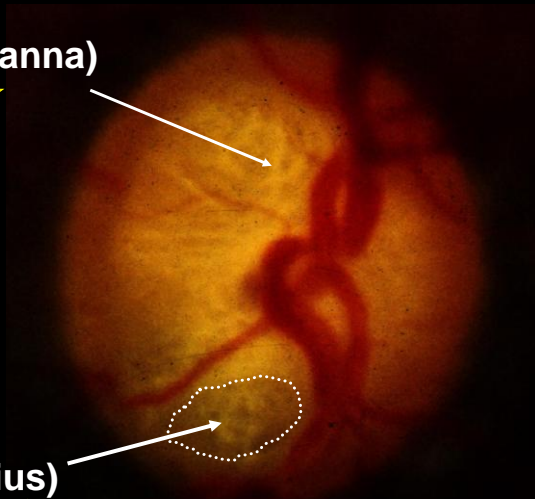
Look at The Lamina Cribrosa

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Lamina Cribrosa

Striated pattern (Susanna)

Susanna R Jr. *Can J Ophthalmol.* 1983. ★



Acquired optic pit (Radius)

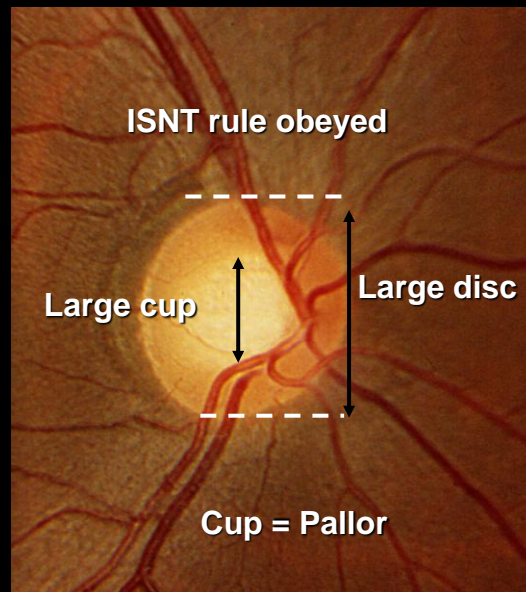
Radius RL, et al. *Br J Ophthalmol.* 1978. ★★★

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Remember That a Normal Large Disc Has a Large Cup

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Normal Disc

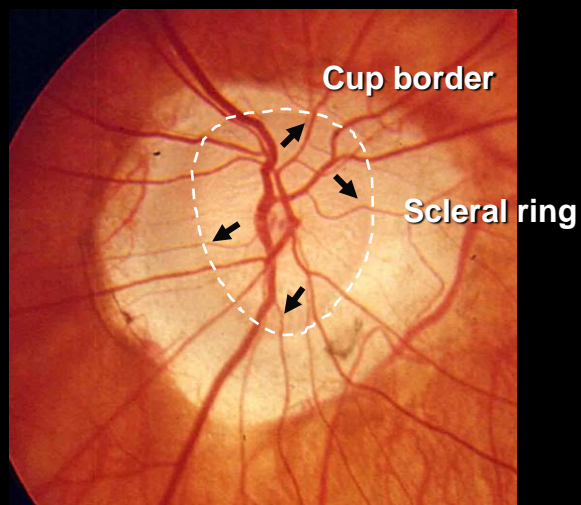


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Be Cautious With Myopic Discs

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Cup Size



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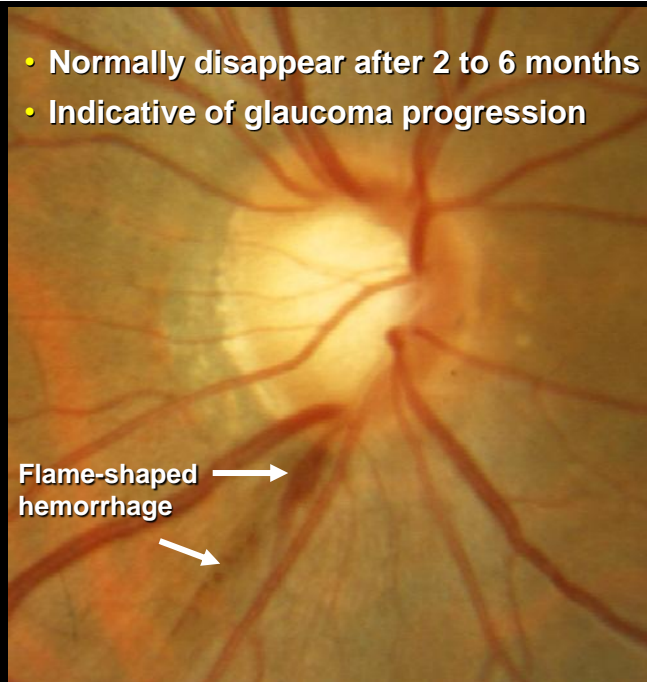
Rule #5 Look for Optic Disc Hemorrhage



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- Normally disappear after 2 to 6 months
- Indicative of glaucoma progression

Flame-shaped hemorrhage →



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Detection of disc hemorrhages requires careful optic disc examination



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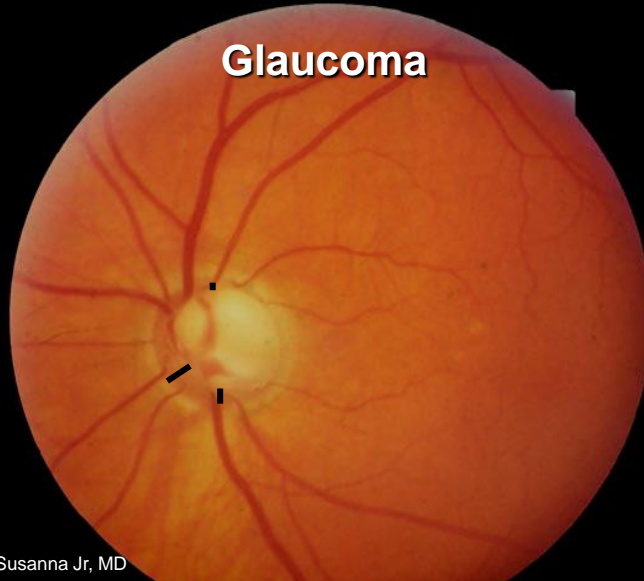
Detecting Glaucoma

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ISNT Rule Is Not Obeyed



Glaucoma



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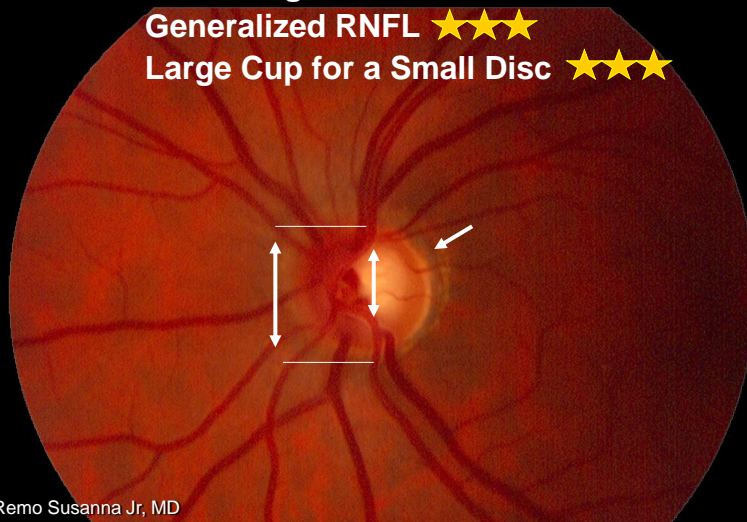
Glaucoma – Small Disc

Peripapillary Halo ★

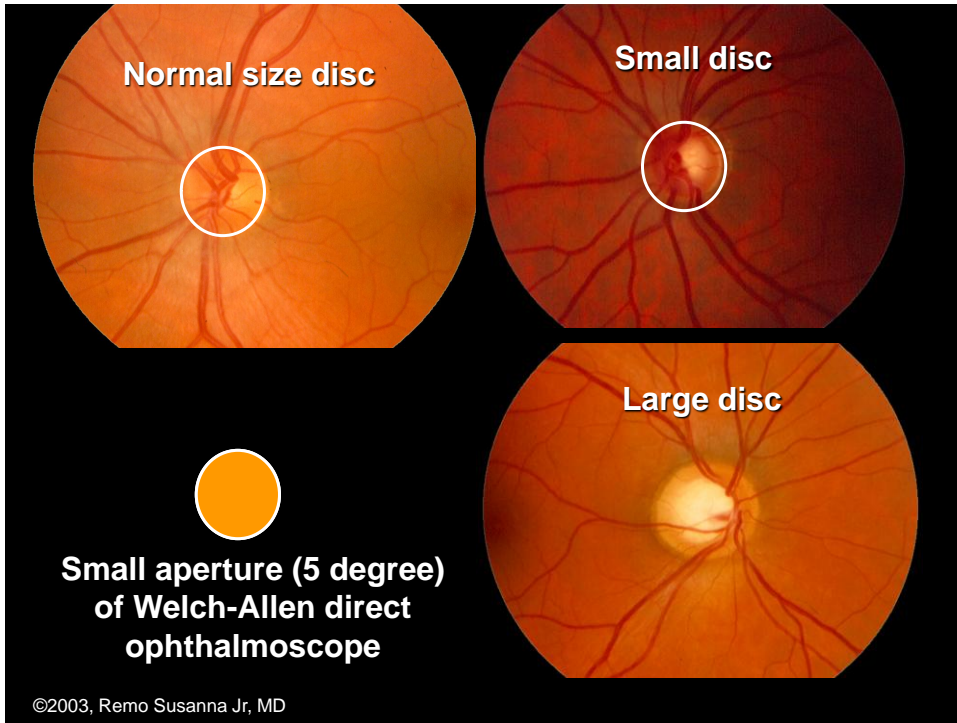
Narrowing of Retinal Arteries ★

Generalized RNFL ★★★★★

Large Cup for a Small Disc ★★★★★



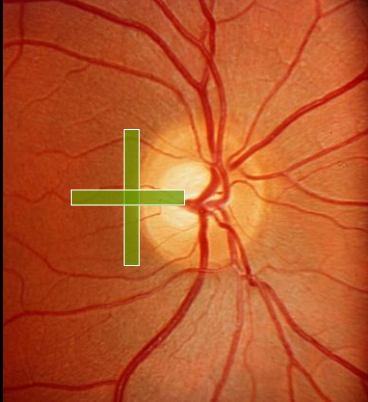
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Optic Disc Size

Measurement of optic disc size:

- Biomicroscopy:
 - Volk lens
 - Measure size of slit beam
- Correction factors:
 - Volk 60D – x 1.0
 - Volk 78D – x 1.1
 - Volk 90D – x 1.3

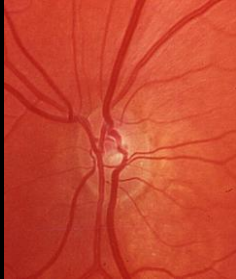


Average vertical diameter: 1.8 mm
Average horizontal diameter: 1.7 mm

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Optic Disc Size

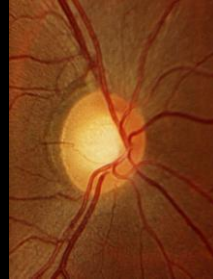
Size of the cup varies with size of the disc



Small



Medium

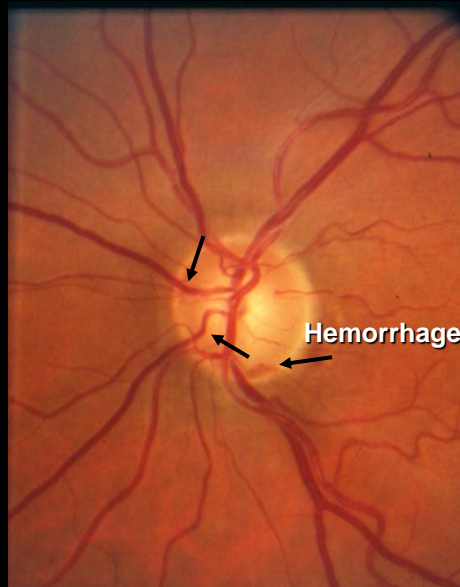


Large

Identify Small and Large Optic Discs
Small Discs: Average Diameter < 1.5 mm
Large Discs: Average Diameter > 2.2 mm

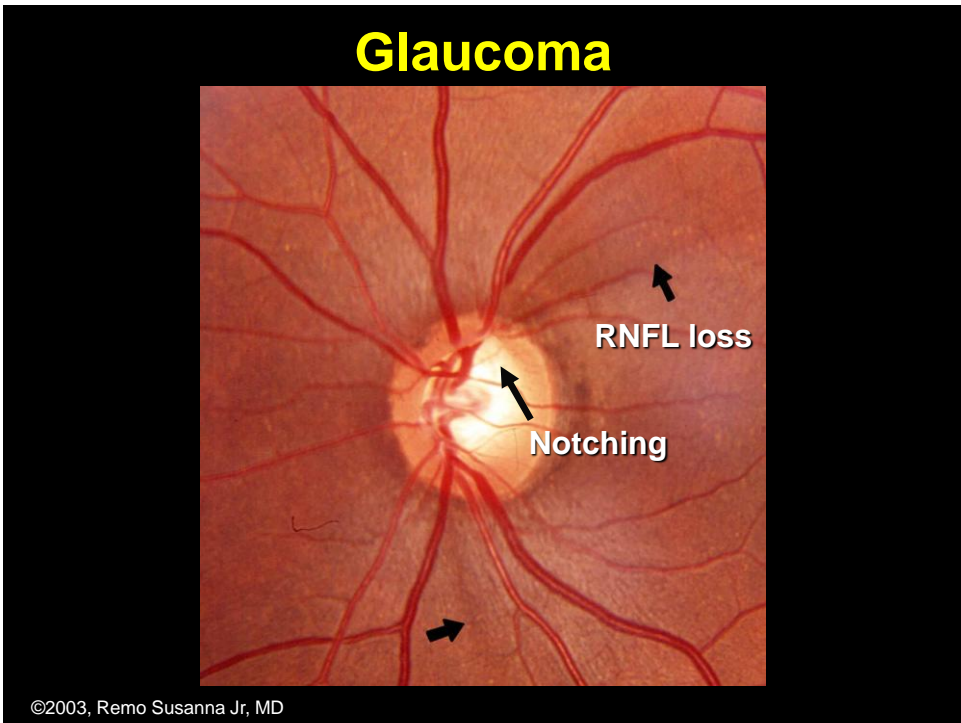
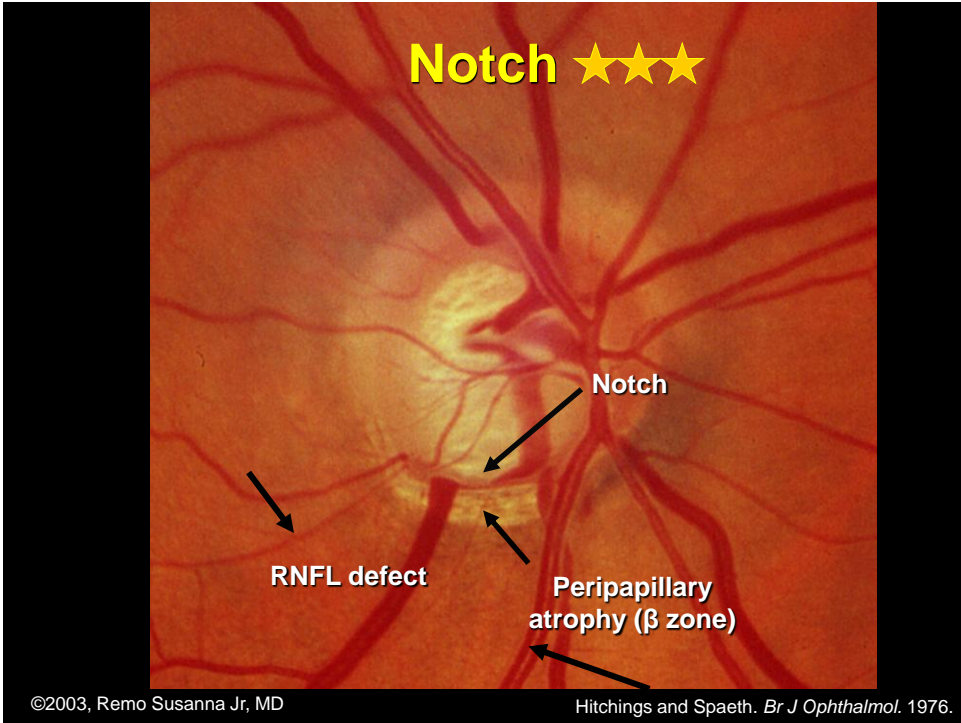
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Nasal Cupping ★★★



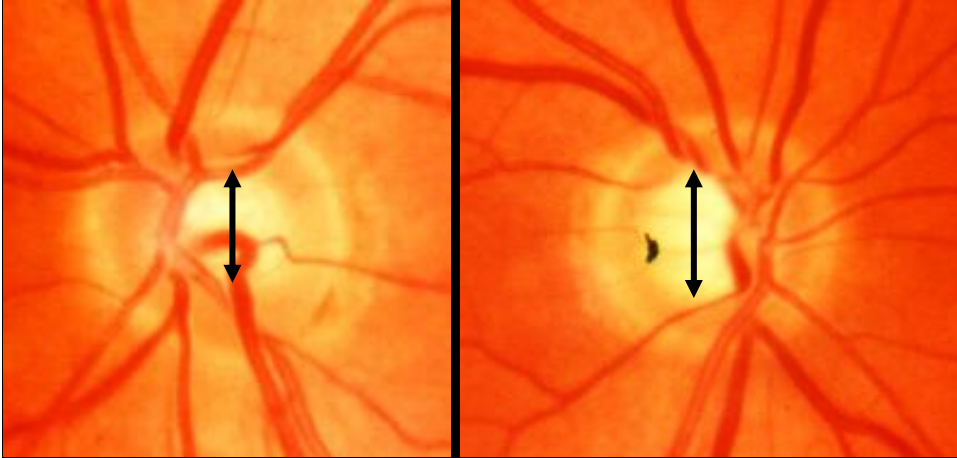
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Read and Spaeth. *Trans Am Acad Ophthalmol Otolaryngol.* 1974.



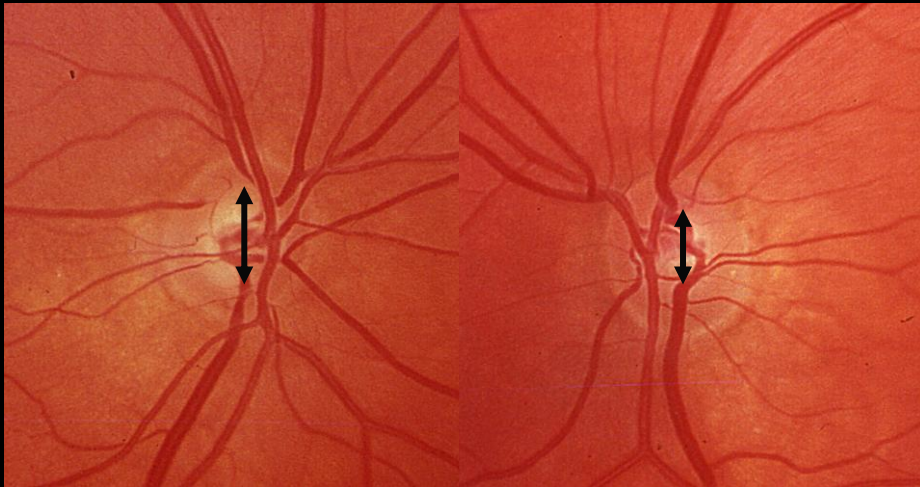
Cup/Disc Ratio Asymmetry ≥ 0.2

★★★



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Armaly. *Arch Ophthalmol.* 1967.

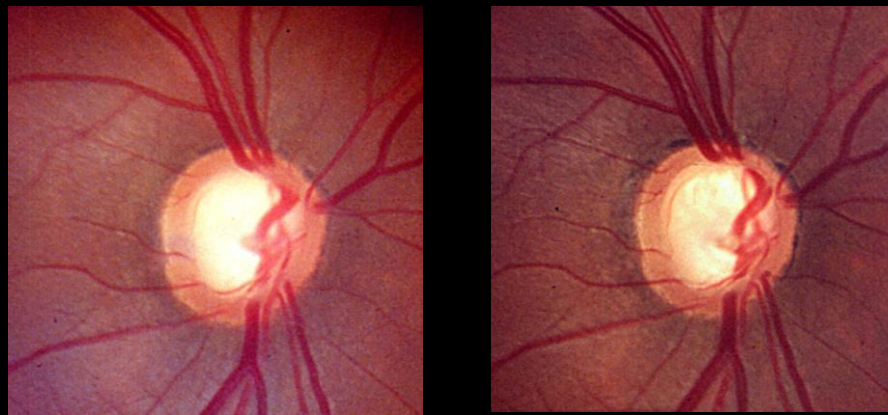


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Detecting Progression (Compare Photographs During Follow-Up)

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Generalized Rim Thinning

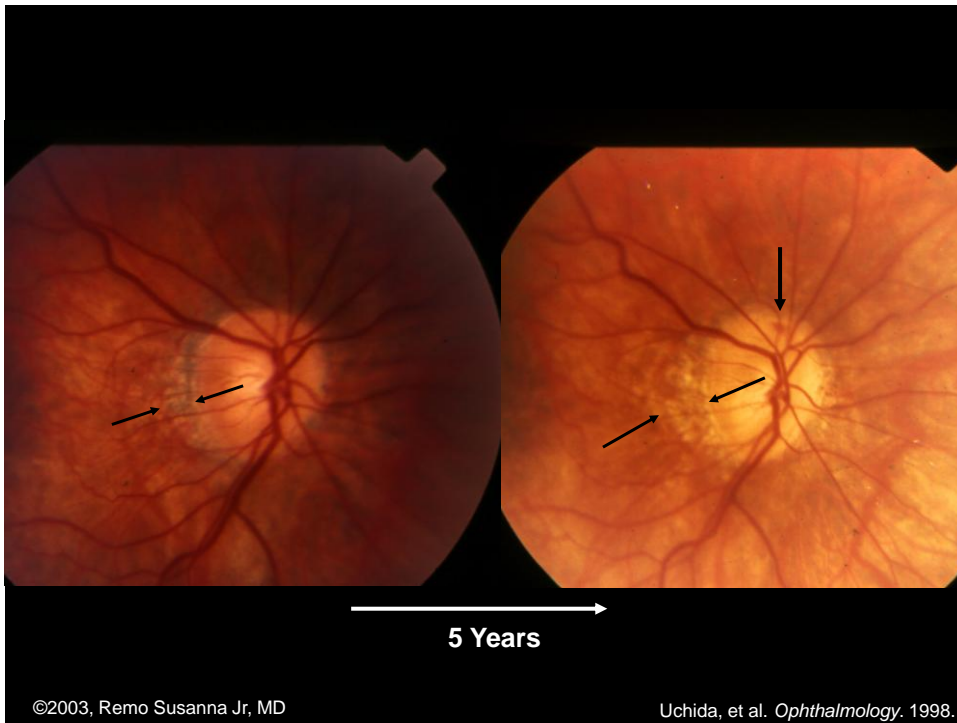
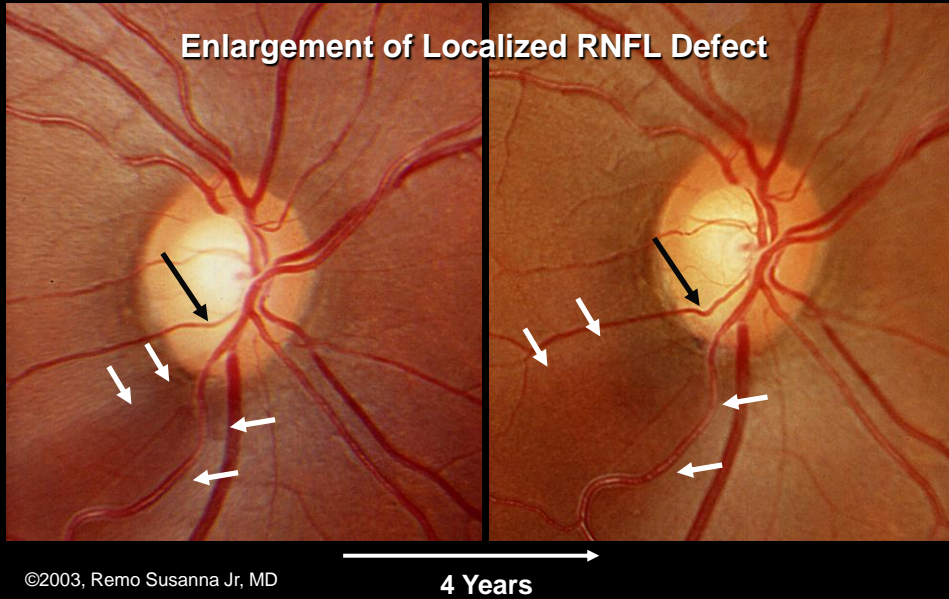


10 Years

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Varma R, et al. *Am J Ophthalmol.* 1992.

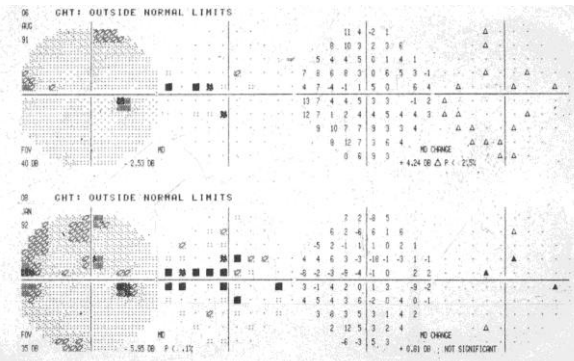
Progressive Rim Thinning





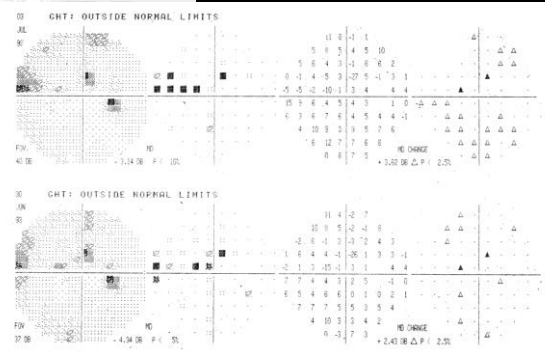
→
5 Months

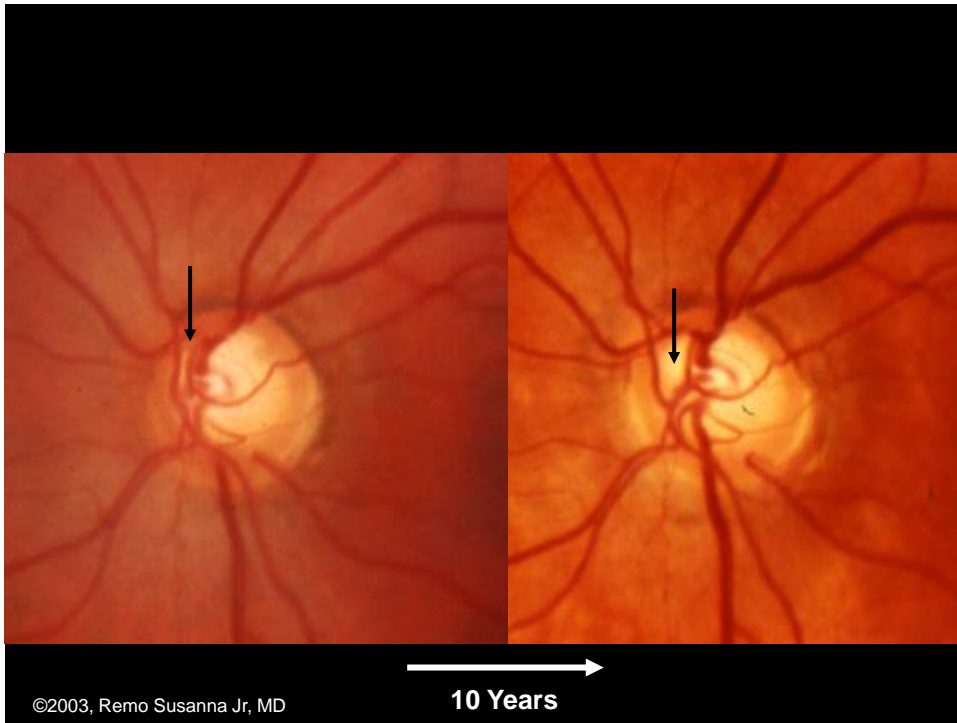
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**Corresponding VF defects
(previous slide)**

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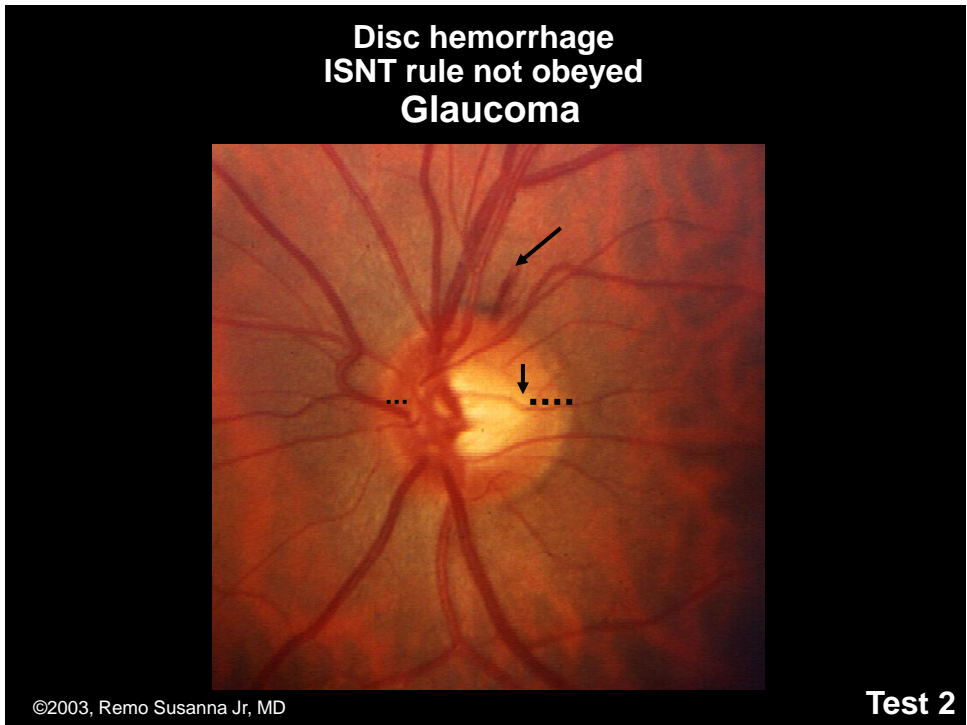
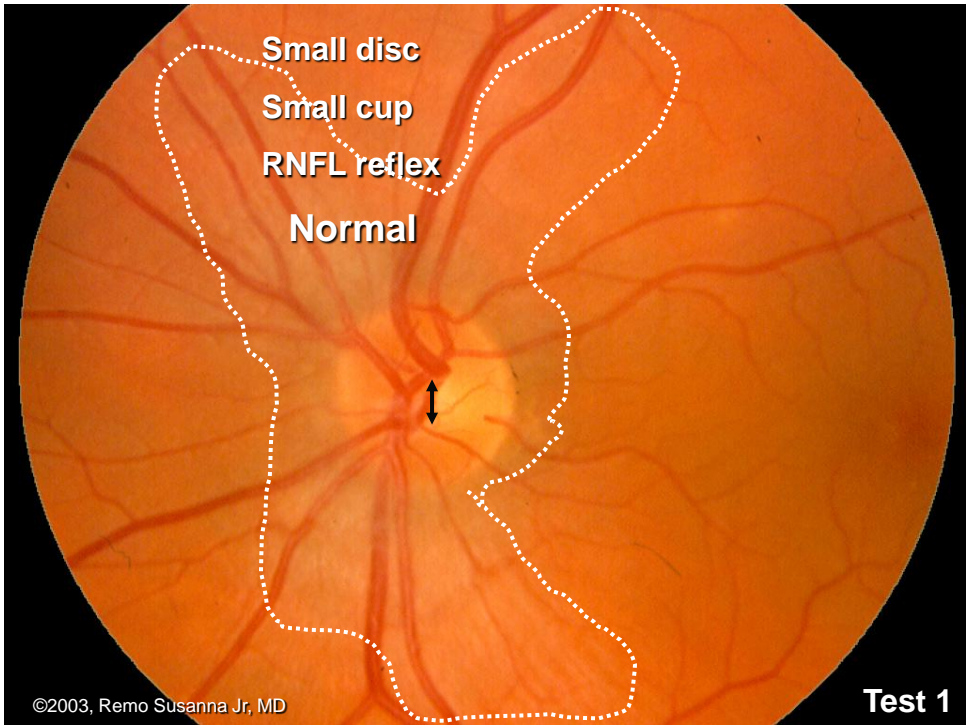


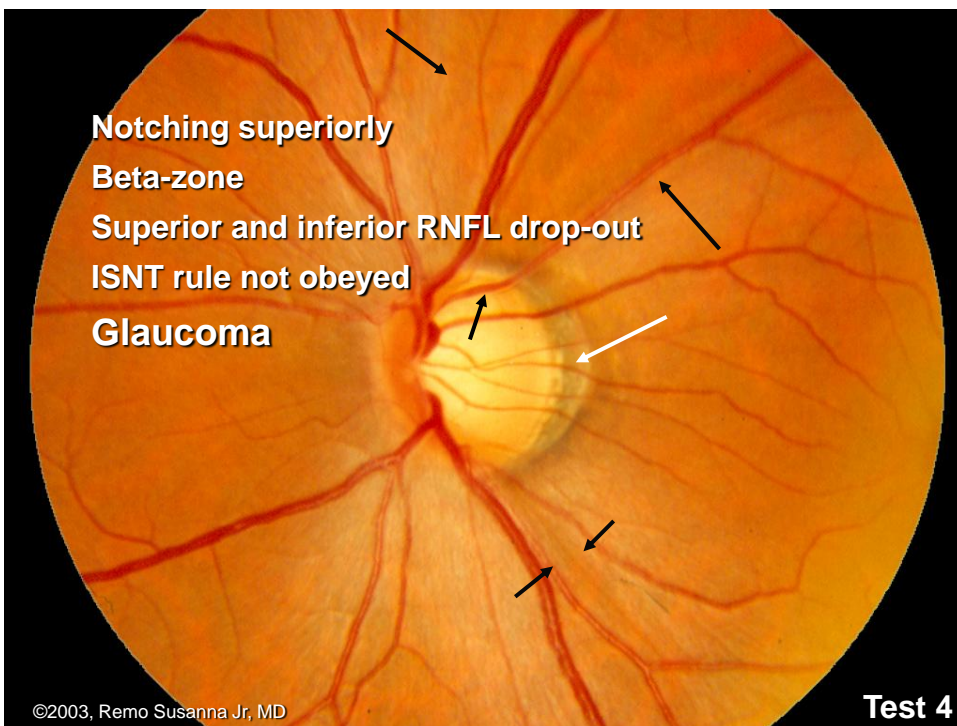
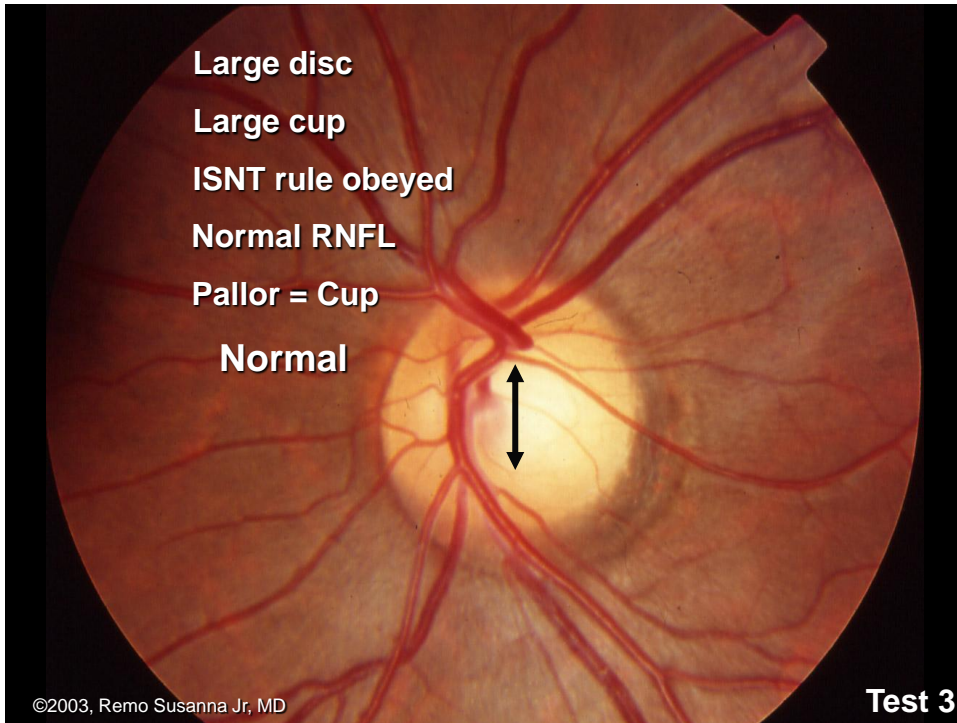
Optic Nerve Head Evaluation Test II

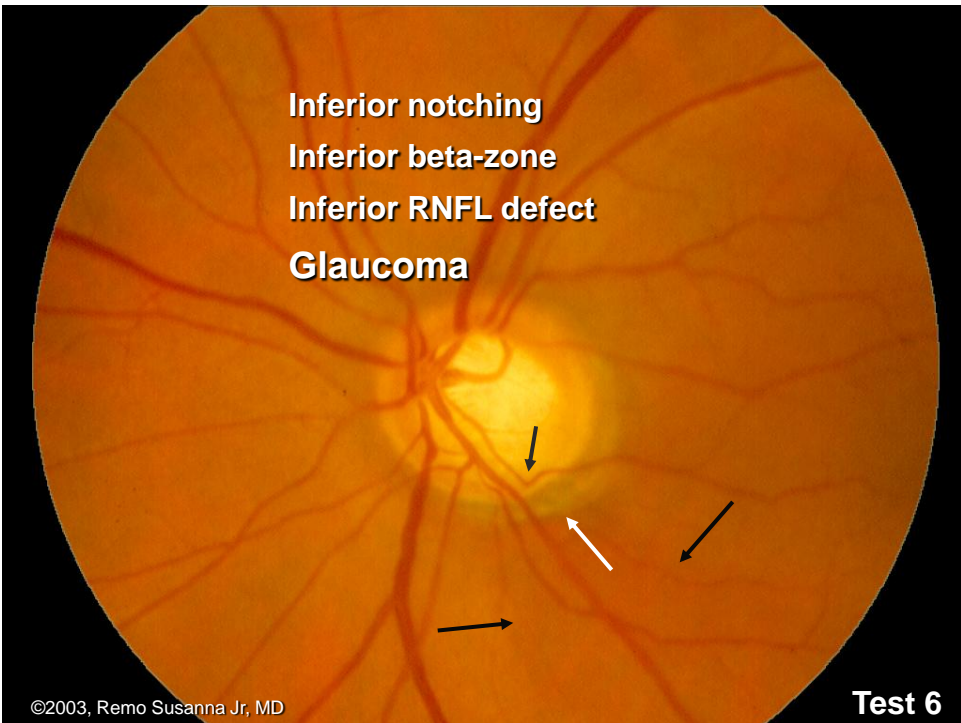
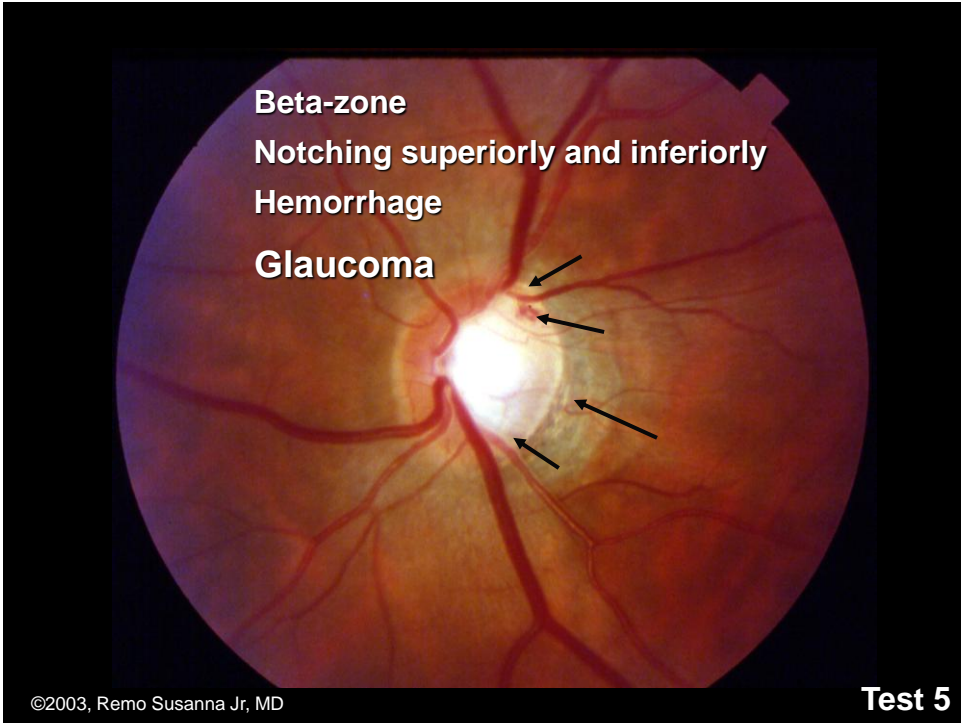


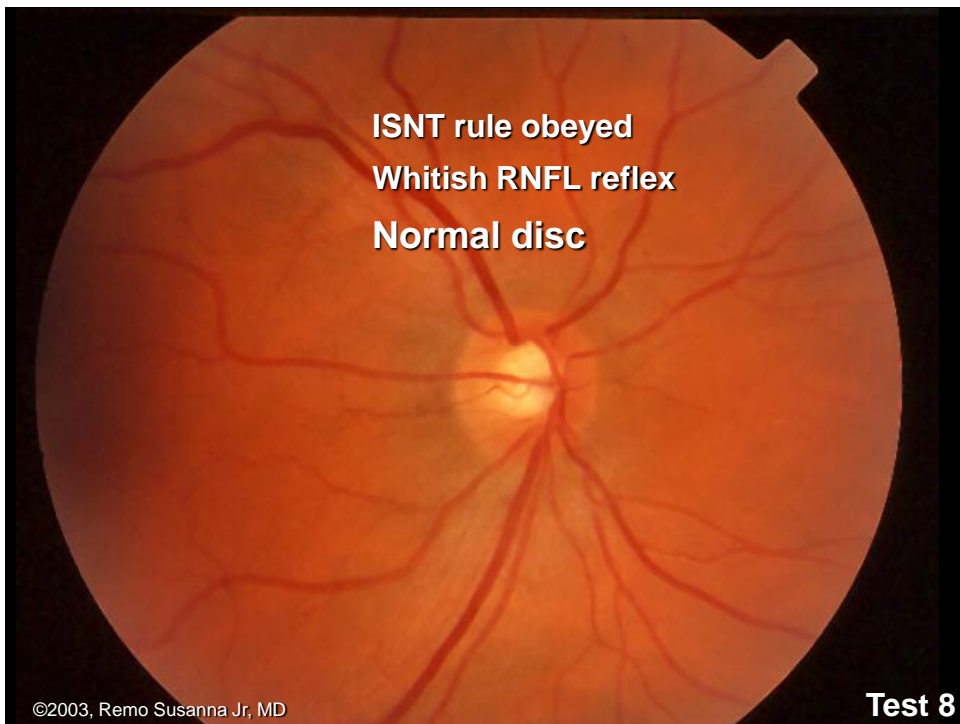
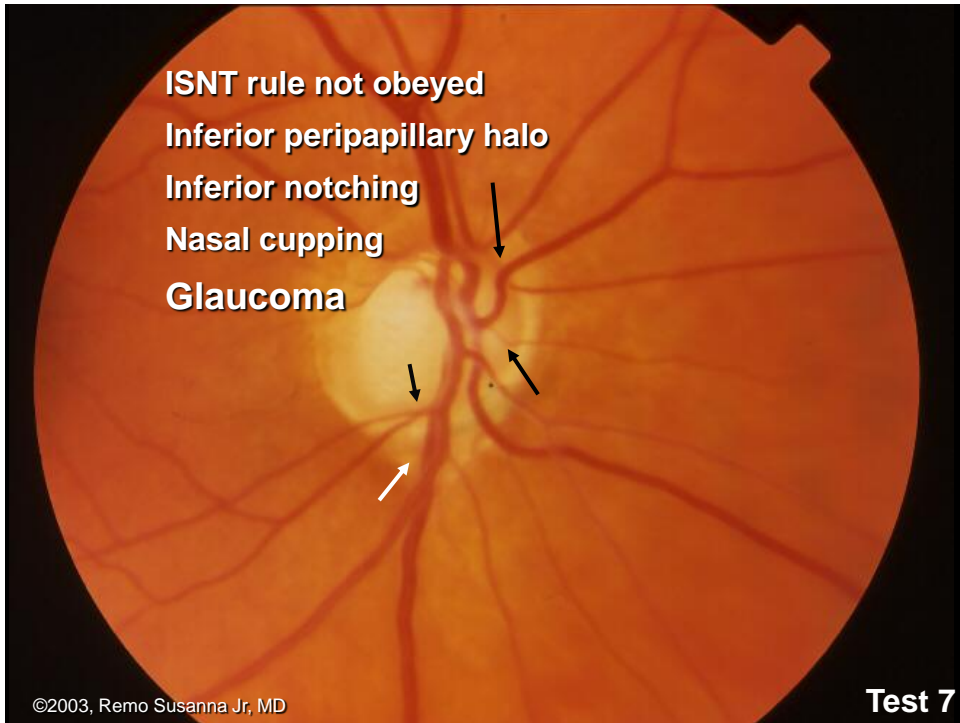
20 seconds/Test

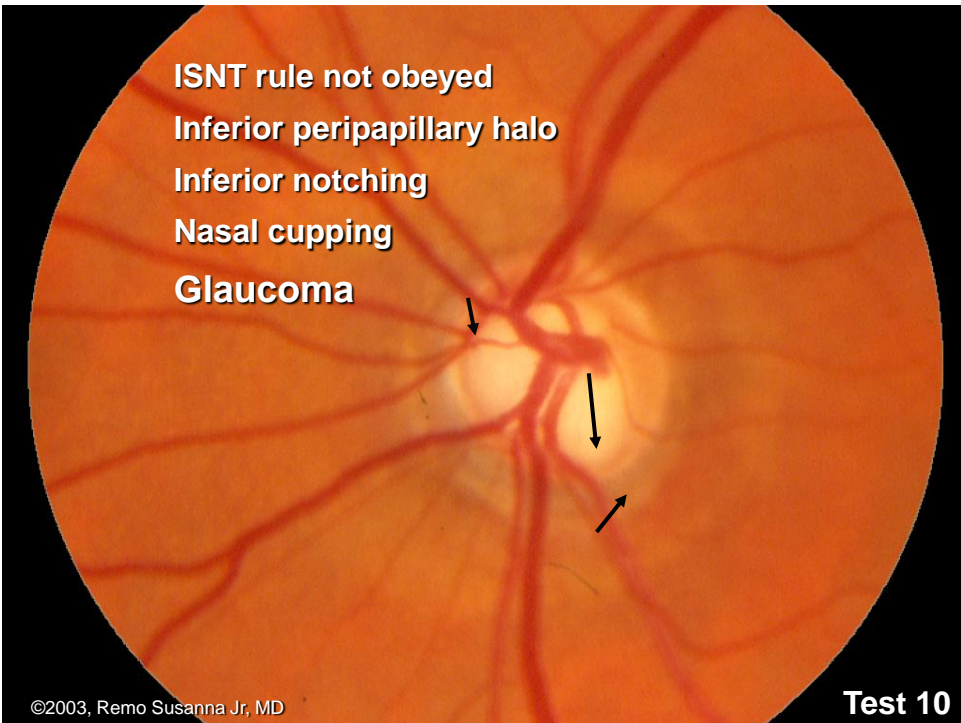
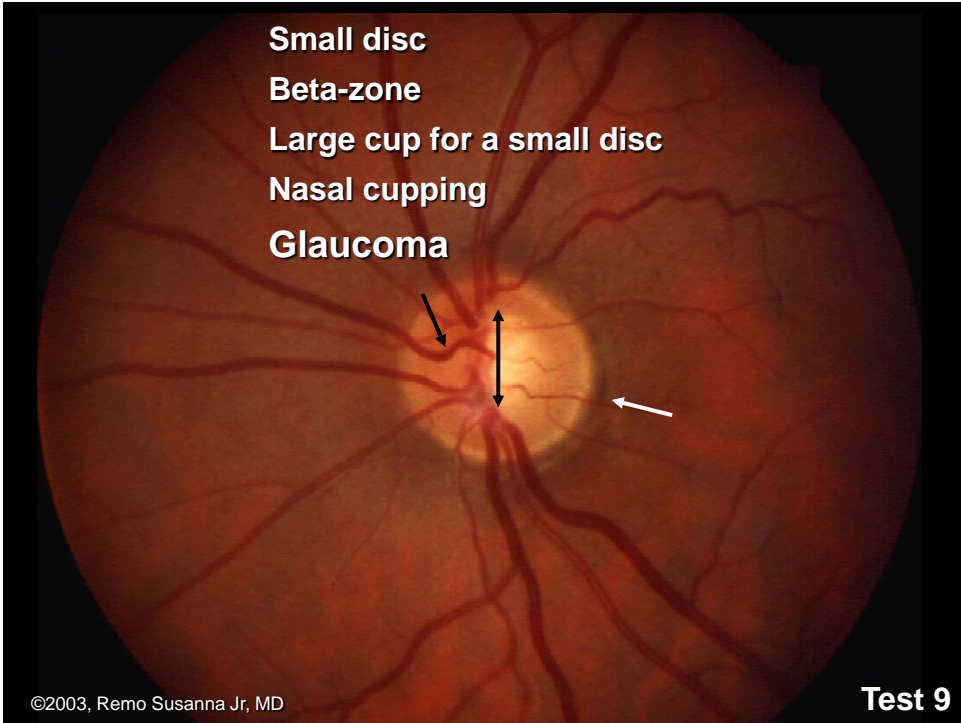
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Thank You

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