NORMAL TENSION GLAUCOMA UPDATE

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GLAUCOMAS: A group of optic neuropathies characterized by progressive retinal ganglion cell and axonal degeneration

Two Broad Categories:
+ Open Angle 80%
+ Angle Closure 20%
Normal-tension Glaucoma accounts for 25-50% of open angle glaucoma individuals with IOP’s < 22mmHg in several population based studies.

*JAMA. 2014; 311(18):1901-1911.doi;10.1001/jama.2014.3192(See references 1,14)
NTG Update
A Typical Presentation

Often 60 years and older
- Blurred vision
- No visual symptoms
- IOP<22mmHg
- Increased optic nerve cupping, especially vertically
- Often significant asymmetrical cupping
- Higher incidence of splinter hemorrhages
- VF loss tends to be more paracentral and deeper?
- OCT RNFL thinning consistent with VF and optic nerve changes
Work Up Strategies

Good Baselines:

- Best corrected visions
- Multiple IOP’s
- Comprehensive dilated eye exam
- Reliable VF’s
- OCT glaucoma
- Disc photos
- Gonioscopy
- Detailed present and past medical history
Present and Past Medical History

- Obstructive sleep apnea (OSA) - snoring and daytime sleepiness
- Systemic vascular or immune related illnesses
- Past history of major hypotensive event
- Head injury
- Current or prior use of systemic or topical steroids
- Migraine
- Past episodes of angle closure glaucoma
Current Systemic and Topical Meds

- Blood pressure meds - morning or evening dosage?
- Steroid: systemic, nasal, and topical routes
Glaucoma Risk Factors

High Risk groups:
- African Americans
- Over 60 years
- Family history
- Hispanics in older age groups
- Asians-increased risk for angle closure glaucoma
- Steroid users
- Eye Injuries
- High Myopia
- Hypertension
- Thin corneas(<500 microns)
- OSA
Pathophysiology of NTG

- Lower tolerance of normal IOP causing mechanical damage
- Perfusion deficit and vascular dysregulation
- Translaminar pressure gradient
- Impaired CSF circulation (compartment syndrome)
Optic Nerve Anatomy
ADVANCED CUPPING

Marked asymmetry
Neuro Imaging

- Indications:
  - Progressive optic nerve cupping and VF loss despite meeting target pressures and no other obvious cause for the progression
  - Unexplainable Headaches
  - Unexpected VF loss especially if loss respects the vertical midline
  - Rapid unexplained vision and/or VF loss
Clinical Case

80 yo female who first presented to TTUHSC at 70 yrs of age with:
+ 20/20 Va OU (with correction)
+ IOP 16/17
+ C/D 0.55/0.7
+F/U one month later: IOP 12/12 and pach 585/585 and now C/D is described as 0.7/0.85

Here’s what happened to her over a 10 year period:
+ slow progressive VF and optic nerve progression despite “normal” IOP’s
+ What questions should have been asked and what further work up would you recommend
Clinical Case

- 63 year old female who presented with blurred vision and headaches:
  - Exam findings: Va(uncorrected) 20/100 ph 20/80-2 OU
    IOP’s 16/17 mmHg
    C/D 0.5 OD and 0.55 OS with mild temporal pallor OU
    Posterior segment: normal except for a 2 DD choroidal nevus inferotemporally OD
  - VF findings: somewhat diffuse overall decrease in sensitivity
B. Sellar tumor:

Hemorrhagic Pituitary adenoma.

C. Sellar tumor liquid in trap #1:

Hemorrhagic Pituitary adenoma.

D. Sellar tumor liquid in trap #2:

Mostly hemorrhage with scant Pituitary tissue.
Sleep Study
When to Recommend

- OSA characterized by:
  - repeated episodes of partial (hypopnea) or complete (apnea) upper airway obstruction during sleep
  - Snoring
  - Daytime sleepiness

*5/18/2013 presentation by Jess Whitson M.D. UTSW*
OSA Risk Factors*

- Upper Body Obesity
- Male gender
- Upper airway abnormalities
- Smoking
- ETOH use
- Snoring
- Neck girth of >17 inches for male and >16 inches for female
- Diabetes and Hypertension
- Family History

*Jess Whitson M.D., UTSW presentation 5/18/2013
Definitive Dx of OSA*

- Requires: Sleep Study
- Interpretation:
  - Apnea/Hypopnea Index (AHI) - number of apneas and hypopneas per hour of recorded sleep
  - AHI >5 is abnormal
  - AHI >15 requires intervention due to increased risk of cardiovascular morbidity and mortality

*Phillips B, et al, eds, Principle and Practice of Sleep Medicine, 2005
OSA Syndrome Associated Systemic Conditions*

- Systemic Hypertension
- Cardiac arrhythmias
- Pulmonary arterial Hypertension
- CHF
- Stroke
- Health-related quality of life issues:
  - motor vehicle crashes and occupation accidents
  - pregnancy issues

OSA syndrome-Associated Ocular conditions*

- Floppy Eyelid Syndrome
- NAION
- Papilledema
- Papillary conjunctivitis
- Retinal vascular tortuosity
- Central Serous Chorioretinopathy

Surgi* and Coworkers found:
- NTG in 3 of 51 patients with OSA (5.9%)
- No OSA in 40 controls

As AHI increased the following were found:
- greater IOP
- more extensive VF loss
- RNFL thickness decreased

Marcus and coworkers* found OSA in 55% of NTG patients (5/9) and 50% (2/4) of NTG suspects.

Blumen and coworkers* found OSA in 50% of NTG patients (3/6) and 48% of POAG patients (12/25).

Comparison of 14 POAG and 34 GS patients with OSA to a control group of POAG and GS patients without OSA:

+POAG patients with OSA:
- 5 times more likely to have diabetes (20 vs. 4, p = 0.0001)
- > 4 times more likely to be pseudophakic (9 vs. 2, p = 0.04)

Geyer and coworkers found POAG in 5 out of 228 patients with OSA, similar to the expected 2% prevalence in the general population.*

Kremmer et al* reported two cases of NTG which continue to progress despite low IOP’s following trabeculectomy.

Following initiation of CPAP, visual field and RNFL indices stabilized for over 3 years.

Sebastian and Associates* described a 49 yo male with moderately advanced POAG and severe OSA.

Two years after CPAP therapy, visual field indices improved significantly.

Glaucoma and OSA
Effect of Treatment

Humphrey's Visual field-pattern deviation: right eye before treatment (test duration: 10 min 16 s); left eye before treatment (test duration: 9 min 37 s).

Humphrey's Visual field-pattern deviation: right eye after treatment (test duration: 3 min 49 s); left eye after treatment (test duration: 3 min 54 s).
OSAS
Treatment Options

- Weight loss
- Avoid supine sleep posture
- Positive Airway Pressure (CPAP)
- Oral Appliance
- Surgery
Glaucoma and OSA Causal Factors*

- Ischemia (hypoxia)
- Ocular perfusion pressures
- IOP
- Autonomic dysfunction
- Inflammation and oxidative stress
- Hypercapnia

Conclusions for glaucoma and OSA*

- Evidence is increasing that strongly suggests and association between OSA and glaucoma.
- Episodic hypoxia may be the link between IOP-independent mechanisms and these two disorders.
- Primary eye care professionals should be aware that OSA is a not infrequent modifiable mechanism in addition to IOP’s associated with the development and progression of glaucoma.

* Jeff Whitson MD, presentation at UTSW 5/8/2013
Observation:
Maybe appropriate in borderline and low risk patients
Follow-up IOP checks at differing times of day
Annual VF’s and OCT’s

Medical Therapy:
Determine target IOP’s
Take into consideration contraindicated topical meds

Surgical Therapy:
SLT
MIGS
Filtering procedure
Summary

✓ NTG is a diagnosis of exclusion

✓ Systemic Hypotension and/or Hypoxic events are more common associated factors than expected

✓ Don’t exclude the Dx of Glaucoma based on normal IOP’s

✓ Early detection of modifiable medical co-morbidities can be transformative in the life of your patients