

1

Learning Objectives

- Review the defining characteristics of a glaucoma suspect patient
- Compare the two primary types of suspect patient: the ocular hypertensive and the normal tension glaucoma
- Discuss when to initiate treatment for a glaucoma suspect patient

2

Outline

- Ocular Hypertension
- Normal Tension Glaucoma

3

The Glaucoma Suspect



4

The Glaucoma Suspect

Table 10.1 Definition of a Glaucoma Suspect

Open angle by gonioscopy and one of the following in at least one eye:

- IOP consistently >21 mm Hg by applanation tonometry
- Appearance of the optic disc or retinal nerve fiber layer suggestive of glaucomatous damage
- Diffuse or focal narrowing or sloping of the disc rim
- Diffuse or localized abnormalities of the nerve fiber layer, especially at superior and inferior poles
- Disc hemorrhage
- Asymmetric appearance of the disc or rim between fellow eyes (e.g., cup-to-disc ratio difference > 0.2), suggesting loss of neural tissue
- Visual fields suspicious for early glaucomatous damage

Adapted from American Academy of Ophthalmology. Primary Open-Angle Glaucoma Suspect, Preferred Practice Pattern. San Francisco, CA: American Academy of Ophthalmology, 2005. Available at: <http://www.aao.org/ppp>.

5

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7

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8

Evaluating Optic Nerve

- Neuroretinal rim (NRR)
 - Orange-pink tissue between the outer edge of the optic cup and the optic disc margin.
 - The inferior rim is the broadest followed by the superior, nasal, and temporal (the 'ISNT' rule)



9

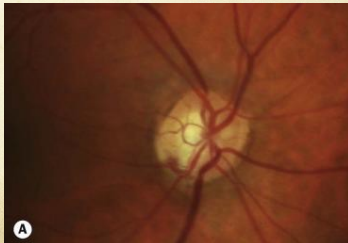
Evaluating Optic Nerve

- Cup/disc (C/D) ratio
 - The vertical rather than the horizontal ratio is usually taken
 - Small optic nerves have small cups and vice versa
 - In any individual asymmetry of .2 or more between the eyes should be suspicious
- Optic disc size
 - Important in determining if C/D ratio is abnormal
 - Also a prognostic factor, large discs are thought to be more susceptible to damage, i.e. NTG
 - Disc size varies between racial groups, largest in black individuals
 - Vertical diameter is the parameter most often used to measure disc height
 - Normal meridian vertical diameter is 1.5-1.7mm

10

Evaluating Optic Nerve

- Focal ischemic disc – characterized by localized superior and inferior notching and may be associated with localized field defects with early threat to fixation



11

Evaluating Optic Nerve

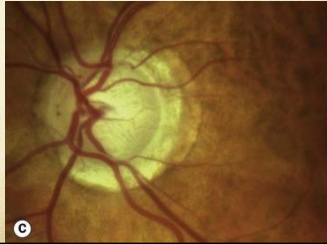
- Myopic disc – refers to a tilted (obliquely inserted), shallow disc with temporal crescent of peripapillary atrophy. Dense superior or inferior scotomas threatening fixation are common.
- Common in younger males



12

Evaluating Optic Nerve

- Senile sclerotic discs – characterized by a shallow, saucerized cup and a gently sloping NRR, variable peripapillary atrophy and peripheral visual field loss.
- Patients are older with ischemic heart disease and HTN



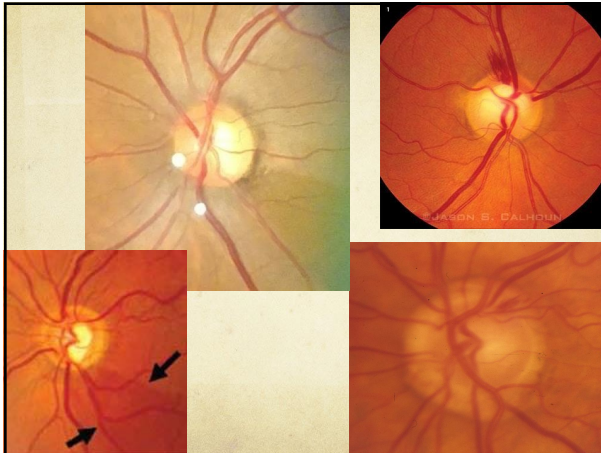
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Evaluating Optic Nerve

- Concentrically enlarged discs – characterized by uniform NRR thinning and are frequently associated with diffuse visual field loss.
- IOP at presentation usually significantly elevated



14



15

OHTN Conversion to OAG

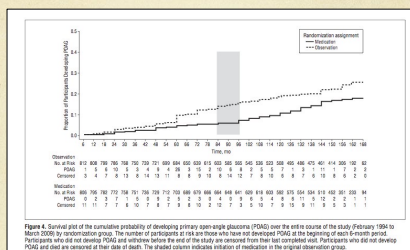
Table 10.2 Incidence of Chronic Open-Angle Glaucoma (COAG) among Persons with Ocular Hypertension			
Study ^a	Patients with Ocular Hypertension, n	Observation Period, y	Patients Developing COAG, n (%)
Perkins, 1973 (12)	124	5–7	4 (3.2)
Walker, 1974 (13)	109	11	11 (10.1)
Wilensky et al., 1974 (14)	50	Mean, 6	3 (6.0)
Norskov, 1970 (15)	68	5	0
Linnér, 1976 (16)	92	10	0
Kikazawa et al., 1977 (17)	75	Mean, 9.5	7 (9.3)
David et al., 1977 (18)	61	Mean, 3.3 Range, 1–11	10 (16.4)
Hart et al., 1979 (19)	92	5	33 (35.9)
Armaly et al., 1980 (20)	5886	13	98 (1.7)
Lundberg et al., 1987 (21)	41	20	14 (34.1)
Kass et al., 2002 (22)	819 ^b	5	89 (10.9)

^aNumbers in parentheses are reference numbers.

^bControl arm.

16

OHTS



Untreated $\geq 10\%$ progress to OAG at 5 years
Treated $\geq 5\%$ progress to OAG at 5 years

Relative Risk Reduction: 50%

Kass MA, Gordon MO, Guo T. Ocular Hypertension Treatment Study Group. Delaying treatment of ocular hypertension: the ocular hypertension treatment study. Arch Ophthalmol 2010;128:76-87.

17

Glaucoma as a Continuum

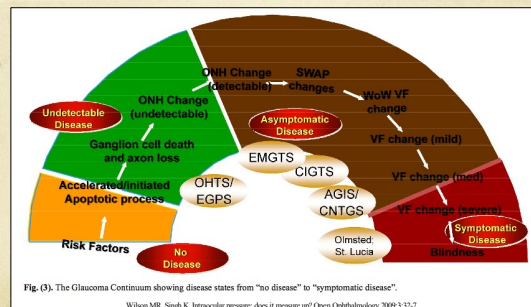


Fig. (3). The Glaucoma Continuum showing disease states from "no disease" to "symptomatic disease".

Wilson MR, Singh K. Intraocular pressure: does it measure up? Open Ophthalmology 2009;3:32-7.

18

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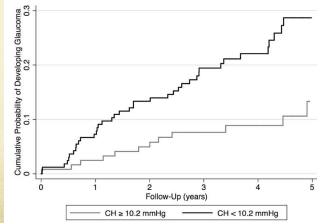
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23

24

Corneal Hysteresis

- Measure of the cornea's viscoelasticity, is the difference (measured in mm Hg) between the pressure at which the cornea bends inward during an air jet applanation and the pressure at which it bends out



25

Risk Calculators

The screenshot shows a mobile application interface for calculating glaucoma risk. It includes a 'Reset' button and a 'Glaucoma Calc' title. Input fields with checkmarks and values are: Age (0.5), IOP (0.6), C/D Ratio (0.7), CCT (0.8), and PSD (Humphrey) (0.9). Below these, it shows 'Vertical Cup/Disc Ratio' (Average of one measurement on both eyes), 'Glaucoma Risk in 5 Years' (7%), and 'Risk Assessment' (Moderate). A red button at the bottom says 'Consider treatment'.

26



When to Treat

Table 10.6 Making the Decision to Treat in Glaucoma Suspects with Elevated IOP

Stratify patients into low, moderate, or high risk for progression (based on best available evidence and clinical judgement):

- High risk: Suggest treatment be initiated
- Moderate risk: Can initiate treatment if appropriate, or monitor closely
- Low risk: Monitor IOP as well as optic nerve structure and function, and treat if evidence of progression

Carefully consider these factors when deciding whether to treat:

- Greater age and life expectancy
- Psychological factors
- Convictions (patient and physician)
- Social environment
- Availability for follow-up
- Pregnancy

27

Vascular Abnormalities

- **Ocular:**
 - Reduced diastolic pulse amplitudes
 - Narrowing/Functional Occlusion of Ophthalmic Artery
 - History of hemodynamic crises
 - Nocturnal Hypotension
 - ?Dysfunctional autoregulation of ONH ?
 - Disc Hemorrhage
- **Systemic:**
 - History of hemodynamic crises
 - Over/under dipping of BP
 - Reduced diastolic BP
 - Increased blood viscosity and hypercoagulability
 - Cerebral Ischemia/Migraine Headaches/Vasospasms

28

What the Academy Thinks

Table 10.5 Recommended Guidelines for Follow-up of a Glaucoma Suspect, American Academy of Ophthalmology

Treatment	Target IOP Achieved	High Risk	Follow-up Interval, mo	
			Examination	ONH/VF Evaluation
No	N/A	No	6-24	6-24
No	N/A	Yes	3-12	6-18
Yes	Yes	Yes	3-12	6-18
Yes	No	Yes	≤4	3-12

IOP, intraocular pressure; N/A, not applicable; ONH, optic nerve head; VF, visual field.
Modified from American Academy of Ophthalmology. Primary Open-Angle Glaucoma Suspect, Preferred Practice Pattern. San Francisco, CA: American Academy of Ophthalmology; 2005. Available at: <http://www.aao.org/ppp>.

29

Binary Dogma

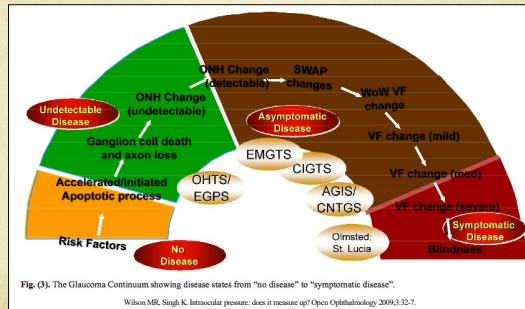


- IOP: Above target vs Below target
- Disease: Stable vs Progressive

Singh K. Is the patient getting worse? *Optom Ophthalmology* 2009;3:65-6.

30

Glaucoma as a Continuum



31

The Art of Medicine

Kuldev Singh

Therapy will not be advanced because a patient shows statistical progression on a visual field test but rather because the rates of progression are deemed unacceptable given the patient's severity of disease, overall health, age, risks and benefits of various treatment options and patient willingness to accept these risk-benefits trades-off. Unlike care in the present era of binary dogma, not all progression will have to be met with additional treatment because all patients will be deemed to be continually progressing, albeit at different rates.

Singh K. Is the patient getting worse? *Open Ophthalmology* 2009;3:65-6.

32

The Oxymoron of Ophthalmology (Low Tension Glaucoma)

Clint Simpson MD
Specialty Eye Institute

May Educational 2021

1

Low Tension Glaucoma

ICD 10 : H40.123x (LTG)

- Chronic Optic Neuropathy with characteristic glaucomatous cupping and visual field loss with a documented intraocular pressure not greater than 22mmHg.
- Normal Tension Glaucoma (NTG)



2

Pathogenesis

Mechanical Theory vs. Vascular Theory

- Mechanical (Compressive) Glaucoma theory of optic nerve loss
 - Elevated intraocular pressure ->excessive fluid force at lamina cribrosa-> compression of axons of nerve fiber layer/retinal ganglion->vision loss.
- Vascular Theory
 - Loss of blood supply to perineurial capillaries->axonal hypoxia->nerve fiber layer loss->vision loss
- Other Theories
 - Include Oxidative Stress, Glutamate Toxicity, autoimmunity, vascular dysregulation

3

Risk Factors

Low Tension Glaucoma

- Increasing Age
- Hx of Migraine, Raynaud's, Sleep Apnea associated with higher risk.
- Systemic Hypotension

4

Signs and Symptoms

POAG with normal IOP

- Little to no symptoms
- Orthostatics/Hypotension
- Migraine/Sleep Apnea/Raynaud's
- Optic disc cupping
- Optic disc hemorrhages
- Thinning of RNFL
- Classic visual field changes
- Normal Diurnal IOP



5

Diagnosis

Diagnosis of Exclusion

- Gonioscopy
- Pachymetry
- OCT of RNFL, Visual Fields, Stereo Disc Photos
- Obtain diurnal IOP checks (AM/PM appts)
- Rule out inflammatory, coagulopathy, vascular, traumatic, compressive, or toxic causes.
- Recommend Sleep Apnea Study

6

When to Image

My Personal Guidelines

- Take into account the sum of the patient
- Central VA less than 20/40
- Younger than 50 years old
- Field defects that respect the vertical meridian
- ON pallor greater than cupping.

7

Treatment

Low Tension Glaucoma Treatment Study

- Brimonidine 0.2% was superior to timolol 0.5% in limiting progression.
- Concern beta-blockers may increase hypotension.
 - If used, dose in AM NOT PM.
- Other drops should be administered in PM as 40-80% of LTG patients IOP peaked at night.



8

Treatment

Collaborative Normal Tension Glaucoma Study (CNTGS)

- 30% reduction from baseline IOP showed 88% reduction in HVF progression at 30 months.
- Study used a combination of drops/laser/surgery to achieve IOP reduction.



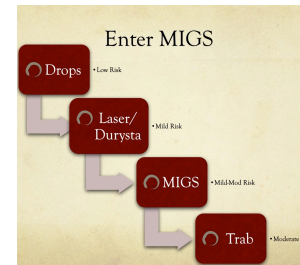
"Not now - I'm under a lot of atmospheric pressure."

9

Treatment Options

Tight Sustained Control

- Topical PGA's (First Line)
- Vyzulta
- Brimonidine 0.1% (Allergy)
- Rhopressa/Rocklatan
- Not huge fan of SLT
 - ?Longevity
- Early Surgery (Trab)
 - Esp with Central Field Defects



10

Summary

- LTG should be treated like POAG with a focused systemic workup.
 - Image (<20/40, <50yo, Field defects respect vertical meridian, disc pallor)
- Reduce IOP to 30% of baseline by whatever means necessary
 - Looking for Tight Sustained Control of IOP
 - Aggressive Tx with Central Field Defects
- Avoid beta-blockers (topically and systemically) where possible
 - Prefer Ca²⁺ blockers if possible in consultation with PCP/Cardiology

11