A Double Dose of Glaucoma Update
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Disclosures
- Neither of us have any financial ties to any of the companies mentioned in this lecture.
- Although if they want to give us money, we would listen.

You Probably Don’t Have Glaucoma…

Glaucoma As We Know It - Statistics
- It is estimated that over 2 million Americans have glaucoma
- Approximately 30% have been diagnosed and are being treated
- Increased prevalence among ethnic groups
  - African American, Hispanic, Indo, Asian American
- Many different types of glaucoma
  - Primary open angle
  - Narrow angle
  - Angle closure
  - Uveitic
  - Pigmentary
  - Not all are treated the same!

Glaucoma As We Know It - Medications
- There are over twenty branded medications used to treat glaucoma
- Approximately half are available in a variety of generic substitutes
- Even cap color is not a guaranteed identification anymore!
- The last novel glaucoma medicine (tafluprost) was released in 2012
- All other recently released products are PF or combinations of existing medicines
- But new medicines are on the horizon!
- It is our responsibility to stay informed!

So what’s next…?
New Meds #1 - Tafluprost 0.0015%
- First preservative-free glaucoma medication
- Prostaglandin analog
- Dosed one drop, every evening
- Carton of 30 vials, separated into three foil pouches
  - Unopened pouches should be refrigerated
  - Opened pouches may be left unrefrigerated
- Who is a good candidate?
  - Young glaucoma patients
  - Multiple medication patients
  - Postoperative patients
  - Multiple allergy patients

New Meds #2 - Dorzolamide HCl 2%/Timolol Maleate 0.5%
- Non-preserved version of existing medicine
- Dosed one drop, two (or three) times per day
- Carton of 60 vials, separated into four foil pouches
  - Unopened pouches should be refrigerated
  - Opened pouches may be left unrefrigerated
- Who is a good candidate?
  - Same patient profile as Zioptan
  - Pre-existing Cosopt users

New Meds #3 - Brinzolamide 1%/Brimonidine 0.2%
- First non timolol combination medication
- Dosed one drop, three (or two) times per day
- Combines industry-leading 2+ line treatments
- Who is a good candidate?
  - Adjunct therapy to PGAs
  - Prostaglandin analog allergy
  - Beta-blocker contraindication

New Meds #4 - Unoprostone Isopropyl 0.15%
- Reformulation of original medication from 2000
  - Concentration increased from 0.12% to 0.15%
  - Reclassified as docosanoid, not prostaglandin
- Increases outflow through trabecular meshwork
- May affect BK and ClC-2 channels as well
- Effective reduction in IOP with limited side effect
- Less systemic effect than most adjunct therapies
  - Similar side effect profile to prostaglandins

New Meds #5 - Netarsudil 0.02%
- Rho-kinase inhibitor
- First new class of glaucoma medications since 1996
- "Triple Action" IOP-lowering capability
  - Inhibits Rho-kinase (ROCK)
  - Increases trabecular meshwork outflow
  - Inhibits Norepinephrine Transporter (NET)
- Reduces episcleral venous pressure
- Inhibits release of intraocular pressure
- Decreases aqueous production
- Potentially mid-to-late 2017 for FDA approval
- Likely to be combined with latanoprost
  - Holds promise to be most efficacious glaucoma medication ever!

New Meds #6 - Latanoprostene Bunod 0.024%
- Novel compound with dual-action IOP-lowering effect
- Addition of nitric oxide donating moiety to latanoprost
- Nitric oxide release to trabecular meshwork, increasing outflow
- Combines with PGA effect to produce significant IOP-lowering effect
- Has completed Phase III trials, awaiting FDA approval
  - However, delayed in July 2016 due to manufacturing concerns
  - NicOx also working on a solo nitric oxide donator
  - Would avoid adverse effects of PGAs
New Meds #7 – Trabodenoson
- Adenosine (A1) receptor agonist
- Receptors found in the trabecular meshwork
- Upregulates proteases that reduces protein accumulation in the TM
- May also exhibit neuroprotectant properties
- Study showed protection against ischemia-induced ganglion cell loss
- Also may be paired with latanoprost in combination drop
- Currently in Phase III trials
- Other companies also investigating drugs in this new class

New Meds #8 – Ripasudil 0.4%
- Rho-kinase inhibitor
- Already in use in Japan, launched December 2014
- Mechanism of action the same as netarsudil
- Dosed one drop, two times per day
- Unknown if product will be brought to the U.S.

New Meds #9 – Alphabet Soup
- AMA0076: ROCK-inhibitor, in Phase II trials since 2012
- Alleged to produce significantly less hyperemia
- OPC-1085EL: latanoprost/cartelol, Phase III ongoing
- Registered in Japan in September 2016
- DE-117: omidenapag isopropyl, Phase III upcoming
- Non-prostanoid selective DP1 receptor agonist

New Meds #10 – Lomerizine
- Oral calcium channel blocker
- Targeted vasodilating effect with affinity for cerebral and neural tissues
- Increases blood flow without significantly lowering blood pressure
- Currently marketed in Japan as a treatment for migraines
- Increased blood flow may provide neuroprotectant effect against ischemia
- Phase II trials ongoing in Japan

New Drug Delivery Systems
- Sustained-release drug therapies are on the horizon
- Aims patient adherence issues
- Intracameral depot
  - DM515 is in phase II trials
  - Utilizes extended-release travoprost
- Bimatoprost SR is in Phase III trials
- External devices
  - Helios is a latanoprost laden polymer ring
  - Sustained delivery for six months of wear
- Drug-eluting punctal plugs also under development
  - OTX-TIP is bridging-table intracanalicular transport (Phase III)
  - Evolutes is travoprost eluting punctal plug (Phase II)

Endoscopic Cyclophotocoagulation (ECP)
- Minimally invasive glaucoma surgery (MIGS)
- Ciliary processes photocoagulated
- Often performed intrasurgically
- Fiber optic camera probe with laser
- Reduces aqueous production
- Severe IOP degree can treated
- Potentially opens narrow angles
- Advantages:
  - Very low risk profile
  - Easy to perform (approx. five min)
- Disadvantages:
  - Slight IOP drop
  - CI: PXE and uveitic glaucoma
More MIGS

- Glaucoma shunt devices proliferating
- Physically inserted intraoperatively
- Location, location, location
  - iStent: trabecular meshwork
  - Hydrus: Schlemm’s canal
  - CyPass: suprachoroidal space
  - XEN: subconjunctival space
  - iStent Inject: trabecular meshwork
  - iStent Supra: suprachoroidal space

Glaucoma As We Know It - Technology

- Managing glaucoma is more than just checking IOP!
  - Visual Field testing
  - Gonioscopy
  - Fundus photography
  - Pachymetry
  - OCT

Advancements in OCT Technology

- Significant improvement in quality
  - Faster, less blink artifact
  - Clear image without dilation
  - Less technician-dependent
  - No targeting, cube of information
  - More versatility in testing
  - Pachymetry
  - Angle imaging
  - Progression modules available
  - RNFL trend analysis

All The Pretty Pictures

Going Where No OCT Has Gone Before

- Time Domain OCT → Spectral Domain OCT → Swept-Source OCT
  - 1.080 nm wavelength allows deeper penetration into tissues
  - Deeper scan captures more information (i.e., choroid, sclera, lamina cribosa)
  - Better signal strength through media opacity (i.e., cataract, hemorrhage)
  - Less susceptible to the eye — no distracting laser sweeps
  - Capable of ~100,000 A-scans per second
  - Compared to SD (~40,000 to 80,000 scans) and TD (~100-400 scans)
  - Gathers more information over a larger scan window
  - Superior for screening patients with difficult fundi
  - Not yet commercially available in U.S.

Ultrasound Biomicroscopy (UBM)

- Utilizes high frequency ultrasound
- Produces anterior segment imagery
- Indications:
  - Anterior segment abnormalities
  - Narrow angle/angle closure
  - Ocular trauma
  - Secondary glaucoma
Annidis RHA

- Multi-spectrum imaging
- Capable of deep tissue scans and simulated fluorescein angiogram
- Patient PC, 66 yo WF
- H/O GLC & ARMD - treated with Xalatan qhs OU
- 2009: Local OMD labeled her glaucoma suspect, D/C Xalatan
- 2013: GAT 21/23, C/D 0.6/0.6 OU; moderate macular drusen OU
- Annidis scan for ARMD; drusen...

Technology Pitfalls

- Patient MR, 42 yo HM
- New patient - denies dilation, but agrees to Optos
- Tech reports “difficulty getting a good image of the right eye, despite several attempts”
- In fact, images of both eyes were taken just fine...
- “Don’t miss the forest for the trees!”

New IOP-Monitoring Technology

- Triggerfish approved by FDA in March 2016
- Microsensor-embedded high-OK silicone SCL
- Gauge fluctuations in corneal circumference secondary to ocular intraocular pressure
- Mathematical relationship to IOP - not actual mmHg
- Taken ~300 measurements (once every 5 minutes)
- Data transmitted to pericircular antenna connected to wearable recorder
- Data downloaded from recorder after 24 hours
- Lens is single-use only, must be discarded
- Available in BC 6.4 mm, 6.7 mm, 9.0 mm
- Cost: $9,000 for system, $1,000 for one setup
- CPT 0329T “Monitoring of IOP >24 hours”
- May change our profession’s approach to IOP

Now What? How Do I Manage?

After initial diagnosis, every three months...
- Office visit with visual field testing
- Dilated exam with OCT
- Office visit with gonioscopy
- May substitute dilated exam with disc photos
- Annual exam with refraction and dilation
- Rinse and repeat
- Don’t be afraid to test!
- Don’t be afraid to repeat test!

Repeat Test Example

24-2, April 2013 24-2, May 2013

Glaucoma Certification

- There are four basic requirements to become glaucoma-certified:
  1) License must be active and in good standing
  2) Must be TPA-certified
  3) Must take 24-hour didactic course on management of glaucoma
  4) If you graduated after May 2008, you are exempt!
  5) Must treat 25 individual patients for twelve consecutive months
  6) 16-hour Case Management Course - 15 patient credits
  7) 16-hour Grand Rounds Program - 15 patient credits
  8) Preceptorship Program - 1 patient credit each
- Preceptor must be GLC-certified OD (≥2 yrs)
- Telemedicine and electronic exchange of information is allowed
- Of 35 ocular disease CE credits, 10 must be GLC-related to maintain certification
So, How Do I Get Paid?

- Step #1: Get on medical insurance panels
- Step #2: Always get updated medical insurance information
- Step #3: Never "just run a test"
  - Your patients (and your wallet) will appreciate it!
- Step #4: Don't be afraid to binge test
  - Do not let glaucoma walk out the door
- Step #5: Repeat tests as necessary
  - Do not make decisions based on unreliable data

Show Me The Money!
2016 Medicare Reimbursement, Sacramento Area

- CPT 92133, OCT Optic Nerve: $46.78
- CPT 92083, Visual Field, Extended: $68.88
- CPT 92020, Gonioscopy: $38.19
- CPT 92250, Fundus Photos: $84.90
- CPT 76514, Pachymetry: $16.03
- One full glaucoma work-up: $244.78
- CPT 76513, Ophthalmic Ultrasound: $99.99 per eye

Typical Glaucoma Management Cycle
2016 Medicare Reimbursement, Sacramento Area

- Schedule every three months!
- January: Full exam + OCT
- April: Office visit + Visual Field
- July: Dilated exam + Disc Photos
- October: Office visit + Gonioscopy
- Rinse and Repeat!
- What is the reimbursement?
  - 92014 + 92133 = $177.96
  - 92012 + 92083 = $159.49
  - 92014 + 92250 = $216.08
  - 92012 + 92020 = $118.80
  - Total: $672.33/year

Glaucoma Management Cycle, Take Two
2016 Medicare Reimbursement, Sacramento Area

- Schedule every six months!
- January: Full exam + OCT + VF + Pachy
- February: Office visit
- July: Dilated exam + Disc Photos + VF + Gonioscopy
- Rinse and Repeat!
- What is the reimbursement?
  - 92014 + 92133 + 92083 + 76514 = $526.87
  - 92012 = $90.61
  - 92014 + 92250 + 92083 + 92020 = $373.15
  - Total: $666.63/year

Who To Refer To?

- Your friendly local glaucoma-certified optometrist!
- Many of us are well-qualified and eager to manage glaucoma
- Referring solely to ophthalmology damages our efforts to expand scope

When To Refer To OMD

- Angle closure (after IOP is controlled)
- Narrow angles (LPI)
- Surgical candidate
- Poor compliance with medication
- Progression despite maximum medication
- Cannot afford medications
- SLT, #IG, trabeculectomy all possible
Case #1 - GLC Suspect v. Initiating Treatment

- Patient RP, 45 yo HM
  - New patient, presents for vision examination
  - Macular hole OD
  - IOP (iCare): 13/13
  - RNFL abnormal OU
  - Testing initiated...

Case #1 - GLC Suspect v. Initiating Tx

- OCT Cirrus
- 24-2 Visual Field

Testing results:
- Highly suspect RNFL OU
- Abnormal VF OU
- Pachy: 493/496
- Tmax = 13/13...
- Decision time!
- Patient started on prostaglandin analogue qhs OU
  - IOP with medication: 08/10
  - Testing stable on medication

Case #2 - Continue Tx v. Add Medication

- Patient AM, 87 yo WF
  - Lives in a skilled nursing home
  - IOP (GAT): 17/18
  - C/D: 0.8 R OD, 0.7 R OS
  - Testing initiated...
  - Patient started on PGA OU
  - IOP (GAT) @ 1 month: 16/16

Five months later...
- IOP stable with treatment
- Visual Field repeated...
- Decision time!
- Added adjunct therapy OD
- Possibilities:
  - Beta blocker
  - Brinzolamide/Brimonidine
  - Combination medication
  - Treat OS?

Case #3 - Continue Mgmt v. Referral

- Patient HK, 66yo IF
  - Longstanding H/O OHTN, diagnosed in India, moved to U.S. in 2007
  - Meds: Latanoprost qhs, Cosopt bid - questionable compliance
  - OCT Stratus
  - 30-2 Visual Field
Case #3 - Continue Mgmt v. Referral

- IOP controlled on multiple meds
- Chronic conjunctivitis exacerbated by medicine, work environment
- 2-3+ injection with chemosis, significant discomfort
- Corneal decompensation with increasing keratitis
- Demonstrated poor reactions to multiple medications
- Attempted to curtail inflammation with topical steroids – IOP: 35/40

Decision time!

- Outside referral to OMD for glaucoma surgery in December 2014
- Patient declined citing surgical risk and transport issues
- Internal referral to OMD for glaucoma surgery in September 2016
- Eventually acquiesced to surgery, underwent trabeculectomy OU

- Now stable S/P trabeculectomy OU
- IOP: 14/17 on no GLC medications!
- Eyes white and quiet for first time in more than ten years!

Questions?
(Softballs Only)

Thank You!