Critical Assessment of the Optic Nerve in Glaucoma

Gray Glaucoma

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Commercial Interests

Haag Streit
Quantel
Optovue
Reichert
Alcon

Optic Nerve Evaluation

• 100 doctors in audience
• 10 patients per day
• 20 nerves / day / doctor
• We performed 2000 optic nerve evaluations today
• 500,000 optic nerves in one year
• We (OD’s) are the front line in glaucoma diagnosis

Agenda

• What’s old and new in optic nerve assessment?
• What’s old and new in our understanding of glaucoma
• Optic nerve grand rounds with emphasis on NTG

the glaucoma continuum

Optic Nerve Evaluation

C/D = .35
Documentation of the Optic Nerve Head

colored pencils

Imaging

Ganglion Cell Complex (GCC)
Swept Source OCT?

The Disc Damage Likelihood Scale
Using the optic disc to diagnose and manage glaucoma.
By George L. Spaeth, MD, FACS

Size matters!

rim matters
C/D = .4

the basics
rim matters

Optic Nerve
5 R’s

- Rim margin
- Rim area
- Nerve Fiber layer
- Peri-papillary atrophy
- Drance Hemorrhage

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Drance Hemorrhage

Disc hemorrhage with PVD

The ISNT rule
- Inferior
- Superior
- Nasal
- Temporal

Drance Hemorrhage

pallor or cupping
Normal Tension Glaucoma (NTG)

- Definition: a neurovascular disease.

Characteristics:
- Drance hemorrhage
- Migraine
- Role in POAG
- Low ocular pulse amplitude (OPA)
- Low diastolic perfusion pressure (DPP)

Autoregulation

The system which attempts to mitigate variations in intraocular pressure and systemic blood pressure to fulfill ongoing axonal metabolic requirements.

What affects ocular blood flow?

- Vessel architecture
- Vessel health
- Autoregulation
- Refractive status
- Axial length
- Aerobic fitness
- Ocular pathology
- Cardiac output
- Systemic medications
- Ocular medications
- Age

Nocturnal Hypotension

- Circadian cycle
- Beta blockers
- ACE inhibitors
- Anti-depressants
- Above Rx’d qhs

Acute Perfusion Pressure Effect

The effect on ocular blood flow which precipitates as the result of change in intraocular pressure.

- Blood flow decreases when IOP increases
- Blood flow increases when IOP decreases

Ocular Pulse Amplitude (OPA)

OPA = systolic – diastolic IOP

Studies by Herndon, Kaufmann, Harris and Schmidt all confirmed that Low OPA is associated with NTG and POAG patients have lower OPA than normal and ocular hypertensives have higher OPA than normal.
diastolic perfusion pressure (DPP)

DPP = diastolic BP – IOP

Barbados and Baltimore Eye Studies

*Increased risk for low DPP (below 55)*

This means that the highest risk is a combination of high IOP and low diastolic BP

**Conclusions:** Low DPP appears to be a reasonable predictor of progressive optic neuropathy. DPP of 56 mm Hg or lower appears to be a clinically useful threshold to identify patients at increased risk of progressive optic neuropathy.

Drance Hemorrhage Case #1

OS
- 67 y/o Caucasian female - slender
- IOP 24, 25
- Open angles
- Family Hx ?
- No Hx migraine
Case #1
assessment & plan

Case #2
• 73 y/o Caucasian female
• IOP 20, 21
• No family Hx
• Open angles

Case #2 HRT
Case #2 OCT
Case #2 fields

- IOP OD = 20 / 21
- 69 y/o Caucasian male
- OPA = .9mm Hg OU
- No Family Hx
- Tall slender stature
- Open angles – light pigment
- CCT – 540 / 535
- Para central defects OS > OD
- Poor tolerance to beta blockers

Case #2 progression

Case #2 assessment & plan

Case #3 Classic NTG

- IOP OD = 20 / 21
- 69 y/o Caucasian male
- OPA = .9mm Hg OU
- No Family Hx
- Tall slender stature
- Open angles – light pigment
- CCT – 540 / 535
- Para central defects OS > OD
- Poor tolerance to beta blockers

Case #3 Classic NTG
Case #3
Classic NTG

Case #3 assessment & plan

Case #4
Is this NTG?

[Images of OCT scans]

Case #4
Is this NTG?

- 57 y/o Caucasian female
- IOP 18 mm Hg OU
- Possible Hx migraine
- No family Hx glaucoma
- Open angles
- Moderate stature

[Images of fundus photos]
Case #4
Is this NTG?

"Always remember to pull the ‘–omas’ out of glaucoma.”
Case #4
assessment & plan

Case #5
the large nerve

Case #5
the large nerve

Case #5
the large nerve

- 53 y/o Caucasian male
- No family Hx POAG
- Mother used thalidomide during pregnancy
- IOP low to mid 20's
- Open angles
Case #6
NTG

- IOP high teens
- Slender 81 y/o Caucasian female
- Hx migraine with aura
- Cold hands
- Vision improves with glaucoma meds
- BP = 95 / 70
- OPA = 1.1 OU

Case #6
assessment & plan

Case #7
good nerves
profound NFL defect

- IOP = 22 / 21 (GAT)
- IOP = 27 / 25 (DCT)
- Caucasian    Age 18
- Positive Family Hx
- grade 4 angles 1+ pigment
- NFL wedge defect
- CCT 540 / 535
- para-central B-Yellow defect OU

Case #7
good nerves
profound NFL defect
Caucasian    Age 18
Case #7

assessment & plan

Case #8

MS Atrophy vs. NTG

- 52 y/o Caucasian female
- Multiple Sclerosis 10 years
- Hx episodes od RB neuritis
- Mother has “glaucoma with low pressure”
- IOP high teens without treatment
- BP = 105 / 72
Case #8 MS Atrophy vs. NTG

Peripapillary atrophy (PPA)

- IOP OD – 26 /25
- 67 y / o Caucasian male
- No Family Hx
- grade 2 angles trace pigment
- PAK 561 / 555 OS OPA
- 1.1 mmHg OU
- OD - normal 30-2 fields, slight nasal depression - OS

Case #8 assessment & plan
Case #8
Peripapillary atrophy (PPA)

Case #9
Chronic Drance Hemorrhage

Case #8
assessment & plan

Case #9
Chronic Drance Hemorrhage

- IOP OD – 27 / 31
- 70 y/o Caucasian female
- Strong Family Hx
- Chronic Drance hemorrhage
- .8 OPA (very low ocular pulse)
- grade 2 angles 1+ pigment
- PAK 555 / 561
- Corresponding Bjerrum defects
- Surgeon offered trabs!

10 degree white on white
Case #9
assessment & plan

Case #10
asymmetric small nerves
LASIK

• GAT = 17 / 15
• post LASIK
• 49 y/o Caucasian female
• DCT 20.1, 20.8
• asymmetric small nerves
• No Family Hx
• grade 4 angles 1+ pigment
• CCT 520 / 515
• Para central defect = 10 degree threshold

Case #10
assessment & plan

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Thank You!

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