PACIFIC UNIVERSITY COLLEGE OF OPTOMETRY
2015 VICTORIA CONFERENCE
July 16 - 19, 2015
Inn at Laurel Point
Victoria, B.C. CANADA
COPE EVENT #109358

Date	Speaker	*Title*	COPE	Verification
Thursday, July 16, 2015	Terry Burris, MD	*Dry Eye Etiology and Diagnosis (1 hr)*	45687 AS	1 hour Therapeutic
	Terry Burns, MD	*Dry Eye: Current and Future Treatment Options (1 hr)*	45701 AS	1 hour Therapeutic
	Danica Marrelli, OD	*VEGF Inhibitors in Eye Care (1 hr)*	36496 PS	1 hour Therapeutic
	Curtis Baxstrom, OD	*Prism Applications in Acquired Brain Injury (1 hr)*	43108 NO	1 hour
	Tad Buckingham, OD	*Diabetes Potpourri (1 hr)*	45456 SD	1 hour Therapeutic
Friday, July 17	Danica Marrelli, OD	*Glaucoma Case Analysis Everyday Challenges for the Primary Care Optometrist (2 hrs)*	40184 GL	2 hours Therapeutic
	Terry Burris, MD	*Corneal Degenerations (1 hr)*	45688 AS	1 hour Therapeutic
	Tad Buckingham, OD	*Pharmaceutical Injections for Optometrists (1 hr)*	45631 IS	1 hour Therapeutic
	Terry Burris, MD	*2015 Update on Corneal Procedures Surgery (1 hr)*	45690 PO	1 hour Therapeutic
			Total hours offered: 10	Total hours earned:

Name_____License #_____

Mailing Address_____

Please retain a copy of this stamped form as verification of hours earned. Please be advised that your individual state board makes the final determination of applicable hours. For more information, contact Pacific University College of Optometry, 2043 College Way . Forest Grove, OR 97116 . 503-352-2202

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Date	Speaker	*Title*	COPE	Verification
Saturday, July18	Tad Buckingham, OD	*Pain Management Spanning the oral pharmaceutical analgesic options from OTC to federally controlled medications (1 hr)*	45141 OP	1 hour Therapeutic
	Curtis Baxstrom, OD	*Visual Considerations of Dizziness,Vertigo and Imbalance (2 hrs)*	37401 NO	2 hours Therapeutic
	Terry Burris, MD	*Infiltrative Keratitis: Diagnosis and Management (1 hr)*	45689 AS	1 hour Therapeutic
	Danica Marrelli, OD	*The Glaucoma Grab Bag: Practical Guidelines for Effective Glaucoma Therapy (1 hr)*	40087 GL	1 hour Therapeutic
Sunday, July 19	Curtis Baxstrom, OD	*Optometric Insights and Therapeutic Interventions for Corticol Visual Impairment (2 hrs)*	44826 FV	2 hours
	Danica Marrelli, OD	*Pharmacology Update (1 hr)*	40085 PH	1 hour Therapeutic
	Tad Buckingham, OD	*Medical Emergencies (2 hrs)*	41029 SD	2 hours
			Total hours offered: 10	Total hours earned:

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2015 Victoria Conference Speakers

Curtis Baxstrom, Tad Buckingham, Terry Burris, Danica Marrelli, Lea McLeod

Curtis R. Baxstrom is a graduate of Pacific University College of Optometry. His private practice in Federal Way, Washington, consists of special needs patients, learning disabled children and patients who have suffered traumatic brain injuries or strokes. He is also adjunct faculty at PUCO where he helps teach several courses. He has lectured on a variety of visual topics in the areas of child development, learning, visual rehabilitation and vision therapy both nationally and internationally. He is a fellow of the Neuro-Optometric Rehabilitation Association (NORA) and was a recipient of the NORA President's Award in 2012.

Tad Buckingham is a graduate of Pacific University College of Optometry where he currently serves as an adjunct clinical instructor. Dr. Buckingham is also a full-time firefighter and Captain of Forest Grove Fire & Rescue in Forest Grove, Oregon. He is credentialed as an Emergency Medical Technician (EMT) – Paramedic and speaks to a number of healthcare professionals on emergencies in the primary care office.

Terry E. Burris graduated from the University Of Kansas School Of Medicine in 1977. He is affiliated with Legacy Good Samaritan Medical Center and Providence Saint Vincent Medical Center. Dr. Burris performed a research and clinical fellowship in Cornea and External Disease and Refractive Surgery at the McGee Eye Institute of the University of Oklahoma. He also served four years as Chief of the Cornea Service for the Northern Pacific rim at the Naval Hospital in Oakland, California. Afterward Dr. Burris served four years as Founder and Chief of the Cornea Service at Devers Eye Institute and also founded the Lions Eye Bank of Oregon Vision Research Laboratory. He continues as a Co-Medical Director of the Lions Eye Bank of Oregon (Lions Vision Gift) in Portland.

After receiving her doctor of optometry degree from the University of Houston College of Optometry, Dr. Danica Marrelli completed a residency in hospital-based optometry at the Ft. Howard/Baltimore VA Medical Center in Baltimore, MD. She is currently a clinical professor at UHCO, where she is the service director of the Ocular Diagnostic Service. In the classroom, Dr. Marrelli teaches in the ocular pharmacology, glaucoma and case-based learning courses. She is the director of the ocular disease residency program. Dr. Marrelli is a diplomate in the ocular disease (glaucoma) section of the American Academy of Optometry, and serves on the executive board of the Optometric Glaucoma Societ

Lea McLeod coaches people in the job search and in their jobs when the going gets tough. Bad bosses. Challenging co-workers. Self-sabotage that keeps you working too long. She's the founder of the Job Success Lab and author of the *The Resume Coloring Book*. Lea has held numerous professional and volunteer leadership roles in organizations of many kinds. In her most recent role, she was a Director level manager for Hewlett-Packard, where she and her global team delivered a $1.3 B global program to over 300,000 employees worldwide.

Conference Administrator: Jeanne Oliver, jeanne@pacificu.edu

2015 Victoria Conference
Inn at Laurel Point

THURSDAY 7/16/2015	FRIDAY 7/17/2015	SATURDAY 7/18/2015	SUNDAY 7/19/20154
Dry Eye: Etiology and Diagnosis 45687 AS Terry Burris, MD 8:00 - 9:00 Dry Eye: Current and Future Treatment Options 45701 AS Terry Burris, MD 9:00 - 10:00 pages 7 - 11	Glaucoma Case Analysis Everyday Challenges for the Primary Care Optometrist 40184 GL Danica Marrelli, OD 8:00 – 10:00 Page 44 - 51	Pain Management Spanning the oral pharmaceutical analgesic options from OTC to federally controlled medications 45141 OP Tad Buckingham, OD 8:00 – 9:00 Page 94 - 100	Optometric Insights and Therapeutic Interventions for Cortical Visual Impairment 44826 FV Curtis Baxstrom, OD 8:00 - 10:00 Page 121 - 129
VEGF Inhibitors in Eye Care 36496 PS Danica Marrelli, OD 10:00 – 11:00 Page 12 - 24	Corneal Degenerations 45688 AS Terry Burris, MD 10:00 – 11:00 Page 82 - 84	Visual Considerations of Dizziness, Vertigo and Imbalance 37401 NO Curtis Baxstrom, OD 9:00 – 11:00 Page 101 - 109	Pharmacology Update 40085 PH Danica Marrelli, OD 10:00 - 11:00 Page 130 - 143
Prism Applications in Acquired Brain Injury 43108 NO Curtis Baxstrom, OD 11:00 – 12:00 Pahge 25 - 30	Pharmaceutical Injections for Optometrists 45631 IS Tad Buckingham, OD 11:00 – 12:00 Page 85 - 89	Infiltrative Keratitis 45689 AS Terry Burris, MD 11:00 - 12:00 Page 110 - 111	Medical Emergencies 41029 SD Tad Buckingham, OD 11:00 – 1:00 Page 144 - 155
Taking Care of the Diabetic Patient 45456 SD Tad Buckingham, OD 12:00 – 1:00 Page 31 - 43	2015 Update on Corneal Surgery 45690 PO Terry Burris, MD 12:00 – 1:00 Page 90 - 93	The Glaucoma Grab Bag: Practical Guidelines for Effective Glaucoma Therapy 40087 GL Danica Marrelli, OD 12:00 - 1:00 Page 112 - 120	

These courses are typically considered therapeutic

GENZYME
Jesse McCoy
JesseMcCoy@Genzyme.com

ALLERGAN
Craig Stark
Stark_Craig@allergan.com

TEAR SCIENCE
Steven Mehl
SMehl@tearscience.com

DRAFT

Dry Eye: Etiology & Diagnosis

Terry E. Burris, MD
Northwest Corneal Services Portland/Tigard, Oregon
Co-Medical Director, Lions VISIONGIFT
Associate Clinical Professor of Ophthalmology, OHSU

Course Outline

"What is dry eye?"

Etiologic classification: Aqueous deficient; Evaporative

Contributions: Intrinsic/systemic; Extrinsic/ environmental

Delicate balance of healthy tears: Mucus, aqueous & lipid

Epidemiology/ risk factors; Diagnostic tools; Questionnaires; Old & New Testing Modalities;

4 levels of Dry Eye Severity (DEWS)

The Dry Eye Workshop (DEWS) 2007 Report: Dry Eye: Definition

DED is an immune mediated disorder

The tear film and ocular surface:

--form an integrated physiologic unit

--surface epithelia and secretory glands linked via neural network.

Sensory-driven network

--regulates secretory activity in quantity and composition

--supports homeostasis of the system.

Etiologic Classification of Dry Eye: Aqueous Deficient; Evaporative;

Aqueous deficient:

Sjogren’s Syndrome: Primary: Secondary

Non-Sjogren’s:

SJO testing finds up to 30% of DED patients may have systemic disease

Myths of Sjögren’s

Eye Care Professionals are uniquely positioned to play a pivotal role in helping to identify undiagnosed Sjögren's patients

Meibomian gland deficiency (posterior blepharitis)

Etiologic Classification of Dry Eye: Evaporative

Evaporative—excessive water evaporation in presence of normal aqueous production

The Healthy Tear Film: A Delicate Balance: Description of Lipid, aqueous & mucin components

Epidemiology of DES

Review of testing procedures old and new

Diagnosis: Other tests: Osmolarity; MMP-9 testing

Meibomian Gland Analysis

So, how do I diagnose dry eye?

Dry Eye Severity Classification & Introduction to Treatment Overview: Severity level 1-4

DRAFT

Dry Eye Disease: Current & Future Treatment Options
Terry E. Burris, MD
Northwest Corneal Services Portland/Tigard
Co-Medical Director, Lions Eyebank of Oregon
Associate Clinical Professor of Ophthalmology, OHSU

Course Title: Dry Eye Disease; Current & Future Treatment Options

Approach to the Dry Eye Patient

DED affects multiple aspects of the functional lacrimal unit:

- Lids & Meibomian glands;
- Lacrimal glands;
- Goblet cells;
- Other ocular surface cells

Determine if Chronic DED vs Acute DED exacerbation

- If acute, put out the fire

Most patients have chronic dry eye

Treat anterior blepharitis/ demodex

- Physical Lid therapies;
- Topical therapies;
- Systemic therapies

Lacrimal gland treatments:

- Eliminate preservatives
- Corticosteroid to reduce active inflammation
- cyclosporine & other calcineurin inhibitors; mechanism of action

    - Restasis study results
    - corticosteroid induction of cyclosporine benefits
- Graft vs host disease special issues; contact lens issues; LASIK issues; caveat LASIK + Sjogrens syndrome
- Lifitegrast: prevents T cell activation and migration; currently in FDA review
- Diquofosol: promotes aqueous tear production and mucin production
- luveniq

Goblet cell treatments:

- Cyclosporine
- Rebamipide
- Diquafosol

Androgens: potential mechanisms

Treating Meibomian gland dysfunction (posterior blepharitis)

- Meibomian gland expression; Lipiflow: confirmatory studies; blinking exercises
- IPL; preliminary studies
- Topical therapies:
    - Warm packs, eyelid scrubs;
    - steroids,
    - cyclosporine,
    - azithromycin,
    - omega3 topical preliminary study
- Systemic therapies:
    - antibiotics: doxycycline, minocycline, erythromycin
    - Nutritional: omega 3's vs omega 6's;
    - Women's Health Study; Impact on contact lens wear and computer vision syndrome
- What do I do for typical case of MGD?
    - MGD & Topical Azithromycin/Durasite; Warm paks;
    - Systemic doxcycyline vs topical Azasite;

- Cyclosporine & MGD;
- Omega-3,

Summary and Conclusions

Anti-VEGF Therapy in Eye Care

Danica J. Marrelli, OD, FAAO
University of Houston College of Optometry

Financial Disclosure

I have received consulting and/or speaking fees from the following companies within the past 12 months:

- Alcon Laboratories
- Allergan
- Zeiss Meditec

Topics

- Physiologic and pathologic results of VEGF expression
- Efficacy of Anti-VEGF therapy
  - ARMD
  - Macular edema
- Safety of Anti-VEGF therapy
- Current Drugs
- Future uses

Vascular Endothelial Growth Factor (VEGF) – what is it?

- **VEGF is a family of peptides (growth factor) responsible for a variety of physiologic processes**
- **First identified as a potent promoter of vascular permeability**
- **Now known as a regulator of angiogenesis**

VEGF

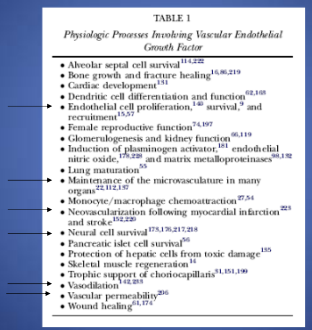


TABLE 1

Physiologic Processes Involving Vascular Endothelial Growth Factor

- Alveolar septal cell survival[114,222]
- Bone growth and fracture healing[16,86,219]
- Cardiac development[191]
- Dendritic cell differentiation and function[62,103]
- Endothelial cell proliferation,[140] survival,[9] and recruitment[15,57]
- Female reproductive function[74,197]
- Glomerulogenesis and kidney function[96,119]
- Induction of plasminogen activator,[181] endothelial nitric oxide,[176,220] and matrix metalloproteinases[80,132]
- Lung maturation[53]
- Maintenance of the microvasculature in many organs[22,112,137]
- Monocyte/macrophage chemoattraction[97,54]
- Neovascularization following myocardial infarction[223] and stroke[152,229]
- Neural cell survival[173,176,217,218]
- Pancreatic islet cell survival[56]
- Protection of hepatic cells from toxic damage[135]
- Skeletal muscle regeneration[44]
- Trophic support of choriocapillaris[51,151,190]
- Vasodilation[140,203]
- Vascular permeability[206]
- Wound healing[61,174]

Survey of Ophthalmology 2011; 56(2): 95-113

VEGF IN THE EYE

- **VEGF is produced by many cell types in the retina:**
  - **RPE**
  - **Vascular endothelial cells**
  - **Pericytes**
  - **Retinal neurons**

VEGF In the Eye

- Essential for normal blood vessel and embryonic development
- Maintains healthy choriocapillaris in the normal eye
- Stimulator of angiogenesis
  - THE common denominator in all neovascular diseases
- Potent inducer of vascular permeability
- Pro-inflammatory effects
- Neuroprotective effects

Increased levels of VEGF

- Overproduction of VEGF is deleterious
  - Ocular neovascular diseases
    - Neovascular ARMD
    - PDR
    - CRVO/BRVO
    - Neovascular glaucoma
    - ROP
  - Macular edema
    - DR
    - CRVO/BRVO

VEGF in the treatment of Ocular Neovascular Disease

- Six principal isoforms:
  - 121 (freely diffusible)
  - 145
  - 165***
  - 183
  - 189
  - 206

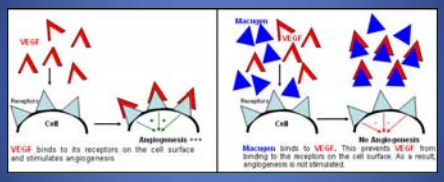
VEGF-BASED THERAPY

- Paradigm shift in management of ARMD
- Based on angiogenesis
  - Multi-step process
    - Angiogenic factors released in response to adverse conditions (reactive oxygen species, hypoxia, others)
    - Factors bind to endothelial cells
    - Cell proliferation, migration
    - Increased vascular permeability

Anti-VEGF Therapy

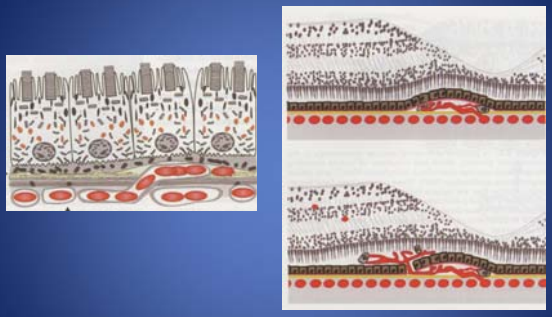
- Four drugs currently employed for treatment of ocular neovascularization
  - pegaptanib (Macugen®): binds VEGF-165 with high affinity and specificity, but does not bind other isoforms (121)
  - ranibizumab (Lucentis®): potent inhibitor of ALL isoforms of VEGF
    - Very brief half life (0.09 days)
  - bevacizumab (Avastin®): potent inhibitor of ALL isoforms of VEGF
    - Longer half life than ranibizumab (20 days)
    - Off-label use only
  - Aflibercept (VEGF Trap-Eye or Eylea®): potent inhibitor of ALL isoforms of VEGF as well as other growth factors
    - Longer half life than ranibizumab or bevacizumab

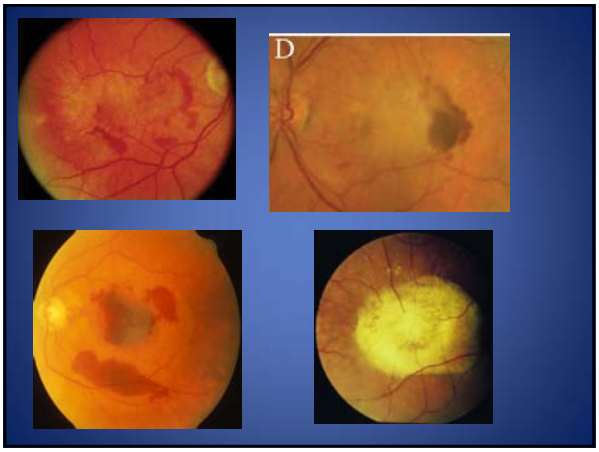
How Do They Work?



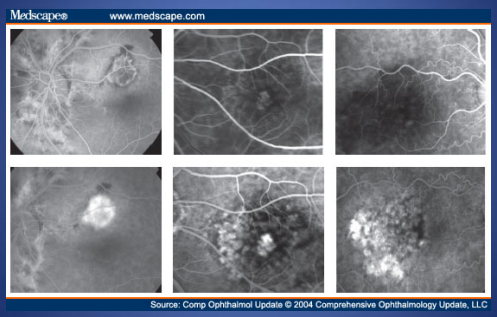
CHANGES IN ARMD

- Neovascular Changes
  - Neovascular Tissue
    - Associated with increased expression of angiogenic growth factors such as VEGF
    - Choroidal/subretinal neovascular membranes (CNVM, SRNVM)
      - Classic
      - Occult
      - Extrafoveal / Juxtafoveal / Subfoveal
  - Bleeding
  - Disciform scar

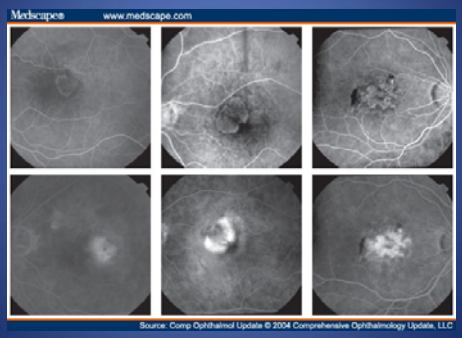


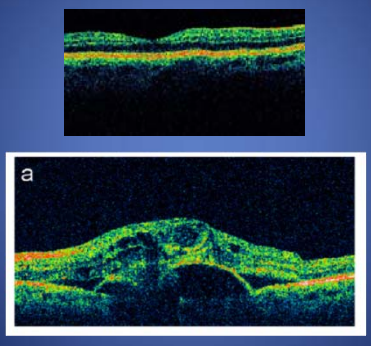


Classification of CNVM



LOCATION OF CNVM





PEGAPTANIB (Macugen)

- 0.3mg intravitreal injection every 6 weeks for 1 year:
  - 70% chance of losing LESS than 3 lines of VA (55% chance in control)
  - Likelihood of moderate improvement in vision: same as control
- Complications:
  - Endophthalmitis 1%
  - RD 1%
  - Cataract formation 1%
- FDA-approved (2004)for all lesion types in exudative AMD

Efficacy Studies - Macugen

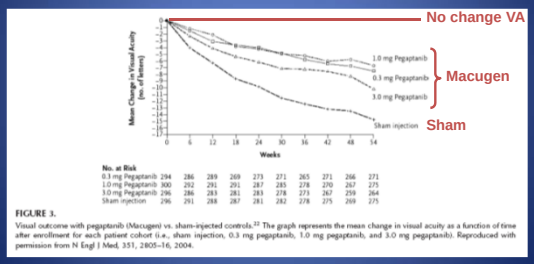


FIGURE 3.
Visual outcome with pegaptanib (Macugen) vs. sham-injected controls.[22] The graph represents the mean change in visual acuity as a function of time after enrollment for each patient cohort (i.e., sham injection, 0.3 mg pegaptanib, 1.0 mg pegaptanib, and 3.0 mg pegaptanib). Reproduced with permission from N Engl J Med, 351, 2805–16, 2004.

Ranibizumab (Lucentis®)

- Two main efficacy studies for exudative ARMD:
  - **MARINA** (ranibizumab vs placebo)
    - Minimally classic or occult lesions
    - 90% of Lucentis patients lost <15 letters (55% of SHAM)
    - Mean VA improvement 7 letters in treatment group
    - 35% of patients gained 15 letters (4% of SHAM)
  - **ANCHOR** (ranibizumab vs PDT)
    - Predominantly classic, subfoveal lesions
    - 96% Lucentis patients lost 15 letters (64% of PDT)
    - 40% Lucentis patients gained 15 letters (6% PDT)

MARINA

ANCHOR

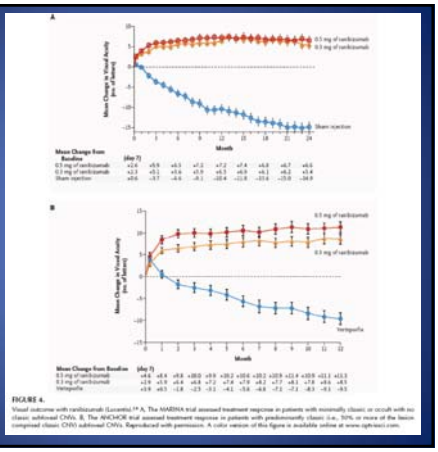


FIGURE 4.

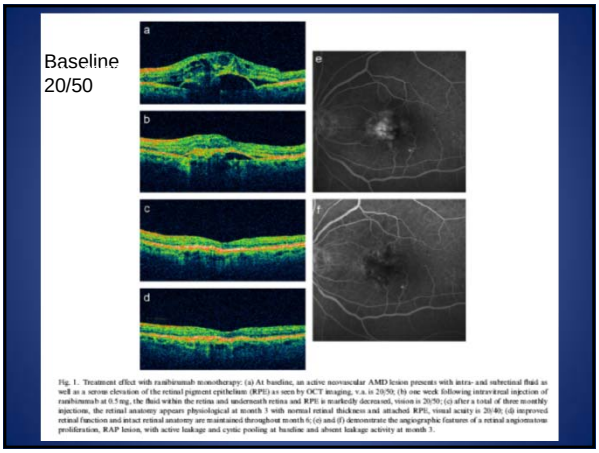


Fig. 1. Treatment effect with ranibizumab monotherapy: (a) At baseline, an active neovascular AMD lesion presents with intra- and subretinal fluid as well as a serous elevation of the retinal pigment epithelium (RPE) as seen by OCT imaging, v.a. is 20/50; (b) one week following intravitreal injection of ranibizumab at 0.5 mg, the fluid within the retina and underneath retina and RPE is markedly decreased, vision is 20/50; (c) after a total of three monthly injections, the retinal anatomy appears physiological at month 3 with normal retinal thickness and attached RPE, visual acuity is 20/40; (d) improved retinal function and intact retinal anatomy are maintained throughout month 6; (e) and (f) demonstrate the angiographic features of a retinal angiomatous proliferation, RAP lesion, with active leakage and cystic pooling at baseline and absent leakage activity at month 3.

BEVACIZUMAB (Avastin)

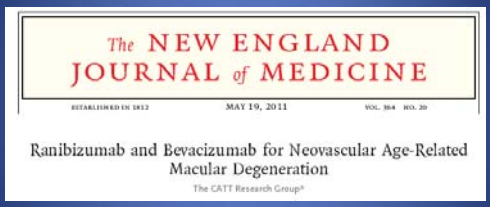
- Similar structure to ranibizumab: full length recombinant, humanized, affinity-matured monoclonal antibody
- Binds to all VEGF isoforms
- FDA-approved as a colorectal cancer drug
- Intravenous infusion – positive results in short-term study (systemic SE)
- *Off-label* intravitreal use in exudative ARMD – comparable results as with ranibizumab

LUCENTIS vs. AVASTIN

- Molecular weight:
  - Lucentis: 48kD
  - Avastin: 149 kD
- Both bind to all biologically active forms of VEGF
  - Lucentis 20x more potent at blocking VEGF-stimulated endothelial cell proliferation, but ↓half life
- Larger glycosylated molecule Avastin more likely to develop immune response???
- Longer half life of Avastin – higher risk of systemic side effects???
- Longer half life of Avastin – fewer intravitreal injections needed???

LUCENTIS vs. AVASTIN

- COST
  - Lucentis: $2,000 per injection
  - Avastin: $50+ per injection
- FDA TRIAL (Comparison of AMD Treatment Trials… CATT)
  - Lucentis vs Avastin
  - First major publication in New England Journal of Medicine


The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 MAY 19, 2011 VOL. 364 NO. 20

Ranibizumab and Bevacizumab for Neovascular Age-Related Macular Degeneration

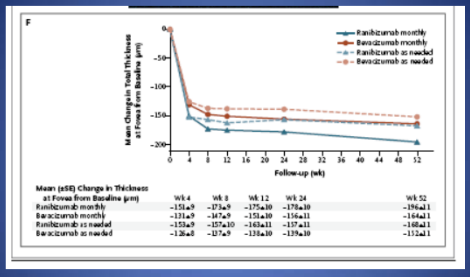
The CATT Research Group*

CATT Trial Results

- "Non-inferiority Trial"
  - 1208 neovascular ARMD patients assigned to receive intravitreal ranibizumab or bevacizumab either monthly or as needed with monthly evaluations
  - Non-inferiority limit of 5 letters on chart

CATT Trial Results

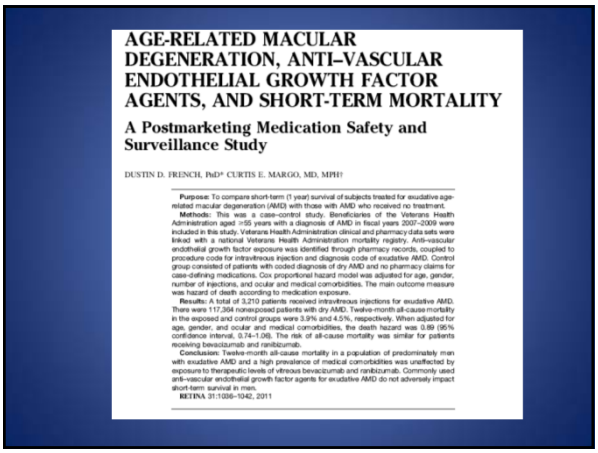
- Ranibizumab monthly (+8.5)= bevacizumab monthly (+8)
- Ranibizumab as needed (+6.8) = bevacizumab as needed (+5.9)
- Ranibizumab monthly = ranibizumab as needed
- Bevacizumab monthly versus bevacizumab as needed = inconclusive



Mean change in total retinal thickness in CATT study

CATT Trial Results

- **Safety:**
  - **Rates of death, MI, stroke were equivalent between the two groups**
  - **Rate of serious adverse systemic events (primarily hospitalizations) was significantly higher in bevacizumab (24.1%) than in ranibizumab (19%) patients**
    - **Wide range of disease categories, many not identified as areas of concern in prior studies**



AGE-RELATED MACULAR DEGENERATION, ANTI–VASCULAR ENDOTHELIAL GROWTH FACTOR AGENTS, AND SHORT-TERM MORTALITY

A Postmarketing Medication Safety and Surveillance Study

DUSTIN D. FRENCH, PhD* CURTIS E. MARGO, MD, MPH†

Purpose: To compare short-term (1 year) survival of subjects treated for exudative age-related macular degeneration (AMD) with those with AMD who received no treatment.

Methods: This was a case–control study. Beneficiaries of the Veterans Health Administration aged ≥55 years with a diagnosis of AMD in fiscal years 2007–2009 were included in this study. Veterans Health Administration clinical and pharmacy data sets were linked with a national Veterans Health Administration mortality registry. Anti–vascular endothelial growth factor exposure was identified through pharmacy records, coupled to procedure code for intravitreous injection and diagnosis code of exudative AMD. Control group consisted of patients with coded diagnosis of dry AMD and no pharmacy claims for case-defining medications. Cox proportional hazard model was adjusted for age, gender, number of injections, and ocular and medical comorbidities. The main outcome measure was hazard of death according to medication exposure.

Results: A total of 3,210 patients received intravitreous injections for exudative AMD. There were 117,364 nonexposed patients with dry AMD. Twelve-month all-cause mortality in the exposed and control groups were 3.9% and 4.5%, respectively. When adjusted for age, gender, and ocular and medical comorbidities, the death hazard was 0.89 (95% confidence interval, 0.74–1.06). The risk of all-cause mortality was similar for patients receiving bevacizumab and ranibizumab.

Conclusion: Twelve-month all-cause mortality in a population of predominately men with exudative AMD and a high prevalence of medical comorbidities was unaffected by exposure to therapeutic levels of vitreous bevacizumab and ranibizumab. Commonly used anti–vascular endothelial growth factor agents for exudative AMD do not adversely impact short-term survival in men.

RETINA 31:1036–1042, 2011

Safety: Avastin vs Lucentis

- American Academy of Ophthalmology:
  - "The year-two CATT results confirm that both Avastin and Lucentis are safe and effective therapies for wet AMD," said George A. Williams, M.D., an investigator in the trial at the Oakland University William Beaumont School of Medicine in Royal Oak, Mich. "These results must be considered when ophthalmologists discuss treatment options with individual patients. The CATT Research Group is to be congratulated for this seminal work on the value of comparative effectiveness research."
  - Over the two years of the study the rates of serious events such as stroke, heart attack and death were similar for patients who received either drug. But, as occurred in year one, the second year results showed a higher rate of non-specific serious adverse events in patients receiving Avastin, at 40 percent, versus Lucentis at 32 percent. More events occurred in the patient group that received fewer injections, which is not the typical dose-response relationship. The researchers say the importance of the adverse events finding is unclear; however, it may be related to the fact that the median age of CATT patients was 80 years, a population in which chronic or acute medical conditions are more common and a high rate of hospitalizations is expected.

Safety: Avastin vs Lucentis

- Novartis:
  - "This data adds to the growing body of evidence suggesting that the overall risk of serious ocular and systemic side effects is higher with unlicensed intravitreal bevacizumab compared to Lucentis. However, the studies were not powered to assess differences in infrequent but serious events such as death and stroke, which were found in previously published large Medicare database analyses to be significantly more frequent with unlicensed Avastin," said Tim Wright, Global Head of Development, Novartis Pharma.
  - Irrespective of the results of CATT or any other head-to-head study, bevacizumab remains unlicensed for any ocular condition, for administration in the eye and compounding into smaller doses.
  - Novartis puts patient safety first and believes Lucentis is the best treatment option for patients with wet AMD. Novartis believes that, within regulatory guidelines, the unlicensed use of drugs should be limited to cases where there is an unmet medical need which cannot be fulfilled by licensed medications.

Safety: Avastin vs Lucentis

- IVAN trial (UK):
  - No clinically significant difference in visual acuity
  - Fewer patients in bevacizumab (Avastin) group experienced arteriothrombotic evens or heart failure compared with ranibizumab (Lucentis) group (0.7% vs 2.9%)

What about VEGF-Trap (aflibercept, Eylea®)

- **Fusion protein: portions of human VEGF receptors fused to Fc portion of human IgG1**
- **Binds all forms of VEGF-A**
- **Much longer half life than ranibizumab**
- **FDA approved for**
  - **Exudative ARMD**
  - **Macular edema following CRVO**
  - **Diabetic macular edema**


retina roundtable

Retina Roundtable: Part 1 of 4

Approach to wet AMD varies among specialists

Physicians discuss following protocol from trials; others advise treating patients on individual basis

ROUNDTABLE PARTICIPANTS

Ophthalmology Times

PODCASTS

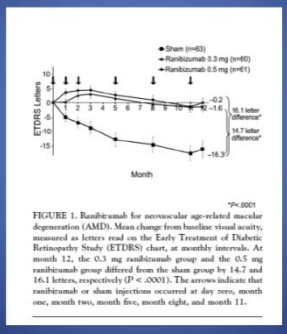
TREATMENT PARADIGMS

- Standard dosing regimens based on MARINA and ANCHOR trials with Lucentis
  - Monthly injections indefinitely
  - Monthly VA, DFE
  - Quarterly IVFA
- Alternative dosing schedules to try to decrease # of injections but maintain efficacy

PIER Trial

- Randomized double-masked sham injection study
  - SHAM injection or Lucentis monthly for 3 months, then quarterly
  - Less effective than continued dosing
  - Possible 5-letter reduction in vision over 9 months of quarterly dosing

PIER Trial



*P<.0001

FIGURE 1. Ranibizumab for neovascular age-related macular degeneration (AMD). Mean change from baseline visual acuity, measured as letters read on the Early Treatment of Diabetic Retinopathy Study (ETDRS) chart, at monthly intervals. At month 12, the 0.3 mg ranibizumab group and the 0.5 mg ranibizumab group differed from the sham group by 14.7 and 16.1 letters, respectively (P < .0001). The arrows indicate that ranibizumab or sham injections occurred at day zero, month one, month two, month five, month eight, and month 11.

PrONTO Trial

- 3 monthly injections of Lucentis with retreatment guided by clinical and OCT criteria
  - Loss of 5+ letters of VA
  - 100μm increase in central macular thickness on OCT or subretinal fluid/macular cysts on OCT
  - New lesion on IVFA
  - Persistent fluid on OCT one month after injection
  - (MODIFICATION of criteria during 2nd year)

PrONTO Trial

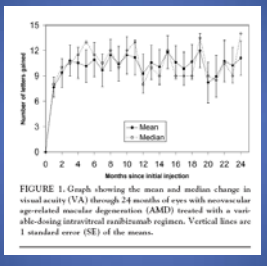


FIGURE 1. Graph showing the mean and median change in visual acuity (VA) through 24 months of eyes with neovascular age-related macular degeneration (AMD) treated with a variable-dosing intravitreal ranibizumab regimen. Vertical lines are 1 standard error (SE) of the means.

PrONTO Trial

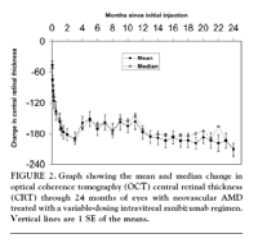


FIGURE 2. Graph showing the mean and median change in optical coherence tomography (OCT) central retinal thickness (CRT) through 24 months of eyes with neovascular AMD treated with a variable-dosing intravitreal ranibizumab regimen. Vertical lines are 1 SE of the means.

PrONTO Trial

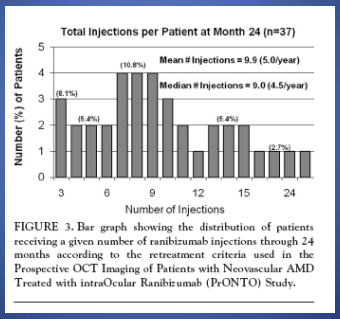
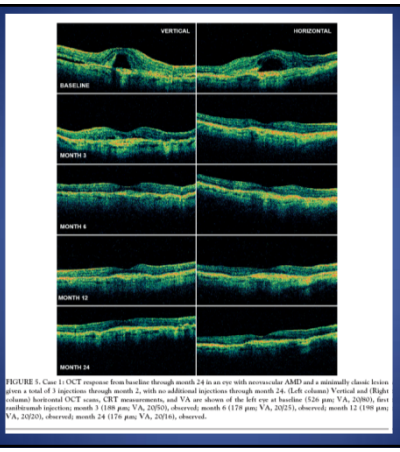
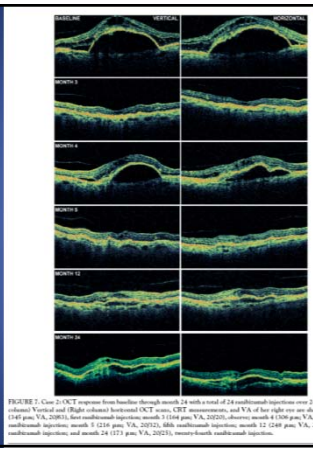


FIGURE 3. Bar graph showing the distribution of patients receiving a given number of ranibizumab injections through 24 months according to the retreatment criteria used in the Prospective OCT Imaging of Patients with Neovascular AMD Treated with intraOcular Ranibizumab (PrONTO) Study.



20/80

20/15



20/60

20/25

"Treat and Extend" Approach

- 3 monthly injections, then follow in 6 weeks
  - EVIDENCE of new activity: inject and follow in 4 weeks
  - NO EVIDENCE of new activity: no injection, extend follow up to 8 weeks

Other Indications for Anti-VEGF Therapy

- VEGF has a key role in pathophysiology of ischemic retina disease
  - PDR
  - DME
  - BRVO
  - CRVO
- Current standard therapies are destructive (laser)

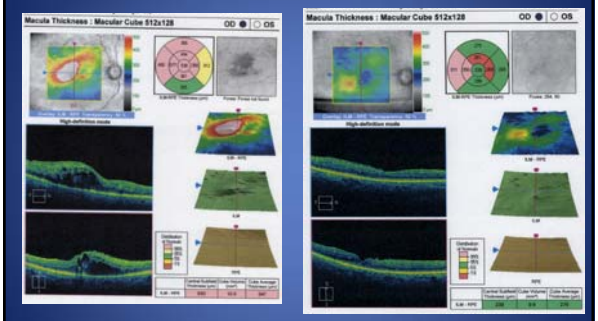
BRAVO Trial

- Multi-centered, randomized, sham-controlled study of ranibizumab (Lucentis) in treatment of macular edema in BRVO
- 6 monthly injections of Lucentis
  - Primary outcome measure: mean VA change at 6 months
  - Secondary outcome measure: % of subjects with 3+ lines VA improvement

BRAVO

- Outcomes:
  - 397 patients enrolled
    - Mean Gain VA @ 6 months:
      - 16.6 letters (0.3mg)
      - 18.3 letters (0.5mg)
      - 7.3 letters (sham)
    - % with 3+ lines improvement in VA @ 6m:
      - 55% (0.3mg)
      - 61% (0.5mg)
      - 29% (sham)

JS, 82 yo AAF

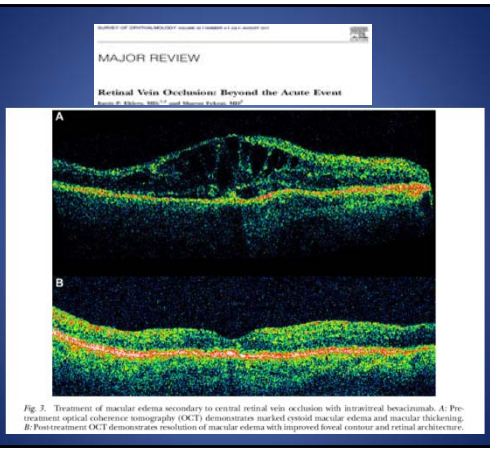


CRUISE Trial

- Multi-centered, randomized, sham-controlled study of use of ranibizumab (Lucentis) in patients with macular edema due to CRVO
  - 392 patients
  - Similar outcome measures as BRAVO

CRUISE

- Results:
  - Mean improvement in VA @ 6 months:
    - 12.7 letters (0.3mg)
    - 14.9 letters (0.5mg)
    - 0.8 letters (sham)
  - % with 3+ line VA improvement @ 6m:
    - 46.2% (0.3mg)
    - 47.7% (0.5mg)
    - 16.9% (sham)


MAJOR REVIEW

Retinal Vein Occlusion: Beyond the Acute Event

A

B

Fig. 3. Treatment of macular edema secondary to central retinal vein occlusion with intravitreal bevacizumab. *A*: Pretreatment optical coherence tomography (OCT) demonstrates marked cystoid macular edema and macular thickening. *B*: Post-treatment OCT demonstrates resolution of macular edema with improved foveal contour and retinal architecture.

Macular Edema in Retinal Vein Occlusions

- Lucentis® is FDA approved for macular edema following retinal vein occlusions (RVO)
- Eylea® is FDA approved for macular edema following RVO
- Avastin® is frequently used off-label in both CRVO and BRVO macular edema

Diabetic Macular Edema

- Numerous studies have shown positive impact of anti-VEGF therapy on the course of diabetic macular edema
  - RESOLVE
  - READ
  - RESTORE
  - DRCRnet (2 year follow-up)
    - Also included triamcinolone
    - Also included laser patients
  - DA VINCI (aflibercept)
    - Compared to laser photocoagulation
  - BOLT (bevacizumab compared to laser)


Revolution to a New Standard Treatment of Diabetic Macular Edema

JAMA June 11, 2014 Volume 311, Number 22

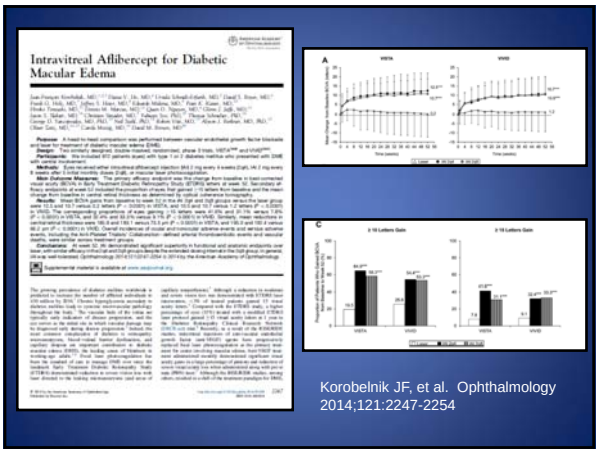
Intravitreal anti-VEGF injections have now replaced laser as standard treatment for DME®; however, laser photocoagulation may still be used when a complete response is not seen. Not all eyes that receive anti-VEGF or laser photocoagulation show complete resolution of DME with improvement of vision. Therefore, other treatments are being considered, including combining corticosteroids with anti-VEGF agents, switching anti-VEGF agents, increasing the frequency of injections, using surgical approaches, and others.

Diabetic Macular Edema

- Current FDA approval:
  - Lucentis® is approved for the treatment of diabetic macular edema
  - Eylea® is approved for treatment of diabetic macular edema
  - Avastin® is NOT approved for treatment of diabetic macular edema

Diabetic Macular Edema: Paradigm Shift?

- CSME – outdated term?
- "Center involved" or "Center not involved"
  - When center is involved, anti-VEGF appears to be much more effective than laser and more effective than intravitreal steroid
  - Longer to reach peak efficacy than anti-VEGF in exudative AMD
  - Delay in dosing reduces chances of visual acuity gain
  - Not as effective in eyes with previous vitrectomy?



Korobelnik JF, et al. Ophthalmology 2014;121:2247-2254

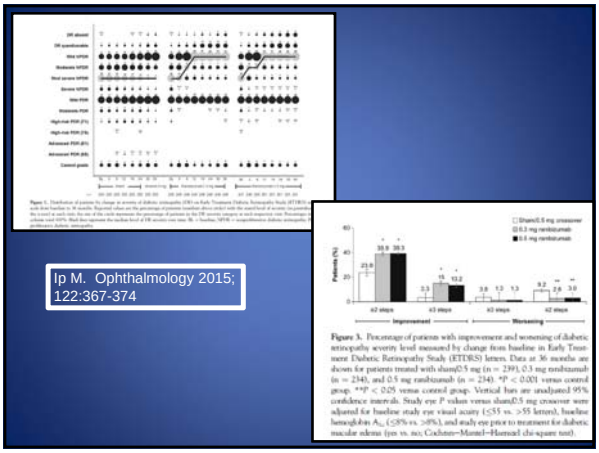
Diabetic Macular Edema: Paradigm Shift?

- Intravitreal steroids
  - More rapid effect than anti-VEGF
  - Longer duration than anti-VEGF
  - Two FDA approved implants
    - Dexamethasone (Ozurdex) (4-6 months)
    - Fluocinolone acetonide (Iluvien) (non-biodegradeable, 3 years)
  - Significant side effects:
    - Cataract
    - Increased intraocular pressure

Diabetic Macular Edema: Paradigm Shift?

- Where does macular edema fit in?
  - Does not work as well as steroid or anti-VEGF for center-involved edema
  - Best for patients with non-center-involved edema and good vision

NEW FDA APPROVAL: Diabetic Retinopathy



Ip M. Ophthalmology 2015; 122:367-374

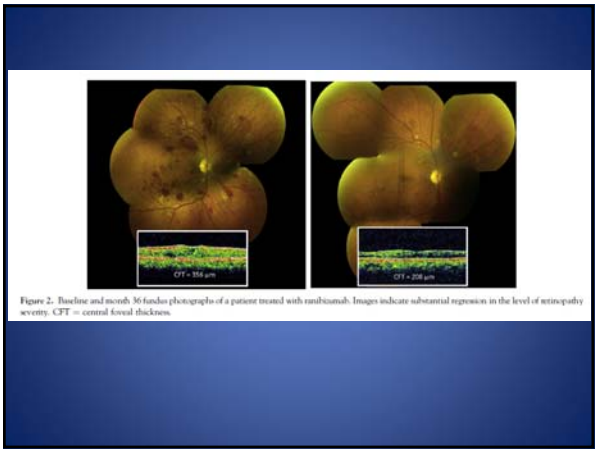
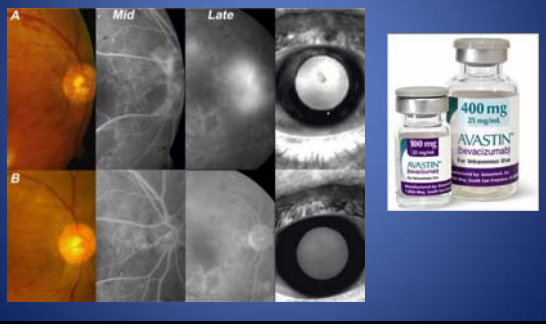


Figure 2. Baseline and month 36 fundus photographs of a patient treated with ranibizumab. Images indicate substantial regression in the level of retinopathy severity. CFT = central foveal thickness.

Proliferative Diabetic Retinopathy

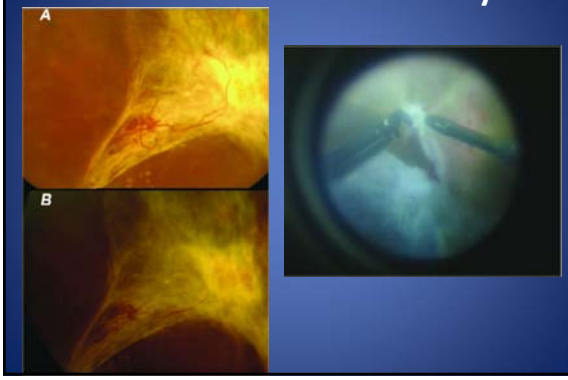
- Numerous small-scale studies/reports indicate very rapid resolution of NVD, NVE, NVI, and NVA following intravitreal injection of anti-VEGF compounds (all types)

Avery et al. "Intravitreal bevacizumab (Avastin) in the treatment of proliferative diabetic retinopathy." Ophthalmology 2006 Oct; 113(10): 1695-1705



Oshima et al. Regression of iris neovascularization after intravitreal injection of bevacizumab in patients with proliferative diabetic retinopathy. Am J Ophthalmol 2006;142(1):155-157.

Anti-VEGF and Vitrectomy



Intravitreal Bevacizumab to Treat Iris Neovascularization and Neovascular Glaucoma Secondary to Ischemic Retinal Diseases in 41 Consecutive Cases

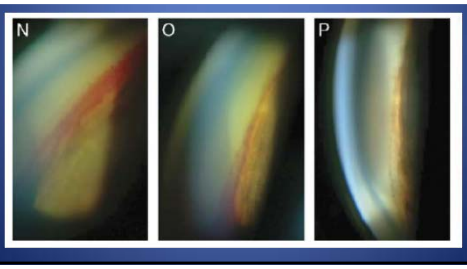
Taku Wakabayashi, MD, Yusuke Oshima, MD, Hirokazu Sakaguchi, MD, Yasushi Ikuno, MD, Atsuya Miki, MD, Fumi Gomi, MD, Yasunasa Otori, MD, Motohiro Kamei, MD, Shunji Kusaka, MD, Yasuo Tano, MD

Purpose: To evaluate the biologic efficacy of intravitreal bevacizumab (IVB) for iris neovascularization (INV) or neovascular glaucoma (NVG) in patients with ischemic retinal disorders.
Design: Retrospective, consecutive, interventional case series.
Participants: Thirty patients (41 eyes) with INV or NVG secondary to ischemic retinal disorders.
Methods: Patients received IVB (1 mg) as the initial treatment for INV or NVG and were followed up for at least 6 months. Ophthalmic evaluations included measurement of visual acuity and intraocular pressure (IOP), a complete ophthalmic examination, and fluorescein angiography. Patients were divided into 3 subgroups: INV without elevated IOP (INV group), NVG with an open angle (O-NVG group), and NVG with angle closure (C-NVG group) for outcomes analysis.
Main Outcome Measures: The controllability of IOP by IVB, incidence of recurrence, and requirement for surgery to treat NVG.
Results: No significant ocular or systemic adverse events developed during follow-up (range, 6–22 months; mean, 13.3 months). The mean IOP levels were 14.7, 31.2, and 44.9 mmHg at baseline in the INV, O-NVG, and C-NVG groups, respectively. In the INV group (9 eyes), the INV regressed or resolved after 1 injection. Iris neovascularization recurred in 4 eyes by 6 months and stabilized after repeated injections without IOP elevation. In the O-NVG group (17 eyes), rapid neovascular regression with successful IOP normalization (≤21 mmHg) occurred in 12 eyes (71%) within 1 week after 1 injection. Five (29%) of the 17 eyes required surgery by 6 months despite repeated IVB injections, and a total of 7 eyes (41%) underwent surgery during follow-up. In the C-NVG group (15 eyes), IVB caused INV resolution but failed to lower the IOP. Fourteen (93%) of 15 eyes required surgery by 2 months after initial IVB and achieved IOP stabilization. The mean interval between IVB and surgery was significantly shorter in the C-NVG group than in the O-NVG group ($P<.0.001$).
Conclusions: Intravitreal bevacizumab is well tolerated, effectively stabilized INV activity, and controlled IOP in patients with INV alone and early-stage NVG without angle closure. In advanced NVG, IVB cannot control IOP but may be used adjunctively to improve subsequent surgical results. Further evaluation in controlled randomized studies is warranted.
Financial Disclosure(s): The authors have no proprietary or commercial interest in any materials discussed in this article. *Ophthalmology 2008;115:1571–1580* © 2008 by the American Academy of Ophthalmology.

CASE REPORT

Intracameral Bevacizumab (Avastin) for Neovascular Glaucoma
A Pilot Study in 6 Patients

Susana Duch, MD, PhD, Oscar Buchacra, MD, Elena Milla, MD, PhD, David Andreu, MD, PhD, and Jesús Tellez, MD



Anti-VEGF in Corneal Neovascularization

CLINICAL TRIALS

Topical Bevacizumab in the Treatment of Corneal Neovascularization

Results of a Prospective, Open-Label, Noncomparative Study

Mohammad H. Dastjerdi, MD; Khalid M. Al-Arfaj, MD; Nambi Nallasamy, BA; Pedram Hamrah, MD; Ula V. Jurkunas, MD; Roberto Pineda II, MD; Deborah Pavan-Langston, MD; Reza Dana, MD, MSc, MPH

CASE REPORT

Bevacizumab (Avastin) and Argon Laser to Treat Neovascularization in Corneal Transplant Surgery

Georg Gerten, MD

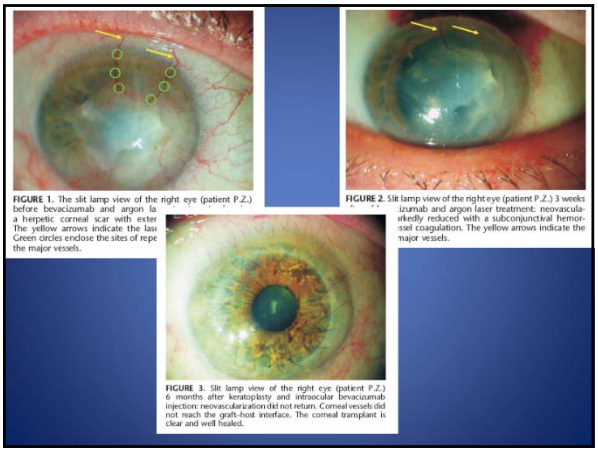
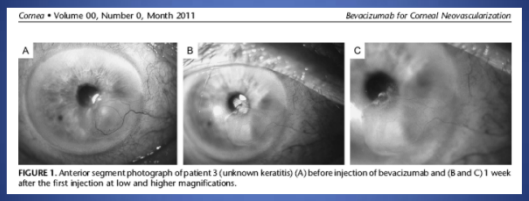


FIGURE 1. The slit lamp view of the right eye (patient P.Z.) before bevacizumab and argon la a herpetic corneal scar with exter The yellow arrows indicate the las Green circles endose the sites of repe the major vessels.

FIGURE 2. Slit lamp view of the right eye (patient P.Z.) 3 weeks izumab and argon laser treatment: neovascula- arkedly reduced with a subconjunctival hemor- ssel coagulation. The yellow arrows indicate the major vessels.

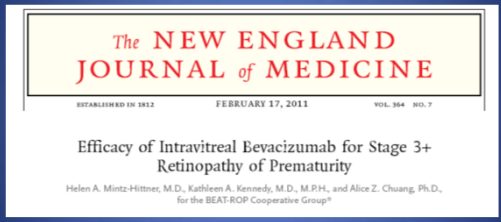
FIGURE 3. Slit lamp view of the right eye (patient P.Z.) 6 months after keratoplasty and intraocular bevacizumab injection: neovascularization did not return. Corneal vessels did not reach the graft-host interface. The corneal transplant is clear and well healed.



Cornea • Volume 00, Number 0, Month 2011 — *Bevacizumab for Corneal Neovascularization*

A B C

FIGURE 1. Anterior segment photograph of patient 3 (unknown keratitis) (A) before injection of bevacizumab and (B and C) 1 week after the first injection at low and higher magnifications.

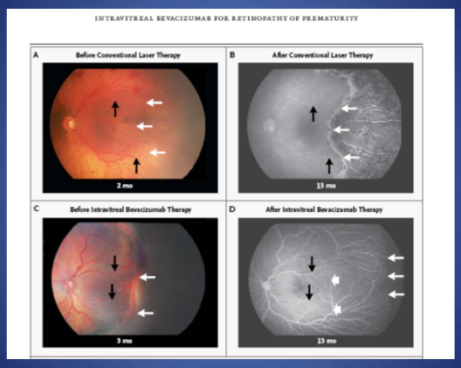


The NEW ENGLAND JOURNAL of MEDICINE

ESTABLISHED IN 1812 — FEBRUARY 17, 2011 — VOL. 364 NO. 7

Efficacy of Intravitreal Bevacizumab for Stage 3+ Retinopathy of Prematurity

Helen A. Mintz-Hittner, M.D., Kathleen A. Kennedy, M.D., M.P.H., and Alice Z. Chuang, Ph.D., for the BEAT-ROP Cooperative Group*



Thank you for your attention!

Questions? Email me:
DMarrelli@uh.edu

Prism Applications in Acquired Brain Injury

COPE # 43108-NO

Curtis R. Baxstrom,MA,OD,FCOVD,FNORA

Prism Applications in Acquired Brain Injury
Curtis R. Baxstrom,OD

Disclosure Statement:
No current financial or commercial relationships with any of the products or companies mentioned in this course

Why Consider Prism ? When ?

- Diplopia and/or Confusion
- Post Trauma Vision Syndrome
- Disequilibrium/Dizziness
- Visual Field Loss
- Unilateral Spatial Inattention
- Others

Prism Considerations

- Compensatory vs. Therapeutic
- Full vs. Sector vs. Spot
- Ground vs. Fresnel
- Amount and Properties (yoked)
  - Integrative – less than 6PD
  - Disruptive – more than 6PD

Prism for Diplopia / Strabismus

- Why prism vs. patching (full/sector) ?
- Recovery – how does it occur ?
- Guidelines
  - Amount – Acute ?
  - Ground vs. Fresnel
  - Bilateral vs. Monocular application
  - Removal during recovery
  - Fixation duress
- Case Presentations

Can You Wean Compensatory Prism?

Non-Surgical Treatment for Esotropia Secondary to Arnold-Chiari I Malformation: A Case Report.

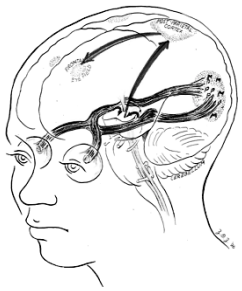
Optometry
2009, 80, p.472-78.
(45eT to fusing 12 BI in 3.5 months)
16 months diplopic prior to start

Treatment for Diplopia - Overview

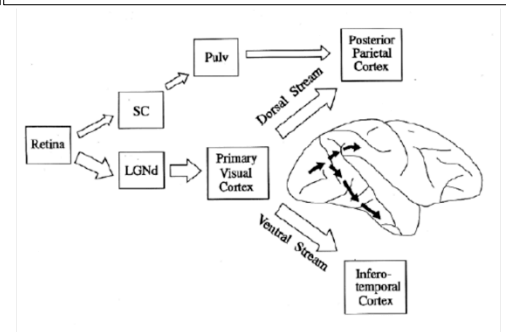
- Selective Occlusion – Complete vs. Sector
  - More likely start here with acquired paresis/palsy
- Prism – Use of compensatory, goal is to decrease over time, what if used and left on ?
- Prism + Vestibular + Vergence Therapy = Modification of Vergence Adaptation
- Can one change the motor component vs. ranges of fusion ? (we don't simply improve fusion ranges)
- Why different than simply prescribing what you measure ?

Post Trauma Vision Syndrome (PTVS)

- A dysfunction of spatial vision involving orientation, balance, and convergent binocular function, hypothesized to result from from damage to the midbrain ambient visual subsystem.



Tectal, Dorsal and Ventral Paths



Deficits Following TBI & CVA – Post Trauma Vision Syndrome

- Characteristics
  - Exotropia or High Exophoria
  - Accommodative Dysfunction
  - Convergence Insufficiency
  - Photophobia
  - Low Blink Rate
  - Spatial Disorientation
  - Oculomotor Dysfunction
  - Unstable Ambient Vision

Deficits Following TBI & CVA – Post Trauma Vision Syndrome

Signs & Symptoms

- Diplopia
- Objects appear to move
- Poor concentration and attention
- Staring behavior
- Poor Visual Memory
- Photophobia
- Associated Neuromotor Difficulties
  - Balance, Coordination, Postural Control

Prism for PTVS

- Typically low base in prism (1-3 total)
  - TRIAL IT !
- Convergence Insufficiency (CITT studies!)
- Ambient visual processing deficit
- Guidelines for trial framing and application
- Case Presentations

Binasal Occlusion-Motion Sensitivity

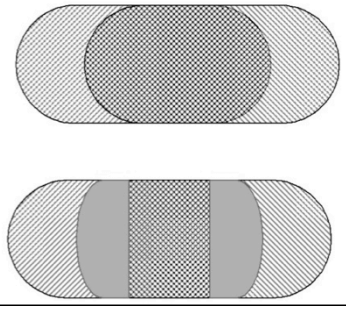
Effect of binasal occlusion (BNO) on the visual-evoked potential (VEP) in mild traumatic brain injury (mTBI).

Ciuffreda KJ, Yadav NK and Ludlam DP

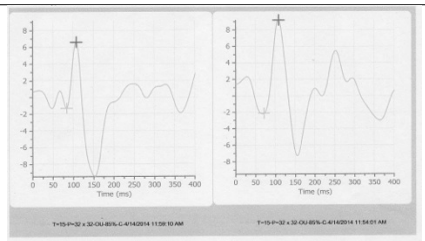
Brain Injury 2013;27(1):41-47.

*It is speculated that mTBI attempt to suppress visual information to reduce their abnormal motion sensitivity. BNO negates the suppressive effect, thus an increase in VEP and decrease in symptoms

Effects of Binasal and Low BI Prism ?



VEP Without and With 2BI Prism



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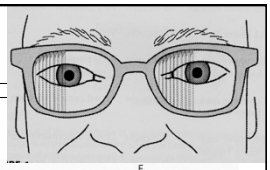
Left Cursor	Lat	83.8 ms	71.2 ms
	Amp	-1.30 uV	-2.14 uV
Right Cursor	Lat	107.3 ms	108.2 ms
	Amp	6.61 uV	9.20 uV
Delta	Lat	23.4 ms	37.1 ms
	Amp	7.92 uV	11.33 uV

Prism for Visual Field / Visual Neglect

- Visual Field Loss / Hemianopsia (Quad?)
  - Prism Systems – PELI, Gottlieb, Inwave
- Visual neglect / Unilateral Spatial Inattention
  - Therapy approaches
  - Compensatory prism
  - Therapeutic prism
- Which above is most likely to recover ?
- What cerebral arteries are involved ?
- What cerebral lobes are involved ?

Field Enhancement



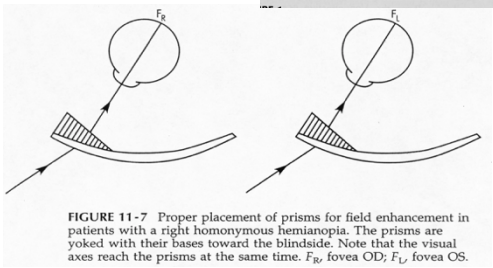
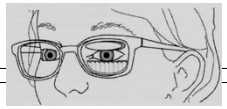
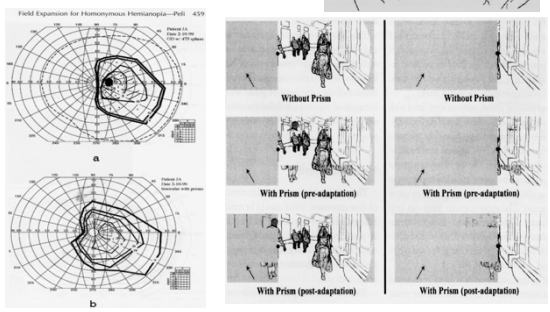


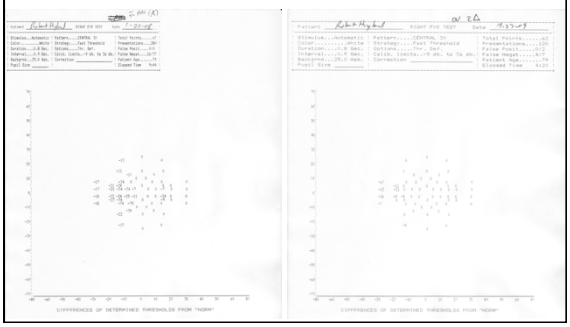
FIGURE 11-7 Proper placement of prisms for field enhancement in patients with a right homonymous hemianopia. The prisms are yoked with their bases toward the blindside. Note that the visual axes reach the prisms at the same time. F_R, fovea OD; F_L, fovea OS.

Peli System

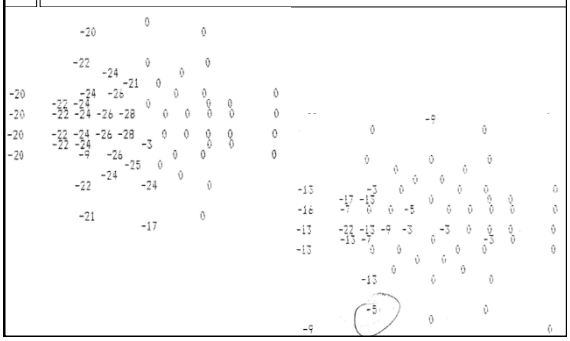




Horizontal Peli Prism – Case Report



Left Hemianopsia 3 month VF loss - 8 weeks later with Peli



Put Back Prism, But VF Worsened !

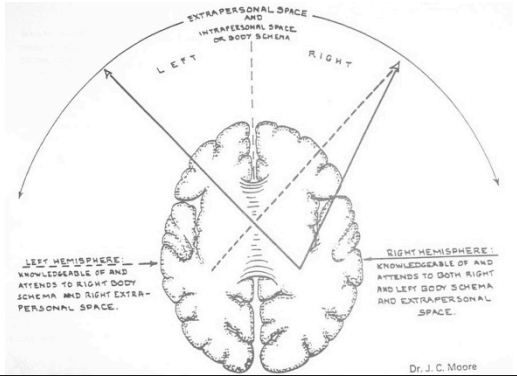
How does a Visual Field Recover ?

- Spontaneous Recovery
- Increased attention or microsaccades
- Decreased Swelling
- Other factors…
  - Automaticity of other skills
  - Surgical Anastamosis
  - Angioplasty

Visual Field vs. Visual Neglect-USI

- Visual field – Occipital Lobe
- Unilateral Spatial Inattention (USI) – Parietal, Frontal, Temporal Lobes, typically left USI
- Combinations
- In General……..most don't like using prism on compensatory basis, but use it on a therapeutic basis with unilateral spatial inattention, so test for it !

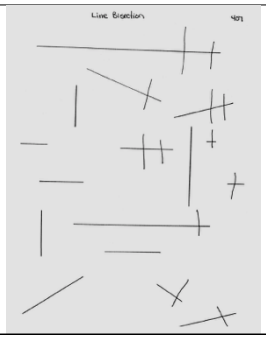
USI – Allocation of Attention



How Do We Tell the Difference Between Visual Field Loss and USI ?

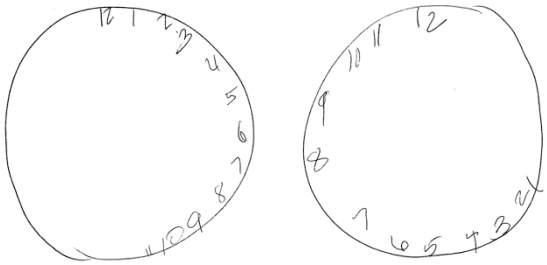
- Double simultaneous stimuli/dual extinction with confrontation testing
  - Counting fingers motion vs. form
  - Neglect is a competitive process
- Line Bisection
- Star Cancellation Task
- Draw a picture (clock)
- Observation and Report (location of lesion)

Line Bisection Crossout Task (Left USI-severe)



Star Cancellation Test

Draw a Clock – CW vs. CCW



Prism in USI – 2 Applications

- Compensatory vs. Therapeutic ?
- Egocentric Localization – Karnath - BR
  - Shifts egocenter to midline, visual input
  - 2D, directional orientation
- Spatial Transformation – Rosetti - BL
  - Localization with visual, motor, vestibular
  - 3D, directional plus rotational

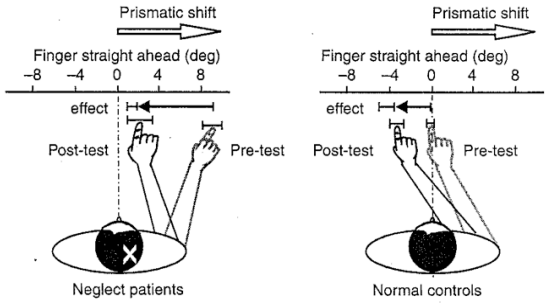
Egocentric Localization in USI

- Karnath found subjective (egocentric) localization was 15 deg to the right of objective center in USI
- Yoked Base Right shifted subjective localization (pointing task) to match objective center
- So should one consider prescribing Base Right prism in Left USI ?

Prism Adaptation Therapy

- Most PAT treatments use Base Left, and include motor pointing tasks which become bimodal vs unimodal tx
- Rossetti (1998) found it lasted 2 hours vs. 10-12 min with caloric, cervical or okn stimulation, 50 reps-10deg prism
- Clinically, likely effects are cumulative, more sustained due to entrainment
- Compression in neglect, likely expansion after using prism base left

Rossetti 1989 study on Yoked Prism



Summary

- Prisms can be used for more than simply aligning eyes in acquired brain injuries
- Set the stage for rehabilitative therapy, or simply provide a stimulus for recovery
- Can be helpful in many types of cases for different conditions…

Diplopia, PTVS, Visual Field loss, and Postural

For More Information…

- Vision Rehabilitation Section of AOA www.aoa.org
- College of Optometrists in Vision Development www.covd.org
- Neuro-Optometric Rehabilitation Association www.nora.cc

Thank you for the opportunity to share with you!

DIABETES

Potpourri

Tad Buckingham, OD
Summer 2015

Disclosure

Tad Buckingham OD, EMT-P does not receive any type of reimbursement or other benefits from any manufactures, dealers, or groups represented in this lecture.

Objectives

- Understand basic Diabetes pathophysiology
- Recognize retinal ophthalmic diabetic manifestations
- Recognize non-retinal ophthalmic diabetic manifestations
- Recognize and Co-Manage diabetic manifestations of acute hypoglycemia/hyperglycemia

Undiagnosed Diabetes

- Systemic Disease Symptoms
  - Polyuria
  - Polydipsia
  - Weight changes
  - Puritis
  - Delayed wound healing
  - Recurrent infections
  - Sexual disfunction

Undiagnosed Diabetes

- General Ocular Symptoms
  - Recent onset of visual changes
  - Blurred/fluctuating vision
  - Presbyopic near vision improvement.
    - myopic shift.
  - New-onset diplopia
    - 3rd, 4th , or 6th nerve palsy
  - Ocular surface and lid disease

Common Diabetes (DM) Types

- Diabetes Mellitus – A group of metabolic diseases causing hyperglycemia
  - Defective insulin secretion
  - Increased cellular resistance to insulin
    - Type I
    - Type II
    - Gestational

Diabetes Type I

- Diabetes Mellitus Type I
  - Type I (juvenile onset or Insulin dependent)
    - Immune system destroys insulin producing beta cells
    - 5-10% of the diabetic population in the USA

Diabetes Type II

- Diabetes Mellitus Type II
  - Type II(adult onset or non-insulin dependent)
    - Body does not produce enough insulin (insulin deficient)
    - …. Or does cannot use it's insulin efficiently
    - Most common form of diabetes world wide (90-95% USA)

Gestational Diabetes

- Diabetes Mellitus
  - Gestational
    - Any level of glucose intolerance with first onset occurring during pregnancy
    - Caused by a shortage of insulin or hormone secretion that occurs during pregnancy
    - 5 – 10 % of pregnant women will experience Gestational diabetes
      - Will not lead to diabetic retinopathy
      - Gestational diabetics have a 35-60% chance of converting to DM II in the subsequent 10 – 20 years

Diabetic ABCs

- Having positive Diabetic ABCs increases the risk of retinopathy
  - A – A1C
    - Reducing A1C to less than 7% reduces microvascular complications
  - B – Blood pressure: HTN
    - < 140/80 recommended control for diabetics

  - C – Cholesterol: Hyperlipidemia
    - Reduce LDL levels < 100 mg/dl
    - Statins first choice

  - S – Smoking: amount and duration of tobacco smoking

Primary Vision loss from Diabetes

- Retinopathy
  - DME – Diabetic Macular Edema (any stage of diabetic retinopathy)
  - Vitreous Hemorrhage (Proliferative Retinopathy)
  - TRD – Traction Retinal Detachment (Proliferative Retinopathy)
- Refractive shifts
- Ocular surface disease
- Cataracts
- Ischemic optic neuropathy
- Papillopathy

Retinal Complications

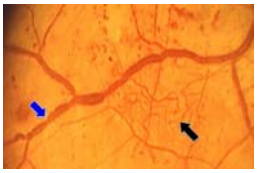
- Diabetes Duration and sustained hyperglycemia are the primary risk factors for developing diabetic retinopathy
- Characteristic lesions of diabetic retinopathy
  - Microaneurisms
  - Retinal hemorrhages
  - IRMA – Intra-retinal microvascular abnormalities
  - Venous caliber abnormalities
  - New vessel growth at or near the optic disk (NVD) or elsewhere on the retina (NVE)
  - Hard Exudates
  - Soft Exudates (cotton wool spots)

Retinal Complications

- Microaneurisms
  - Saccular out-pouchings of retinal capillaries that weaken capillary walls
- Retinal hemorrhages
  - Ruptured or leaking microaneurisms or retinal capillaries. Usually occur in the INL or OPL resulting in a dot or pinpoint shape

Retinal Complications

- IRMA – Intra-retinal microvascular abnormalities
  - Pre existing vessels that have endothelial cell proliferation resulting in shunts for areas of non perfusion.
  - Indicates severe ischemia & high risk of neovascularization
- Venous caliber abnormalities
  - Indicate retinal hypoxia
  - Forms include:
    - Venous dilation
    - Venous beading
    - Venous loop formation

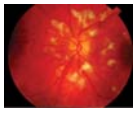


Retinal Complications

- Neovascularization
  - NVD - New vessel growth at or near the optic disk
  - NVE – New vessel growth elsewhere on the retina
  - Creates a great risk of vision loss due to vitreous hemorrhage and traction retinal detachment

Retinal Complications

- Hard Exudates
  - Lipid deposits in the retina secondary to vascular leakage
  - The aqueous portion of the exudative fluid is absorbed much more rapidly leaving the lipid component



- Soft Exudates (cotton wool spots)(Diabetes or HTN)
  - Nerve fiber layer infarct from arterial capillary occlusions – ischemic events in a small amount of tissue
  - Diffuse borders and definition

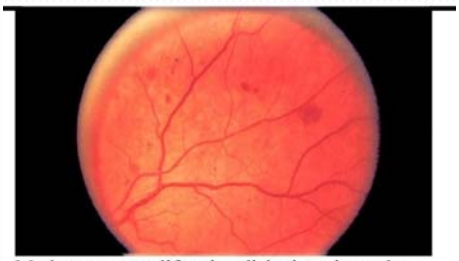
Severity of Retinal Involvement

- Levels of Diabetic retinopathy with the ETDRS standard
  - NPDR – Non-Proliferative Diabetic Retinopathy
  - PDR – Proliferative Diabetic Retinopathy
- NPDR
  - Mild NPDR
    - Marked by at least 1 retina MA but less H/MA that the severity in ETRDS standard photo 2A
    - Prognosis: PDR in 1 yr – 5%

Moderate nonproliferative diabetic retinopathy (standard photograph 2A)

  - Moderate NPDR
    - Marked by H/MA greater that 2A in 1 to 3 retinal quadrants and/or soft exudates, VB, or IRMA present
    - Prognosis: PDR in 1 yr – 12 to 27%

ETDRS Standard 2A



Moderate nonproliferative diabetic retinopathy (standard photograph 2A)

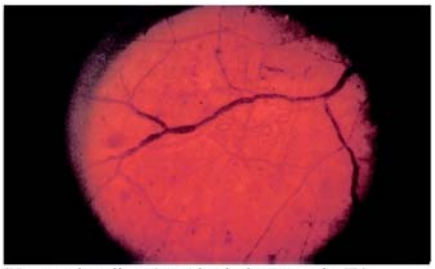
Severity of Retinal Involvement

- NPDR
  - Severe NPDR – any one of the three following criteria (4-2-1 rule)
    - H/MA > that ETDRS 2A photo in **4** retinal quadrants

    or
    - VB(similar to ETDRS 6B) in **2** or more retinal quadrants

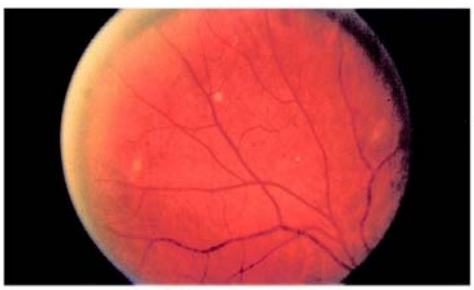
    or
    - Prominent IRMA (> than ETDRS 8A) in at least **1** quadrant
    - Prognosis: PDR in 1 yr - 52%
  - Very Severe NPDR
    - Two or more of the criteria for severe NPDR are met without the additional presentation of frank neovascularization
    - Prognosis: PDR in 1 yr >75%

ETDRS Standard 6B



Venous beading (standard photograph 6B)

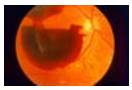
ETDRS Standard 8A



IRMAs (standard photograph 8A)

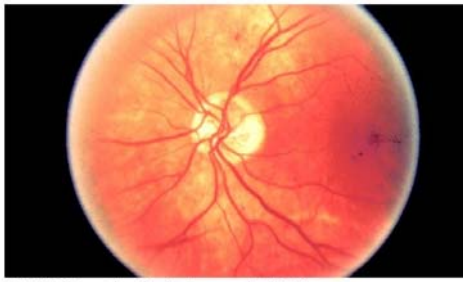
Severity of Retinal Involvement

- PDR –50% of eyes are blind within 5 yrs
  - PDR
    - One or more of the the following:
      - New Vessel on or close to 1 DD of optic disc(NVD) or New Vessels Elsewhere on the retina(NVE) < than ETDRS 10A
      - Preretinal hemorrhage(PRH) and NVE < ½ disc area without NVD
      - Prognosis: HR PDR in 5 yrs 75%



  - High Risk PDR
    - One or more of the the following:
      - NVD > ¼ to 1/3 DD in size on ETDRS 10A
      - NVD < ¼ DD in size with fresh Vitreous hemorrhage (VH) or PRH present
      - NVE > ½ DD in size with VH or PRH present
      - Prognosis: 25 –40% develop severe vision loss in 2 yrs

ETDRS Standard 10A

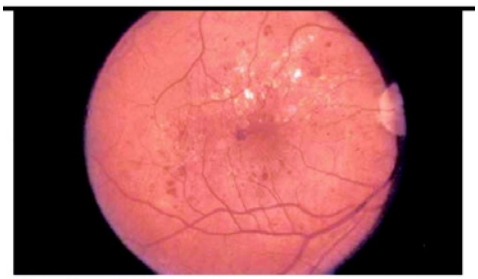


NVD (standard photograph 10A)

Retinal Complications

- Diabetic Macular Edema
  - Retina thickening within two DD of center of the macula
- Clinically Significant Macular Edema (CSMA)
  - One or more of the following:
  - Retinal thickening 1/3 DD or closer to the center of the macula
  - Hard exudates 1/3 DD or closer to the center of the retina with thickening of the adjacent retina
  - Zone or zones of retinal thickening > than 1DD in size an less than 1DD from the center of the macula

ETDRS Standard Macular Edema



Macular edema

AOA Follow-up Guidelines For Retinal Complications

Severity of Condition	Natural Course Rate of Progression to		Frequency of Follow-up	Components of Follow-up Evaluations	
	PDR (1 year)	HRC* (3 years)		Fundus Photography	OCT/ Fluorescein Angiography
Mild NPDR	5%	15%			
No macular edema			12 months	No	No
Macular edema			4 to 6 months	Yes	Based on clinical judgment
CSME			2 to 4 months**	Yes	Yes
Moderate NPDR	12-27%	33%			
No macular edema			6 to 8 months	Yes	No
Macular edema (not CSME)			4 to 6 months	Yes	Based on clinical judgment
CSME			2 to 4 months**	Yes	Yes
Severe NPDR	52%	60-75%			
No macular edema			3 to 4 months	Yes	No
Macular edema (not CSME)			2 to 3 months	Yes	Based on clinical judgment
CSME			2 to 3 months**	Yes	Yes
Very Severe NPDR	75%	75%			
No macular edema			2 to 3 months	Yes	No
Macular edema (not CSME)			2 to 3 months	Yes	Based on clinical judgment
CSME			2 to 3 months**	Yes	Yes
Non-high-risk PDR		75%			
No macular edema			2 to 3 months	Yes	No
Macular edema			2 to 3 months	Yes	Based on clinical judgment
CSME			2 to 3 months**	Yes	Yes
High-risk PDR					
No macular edema			2 to 3 months	Yes	No
Macular edema			1 to 2 months	Yes	Yes
CSME			1 to 2 months**	Yes	Yes

*HRC = High-risk category
**Follow-up is typically monthly for the first year of treatment if intravitreal anti-VEGF injections are given.

Non-Retinal Ocular Complications

- Refractive shifts
  - Due to fluid changes in the crystalline lens. Shifts can be up to several diopters.
  - Myopic shifts are associated with hyperglycemia
  - Hyperopic shifts are associated with glucose stabilization or hypoglycemia.
  - Refractive status tend to stabilize within weeks of successful diabetic treatment
- Accommodative dysfunction
  - Accommodative amplitude may be reduced but resolves with successful glucose control

Non-Retinal Ocular Complications

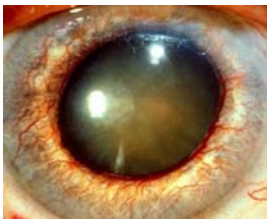
- Eye movement anomalies
  - III, IV, VI Cranial nerves effected.
  - Third nerve palsy the most common
  - Sx: ptosis, exotropia and hypotropic
  - Pupil sparing of affected eye is an important diagnostic feature.
    - Need DDx to rule out intracranial aneurysms or tumors.

Non-Retinal Ocular Complications

- Dry eye
  - Rapid TBUT
  - Tear film instability
  - Reduced reflex tear secretion from corneal nerve neuropathy
- More susceptible to corneal injury
  - Reduced corneal sensitivity
  - Delayed corneal healing secondary to poor attachments between epithelial cells and the basement membrane
- Contact lens
  - Increased risk of CL related microbial keratitis with extended wear lenses.
  - Slower recovery from CL induced corneal edema.
  - Daily wear lenses are a safe option with compliant patients

Non-Retinal Ocular Complications

- Iris
  - Depigmentation
  - Neovascularization (Rubeosis Iridis)
    - Can result in neovascular glaucoma when effecting the TM

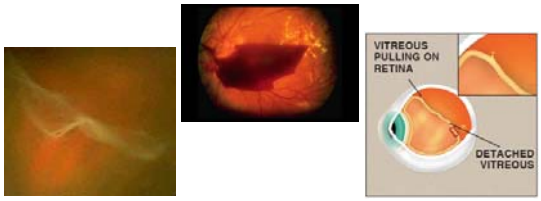


Non-Retinal Ocular Complications

- Lens
  - Occur earlier and progress more rapidly than nondiabetics
  - Type 2 Diabetics will get Nuclear sclerosis and Cortical (age related) cataracts earlier, especially if taking statins for hyperlipidemia
  - Risk of cataracts depends on duration of diabetes and severity of hyperglycemia

Non-Retinal Ocular Complications

- Vitreous Complications
  - Degeneration and earlier increased onset PVD
  - Neovascularization can illicit vitreal traction
  - Can result in Tractional Retinal Detachment



Non-Retinal Ocular Complications

- Optic disc
  - Papillopathy
    - Unilateral or bilateral hyperemic disc swelling
    - +/- APD and visual field defect
    - A risk factor for diabetic retinopathy progression.
    - Most resolve within a year with VAs improving to 20/30
  - Ischemic Optic Neuropathy
  - Open Angle Glaucoma

Emergent Diabetic Findings

Acute Hypoglycemia Control

- Plasma glucose of < 70 mg/dl in symptomatic patients
- Symptoms
  - Shaking, nervousness, sweating, weakness, transitioning from semi consciousness with combativeness to unconsciousness
  - 4-10% mortality from all cause (brain death to cardiac dysrhythmias)

- Treatment
  - Conscious patients who can control their airway
    - Give 15 grams of simple carbohydrate (oral glucose)
    - Recheck CBG in 5 minutes and re-dose if plasma glucose is still < 70 mg /dl
    - Follow up with complex carbohydrates
  - If patient cannot control their airway or they are unconscious call 911 and if available inject 1mg Glucagon IM

Acute Hyperglycemic Control

- Plasma glucose of > 600 mg/dl in symptomatic patients
- Symptoms
  - Increased hunger and thirst, frequent urination, dehydration, ketoacidosis, weakness, transitioning to semi consciousness with combativeness to unconsciousness
  - Mortality 2 – 20%
- Treatment
  - Call 911
  - Monitor airway of unconscious patients
  - Hospital treatment
    - Intervenous fluid
    - Insulin therapy
    - Electrolyte Replacement
    - Continued evaluation and treatment

Questions?

Glaucoma Case Analysis

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Financial Disclosure

I have received speaker and/or consulting fees from:

- Zeiss Meditec
- Alcon Laboratories
- Allergan

I have no direct financial interest in any company or product mentioned during this presentation.

Glaucoma Case Analysis

- Diagnostic Issues/Deciding to Treat
- Initiating Treatment
- Detecting Progression
- Miscellaneous Cases

CASES 1-2

IS THIS GLAUCOMA?

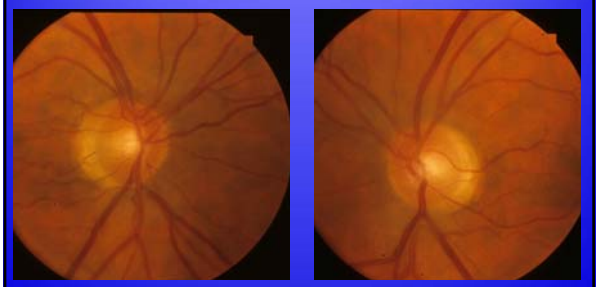
Case 1: Dennis, 65yo WM

- POH: (-) injury, (-) surgery
- PMH: (+) DM2, (+) Systemic HTN
- FH: (-) glaucoma
- Meds: metformin, HCTZ
- All: None

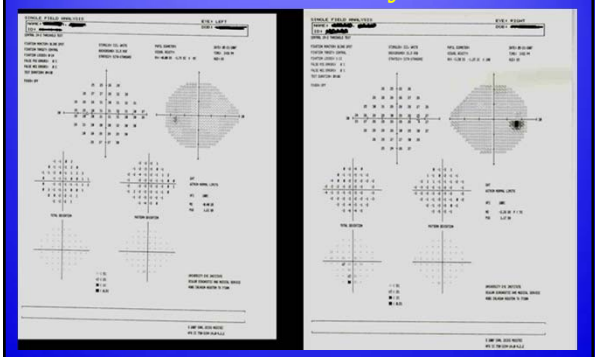
Case 1: Dennis, 65yo WM

- BVA: 20/25 OD 20/20 OS
- Pupils: 3mm, 3+ D/C OD/OS, (-) RAPD
- CVF: FTFC OD, OS
- Slit lamp: mild nuclear sclerosis OD>OS
- IOP: 31mmHg OD, 30mmHg OS
- See ONH and VF

Case 1: Dennis, 65yo WM



Case 1: Dennis, 65yo WM



Case 1: Is this glaucoma?

A. Yes
B. No
C. I need additional information

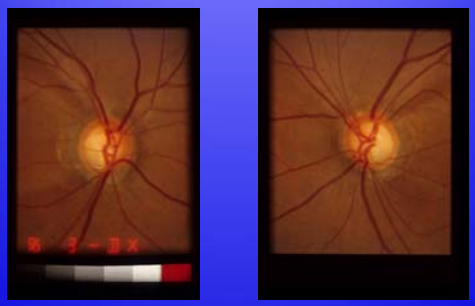
Case 2: Maria, 45 yo Hispanic female

- **CC: referred for glaucoma evaluation**
- **POH: unremarkable, no trauma, no surgery**
- **PMH: unremarkable, no vascular disease**
- **FH: no known glaucoma, most family in Mexico**
- **Meds: None**
- **All: None**

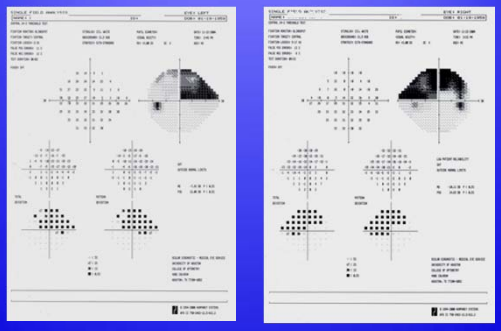
Case 2: Maria, 45 yo Hispanic female

- **BVA: 20/20 OD, OS**
- **Pupils: 3mm, 3+ D/C OD/OS, (-) RAPD**
- **Slit Lamp: normal, no secondary signs, open angles**
- **Gonioscopy: open to CB, no secondary findings**
- **IOP: 24mmHg OD 23mmHg OS**
- **See ONH and VF**

Case 2: Maria, 45 yo Hispanic female



Case 2: Maria, 45 yo Hispanic female



Case 2: Is this glaucoma?

A. Yes
B. No
C. I need additional information

Is this glaucoma?

- If there is characteristic optic nerve damage…
  - "Yes"
- If there are no characteristic optic nerve or VF changes …
  - Usually "No"

Characteristic Optic Nerve Changes

- Large C/D ratio FOR THE SIZE OF THE OPTIC NERVE
- Focal or diffuse rim thinning
- Focal or diffuse RNFL loss
- Optic disc hemorrhage
- Peripapillary atrophy

Why is disc size important?

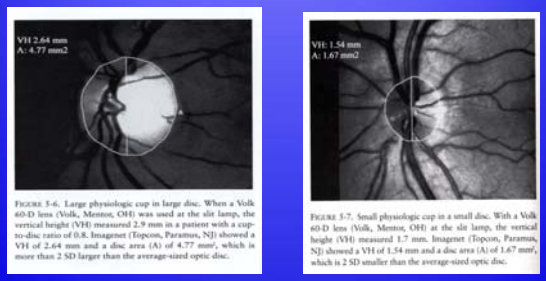
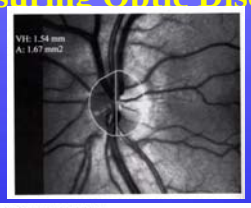


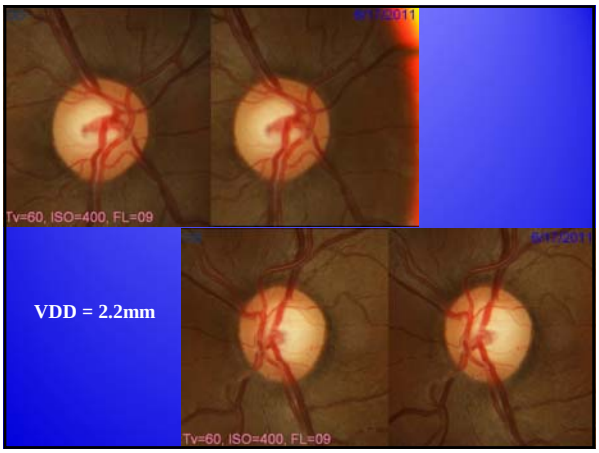
FIGURE 5-6. Large physiologic cup in large disc. When a Volk 60-D lens (Volk, Mentor, OH) was used at the slit lamp, the vertical height (VH) measured 2.9 mm in a patient with a cup-to-disc ratio of 0.8. Imagenet (Topcon, Paramus, NJ) showed a VH of 2.64 mm and a disc area (A) of 4.77 mm², which is more than 2 SD larger than the average-sized optic disc.

FIGURE 5-7. Small physiologic cup in a small disc. With a Volk 60-D lens (Volk, Mentor, OH) at the slit lamp, the vertical height (VH) measured 1.7 mm. Imagenet (Topcon, Paramus, NJ) showed a VH of 1.54 mm and a disc area (A) of 1.67 mm², which is 2 SD smaller than the average-sized optic disc.

Glaucoma Handbook, Litwak

Measuring Optic Disc Size





Rim Thinning

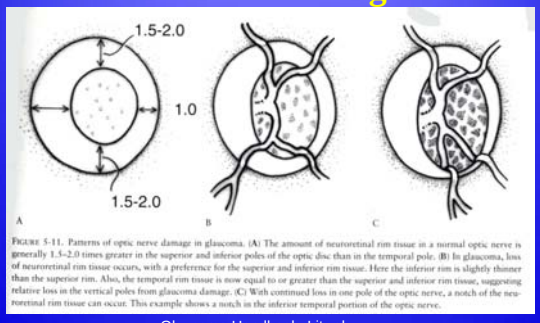
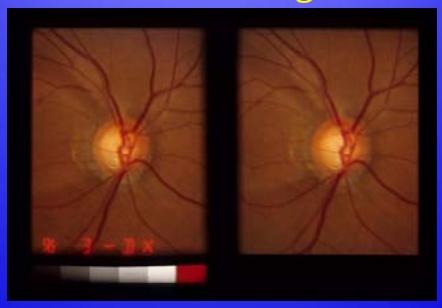
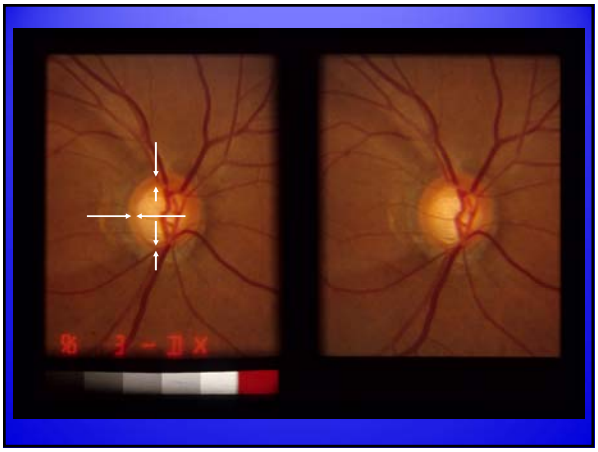


FIGURE 5-11. Patterns of optic nerve damage in glaucoma. (A) The amount of neuroretinal rim tissue in a normal optic nerve is generally 1.5–2.0 times greater in the superior and inferior poles of the optic disc than in the temporal pole. (B) In glaucoma, loss of neuroretinal rim tissue occurs, with a preference for the superior and inferior rim tissue. Here the inferior rim is slightly thinner than the superior rim. Also, the temporal rim tissue is now equal to or greater than the superior and inferior rim tissue, suggesting relative loss in the vertical poles from glaucoma damage. (C) With continued loss in one pole of the optic nerve, a notch of the neuroretinal rim tissue can occur. This example shows a notch in the inferior temporal portion of the optic nerve.

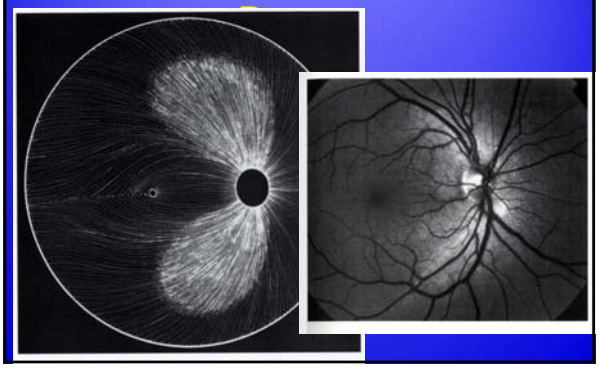
Glaucoma Handbook, Litwak

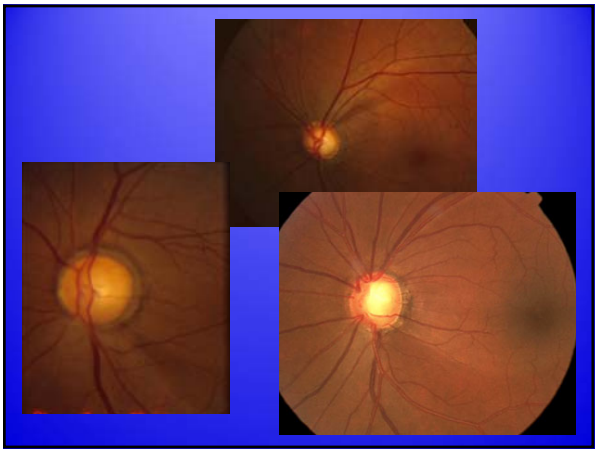
Rim Thinning





Retinal Nerve Fiber Layer





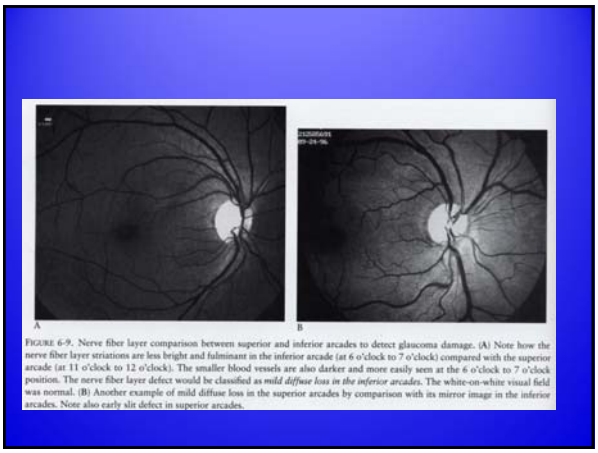
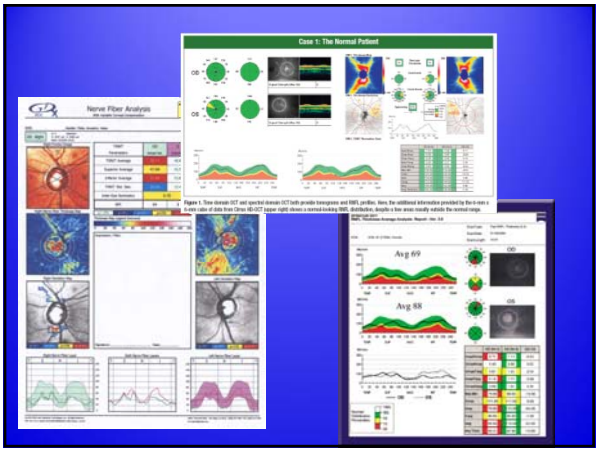


FIGURE 6-9. Nerve fiber layer comparison between superior and inferior arcades to detect glaucoma damage. (A) Note how the nerve fiber layer striations are less bright and fulminant in the inferior arcade (at 6 o'clock to 7 o'clock) compared with the superior arcade (at 11 o'clock to 12 o'clock). The smaller blood vessels are also darker and more easily seen at the 6 o'clock to 7 o'clock position. The nerve fiber layer defect would be classified as *mild diffuse loss in the inferior arcades*. The white-on-white visual field was normal. (B) Another example of mild diffuse loss in the superior arcades by comparison with its mirror image in the inferior arcades. Note also early slit defect in superior arcades.

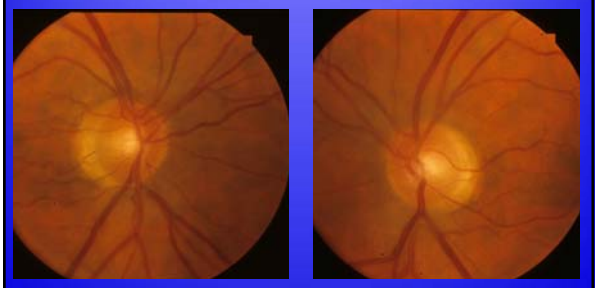


Disc Hemorrhage

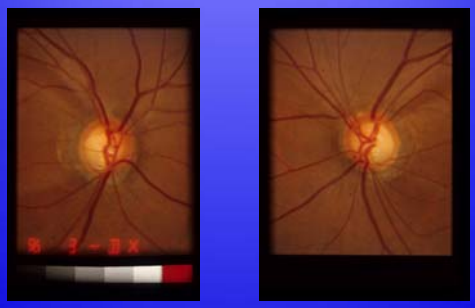
Peripapillary Atrophy

Central β zone (black arrow) and peripheral α zone (white arrow).

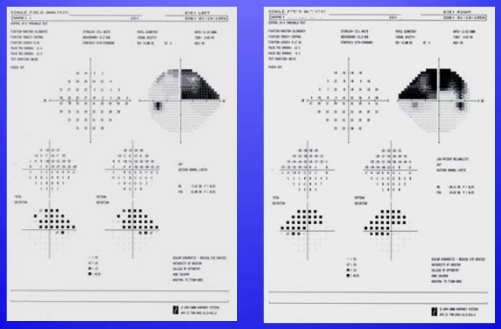
Case 1: Dennis, 65yo WM



Case 2: Maria, 45 yo Hispanic female



Case 2: Maria, 45 yo Hispanic female



Why haven't we talked about IOP?

- IOP no longer defines glaucoma
- Is IOP important?
  - Higher IOP = greater risk of damage and/or progression
  - Suggestion that greater fluctuation in IOP= greater risk of damage and/or progression
  - Multiple clinical trials show benefit of lowering IOP in terms of progression

What if only the IOP is high?

- Ocular Hypertension Treatment Study (OHTS)
  - To evaluate safety and efficacy of topical ocular hypotensive agents in delaying/preventing onset of glaucoma damage in individuals with moderately elevated IOP
  - To produce natural history data to aid in identifying patients at highest risk for development of POAG

OHTS

- Description:
  - Long –term, randomized, controlled multi-center clinical trial
  - Patients with OH randomized to close observation or stepped medical regimen
  - All subjects followed for minimum of 5 years (perimetry, ONH photography)
  - Must recruit 25% African Americans

OHTS

- Patient Eligibility:
  - Age 40-80
  - IOP 24-32 in one eye AND 21-32 in fellow eye
  - Normal ONH and VF
- Exclusions:
  - Reduced BVA
  - Previous intraocular surgery
  - Anatomical narrow angles
  - Diabetic retinopathy
  - Other causes of VF loss or ONH abnormalities
- 1636 patients enrolled

OHTS

- Results:
  - "Big Results"
    - Cumulative probability of developing POAG was 4.4% in medication group vs. 9.5% in observation group
  - "Smaller Results" (???)
    - Baseline factors that predict development of POAG

OHTS

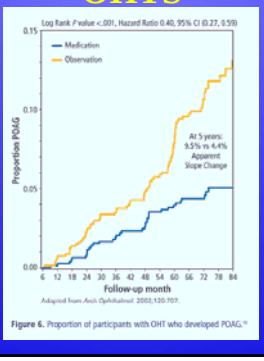


Figure 6. Proportion of participants with OHT who developed POAG.[10]

OHTS

- Baseline factors that predict POAG:
  - Multivariate analyses:
    - Older age
    - Larger vertical or horizontal c/d ratio
    - Higher IOP
    - Greater PSD on HVF
    - Thinner CCT

CCT AS A RISK FACTOR

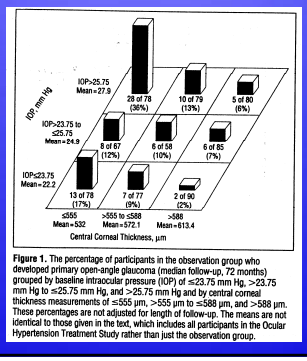


Figure 1. The percentage of participants in the observation group who developed primary open-angle glaucoma (median follow-up, 72 months) grouped by baseline intraocular pressure (IOP) of ≤23.75 mm Hg, >23.75 mm Hg to ≤25.75 mm Hg, and >25.75 mm Hg and by central corneal thickness measurements of ≤555 µm, >555 µm to ≤588 µm, and >588 µm. These percentages are not adjusted for length of follow-up. The means are not identical to those given in the text, which includes all participants in the Ocular Hypertension Treatment Study rather than just the observation group.

OHTS

- Conclusions:
  - Lowering IOP may prevent/delay the development of POAG in patients at risk
  - Must take into account risk factors for the development of POAG
  - Must weigh risk/benefit of chronic medication use
  - Consider: cost, inconvenience, side effects
  - Consider: age, IOP, CCT, C/D ratio

OHTS

- Pachymetry has now become standard of care in evaluation of OH patients
- Is pachymetry important in other forms of glaucoma/glaucoma suspects?

NEWEST OHTS DATA

Delaying Treatment of Ocular Hypertension

The Ocular Hypertension Treatment Study

Michael A. Kass, MD; Mae O. Gordon, PhD; Feng Gao, PhD; Dale K. Heuer, MD; Eve J. Higginbotham, MD; Chris A. Johnson, PhD; John K. Keltner, MD; J. Philip Miller, BS; Richard K. Parrish, MD; M. Roy Wilson, MD; for the Ocular Hypertension Treatment Study Group

Arch Ophthalmol 2010; 128(3): 276-287

Delaying Treatment of Ocular Hypertension

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- **Objective: Compare safety and efficacy in earlier vs later treatment of OHT pts**
- **Main Outcome Measure: cumulative proportion of participants who developed POAG**

Delaying Treatment of Ocular Hypertension

The Ocular Hypertension Treatment Study

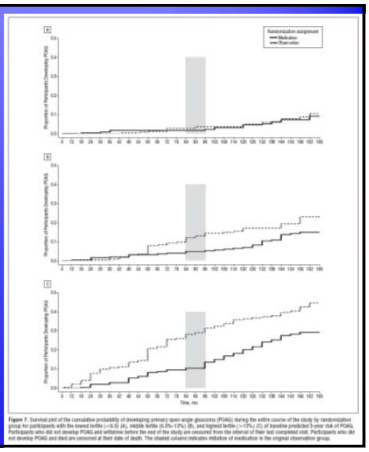
Michael A. Kass, MD; Mae O. Gordon, PhD; Feng Gao, PhD; Dale K. Heuer, MD; Eve J. Higginbotham, MD; Chris A. Johnson, PhD; John K. Keltner, MD; J. Philip Miller, BS; Richard K. Parrish, MD; M. Roy Wilson, MD; for the Ocular Hypertension Treatment Study Group

- **Results: Cumulative proportion of participants who developed POAG at 13 years:**
  - **0.22 observation group**
  - **0.16 treatment group**
- **Highest third baseline risk:**
  - **0.4 observation group**
  - **0.28 medication group**

Lowest risk

Middle risk

Highest Risk



Delaying Treatment of Ocular Hypertension

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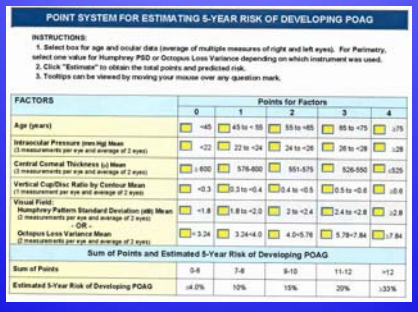
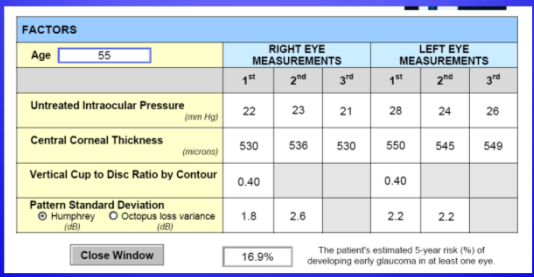
- **African Americans:**
  - **28% developed POAG at 13 years**
  - **16% non-AA participants developed POAG at 13 years**
  - *****difference in prognosis appears related to baseline risk factors (C/D and CCT)**
  - ***** did not differ from non-AA patients with similar baseline characteristics**

OHTS Risk Calculator



http://ohts.wustl.edu/risk/calculator.html

"Continuous Method" calculator

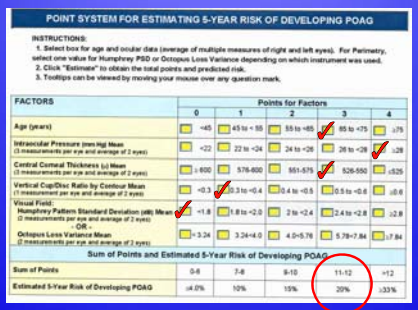


FACTORS		RIGHT EYE MEASUREMENTS			LEFT EYE MEASUREMENTS		
Age 55		1st	2nd	3rd	1st	2nd	3rd
Untreated Intraocular Pressure (mm Hg)		22	23	21	28	24	26
Central Corneal Thickness (microns)		530	536	530	550	545	549
Vertical Cup to Disc Ratio by Contour		0.40			0.40		
Pattern Standard Deviation	⦿ Humphrey (dB) ○ Octopus loss variance (dB)	1.8	2.6		2.2	2.2	

Close Window | 16.9% | The patient's estimated 5-year risk (%) of developing early glaucoma in at least one eye.

http://ohts.wustl.edu/risk/calculator.html

http://ohts.wustl.edu/risk/calculator.html



For patient in Case 1, the 5 year risk is 20%

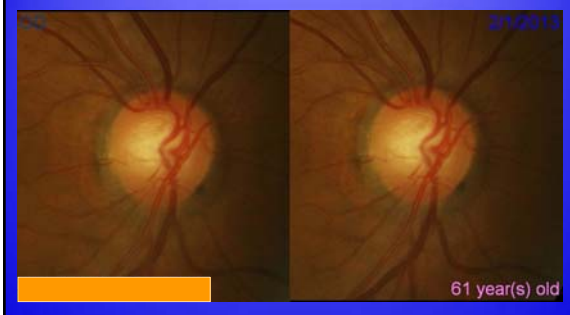
CASES 3-4: IS *THIS* GLAUCOMA?

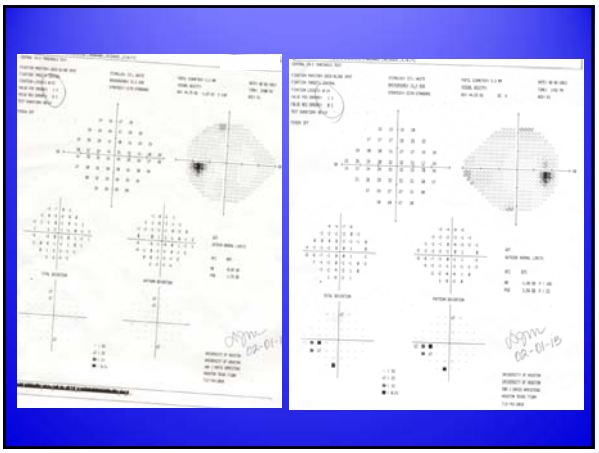
Case 3: Victor, 61 yo HM

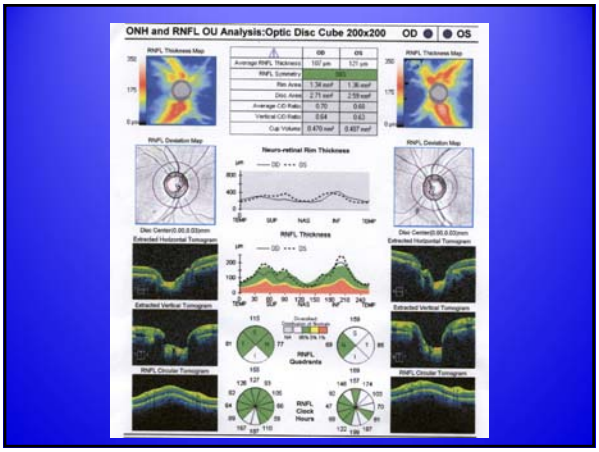
- Referred for glaucoma evaluation ("big C/D")
- POH: unremarkable
- PMH: hypothyroid disease, pre-diabetes
- Fam Hx: No glaucoma
- Meds: thyroid replacement hormone
- Allergies: NKDA

Case 3: Victor, 61 yo HM

- BCVA: 20/20 OD, OS
- Pupils, EOMs, CVF: normal OU
- Slit lamp: normal, (-) secondary signs
- Gonioscopy: open to CB, normal
- IOP: 18mmHg OD 15mmHg OS
- See ONH and VF







Case 3: Is this glaucoma?

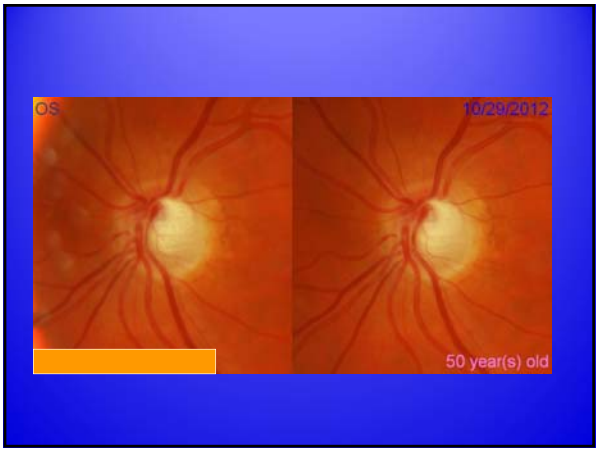
A. Yes
B. No
C. I need additional information

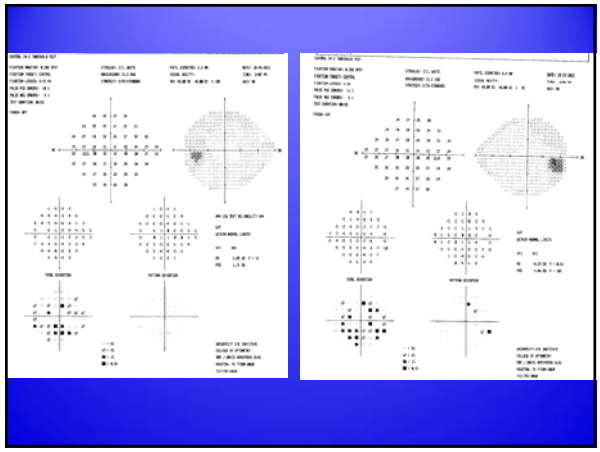
CASE 4: Allison

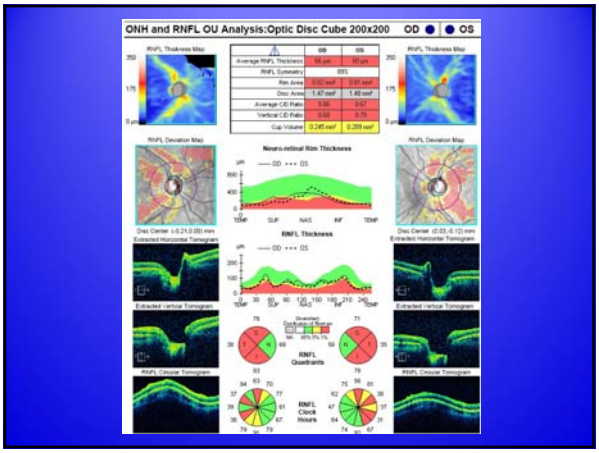
- 50 year old Caucasian female referred for glaucoma evaluation due to ONH appearance
- PMH: hypothyroidism; Sjogren syndrome
- POH: (+) myopic LASIK 2002 OU
- Fam Hx: Brother recently diagnosed with glaucoma
- Meds: Levoxyl, Restasis, AT

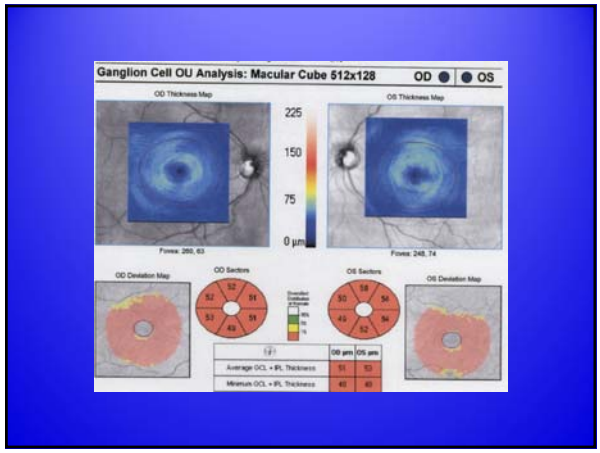
Case 4: Allison

- BCVA: 20/25+ OD, OS
- Pupils, EOMS, CVF: normal
- SLE:
  - Dry eye, mild meibomian gland dysfunction
  - LASIK flaps visible
  - No K spindle, TIDs, PXmaterial
- IOP: 12-15 OD 11-15 OS
- Pachymetry: 478 OD 457 OS





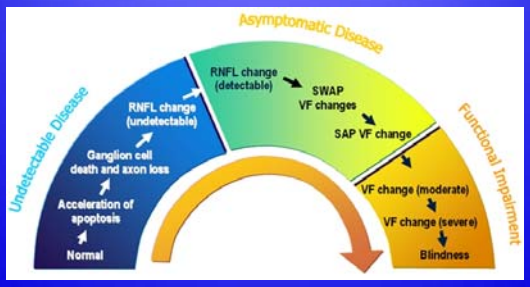




Case 4: Allison
Is This Glaucoma?

1. Yes
2. No
3. I need more information

Glaucoma Continuum (Weinreb)



Trends in Use of Ancillary Glaucoma Tests for Patients with Open-Angle Glaucoma from 2001 to 2009

Joshua D. Stein, MD, MS, Nidhi Talwar, MA, Alejandra M. LaVerne, BS, Bin Nan, PhD, Paul R. Lichter, MD

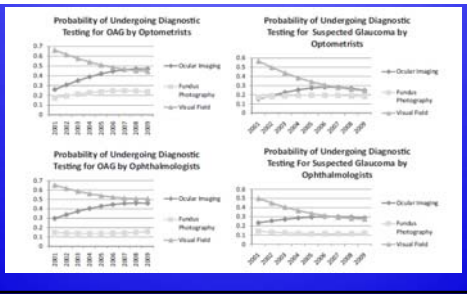
Results: For patients with OAG, the odds of undergoing VF testing decreased by 36% from 2001 to 2005, by 12% from 2005 to 2009, and by 44% from 2001 to 2009. By comparison, the odds of having OOI increased by 100% from 2001 to 2005, by 24% from 2005 to 2009, and by 147% from 2001 to 2009. Probabilities of undergoing FP were relatively low (13%–25%) for both provider types and remained fairly steady over the decade. For patients cared for exclusively by optometrists, the probability of VF testing decreased from 66% in 2001 to 44% in 2009. Among those seen exclusively by ophthalmologists, the probability of VF testing decreased from 65% in 2001 to 51% in 2009. The probability of undergoing OOI increased from 26% in 2001 to 47% in 2009 for patients of optometrists and from 30% in 2001 to 46% in 2009 for patients of ophthalmologists. By 2008, patients with OAG receiving care exclusively by optometrists had a higher probability of undergoing OOI than VF testing.

Conclusions: From 2001 to 2009, OOI increased dramatically whereas VF testing declined considerably. Because OOI has not been shown to be as effective at detecting OAG or disease progression compared with VF testing, increased reliance on OOI technology, in lieu of VF testing, may be detrimental to patient care.

Ophthalmology Volume 119, Number 4, April 2012

Trends in Use of Ancillary Glaucoma Tests for Patients with Open-Angle Glaucoma from 2001 to 2009

Joshua D. Stein, MD, MS, Nidhi Talwar, MA, Alejandra M. LaVerne, BS, Bin Nan, PhD, Paul R. Lichter, MD



Glaucoma Detection - Imaging

- **ONH/RNFL photography**

- **Scanning laser ophthalmoscopy**
- **Scanning laser polarimetry**
- **Optical Coherence Tomography**
  - **Time Domain**
  - **Spectral Domain**

1990s

2013

Structural *Progression* – WGA Consensus

- Serial optic disc photography and RNFL photography are **valuable** and **enduring** methods for monitoring structural progression (**my emphasis**)
  - Subjective estimate of C/D is insufficient
- Color fundus imaging is the preferred modality to identify disc hemorrhage & change in PPA
- Critically evaluate for:
  - Narrowing of NRR/notching
  - Enlargement of cupping
  - Disc hemorrhage

Progression of Glaucoma, World Glaucoma Association, 2011 Kugler Publications

Quantifiable/Objective Imaging

- "Diagnostic capability":
  - Good for early glaucoma
  - Excellent for moderate to severe glaucoma
  - Improved when more than one parameter is evaluated
- Many of us rely on imaging devices to identify glaucoma (and progression)
- Has imaging become "the answer"?

Pitfalls of Imaging

- "Normative Database"
  - "REFERENCE DATABASE"
    - Reference population WITHOUT DISEASE in question, to which an individual's data will be compared
    - Can be utilized to classify the patient's data as "normal" or "abnormal"
    - Can be utilized to measure reproducibility
  - Problem: "normal" and "healthy" are often used interchangeably
    - Does "abnormal" mean "unhealthy"?

https://client.blueskybroadcast.com/WGA/2013/202-203/index.html

Database Considerations

- Inclusion/exclusion criteria
  - Cohort should be representative of the population from which the suspects are drawn, except free of the disease in question
    - How do you define "un-diseased"?
  - Exclusion criteria should be minimized to avoid a "hyper-normal" database
    - Include co-morbidities that are often seen in population, so long as they don't interfere with the data in question

Database Considerations

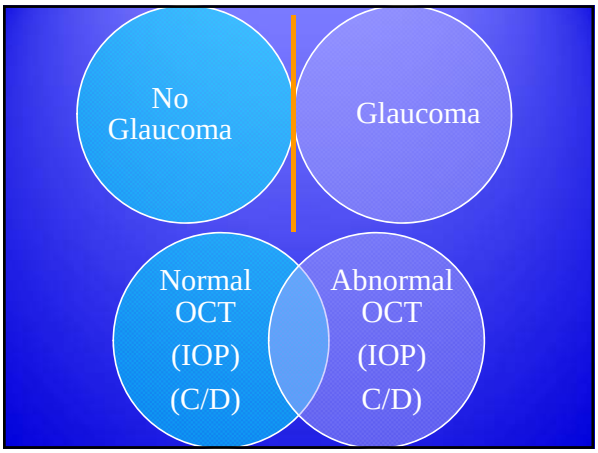
- Covariates:
  - Some covariates are known to affect measurements (age, refractive error, axial length, etc)
  - When the effect of the covariate is known and is potentially large, adjustment for that covariate is preferred.
- Database Size:
  - Sufficient to adequately characterize the reference population, including covariates

Database Considerations

- Users ("us") should understand the limits of the devices in order to avoid misinterpretation of the results

"CLASSIFICATION IS DIFFERENT THAN DIAGNOSIS"

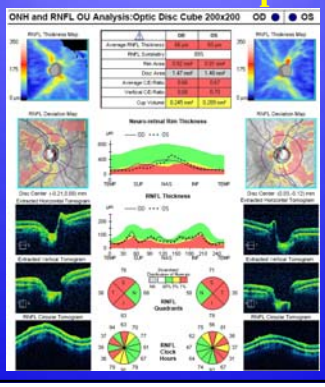
(outside normal limits is not necessarily glaucoma)



Extreme Example: IOP

- 1955 Leydhecker study on IOP
  - Mean IOP 15.8
  - Standard deviation = 2.57
  - Mean + 2SD = 15.8 +2.57 +2.57 = 20.94 (21)
- "Magic Number" for DIAGNOSIS of glaucoma became 21 for many years
- Today, we'd CLASSIFY that patient's IOP as abnormal

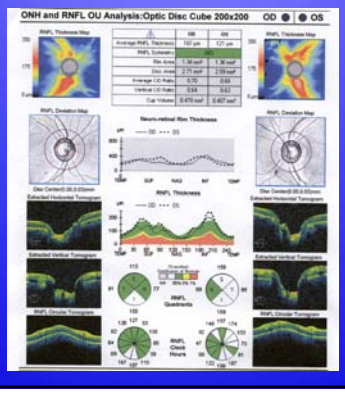
Pitfalls of OCT: Interpretation

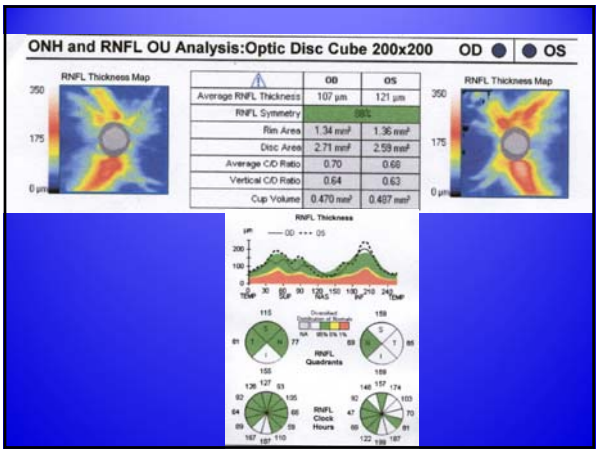


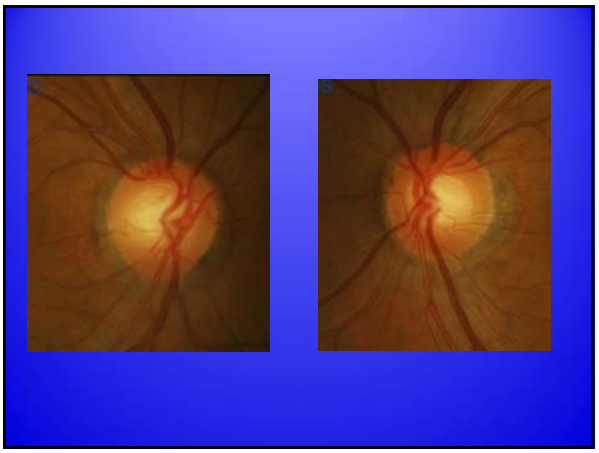
Pitfalls of OCT: Interpretation

- Operator Errors:
  - Acceptance of images with poor signal strength
  - Improper RNFL circle placement
  - Truncation of OCT images
- Misinterpretation:
  - Localized loss of RNFL classified as normal due to averaging by sector, quadrant or hemisphere
  - Shadow artifact from PVD or other
  - VM interface causing mild increase in macular thickness and/or RNFL thickness
  - Myopia

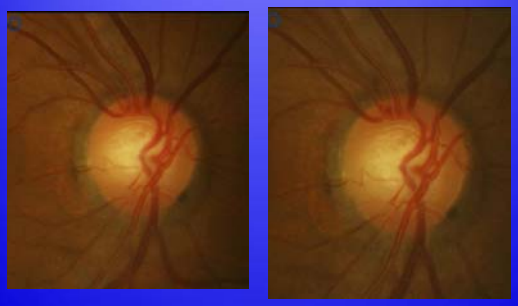
"Green Disease"

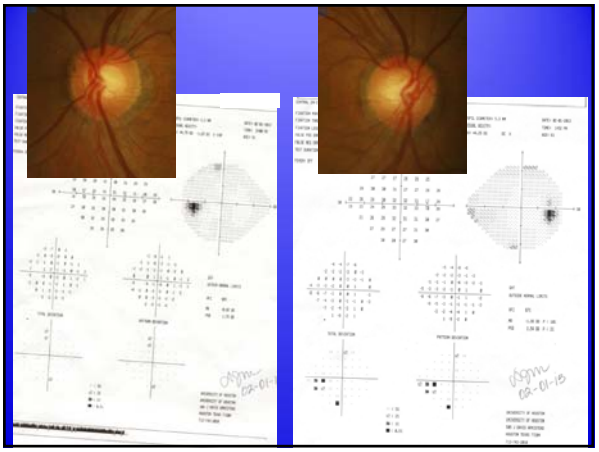




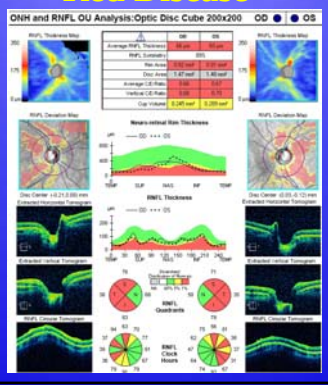


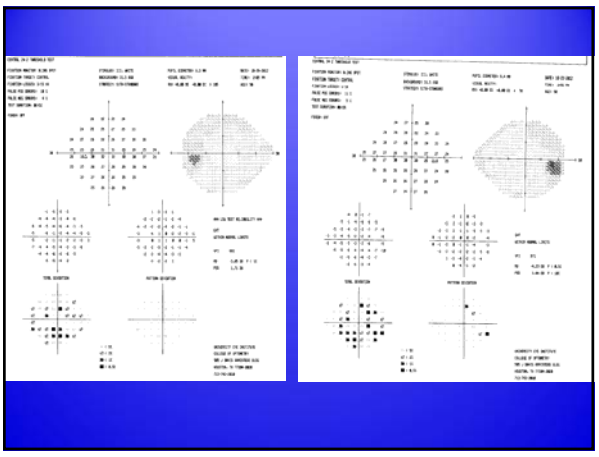
Case 3: Victor





"Red Disease"





REVIEW

Glaucoma versus red disease: imaging and glaucoma diagnosis

Gabriel T. Chong and Richard K. Lee

Purpose of review
The use of ophthalmic imaging for documentation and diagnosis of ocular disease is rising dramatically. Optical coherence tomography (OCT), confocal scanning laser tomography (CSLT), scanning laser polarimetry (SLP) and photographic imaging of the optic nerve head (ONH) are currently used to document baseline characteristics of the ONH and for diagnosing glaucoma and glaucoma progression secondary to loss of retinal nerve fiber layer (RNFL). Imaging modalities typically provide information on ONH and RNFL characteristics which are outside of the normal (relative to normative database) in red lettering or boxes, whereas ONH and RNFL characteristics within the normal range are presented in green.

Recent findings
As imaging modalities have become more sophisticated and are validated in research studies, clinicians have come to rely upon data from these imaging devices to aid in differentiating between normal and glaucomatous states of the ONH and RNFL – typically by examining if the data are green or red suggesting normal or abnormal. However, normative databases can sometimes be flawed relative to atypical ONH or RNFL morphologies and imaging can provide artifacts which do not represent true ocular disease but secondary to limitations of imaging technology.

Summary
Ophthalmic imaging is an important adjunct to clinical diagnosis but the results from imaging devices need to be assessed critically relative to artifacts of imaging and the limitations of the technology and its normative databases.

Keywords
confocal scanning laser tomography, glaucoma, imaging, optical coherence tomography, peripapillary, scanning laser polarimetry

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KEY POINTS

- Glaucoma imaging is an integral part of the glaucoma management armamentarium for glaucoma screening, diagnosis, and follow-up, that is real disease.
- Glaucoma imaging results can be easily misunderstood without a good understanding of the underlying technology limitations and result in false-positive results and diagnosis, that is red disease.
- The normative databases for the different imaging technologies have limitations in defining what is a normal versus a glaucomatous optic nerve head.

Pitfalls of OCT: "Non-glaucoma"

- NAION
- Retinal Dystrophies
- Hemiretinal vein occlusion
- Optic Neuritis
- Toxic, nutritional, infectious causes of optic atrophy

Newest Addition to Glaucoma Diagnosis Arsenal: Macular Imaging

- 1998: Zeimer et al reported on macular thickness loss in patients with known glaucomatous damage
- 2003: Greenfield reported correlation between total macular thickness and MD on VF in glaucoma patients (time domain OCT)
- Newer instruments can segment retinal thickness into specific areas

TECHNOLOGY TODAY

Measuring Macular Thickness in Glaucoma

Clinicians must be aware of important differences in the macular imaging protocols of the commercially available optical coherence tomography systems.

BY AHMAD A. AREF, MD

TABLE. COMPARISON OF COMMERCIALLY AVAILABLE IMAGING DEVICES FOR MACULAR ANALYSIS IN GLAUCOMA

OCT Device	Macular Imaging Protocol	Macular Area of Analysis	Macular Layers Analyzed	Normative Database?
RTVue FD-OCT	Ganglion cell complex analysis	7 mm², centered 1 mm temporal to fovea	RNFL, RGC, IPL	Yes
Spectralis SD-OCT	Posterior pole asymmetry analysis	8 mm², centered on fovea	All macular layers	No
Cirrus HD-OCT	Ganglion cell analysis	Elliptical annulus (vertical radius of 2 mm, horizontal radius of 2.4 mm), centered on fovea	GC-IPL	Yes

Abbreviations: OCT, optical coherence tomography; RNFL, retinal nerve fiber layer; RGC, retinal ganglion cell; IPL, inner plexiform layer; GC-IPL, ganglion cell and inner plexiform layers.

RT-Vue

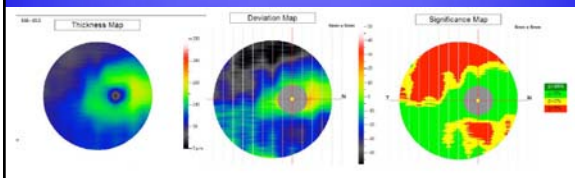


Figure 3. The Thickness, Deviation, and Significance Maps for a glaucoma patient. In the Deviation Map note the blue and black regions inferior and superior to the macula, corresponding to a 25% loss and 50% loss of GCC in those areas respectively. The center of the macula has a mask over the fovea because there are no ganglion cells in this area. The color scale to the right shows the percent loss associated with each color. Cooler colors such as blue and black represent areas with more loss.

RT-Vue

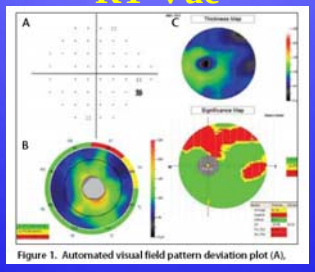
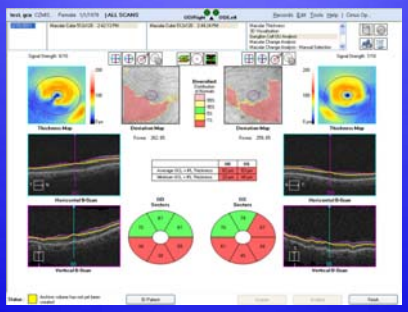


Figure 1. Automated visual field pattern deviation plot (A),

Cirrus OCT



Cirrus OCT

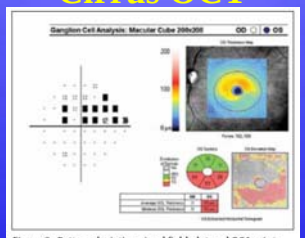
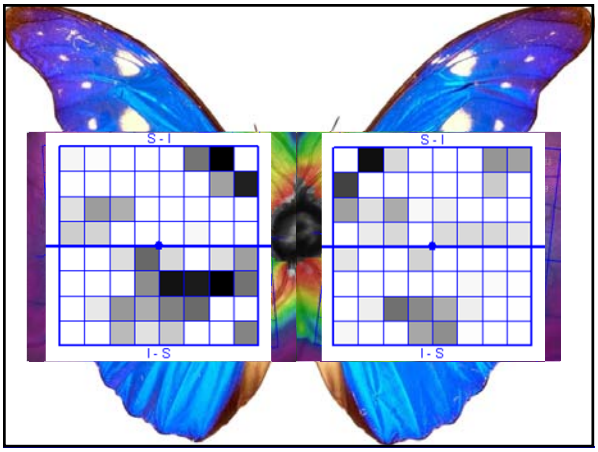
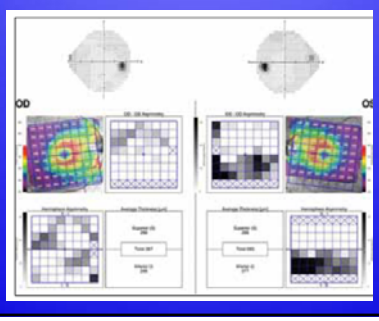


Figure 3. Pattern deviation visual field plot and GCA print-out obtained by the Cirrus HD-OCT system in a 50-year-old



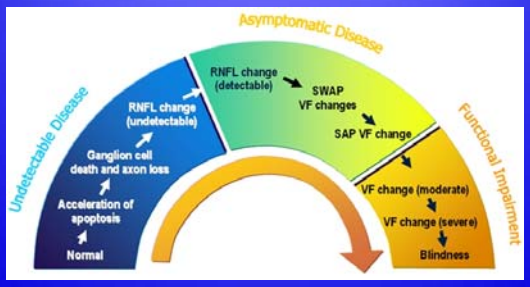
Spectralis - macula



Initiating Therapy

- When?
- Why? (What is the Goal?)
  - Ultimate goal
  - Practical goal
- How to achieve the goal?
  - Medicine
  - Laser
  - Surgery

When to Initiate Therapy?



Why? (Goal of Glaucoma Therapy)

- Ultimate Goal:
  - Maintain functional vision for the rest of the patient's life
  - Limit side effects and cost of therapy
- Practical Goal:
  - Lower IOP to a point at which we believe we can achieve the ultimate goal

How? (Setting Target IOP)

- Target IOP = best guess at IOP where we balance the risk of future vision loss with the side effects of treatment
- Should our goal be NO progression?
  - At what cost ($$, side effects, inconvenience) are we "saving vision"?
  - Does everybody with glaucoma go blind?
  - Should we focus on NO more progression or on the rate of progression?

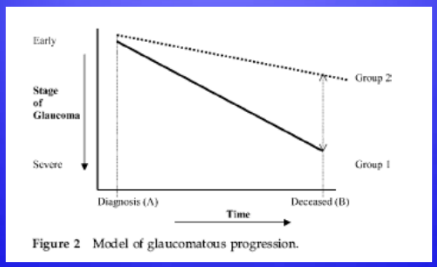


Figure 2 Model of glaucomatous progression.

Setting a Target IOP

- Target IOP is not set in stone, should be re-analyzed periodically
- Target IOP must balance benefit of preserving vision with safety of tx

Target IOP

- IOP: Higher IOP has poorer prognosis
- Age:
  - Younger patients have longer to become visually impaired, and may have more aggressive glaucoma - -SET TARGET LOW
- Rate of Progression (if known)
- Stage of Disease
  - More advanced disease requires more aggressive therapy
  - Based on optic nerve and visual field

Target IOP – 2 methods

- Stage of Disease:
  - Mild: ~30% IOP drop from highest IOP
  - Moderate: 30-40% drop
  - Severe Loss: 40-50% drop
- Stage of Disease:
  - Mild: high teens
  - Moderate: mid teens
  - Severe loss: low teens

How do you determine stage of disease?

- Visual Field
  - Use MD, number of points on PSD, and Central four point decibel levels
- Optic Nerve
  - C/D can be misleading
  - Consider thinning/notching, NFLDO

Target IOP

- Other Considerations:
  - Race
  - Level of IOP
  - Family history of blindness from glaucoma
  - Monocular status
  - Poor visual field taker
  - Other optic nerve or retinal disease
  - Life expectancy/systemic disease

Advanced Glaucoma Intervention Study (AGIS)

- Important results:
  - Patients with IOP <18mmHg at 100% of visits
    - Average of this group was ~12mmHg
  - IOP <18mmHg at 75-99% of visits
  - IOP <18mmHg at 50-75% of visits
  - IOP<18mmHg at less than 50% of visits

AGIS

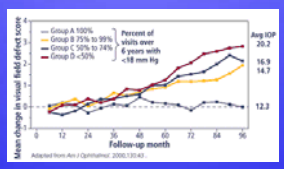


Figure 8. Mean change from baseline in visual field defect score by IOP over 6 years after surgery (associative analysis).[1]

How? (Initiating Therapy)

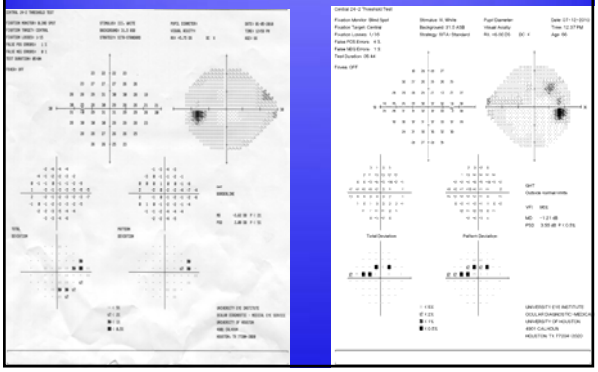
- Options:
  - Medical Therapy
  - Laser Trabeculoplasty (argon or SLT)
  - Trabeculectomy
- What will it take?
  - 20-30% drop in IOP: 1 or 2 medications
  - 30-40% drop: 2+ medications +/- laser
  - >40% drop: 2-3+ medications +/- laser +/- surgery
- Maximum therapy is debatable

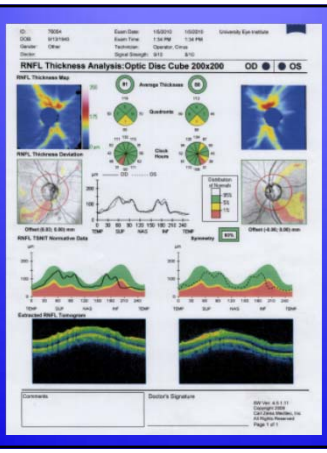
Case 5: MZ, 64 yo HF

- POH: unremarkable
- PMH: no known systemic illnesses
- FH: non-contributory
- BVA: 20/20 OD, OS
- Pupils: normal
- SLE: normal OU
- Gonioscopy: open 360 OU
- IOP: 20mmHg OD, 19mmHg OS
- See disc/VF

MZ

MZ





Case 5: MZ – Initial Decision-Making

- Initial visit:
  - IOP 20 mmHg OD, 19mmHg OS
  - Pach: 540 microns OD, OS
- Plan:
  - Target IOP low teens OU
  - Begin Xalatan OU

MZ – Why that wasn't such a good option

- Return visit one month later:
  - Reports excellent compliance
  - IOP: 19mmHg OD, 19mmHg OS

MZ – why was that a bad idea?

- Now question is:
  - Does Xalatan not work? -OR-
  - Is her IOP really higher than that first reading?
  - IF her IOP is really higher, then is our target valid???
- Solution:
  - Establish baseline IOP PRIOR to initiating therapy
    - Diurnals (?)
    - Multiple IOP readings on different days/times

MZ – it gets worse…

- At follow-up visit when IOP was 19mmHg on Xalatan
  - Plan:
    - Continue Xalatan qhs OU
    - Add Cosopt BID OU

MZ – why were these bad choices?

- Why keep a medication when it appears to be ineffective?
- Why add 2 medicines at once (Cosopt)?

Case 5: MZ – how could we have done better

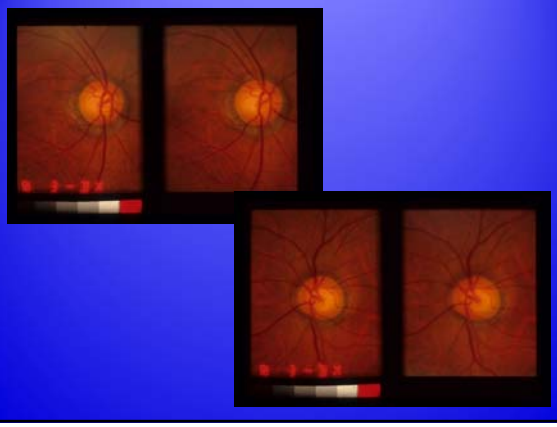
- Multiple IOP readings prior to therapy
  - True baseline establishment
  - Better target
- On follow-up with initial medications, if the medication doesn't work, STOP it!
- Don't start combination medications until the effect of one of the components is known
  - Exception: emergency situation or endstage disease

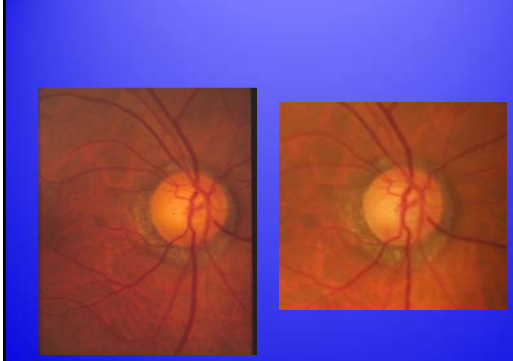
Case 6: Oscar

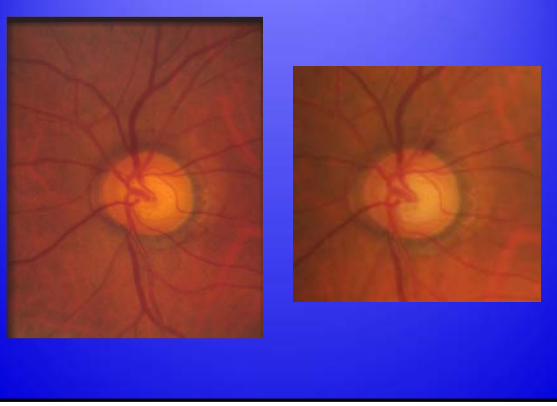
- 67yo HM
- Scheduled POAG visit, missed last 2 follow-up visits
- POH: diagnosed with POAG 2 years ago
  - Highest IOP 25mmHg OD, OS
  - Target IOP set at mid-teens
  - Treated with prostaglandin daily OU
- PMH: DM2x10y

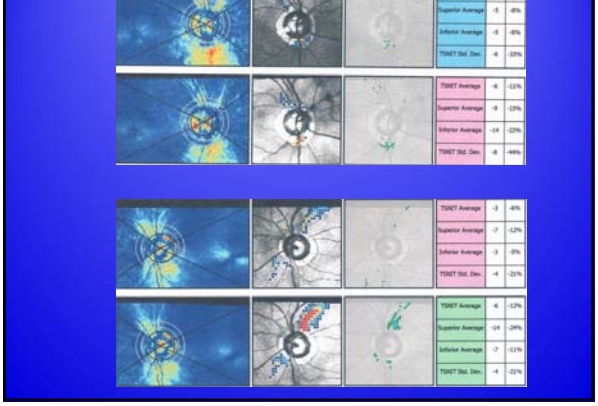
Exam Findings

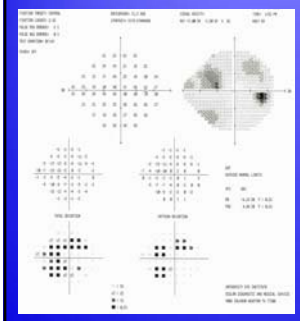
- HPI: no problems with gtts, no missed doses in last week, 2weeks, or 1 month
- BVA:20/20 OD, OS
- EOMS, Pupils: Normal
- SLE: normal OU
- IOP: 14mmHg OD, 16mmHg OS
- See ONH and VF

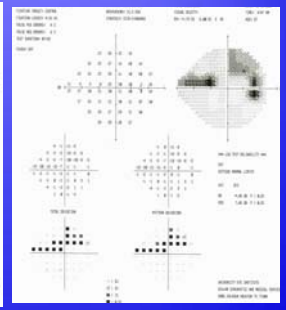


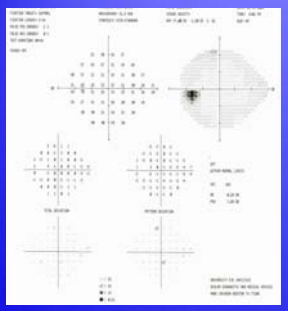


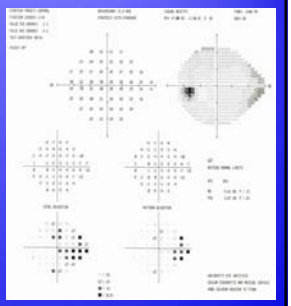












What Do We Do Now?

- **Re-set target IOP lower**
- **Add another medication**
- **Send patient for SLT**
- **Send patient for filtering surgery**

What Do We Do Now?

- **Re-set target IOP lower**
- **Add another medication**
- **Send patient for SLT**
- **Send patient for filtering surgery**
- **How about inquire again about compliance…**

Oh, well, the truth is…

- **No drops for approximately 9 months, only re-started drops about 6 weeks ago**

Glaucoma Adherence – The Problem

- Non-adherence is a problem with all disease management, especially chronic illnesses
- Poor adherence in glaucoma therapy is well documented
  - Associated with progression and blindness
- Average glaucoma adherence in glaucoma is ~60% with “cycling”

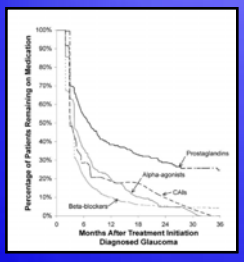
Barriers to Compliance

- Social / environmental factors
  - Change in daily routine
  - Travel
- Problems with medications
  - Side effects
  - Cost
  - Complexity*
- Problems with Self
  - Memory
  - Difficulty with instillation
- Problems with Doctor
  - Inadequate education
  - Dissatisfaction with doctor


Original Articles

Compliance Barriers in Glaucoma: A Systematic Classification

Glaucoma Adherence and Persistency Study (GAPS)




Persistence and Adherence With Topical Glaucoma Therapy

GAPS – Factors Associated With Non-Adherence

1. Not believing that vision loss is a possible result of not using medications
2. Traveling/ time away from home
3. Hearing all of what you know about glaucoma from your doctor
4. Cost
5. Not receiving phone call reminders of follow-up visits
6. Non-white

GAPS

- Better adherence based on self-report than medication refill data
- Physicians showed very poor ability to detect adherence

What Helps?

- Health Belief Model: Predicts that health behavior will occur if
  - Patient believes a disease will affect them
  - Patient believes that it will have important consequences
  - Patient believes that the treatment will help mitigate the risk
  - There are not too many barriers to overcome implementing the therapy
  - Patient has sufficient self-efficacy to carry out the plan

What Helps?

- Systematic reviews of intervention studies are difficult to interpret
- Possible helpful interventions:
  - Simple regimen
  - Instruction/counseling
  - Dosing reminders
  - More frequent follow-up

Dosing Reminders

- Non-adherent patients were randomized to automated phone intervention vs control
- Adherence improved from 54-73% in intervention group


Automated Telecommunication-Based Reminders and Adherence With Once-Daily Glaucoma Medication Dosing
The Automated Dosing Reminder Study

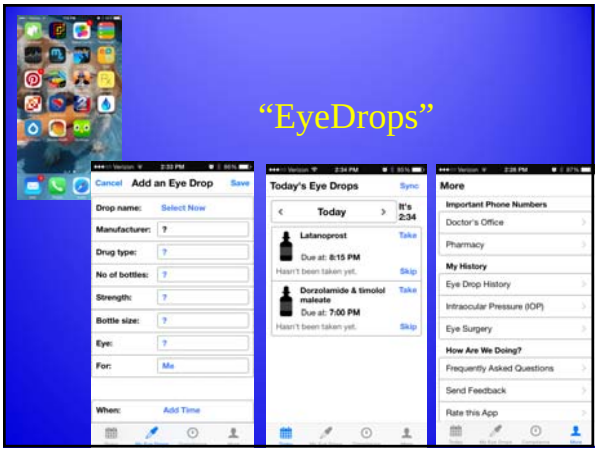
FIRST - IDENTIFY

- Ask open-ended questions
  - "Tell me how you use your drops."
  - "What is your understanding of glaucoma?"
- Reverse the judgmental environment
  - "It's hard to use the drops exactly as prescribed."
  - "No one is perfect."
- Explain the importance of accurate self-report
  - "Adding more medication is not a good idea unless I know exactly how often you are using the current medication"

Next – Implement Intervention

- Simple and affordable regimen
- Get family members on board
- Connect drop use with daily routine
- Teach/observe administration in office
- Personal phone call reminders/follow-up
- Utilize technology

"EyeDrops"



When Non-adherence Continues

- Consider laser and/or surgical intervention earlier in patients whose poor adherence is recognized and chronic

Case 7

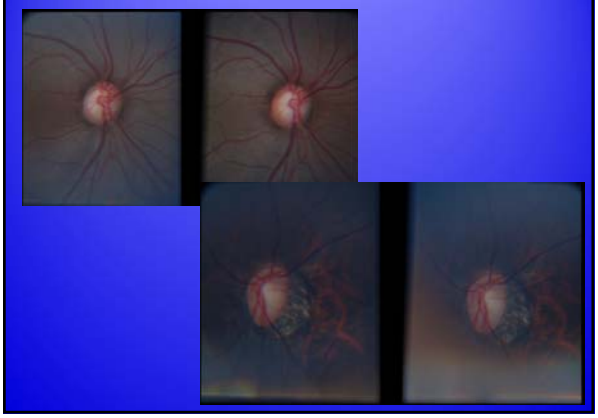
- 32 yo HF referred to Medical Eye Service from Family Practice Service of UEI for glaucoma evaluation
- HPI:
  - Exam in FPS found IOP 28mmHgOU, large C/D
- POH:
  - Several years since last exam
  - Spectacle wearer
  - No surgery, trauma
  - Refractive amblyopia OS (20/80)

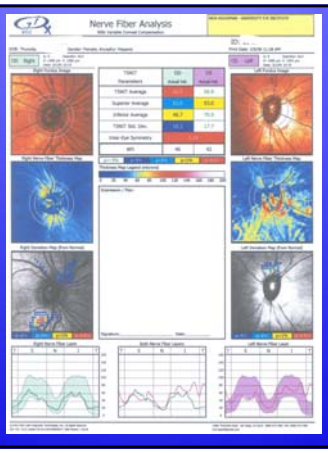
Case 7

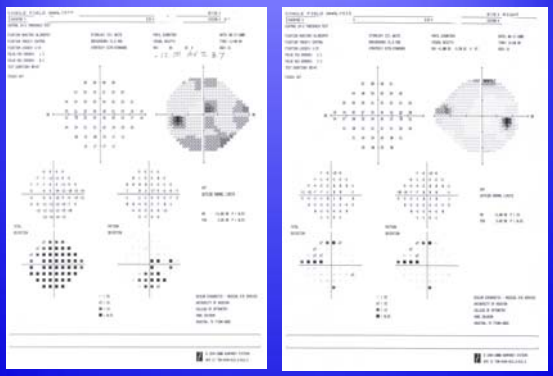
- PMH:
  - 22 weeks pregnant, no complications to date
  - Seeking regular prenatal care
  - History of 3 previous miscarriages in first/early second trimester
  - No other significant medical history
- FH: unknown
- Meds: prenatal vitamins, calcium
- ALL: NKDA

Exam Findings

- BCVA: 20/15 OD, 20/80 OS
- EOMS: Full OU
- CVF: FTFC OD, OS
- Pupils: 5mm OU, 4+ D/C OD, OS; (-)RAPD
- SLE: normal OU
- Ta: 27mmHg OD, 26 mmHg OS
- See ON and VF







Question:

- Are there any other tests you want to do?

Question:

- What is your diagnosis?
  - A. Primary Open Angle Glaucoma
  - B. Glaucoma Suspect
  - C. Ocular Hypertension
  - D. Other

Question:

How do you wish to manage this patient?

- A. Begin medical therapy
- B. Laser trabeculoplasty
- C. Filtering surgery
- D. Close follow up
- E. Refer for second opinion

Question:

Which (if any) medications are safe to use during pregnancy?

- A. Beta blockers
- B. Prostaglandin analogs/prostamides
- C. Alpha-adrenergic agonists
- D. Carbonic anhydrase inhibitors
- E. Pilocarpine

Use of Pharmaceutical Agents in Pregnancy

"…extreme caution should be used in administering any sort of medication to a pregnant woman."

- Sunness. The Pregnant Woman's Eye. Surv Ophthalmol 1988;32(4):219-238.

"A recent review article suggested that most topical ophthalmic drugs pose little risk to the mother and developing fetus."

- Schultz, Birnbaum, Goldstein. Ocular disease in pregnancy. Curr Opin Ophthalmol 2005;16:308-314

FDA Pregnancy Categories

- Category A
  - Adequate and well-controlled studies have failed to demonstrate a risk to the fetus in the first trimester of pregnancy (and there is no evidence of risk in later trimesters).
- Category B
  - Animal reproduction studies have failed to demonstrate a risk to the fetus and there are no adequate and well-controlled studies in pregnant women.

FDA Pregnancy Categories

- Category C
  - Animal reproduction studies have shown an adverse effect on the fetus and there are no adequate and well-controlled studies in humans, but potential benefits may warrant use of the drug in pregnant women despite potential risks.

FDA Pregnancy Categories

- Category D
  - There is positive evidence of human fetal risk based on adverse reaction data from investigational or marketing experience or studies in humans, but potential benefits may warrant use of the drug in pregnant women despite potential risks.

FDA Pregnancy Categories

- Category X
  - Studies in animals or humans have demonstrated fetal abnormalities and/or there is positive evidence of human fetal risk based on adverse reaction data from investigational or marketing experience, and the risks involved in use of the drug in pregnant women clearly outweigh potential benefits.

Ocular Hypotensives

- Beta Blockers
  - Category C
  - Associated with fetal cardiac arrhythmia
  - Timolol is approved by AAP during lactation
- Prostaglandin Analogs
  - Category C
  - Some concern for pregnancy loss
- Brimonidine
  - Category B
  - Potential toxicity when nursing

Ocular Hypotensives

- Carbonic Anhydrase Inhibitors
  - Category C
  - Acetazolamide associated with neonatal acidosis
  - Acetazolamide approved by AAP during lactation
- Cholinergics (Miotics)
  - Category C

Question:

How do you wish to manage this patient?

A. Begin medical therapy
B. Laser trabeculoplasty
C. Filtering surgery
D. Close follow up
E. Refer for second opinion

Glaucoma in Pregnant Patient

Stage of Disease

Suspect
- **Risk outweighs benefit**

Mild
- Consider observation
- Consider SLT
- Nursing considerations

Moderate
- Consider SLT
- Alpha agonist
- Nursing considerations

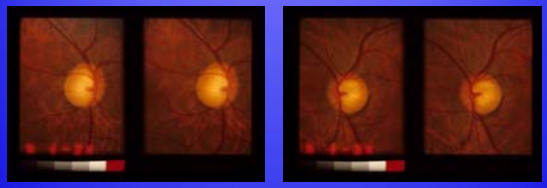
Severe
- Consider SLT
- Alpha agonist
- Refer early
- Consider filter
- Nursing considerations

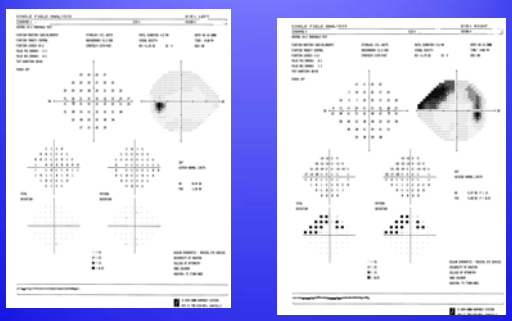
Case 8

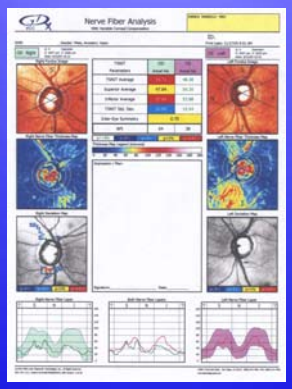
- 60 year old Asian Male
- Referred for glaucoma evaluation due to optic disc and IOP of 22 mmHg OU
- Medical history: (+) Systemic HTN
- Ocular history: unremarkable
- Fam Hx: No glaucoma

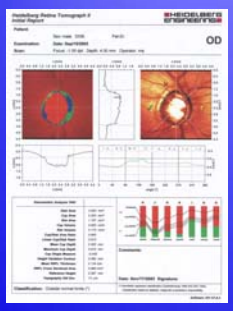
Case 8

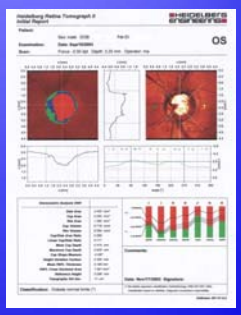
- BVA: 20/20 OD, OS
- Pupils normal, (-) RAPD
- SLE: Normal
- IOP: 22mmHg OD 20mmHg OS
- See ONH and VF





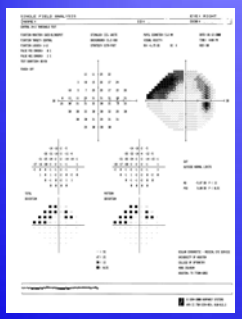


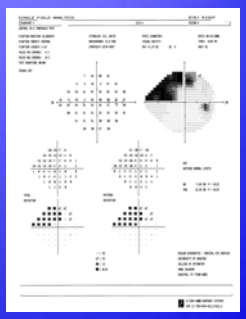


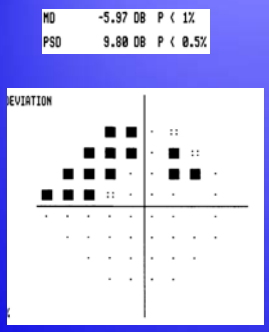


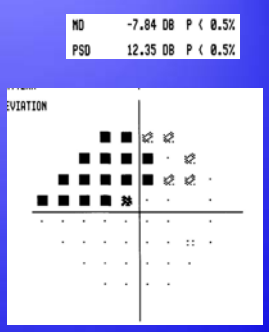
CASE 8

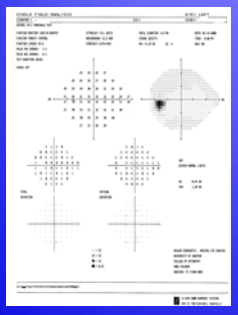
- Multiple Visits Over Several Years:
  - IOP Range:
    - On Xalatan: 9-12 mmHg OD, OS
    - Off Xalatan: 19-22 mmHg OD, OS
  - Reports difficulty with compliance
  - See VF

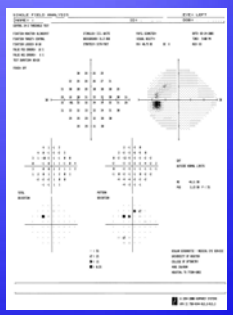












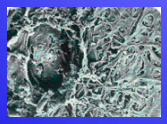
Case 8

- What options do we have?
  - Add another medication
  - Switch to another medication
  - Laser Trabeculoplasty
  - Filtering Surgery

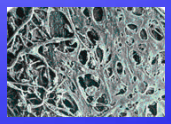
SELECTIVE LASER TRABECULOPLASTY

- Specially designed laser used to treat pigmented trabecular meshwork cells
- Application of laser is same technique as for Argon Laser Trabeculoplasty (ALT)
- Differences:
  - Very short pulse (3 nanoseconds)
  - Eliminates collateral "burn" damage
  - Mechanism appears to be cytokine-mediated macrophage recruitment
  - Can be repeated

SELECTIVE LASER TRABECULOPLASTY



ALT



SLT

- 195 eyes
  - 154 ALT 180
  - 41 SLT 180
- Followed for a maximum of 5 years (mean 3 years)
- No significant difference between ALT and SLT eyes

Comparison of Long-term Outcomes of Selective Laser Trabeculoplasty versus Argon Laser Trabeculoplasty in Open-Angle Glaucoma

Mark S. Juzych, MD, MPHA, Vikas Chopra, MD, Michael R. Banitt, MD, MHA, Bret A. Hughes, MD, Church Kim, BSEE, Mark T. Goulas, MD, Doug H. Shin, MD, PhD

Purpose: To compare the long-term success rate of selective laser trabeculoplasty (SLT) versus argon laser trabeculoplasty (ALT).

Design: Retrospective chart review.

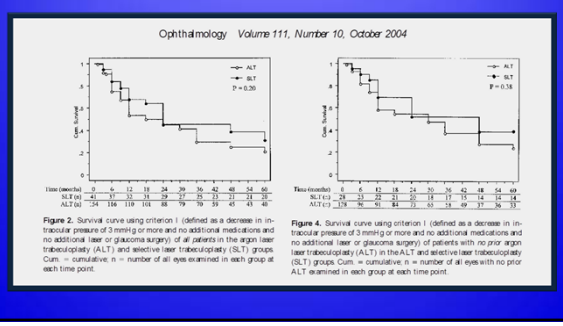
Participants: One hundred ninety-five eyes of 195 patients with uncontrolled open-angle glaucoma (OAG), of which 154 were treated with ALT and 41 were treated with SLT, and were followed a maximum of 5 years, mean 3 years. The SLT group included 9 eyes that received a second treatment. A frequency-doubled Q-switched neodymium:yttrium-aluminum-garnet laser (532 nm). Approximately 50 to 55 nonoverlapping spots were placed over 180° of the trabecular meshwork at energy levels ranging from 0.6 to 1.0 mJ per pulse. The ALT patients were treated with the argon blue–green laser with between 45 to 55 adjacent, nonoverlapping spots over 180° of the trabecular meshwork at 470 to 1150 mW of energy per pulse.

Main Outcome Measures: The success rates were defined by criterion I and criterion II. Success by criterion I was defined as a decrease in intraocular pressure (IOP) of 3 mmHg or more with no additional medications, laser, or glaucoma surgery. Criterion II had the same requirements as criterion I, except that a 25% or more IOP reduction was required for success.

Results: The mean follow-up time was 37.4±14.7 months for patients in the SLT group and 33.6±17.0 months for patients in the ALT group. The long-term success rate was not significantly different between the two SLT groups by either criterion (Kaplan–Meier survival analysis log-rank $P = 0.20$ by criterion I and $P = 0.38$ by criterion II). The success rate was not significantly different between the two groups ($P = 0.37$ by criterion I and $P = 0.39$ by criterion II).

Conclusions: In eyes with primary OAG that are receiving maximally tolerated medical therapy, SLT was found to be as effective as ALT in lowering IOP over a 5-year period. However, long-term data reveal that many of the glaucoma patients treated with SLT and ALT required further medical or surgical intervention. Whether SLT has better long-term success than ALT in repeat laser trabeculoplasty treatments remains unclear. *Ophthalmology* 2004;111:1853–1859 © 2004 by the American Academy of Ophthalmology

SLT vs ALT



Ophthalmology Volume 111, Number 10, October 2004

Figure 2. Survival curve using criterion I (defined as a decrease in intraocular pressure of 3 mmHg or more and no additional medications and no additional laser or glaucoma surgery) of *all patients* in the argon laser trabeculoplasty (ALT) and selective laser trabeculoplasty (SLT) groups. Cum. = cumulative; n = number of all eyes examined in each group at each time point.

Figure 4. Survival curve using criterion I (defined as a decrease in intraocular pressure of 3 mmHg or more and no additional medications and no additional laser or glaucoma surgery) of patients with *no prior* argon laser trabeculoplasty (ALT) in the ALT and selective laser trabeculoplasty (SLT) groups. Cum. = cumulative; n = number of all eyes with no prior ALT examined in each group at each time point.

- SLT-Med Study (2012)
- 360 degree treatment SLT versus prostaglandin analog
- Primary outcome measure: IOP
- Secondary outcome measure: # treatment steps

ORIGINAL STUDY

Selective Laser Trabeculoplasty Versus Medical Therapy as Initial Treatment of Glaucoma: A Prospective, Randomized Trial

L. Jay Katz, MD, William C. Steinmann, MD,† Asad Kalev, MD,‡ Joanne Molinaccio, COA,* Sheryl S. Wizov, COA,* and George Marcellino, PhD; the SLT-Med Study Group*

SELECTIVE LASER TRABECULOPLASTY

- **Post-Op Care**
  - **Similar to ALT (NO steroid)**
- **Complications:**
  - **Similar to ALT**
  - **Include:**
    - **Corneal abrasion**
    - **Uveitis**
    - **Scattered PAS**
    - **Transient IOP rise**

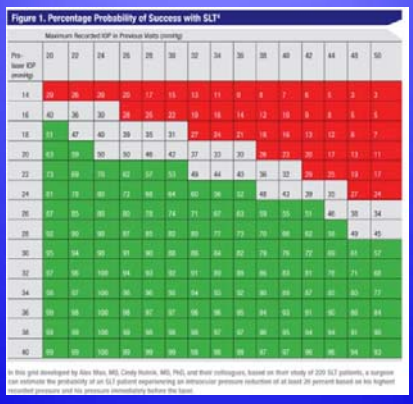
Ayala M, Chen E. Long-Term Outcomes of Selective Laser Trabeculoplasty (SLT) Treatment. Open Ophthalmol J. 2011;5:32-4. Epub 2011 May 12.

- **Retrospective chart review of 120 eyes of 120 patients undergoing 90° SLT**
- **Primary measure: time to failure**
- **Results:**
  - **Average time to failure: 18 months**
  - **Success at 12 months: 62%**
  - **Success at 24 months: 34%**
  - **Success at 36 months: 28%**
  - **Success at 48 months: 24%**

Predictors of Success in Selective Laser Trabeculoplasty for Chinese Open-angle Glaucoma

Lee et al, J Glaucoma July 2014

- Positive Predictors of Success:
  - Higher pre-treatment IOP
  - Use of Topical CAI
  - Thinner RNFL
  - Lower 1-day IOP
- Negative Predictors:
  - Use of 3 anti-glaucoma medications



SELECTIVE LASER TRABECULOPLASTY

- **Consider when:**
  - **Non-compliance is an issue**
  - **There are undesirable or intolerable side effects from medications**
  - **Patient is on maximum tolerated medical therapy**

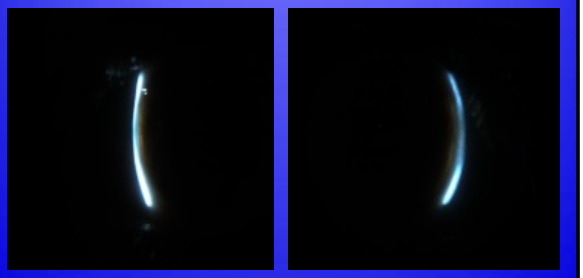
"Case 9: My Eye Hurts & I Can't See"

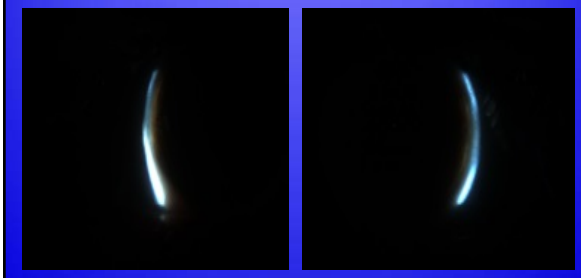
- CC: 28 YO WF presented with blurry vision OU, seeing rainbows around lights, severe frontal HA, and nausea for one day
- Ocular History: unremarkable, 5D Myope OU (DWSCL)
- Medical History: (+) HA, Tremors, Dizziness – currently under care of neurologist for evaluation/management
- Family Ocular/Medical History: unremarkable
- Social History: unremarkable

Clinical Exam

- VA w/glasses: 20/100 OD and OS, PH – 20/40 OD, OS
- Pupils: 4mm OU, sluggish reaction OU
- Motility normal OU
- SLE:
  - 1+ diffuse Corneal Edema OU
  - Closed angles OU (Van Herrick)
  - Shallow anterior chambers OU
- IOP: 34 OD, 35 OS @ 2:15 pm

Due to nausea & vomiting, unable to perform gonioscopy at initial visit





Diagnosis?

- Posner-Schlossman Syndrome
- Ocular Hypertension
- Bilateral acute primary angle closure
- Bilateral acute secondary angle closure

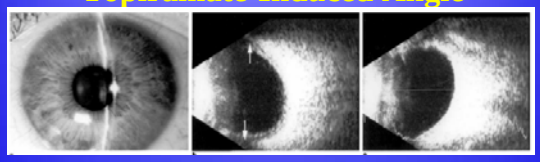
Classification of Angle Closure (Primary versus Secondary)

- **Primary Angle Closure**
  - With Pupillary Block
    - Acute/Subacute/Chronic
  - Without Pupillary Block (Iris Plateau)
- **Secondary Angle Closure**
  - With Pupillary Block
    - Lens-induced
    - Complete posterior synechiae
  - Without Pupillary Block
    - Anterior Pulling (NVG, ICE syndrome)
    - Posterior Pushing (Drug-induced/Choroidal Expansion, malignant glaucoma/aqueous misdirection)

Angle Closure (Anatomical Consideration)

- **Anterior to Lens**
  - Pupil block (major contributor)
  - Non-pupillary block (ciliary body)
    - Plateau iris configuration
    - Plateau iris syndrome
    - Pseudo-plateau iris
- **Lens-induced**
  - Phacomorphic
  - Subluxation of lens
- **Retro-lenticular forces**
  - Malignant glaucoma
  - Choroidal effusion/ciliary body rotation

Topiramate-Induced Angle



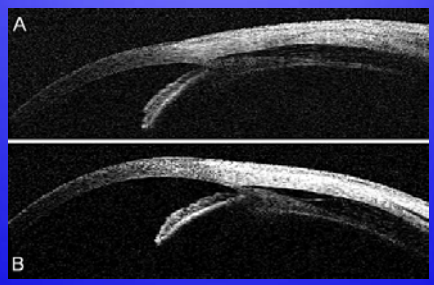
TOPIRAMATE (TOPAMAX®, TROKENDI XR®)

- **FDA approved for:**
  - **Various Epileptic Disorders**
  - **Migraines**
  - **Pain**
  - **Weight loss**
    - **phentermine with topiramate (Qsymia®)**
- **Sulfa-based with carbonic anhydrase inhibition**

Topiramate-induced Angle Closure

- May cause myopic shift and acute angle closure – occurs in 3/100,000
- Usually occurs within the first two weeks – one case was after only two doses at 25mg/day
- Pathophysiology:
  - Unknown what triggers reaction:
    - Possible blood-eye barrier disruption?
    - Hypersensitivity reaction?
    - Change in membrane potential?
  1) Choroidal effusion
  2) Anterior displacement of Iris/CB/Lens diaphragm
  3) Zonules relax
  4) Lens thickens
  5) Induced Myopia
  6) Acute angle closure
- IOP: usually below 40
  - Some degree of CB shutdown with detachment
  - Carbonic Anhydrase inhibition

OCT



- **Fig. 2 -** *Anterior segment optical coherence tomography shows bilateral, shallow, anterior ciliochoroidal detachments and angle closure with anterior rotation of the ciliary body* (**A,** *right eye*, **B,** *left eye*). *van Issum et al.* "Topiramate-induced acute bilateral angle closure and myopia: pathophysiology and treatment controversies."

What Is the Treatment Plan?

- Urgent referral to ophthalmology
- Topical aqueous suppressants, pilocarpine, oral acetazolamide
- Topical aqueous suppressants, cycloplegic agent, steroid
- LPI

Treatment – DIFFERENT THAN PRIMARY ANGLE CLOSURE!!!

- Discontinuation of Topamax
- Strong, short course of cycloplegic:
  - 1 or 2 doses generally sufficient

  1) Relaxes ciliary muscles
  2) Iris/Lens/CB diaphragm displace posteriorly
  3) Zonules tighten
  4) Angle opens/Myopia reduced
- Pilocarpine contraindicated:
  - Causes ciliary spasm, exacerbating choroidal detachment
  - Slightly pro-inflammatory

Treatment continued

- IOP – lowering agents:
  - Beta-blockers and Alpha-agonists typically first choice
  - Prostaglandins effective but not first choice due to pro-inflammatory properties & because of delayed onset of effect
  - Topical CAIs also effective but not commonly used since they are sulfa-based, and thus chemically related to topiramate (although no incidences of angle closure have been reported with topical CAIs)
- Steroids:
  - Tighten capillary junctions as well as decrease CB swelling
- Surgical:
  - LPI is not effective because mechanism is not pupillary block
  - Drainage of suprachoroidal fluid – very rarely done (usually medical therapy is sufficient)
  - Trabeculectomy/Filtering surgery - only if PAS formed after resolution

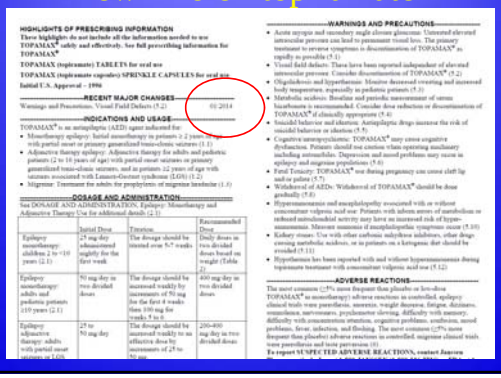
Back to Our Patient…

- Immediate Therapy
  - Two doses of scopolamine, topical steroid, and Combigan®
  - IOP reduced to 20mmHg OD and 26mmHg OS
  - Discharged with Combigan® and pga
  - D/C Topamax®
- Follow-up (24 h):
  - VA still blurry (no haloes), no pain
  - VA: 20/25 OD, OS through -10.00DS
  - IOP: 10mmHg OD , 12mmHg OS
- Follow-up (Day 4):
  - VA 20/20 through habitual (-5D) spectacles
  - IOP 10mmHg OU
  - D/C all topical meds

Clinical Pearls

- Angle closure is not always pupillary block mechanism
- Bilateral angle closure is nearly ALWAYS secondary angle closure – think medications!
- Clinical management of choroidal effusion/ciliary detachment angle closure is different than that of pupillary block (no pilo, no LPI, no acetazolamide) – CYCLOPLEGIA is key.

New Info on topiramate



HIGHLIGHTS OF PRESCRIBING INFORMATION

These highlights do not include all the information needed to use TOPAMAX® safely and effectively. See full prescribing information for TOPAMAX®

TOPAMAX (topiramate) TABLETS for oral use

TOPAMAX (topiramate capsules) SPRINKLE CAPSULES for oral use

Initial U.S. Approval – 1996

RECENT MAJOR CHANGES

Warnings and Precautions, Visual Field Defects (5.2) 01/2014

INDICATIONS AND USAGE

TOPAMAX® is an antiepileptic (AED) agent indicated for:

- Monotherapy epilepsy: Initial monotherapy in patients ≥ 2 years of age with partial onset or primary generalized tonic-clonic seizures (1.1)
- Adjunctive therapy epilepsy: Adjunctive therapy for adults and pediatric patients (2 to 16 years of age) with partial onset seizures or primary generalized tonic-clonic seizures, and in patients ≥2 years of age with seizures associated with Lennox-Gastaut syndrome (LGS) (1.2)
- Migraine: Treatment for adults for prophylaxis of migraine headache (1.3)

DOSAGE AND ADMINISTRATION

See DOSAGE AND ADMINISTRATION, Epilepsy: Monotherapy and Adjunctive Therapy Use for additional details (2.1)

	Initial Dose	Titration	Recommended Dose
Epilepsy monotherapy: children ≥ 2 to <10 years (2.1)	25 mg/day (25 mg/day administered nightly for the first week	The dosage should be titrated over 5-7 weeks	Daily doses in two divided doses based on weight (Table 1)
Epilepsy monotherapy: adults and pediatric patients ≥10 years (2.1)	50 mg/day in two divided doses	The dosage should be increased weekly by increments of 50 mg for the first 4 weeks then 100 mg for weeks 5 to 8	400 mg/day in two divided doses
Epilepsy adjunctive therapy: adults with partial onset seizures or LGS	25 to 50 mg/day	The dosage should be increased weekly to an effective dose by increments of 25 to 50 mg	200-400 mg/day in two divided doses

WARNINGS AND PRECAUTIONS

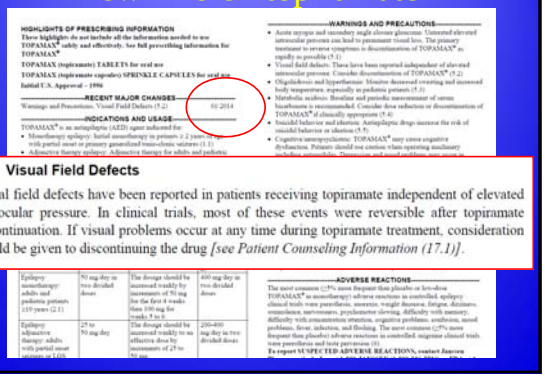
- Acute myopia and secondary angle closure glaucoma: Untreated elevated intraocular pressure can lead to permanent visual loss. The primary treatment to reverse symptoms is discontinuation of TOPAMAX® as rapidly as possible (5.1)
- Visual field defects: These have been reported independent of elevated intraocular pressure. Consider discontinuation of TOPAMAX® (5.2)
- Oligohidrosis and hyperthermia: Monitor decreased sweating and increased body temperature, especially in pediatric patients (5.3)
- Metabolic acidosis: Baseline and periodic measurement of serum bicarbonate is recommended. Consider dose reduction or discontinuation of TOPAMAX® if clinically appropriate (5.4)
- Suicidal behavior and ideation: Antiepileptic drugs increase the risk of suicidal behavior or ideation (5.5)
- Cognitive/neuropsychiatric: TOPAMAX® may cause cognitive dysfunction. Patients should not exercise when operating machinery including automobiles. Depression and mood problems may occur in epilepsy and migraine populations (5.6)
- Fetal Toxicity: TOPAMAX® use during pregnancy can cause cleft lip and/or palate (5.7)
- Withdrawal of AEDs: Withdrawal of TOPAMAX® should be done gradually (5.8)
- Hyperammonemia and encephalopathy: Associated with or without concomitant valproic acid use: Patients with inborn errors of metabolism or reduced mitochondrial activity may have an increased risk of hyperammonemia. Measure ammonia if encephalopathic symptoms occur (5.10)
- Kidney stones: Use with other carbonic anhydrase inhibitors, other drugs causing metabolic acidosis, or in patients on a ketogenic diet should be avoided (5.11)
- Hyperthermia has been reported with and without hyperammonemia during topiramate treatment with concomitant valproic acid use (5.12)

ADVERSE REACTIONS

The most common (≥5% more frequent than placebo or less-dose TOPAMAX® as monotherapy) adverse reactions in controlled, epilepsy clinical trials were paresthesia, anorexia, weight decrease, fatigue, dizziness, somnolence, nervousness, psychomotor slowing, difficulty with memory, difficulty with concentration/attention, cognitive problems, confusion, mood problems, fever, infection, and flushing. The most common (≥5% more frequent than placebo) adverse reactions in controlled, migraine clinical trials were paresthesia and taste perversion (6)

To report SUSPECTED ADVERSE REACTIONS, contact Janssen

New Info on topiramate



HIGHLIGHTS OF PRESCRIBING INFORMATION

These highlights do not include all the information needed to use TOPAMAX® safely and effectively. See full prescribing information for TOPAMAX®

TOPAMAX (topiramate) TABLETS for oral use

TOPAMAX (topiramate capsules) SPRINKLE CAPSULES for oral use

Initial U.S. Approval – 1996

RECENT MAJOR CHANGES

Warnings and Precautions, Visual Field Defects (5.2) 01/2014

INDICATIONS AND USAGE

TOPAMAX® is an antiepileptic (AED) agent indicated for:

- Monotherapy epilepsy: Initial monotherapy in patients ≥ 2 years of age with partial onset or primary generalized tonic-clonic seizures (1.1)
- Adjunctive therapy epilepsy: Adjunctive therapy for adults and pediatric

5.2 Visual Field Defects

Visual field defects have been reported in patients receiving topiramate independent of elevated intraocular pressure. In clinical trials, most of these events were reversible after topiramate discontinuation. If visual problems occur at any time during topiramate treatment, consideration should be given to discontinuing the drug *[see Patient Counseling Information (17.1)]*.

Case

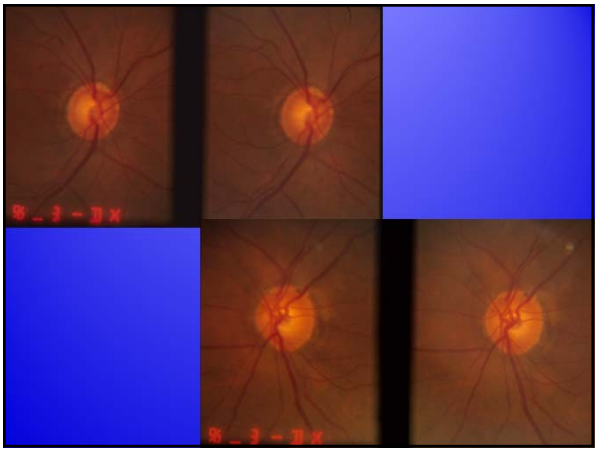
- RD, 58 year old AA male
- Referred to UEI Med Eye Service from FPS due to
  - IOP 24 mmHg OD, 26 mmHg OS @9:30am
  - C/D 0.85/0.85 OD, OS

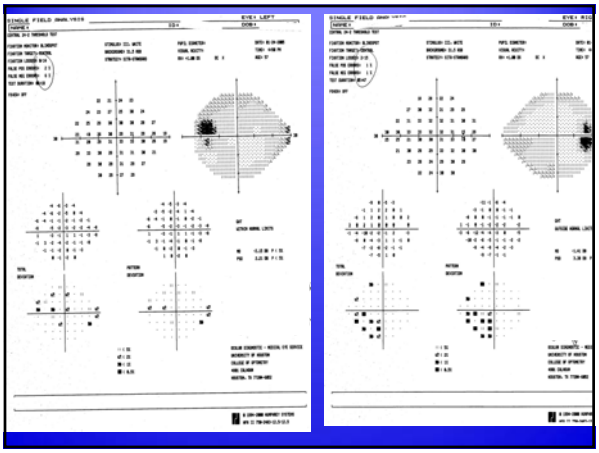
Case 6

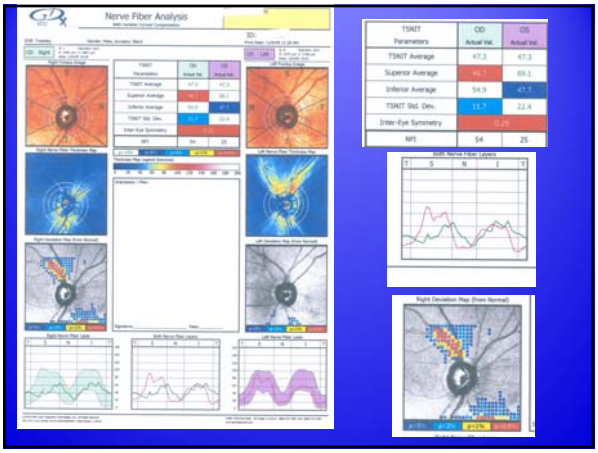
- POH:
  - (-) surgery, trauma, inflammation
- PMH:
  - (+) Systemic HTN dx 1 month prio
  - (-) DM, cardiovascular disease, other
- FH:
  - (+) glaucoma (sister)
  - (+) blindness (unknown cause – father/gf)
- Meds: Toprol XL
- All: NKDA

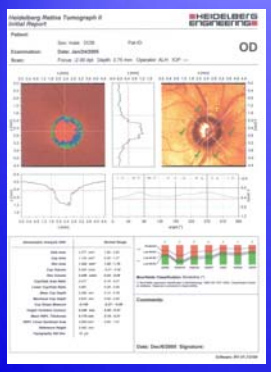
Case 6

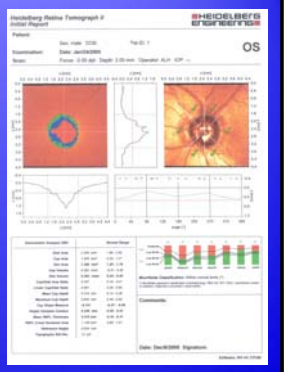
- Exam Findings:
  - VA: 20/20 OD, OS (mild SH)
  - Pupils: 3mm, 3+ D/C, (-) RAPD
  - EOMS – Full OU CVF: FTFC OD, OS
  - Color: Normal OD, OS
  - BP 164/100
  - Slit Lamp:
    - Mild anterior blepharitis OU
    - Clear cornea
    - Deep AC
    - Normal iris
    - Mild NS OU
  - IOP: 23 mmHg OD 24mmHg OS @ 4:25 pm
  - Pach: 562 OD 566 OS

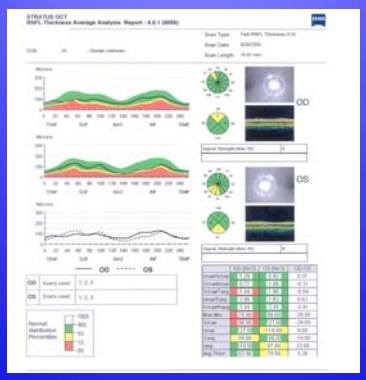












Case 6

- Questions:
  1. Does this patient have glaucoma?
  2. Are there any additional tests you want to do?
  3. What is your next step?

Case 6

- Deciding to initiate treatment:
  - Bring in for another IOP measurement & gonioscopy
  - IOP was 23 mmHg OD and 25 mmHg OS @ 9:30 am
- Target IOP?
- Med choices:
  - Contraindications?
  - Monocular Trial?
- RTC when?

Case 6

- Monocular trial Xalatan OD
- Target IOP lower = 30%
- RTC 1 month
  - Good compliance, mild redness
  - IOP 12 mmHg OD 19mmHg OS @3:00 pm
- WHAT IS NEXT? F/U when?

Case 6

- Begin Xalatan OS as well
- RTC 2 months IOP check
  - 12mmHg OD 11mmHg OS
- Next Follow Up?

Case 6

- Follow-Up 4 months for IOP check
  - Good compliance, no complaints with Xalatan
  - IOP 16mmHg OD, OS @3PM
- Q: Do you have any concerns?

Case 6

- On questioning, patient reported a recent switch of systemic HTN meds from Toprol XL to hydrochlorothiazide
- Disposition?

Thank you for your attention!

Questions?

DMarrelli@uh.edu

DRAFT

Terry E. Burris, MD
Northwest Corneal Services
Portland, OR
Co- Medical Director, Lions Eye Bank of Oregon
Associate Clinical Professor of Ophthalmology
Oregon Health Sciences University

Course Title: Corneal Degenerations

1. Briefly review differences between degenerations & dystrophies
2. Degenerations: Common: Age related (involutional): Less common: related to local & systemic conditions (noninvolutional)
3. Pinguecula; Limble girdle of Vogt; Arcus; Cornea farinata; Descemet's striae; Hassal-Henle bodies; Crocodile (mosaic) shagreen; Furrow degeneration
4. Non involutional Degenerations: Pterygium: Amyloid degeneration; Band keratopathy; Spheroidal; Salzmann's nodular; ; Terrien's marginal; Coats' white ring; Pellucid marginal; Lipoidal; Limbal stem cell deficiency
5. Pterygium: Fibrovascular overgrowths from bulbar conjunctiva; features
6. Pterygium symptoms; Pterygium Treatment; Surgery indicated when with the rule irregular astigmatism induced by keratometry or photokeratoscopy
7. Superficial lamellar keratectomy/ conjunctival surgery for Pterygium; Pterygium excision alone has 40-50% recurrence rate; 50% of recurrences within 3 months, most by 1 year; mitomycin C chemotherapy ~10%; Conjunctival or amniotic graft~10%
8. Beta-irradiation may induce severe scleromalacia; Topical mitomycin C or Thiotepa may cause skin ; depigmentation;
9. Conjunctival or Amniotic membrane graft after Pterygium Excision

10. Helps prevent scleral melts after Mitomycin C treatment; Mother's own remedy for Ocular Surface Disease; Cornea-like basement membrane-coated extracellular matrix/collagen containing: growth factors; Neurotrophins; Cytokines; Anti-inflammatory; Anti-fibroblastic; Anti-angiogenic; Anti-microbial activity; Nearly no immunogenicity
11. Ocular Surface Reconstruction: Amniotic Membrane Graft; From full term placenta; Clinic Use! Dehydrated extracellular matrix; For use with bandage contact lens; Frozen on PMMA carrier ring; Useful for corneal Indolent epithelial defects; Ulcers; Band keratopathy irritations; Bullous keratopathy; Chemical/ thermal burns
12. Pterygium Surgery: Postop care
13. Pseudopterygium: Stimulated by peripheral corneal disease: Ulcers ;Herpes; Rosacea keratitis; Phlyctenular diseases
14. Primary localized amyloid: Lattice dystrophy; Gelatinous drop-like dystrophy; Polymorphic amyloid degeneration
15. Primary systemic amyloidosis; Climactic droplet keratopathy; Secondary localized amyloid?
16. DDX included MALT (mucosal associated lymphoid tissue)
17. Band keratopathy: etiologies
18. Chelation of Band Keratopathy
19. Spheroidal degeneration (Climactic droplet keratopathy)
20. Salzmann's nodular degeneration
21. Surgical treatment of Salzmann's nodular degeneration
22. EBMD & Salzmann's nodular degeneration
23. Terrien's marginal degeneration
24. Tectonic ALKP
25. Coat's white ring: Metallic foreign body

26. Pellucid marginal degeneration: Uncommon form of ectasia
27. Lipid degeneration: Primary form (rare); Secondary forms
28. Secondary lipoidal degeneration
29. Dellen: Localized dryness and stromal thinning
30. LSCD: limbal stem cell degeneration: Genetic; traumatic/ iatrogenic; aniridia; Stevens-Johnson (erythema multiforme); OCP (pemphigoid); GVHD (graft vs host); Chronic allergy; Neurotrophic keratitis; Chronic bullous keratopathy
31. Ocular Surface Rehabilitation and Reconstruction for LSCD

PHARMACEUTICAL INJECTIONS for OPTOMETRISTS

Pacific University
College of Optometry

July 2015

Before we inject

- **GET INFORMED CONSENT**
- Remember consent must include PARQA
  - Purpose
  - Alternatives
  - Risks
  - Question & Answers
- Prepare equipment
- Sharp shuttle containment

Disclosure

Tad Buckingham OD, EMT-P does not receive any type of reimbursement or other benefits from any manufactures, dealers, or groups represented in this lecture.

Why do we inject?

Objectives

- Understand the anatomy of consent
- Know types of medicines and there uses
- Understand contraindications and side effects of covered injectables
- Heighten awareness of injectable routes for covered medications

Injection Applications

- Emergency Use
  - Management of the acute allergic reaction Anaphylaxis
  - Management of Closed Angle Glaucoma
  - Management of acute Hypoglycemia
- Diagnostic Use
  - Fluorescein Angiography
- Therapeutic Use
  - Local infiltration anesthesia
    - Lesion (ie skin tag, chalazion) removal or structural repair via incision, excision, or electrocautery
  - Steroid Deposition
    - Chalazion, Scleritis, Iridocyclitis, and Recalcitrant Uveitis

What we inject

Anaphylaxis Treatment

- Confirm the symptoms of Anaphylaxis
  - Difficulty breathing
  - Feeling of airway constriction
  - Hyper secretion production
  - Lowering blood pressure
  - Dizziness
  - Rash
  - Itching
- Call 911
- Prepare Epinephrine 1:1000 (from MD vial or Ampule)
  - Draw up 0.3 – 0.5ml in a 1 ml syringe (larger than 66 lbs)
  - Draw up 0.15ml (0.01 mg/kg) in a 1 ml syringe (33 to 66 lbs)
- Administer IM or SQ
- Repeat dose in 3-5 minutes if symptoms are not resolving

Epinephrine 1:1000 (emergency)

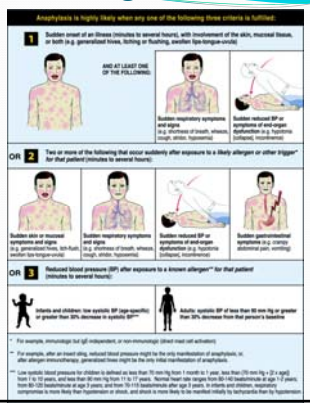
- **Epinephrine 1:1000 for Anaphylaxis**
- **Anaphylaxis** is an acute systemic (multi-system) and severe Type I Hypersensitivity allergic reaction in humans and other mammals. Minute amounts of allergens may cause a life-threatening anaphylactic reaction. Anaphylaxis may occur after ingestion, skin contact, injection of an allergen or, in rare cases, inhalation.

Anaphylaxis Treatment cont

OR

- Call 911
- Prepare Epinephrine 1:1000 by grabbing your weight appropriate Epi Auto-injector (Epi Pen)
- Follow the directions of the Auto pen to deliver the epi (single dose) injection IM.
- Prepare to give a second injection in 3-5 minutes if symptoms are not resolving.
- NOTE: Pt. should be evaluated at an ED via ambulance immediately after the episode.

Anaphylaxis Diagnosis



Anaphylaxis Treatment cont

- Antihistamine
  - Diphenhydramine (Benadryl)
    - Dose 50 mg IM, IV

How Does Epinepherine work?

- It is a beta agonist
- Causes vasoconstriction
  - Decreases tissue swelling
  - Increases blood pressure
- Increases heart rate and contraction strength
  - Prevent or reverse cardiovascular collapse
- Relaxes smooth muscle around the lungs
  - Helps increase lung tidal volume and open up the airway
- Prevents the release of additional allergic chemicals
  - Halts the allergic cascade
- Side effects
  - Diaphoresis, N/V, dizziness, HA, pale skin, tremors

How Does Zofran work?

- It is a serotonin inhibitor
- When stomach cells are upset copious amounts of serotonin is released
- When this released serotonin overwhelms the gut it leaks in to circulatory system where it stimulates 5HT3 cells in the brain.
- 5HT3 cells are responsible for inducing vomiting.
- Metabolized by the liver.
- Common side effects
  - HA, Dizziness, fever, weakness, SOB, confusion

How Does Diphenhydramine work?

- It is an antihistamine
- Blocks natural histamine created by the body when influenced by allergies
- Has a drying effect by blocking endogenously produced acetylcholine
- Common Side Effects
  - Drowsiness, Thickness of lung secretions

Acetazolamide (Emergency - IOP Reduction)

- Most start with topical or oral medication. If IOP is still dangerously high add IV medications.
- Acetazolamide 500mg/5ml IV
  - Fast acting with peak onset of 15 minutes
  - Therapeutic duration of about 5 hours
- Contraindications
  - Sulfa allergies (relative)
  - Pregnancy
  - Severe pulmonary obstruction
  - Severe Liver or Kidney disease
  - Low blood levels of K, Na or high blood levels of Cl

Ondansetron (Emergency - IOP Reduction)

- Nausea/Vomiting Prevention
- May be used during angle closure Glaucoma, if the patient is nauseous, and to prevent IOP spikes that occur during vomiting. Allows for oral medication injestion without voiding.
- 4mg IV/IM
  - Can be repeated once if N/V is not controlled after 10 min.
- Contraindications
  - Hypersensitivity to drug/class/components
  - Hx of long QT syndrome
  - Caution with hepatic impairment
  - Caution with recent abdominal surgery

How Does Acetazolamide work?

- It is a carbonic anhydrase inhibitor
- Causes a decrease in the production of aqueous humour
  - It blocks carbonic anhydrase from making bicarbonate
  - Bicarbonate is needed for the production of the aqueous humour
- By reducing bicarbonate aqueaous humour will be reduced.
- Common Side Effects
  - Lightheadedness, dizziness, increased diuresis, blurred vision, dry mouth, HA

Glucagon (emergency – acute Hypoglycemia)

- Plasma glucose of < 70 mg/dl in symptomatic patients
- Symptoms
  - Shaking, nervousness, sweating, weakness, transitioning to semi consciousness with combativeness to unconsciousness
  - 4-10% mortality from all cause (brain death to cardiac dysrhythmias)
- 2nd line Treatment
  - May be used to treat hypoglycemia if the patient cannot ingest sugars orally.
  - Dose: 1 mg IM
  - Common Reactions
    - Nausea/Vomiting, urticarial, rash, and hyperglycemia
- Contraindications
  - Hypersensitivity to drug/class/compon., insulinoma, pheochromocytoma

How Does Fluorescein work?

- An organic dye
- Absorbs light in the blue spectrum
  - Peak absorption between 465 - 490 nm action
  - Used to identify and quantify vascular and nervous tissue breakdown
- Metabolized by the liver and excreted by the kidneys.

How Does Glucagon work?

- Peptide hormone that results in glycogen conversion
- Glycogen is a form of glucose found in the liver. The glycogen form of glucose cannot be used in the body for cellular metabolism.
- Glucagon converts liver glycogen to glucose and releases it into the blood stream.
- May be used to treat hypoglycemia if the patient cannot ingest sugars orally.
- Common Side Effects
  - N/V

Anesthetics (Therapeutic)

- Lidocaine (Xylocaine)
  - 0.5, 1, 1.5, 2, 4% concentrations
  - 1 minute onset with a maximum dose of 300mg
  - Duration is 30 to 60 minutes
- Lidocaine w/ Epinephrine
  - 1:100,000: 2% (20mg/ml) best ophthalmic concentration
  - 1-5 minute onset with a maximum dose of 500mg
  - Duration of 2 to 6 hours

Fluorescein for Angiography (Diagnostics)

- Fluroscein dye is injected into vein, from an established IV, to evaluate the retinal vasculature and it's surrounding structures by using angiography.
  - 500 mg in 5 ml 10% sol. Or 2-3 ml 25% sol.
- Common Side Effects
  - HA, N/V, GI distress, hypotension, syncope

How Does Lidocaine work?

- As an Anesthetic:
  - Alters signal conduction in neurons
    - Sodium Channel blocker halting signal propagation
    - Stops action potential
  - Anesthetic effect is created by stopping pain signals before they begin
  - Common Side Effects
  - Mild bruising, mild dizziness, nausea, itching
  - Add epinephrine as a vasoconstrictor for hemorrhage control.

Corticosteroids (Therapeutics)

- Triamcinolone acetomide (Kenalog 40)
  - Kenalog 40 works well, for intralesional injections, because of the drug concentration (40mg/ml)
  - Intralesional dose (ie. New onset Chalazions)
    - 2-12mg
- Methylprednisolone acetate (Depo-Medrol)
  - Depo-Medrol 80mg/ml works well, for subconjunctival injections, because of it's concentration
  - Subconjunctival dose (ie 2nd rnd Tx for recalcitrant Uveitus and Iridocyclitis)
    - 40-80mg (inject the dose in 2 to 4 subconjunctival sites)

How Do Corticosteroids Work?

- Suppress multiple inflammatory genes
  - Kenalog's greatest strength is reducing swelling and scaring.
  - Depo Medrol's greatest strength is inflammation reduction.
- Common Side Effects
  - Injection site atrophy, depigmentation, diaphoresis, insomnia, elevated blood sugar, decrease ability to fight infection

We are done!!!

Any Questions?

DRAFT

Terry E. Burris, MD; Northwest Corneal Services
Portland, OR; Co- Medical Director, Lions VisionGift
Associate Clinical Professor of Ophthalmology
Oregon Health Sciences University

2015 Update in Corneal Procedures & Surgery

1. Perforations: cyanoacrylate glue; New ReSure Corneal Sealant

2. Chelation of band keratopathy

3. Superficial lamellar keratectomy with conjunctival involvement: --Pterygium surgery

4. Ocular Surface Reconstruction (conjunctival flap, amniotic membrane, limbal stem cell grafts)

5. OSSN: Ocular surface squamous neoplasia (CIN): Often overlooked with pterygium dx: Treatment Options paradigm shift: Excisional biopsy with adjuvant MMC, cryopexy and AMT; Advantage is histologic confirmation; Topical MMC 0.4 mg/ml; Topical Interferon (IFN a2b-1M units/ml); Most recurrences within 2 years

6. Ocular Surface Reconstruction: Limbal Stem Cell Deficiency (LSCD): Genetic; Pax6 gene mutations: aniridia, Peter's anomaly; EECD (ectrodactyly-ectodermal dysplasia-clefting dystrophy); KID syndrome (keratitis-ichthyosis-deafness; Xeroderma pigmentosa; Dominantly inherited keratitis; Turner Syndrome; Dyskeratosis congenital; Acquired; Inflammation; Stevens-Johnson (erythema multiforme); OCP (pemphigoid); GVHD (graft vs host); Chronic allergy; Neurotrophic keratitis; Chronic bullous keratopathy; Traumatic/ iatrogenic: Chemical; Therma; Multiple ocular surgeries/ cryo; Radiation, chemotherapy; BAK/ glaucoma meds; Contact lens overwear/ improper fit and follow up

7. Limbal stem cell deficiency: Treatments: Stop inciting irritants; Treat dry eyes; PF tears, punctal plugs, cyclosporine, PF steroid; ASED's (autologous serum eye drops); AMT (amniotic membrane); Prokera, BioD Optics; Limbal stem cell grafting

8. CLET (Ex vivo cultured limbal epithelial transplant (not available in USA)

9. ANTERIOR LAMELLAR/ TECTONIC GRAFTING: indications: Descemetocele/perforations; Corneoscleral limbal melts; Anterior stromal scars (e.g. herpetic); Anterior stromal dystrophies (granular, lattice); Chemical burn scars (after limbal grafting); Ectasias (keratoconus, pellucid, keratoglobus, post LASIK)

10. Progression to transplant may become a historical curiosity!

11. ALK (Anterior Lamellar Keratoplasty): Indications: Severely thinned corneas; descemetoceles & perforations: Bacterial; Viral; Fungal; Amebicj; Neurotrophic; Mooren's ulcer; Rheumatologic conditions

12. LARGE DIAMETER ANTERIOR LAMELLAR KERATOPLASTY: indications: Keratoglobus; keratoglobus; Crescentic Tectonic ALKP: Indications: Pellucid marginal degeneration; Severe Terrien's marginal degeneration; Mooren's ulcer; rheumatoid melt; Surgical misadventures; Subsequent Penetrating Keratoplasty (or DALK)

13. DEEP ANTERIOR LAMELLAR KERATOPLASTY (DALK): Indicated for Bowman's/anterior/ & posterior stromal replacement; Anterior, mid & certain posterior stromal scarring & vascularization; Anterior corneal dystrophies; Anterior Basement membrane/ Reis Buckler's, Honeycomb; Granular; Lattice; Macular;

14. DSEK/DSAEK: Descemet's Stripping (Automated) Endothelial Keratoplasty: —Most frequent EK technique

15. DMEK/DMAEK (Descemet's Membrane (Automated) Endothelial Keratoplasty) —Gaining use

16. New Directions in Eye Banking:

17. DMEK: Descemet's membrane endothelial keratoplasty—Beginning of the last surgical frontier?

18. DMEK Advantages: Descemet's may stick better than donor disk of DSEK/DSAEK—so far NOT; May choose to transplant Fuchs patients at an earlier stage; Virtually "zero" refractive error change

19. DMEK Disadvantages: Technically difficult to prepare donor; Technically difficult to unfurl donor in the anterior chamber; May take week(s) to adhere

20. Surgical Challenges with DMEK and DMAEK

21. Descemetorrhexis: Fuchs may not be a Dystrophy! Descemetorrhexis alone in select cases; Maybe less (surgery) is more!

22. Penetrating Keratoplasty: (full thickness corneal graft): Still ~20 K performed in US per year

23. Indications: Keratoconus/post-LASIK ectasia; Herpetic corneal scars; Traumatic scars; Dystrophies; Congenital opacities e.g. Peter's anomaly; CHED; Therapeutic: Non-responsive infective ulcers e.g. mycobacteria, fungus

24. Penetrating Keratoplasty: Numerous potential complications: Wound problems associated with sutures; Indolent erosions; Wound leak; Penetrating Keratoplasty; Wound

problems/Wound mismatch; Infection; Graft failure; Rejection; Recurrence of pathology; High and Irregular Astigmatism; Endophthalmitis

25. Femtosecond PKP: Penetrating Keratoplasty (FPKP or FLAK))

26. Keratoprosthesis: temporary; permanent

27. Surgical Treatment of Keratoconus: New Paradigm

28. ICRS for early contact lens intolerance/ apical staining/ early scarring; CXR after ICRS to inhibit further progression of keratoconus; ...Avoids corneal transplantation

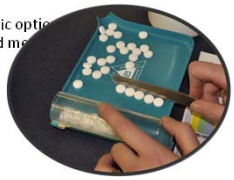
29. ICRS: INTACS (WORLDWIDE USE); FERRARA RINGS (NON-USA); OTHERS (NON-USA)

30. Goal: Restore Functional Vision/ ability to continue contact lens wear/ Stop the apical scarring/ Potentially Defer PKP

31. Preponderance of papers support ICRS followed by riboflavin CXR to prevent further progression

Pain Management

Spanning the oral pharmaceutical analgesic optio
Counter to federally controlled me

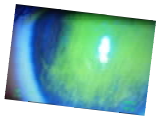


Declaration

Tad Buckingham OD does not receive any benefit, financial or otherwise, from the products, companies, or other entities mentioned in this discussion.

Objectives

- Understand the difference between acute and chronic pain
- Know the uses, dosing, and risks for Acetaminophen
- Know the uses, dosing, and risks for Non Steroidal Anti-Infammatory Drugs
- Know the uses, dosing, and risks for Opioid agonists
- Provide specific patient based options for successful pain management



Types of Pain

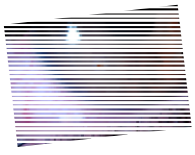
- Acute
  - Recent onset, transient, and from an identifiable source
- Chronic
  - Recurrent or ongoing pain lasting beyond the normal course of an acute illness or injury, which lasts more than 3 to 6 months, that adversely affects the individuals well being. Pain that continues when it should not.
  - Two suspected etiologies
    - Nociceptive – due to an ongoing tissue injury
    - Neuropathic – secondary to brain, spinal cord, or peripheral nerve damage
      - *** Analgesics are generally effective for nociceptive pain origination but less effective for neuropathic pain

Ways to manage Pain

- Acute Pain
  - Acetaminophen
  - NSAIDs
  - Opioids
  - Combination meds
- Chronic Pain
  - Acute pain management methods plus…
  - non-formulary medicines (Antidepressents, Anticonvulsants, Anti-Arrhythmic agents, Sedatives, and Muscle relaxants)
  - Herbal medicines, supplements and vitamins
  - Behavioral adaption/modification

Over the Counter (OTC) medications

- Two types of OTC pain management medication
  - Acetaminophen (APAP)
  - NSAIDs



Acetaminophen

- Unknown direct mechanism of effect targeting the pain recepters in the central nervous system and spine. Pain and Fever reducer.
- Analgesic Ceiling Effect – after a certain dose additional quantities do not provide added pain relief.
- Maximum daily dose is 4 gram
- APAP does not have anti-inflammatory properties

Acetaminophen

- Narrow margin between therapeutic and toxic effects
  - Liver
    - Pre-existing Liver problems and increased alcohol use heighten risks
- Combined long term use of both APAP and NSAIDs can increase kidney abnormalities

Non Steroidal Anti Inflammatory Drugs (NSAIDs)

- NSAIDs manage pain response by reducing the level of prostaglandins, created during tissue insult, that are part of the pain pathway
- Pain and fever reducer with anti-inflammitory properties.
- Common NSAIDs
  - Aspirin (OTC) (Adult max dose 4 g in 24 hr)
  - Ibuprofen((OTC)2400mg/24hr for pain or anti inflam)
  - Ketoprofen (Rx only) (300mg/24hr for pain or anti inflam)
  - Naproxen Sodium (OTC) (1375mg/24 hr for pain or anti inflam)
  - Celebrex(Rx only) (COX-2 Inhibitor) 400mg/24hr for acute pain

Non Steroidal Anti Inflammatory Drugs (NSAIDs)

- Analgesic Ceiling Effect – after a certain dose additional quantities do not provide added pain relief.
- AHA recommends avoiding NSAIDs for people with a Hx of MI. NSAIDs greatly increase the risk of a second MI or death

Non Steroidal Anti Inflammatory Drugs (NSAIDs)

- Cause gastric distress and bleeding
  - NSAIDs can reduce the stomach's protective mucous layer increasing insult from the stomach's acid.
  - GI protective medications are recommended for people with an added GI risk (GI Hx, elderly, diabetics, cigarette smokers, concurrent users of ASA, corticosteroids, and blood thinners).
    - Proton pump inhibitors – Prevacid, Prilosec, Protonix, Aciphex, etc.
    - Histamine type 2 blockers – Pepcid, Axid, Zantac, Tagamet, etc.
  - Long – term NSAID Tx increases GI side effects among those most susceptible although any patient, taking NSAIDs, can develop GI effects at any time during the Tx course.

OPIOID Agonist

- Opioid agonists control pain by binding to the body's opioid receptors that mediate pain
  - Examples include morphine, fentanyl, hydromorphone, and oxycodone
- Durational
  - Short acting (acute pain mediators)
    - Opioid or opioid combination drugs
  - Long acting (chronic pain mediators)
    - Opioids

OPIOID Agonist

- Opioid Delivery
  - Orally, Intraveniously, Intramuscular, Intranasally, transdermally, oral transmucosally, sublingually, via suppository, and injection in and around the spinal cord
- Simulated Allergic Reactions
  - Morphine and Meperidine can stimulate histamine release mimicking an allergic reaction.
  - S/Sx: Lightheadedness, dizziness, tachycardia, facial flushing, and itching
  - Continue med with antihistamine, switch to an opioid not associated with histamine release , or use a non-narcotic alternative.

OPIOID Agonist

- Short acting Immedate Release (acute pain mediators)
  - Opioid
    - Morphine, Hydromorphone, Oxycodone, and Oxymorphone
  - Opioid combination drugs
    - oxycodone + acetaminophen = Percocet
    - oxycodone + aspirin = Percodan
    - oxycodone + ibuprofen = Combunox
    - hydrocodone + acetaminophen = Lorcet, Lortab, Vicodin, or Norco
    - Hydrocodone + ibuprofen = Vicoprofen

OPIOID Agonist

- Short acting Immedate Release (acute pain mediators)
  - Short acting opioid anesthetics start working 15 – 30 minutes after administration with peak analgesic effect within 1 – 2 hours
  - Due to short half life must be taken every 4 - 6 hours

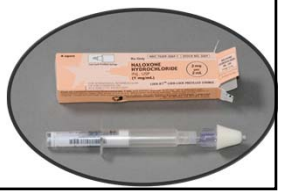
Agonist

- Long acting Slow Release (chronic pain mediators)
- Often described as having sustained, extended, or controlled release abbreviated as SR, ER, or CR respectively
  - Long acting opioids
    - Morphine (oral) (MS Contin, Avinza)
    - Oxycodone(oral) (OxyContin)
    - Methadone (oral) (Dolophine, Methadose)
    - Fentanyl (transdermal system) (Duragesic)
  - Long opioid anesthetics are slower acting after administration with prolonged analgesic effect lasting 8 - 12 hours
  - Due to slow release must be taken every 8, 12, or 24 hours

- Codeine Challenges
  - Codeine is converted to morphine by a specific liver enzyme (CYP2D6). This enzyme is absent in about 7% of the caucasion population and will not be effective in pain management.
  - Often associated with higher levels of nausea/vomiting and constipation compared to other opioids.

- Common opioid side effects
  - Nausea, Vomiting, constipation, thought and memory impairment, and drowsiness
    - Approx. 40% of people taking opioids for non cancer pain experience constipation (< 3 BM a week). Tx with diet changes, laxatives, and stool softeners during opioid treatment course
    - Mild sedation and impaired judgement can be anticipated until tolerance is reached
    - Mild nausea is common but usually resolves within a few days
    - High dose opioids in new users can cause respiratory depression. Tolerance occurs with use.

- Opioid overdose
  - Pinpoint pupils
  - Severely depressed mental status to frank unconsciousness
  - Respiratory depression to apnea
  - Bradycardia to asystole
  - death
  - Tx with Naloxone – competitive inhibitor
    - Dose 0.4 – 2.0 mg IV/IM/intranasal



- Smoke from tobacco
  - Increases wound healing time and decreases efficacy of pain management
  - It triggers the release of pro-imflammitory cytokines increasing both inflammation and pain.
  - Even a reduction in cigarette smoking during pain management of an acute condition will improve the patients comfort and increase healing time. Recommend nicotine replacement patches or gum during the healing process.

- Alcohol
  - Chronic alcoholism causes damage to the liver, a relative contraindication to Acetaminophen. It causes bleeding in the esophagus and stomach, a relative contraindication to NSAIDs
  - High doses of alcohol act as a CNS depressant and can cause respiratory depression and death when combined with increased dosage of opioids

Visual Considerations of Dizziness, Vertigo and Imbalance

COPE # 37401-NO

Curtis R. Baxstrom, MA, OD, FCOVD, FNORA

Introduction

- Third most common complaint among outpatients
- 5/1000 consult PCP annually for vertigo
- 10/1000 consult PCP for dizziness
- 80% severe enough to necessitate intervention
- 40-80% are unexplained by PCP…visually related ?
- >50% of elderly population affected
- Most common complaint for visits in >75 yr olds

Who is Helping With What ?

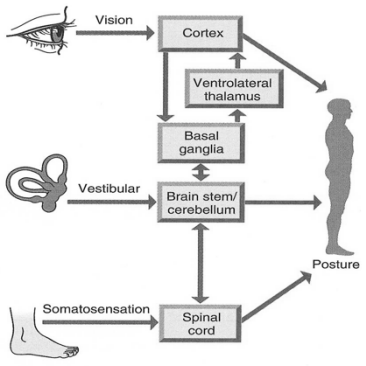
- Medical Concerns - Evaluation and Treatment
- Physical/Occupational Therapy
  - Functional Motor Skills, often includes balance therapy
  - Vestibular Rehabilitation including eye movements
- Neuro-Optometric Rehabilitation (NOR)
  - Visual Rehabilitation including effects upon vestibular rehabilitation and mobility
  - Central/Peripheral and Reciprocal Interweaving
  - So what's so special or different ?
- Multi-Disciplinary Approach provides better care !

Overview of Dizziness and Balance Disorders

- Intimate relationship between visual, vestibular and motor processing
- Health Concerns
- Medications (interactions?)
- Trauma, CVA and Neuro Concerns
- Evaluation
- Treatment
- Follow-up

Balance and Imbalance

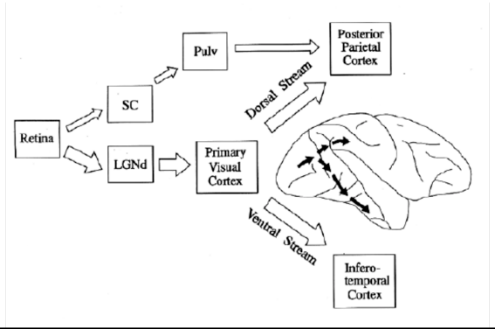
- Motor – general, *cervical (VVC triad)
- Visual – central / peripheral vs. fixations (Where do you look during ambulation?, etc.)
- Vestibular – address bppv, then habituation tx
- Subcortical and Cortical Integration-meds ?
- Without integration, primarily 'substitute' other inputs to maintain homeostasis of balance
- Cerebellum-modulates processes as well



6

FIGURE 10–18
Sensory influences on postural control.

Dorsal and Ventral Paths



Visual Motion, Vestibular, Cervical

- Head-Static – movement in the visual field may lead to motion hypersensitivity (linear vs. optic flow)
- Head-Dynamic –
  - Vestibular - Linear vs. Rotational
  - Visual – Fixation vs. Peripheral Lock (KEY?)
  - Visual Motion – linear vs. optic flow
  - Proprioception - Cervical vs. Torso Component vs. Others

Vestibular vs. Motion Sensitivity

- VOR gain = head + eye movement, should = 1.0
- Includes Subcortical and Cortical components
  - Includes VOR, OKN, pursuits, saccades, fixation
  - Blinking during movement eliminates motion, fixation breaks up motion
  - Peripheral vision provides lock for fusion and stability (vs. tunnel vision with motion peripheral)
- Saccadic suppression mechanisms work by dampening motion, and then reset with fixation

Importance of VOR Gain in ABI

- Born with a primarily subcortically driven gain of 1.0
- By 6-9 months the cortical control of fixation, pursuits and motion processing/OKN are coming along
- Gain of 1.0 at this time = SC of 0.6, Cortical of 0.4, but this relationship 'varies' throughout the day
- Following ABI, gain is often <1.0 resulting in blur and motion awareness (PT prescribe gaze stabilization)
- *To make up for this you can also consider vestibular rehabilitation, low plus/less minus, visual skill therapy

Etiologies of Dizziness

- Peripheral Vestibular System
  - Semicircular Canals, Otoliths
- Central Vestibular System
  - Processing of inputs
- Central Nervous System
- Vascular Changes
- Visual Pathway
- Cervicogenic
- Differentiating Etiology and Treatment

Tests of Dizziness, Gait and Balance

- Dizziness Handicap Inventory (DHI)
- Romberg and Sharpened Romberg test
- Hallpike-Dix Maneuver (bppv)
- Posturography, Electronystagmography (ENG)
- The Clinical Test for Sensory Interaction in Balance
- The Tinetti test (POMA-Performance-Oriented Mobility Assessment)
- The Berg Balance Scale, The 'Get Up and Go' test
- 'Five Times Sit to Stand' test, 'Four Square Step' test
- The 'Stops walking when talking' test
- Others

Examples of Precipitating Factors

- Monovision
- Diplopia and Confusion (motion?)
- Inability to compensate for low hyperopia and/ or decrease in VOR gain
- Changes in medications
- Orthostatic hypotension-BP drops suddenly
- Others…

Optometric Assessment

- Case History
- Observations – where are they looking?
- Clinical Testing
  - Routine visual examination
  - Ocular motor examination
  - *Disequilibrium Evaluation Form
    - This can lead guidance in "substitution" activities
  - *Special Testing – dynamic visual acuity

Disequilibrium Evaluation Form

- Determine level of dizziness and motion sensitivity with provocative testing
- 1-Head (vestibular-visual motion) vs. Ocular-Motor (visual motion)
  - Spontaneously move eyes vs. move head ?
  - Blink during saccades ? Head movement ?
- 2-Static Posture – sitting vs. standing
- 3-Dynamic Posture – walking, including turns
- Scale 0(no dizziness) to 10(not tolerable)

Disequilibrium Evaluation Form

- Head Movement – L to R, R to L
- Ocular-Motor Movement – L to R, R to L
- Sitting
- Standing
- Stand and Turn R, Stand and Turn L
- Walking
- Walk and Turn R, Walk and Turn L
- Substitution – Feel Feet, Visual Fixations, Touch

Special Testing

- *Dynamic Visual Acuity (DVA)
  - Check static VA, rotate head 2 hz, Drop of 2-3 lines suggests vestibular defect (what if 1?)
- Head Thrust Test
  - Quickly shift head R and L, refixation saccade suggests decreased VOR
- Head Shaking Nystagmus
  - Head down 30 degrees, oscillate head 20X
  - Resultant jerk nystagmus indicates unilateral vestibular imbalance

Dizziness/Vertigo Management

- Spontaneous Recovery
  - Integration improves to overcome symptoms
- Adaptation
  - Resilience – including other factors
  - Symptoms may return later when other demands increase and the patient has to divide attention, resulting in loss of control of dizziness (ie-decompensating phoria)

Movement Needed to Recover

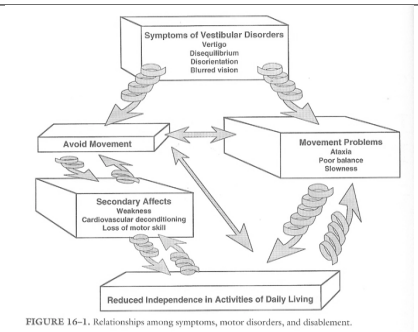
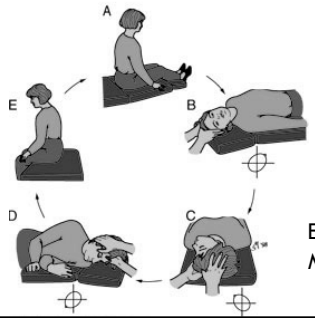


FIGURE 16–1. Relationships among symptoms, motor disorders, and disablement.

Dizziness/Vertigo Management-Traditional

- Vestibular Rehabilitation
  - Repositioning-for BPPV (Vertigo)-reset the crystals
    - Dix-Hallpike, Epley, Brandt-Daroff Maneuver
    - Epley Exercises as well
  - *Substitution – touch the wall, walk heavy
  - *Habituation – improve visual-vestibular integration
  - *Eye Exercises – Neuro-Optometric Rehabilitation
- Medical Treatment
  - Medication
  - Surgery

Benign Paroxysmal Positional Vertigo



Epley Maneuver

BIG Picture in Treatment

- Address BPPV Positioning if true vertigo
- Habituation Therapy (vestibular component)
- Eye Movement/Vergence Therapy (to decrease the visual motion component)
- Functional Mobility – many motor aspects
- *Substitution may be a missing KEY?
  - For recovery to occur, you must have some baseline ability to recover or reduce symptoms

Dizziness Course for Physical Therapy

"It's an injustice to NOT overstimulate your patient, because your goal is to make their daily life as normal as possible."

What does this really mean ?

1-How does the patient cope or recover from the increased symptoms?

2-Assumes a "No Pain, No Gain" attitude

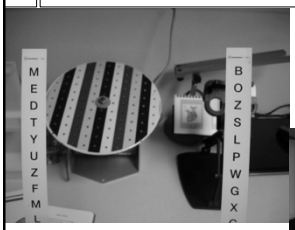
Optometric Management

- Visual - Vestibular Guidance
  - Consider Substitution and Habituation activities
  - *Awareness of head movement vs. visual motion
  - *Blinking, Central/Peripheral, Fixation(visual anchor)
- Lenses
  - Progressives vs. Bifocals vs. Multiple Pairs-SV
  - *Low plus a valuable tool or cut minus
  - Spectacles vs. Contact Lenses
  - Aniseikonia (Shaw Lens)

Optometric Management

- Prism
  - Stabilize binocularity
  - Low base in (1-3 total)
- Selective Occlusion
  - Binasal, Pinholes?
- Basic Binocular and Visual Skills
  - Much more than "orthoptics"
  - Importance of visual skills to help VOR gain

Watch What We're Doing !



Be aware of F/G !
Load task as you can

Key Points in Treatment

- Spontaneous Adaptation needs movement
- Gaze Stabilization needs movement to recover, patients often decrease movement (avoidance)
- Gain of VOR needs to be 1.0 (ABI changes?)
  - Habituation therapy likely modifies VOR gain
  - Increase VOR gain with EOM therapy-pursuits, saccades
  - Increase VOR gain with low plus lenses, or cut minus
- KEY – Must learn to control symptoms (scale 0-10) AND improve VOR gain to be successful in overall treatment

The BIG Picture in Treatment

- Dysequilibrium scores of 4 or greater need to introduce substitution skills to learn to control symptoms before beginning rehab (goal=3)
- Otherwise if you treat, they may not know how to recover from the stimulation, some get worse
- This mandates multi-disciplinary care with other providers such as physical therapists
- Visual considerations (lenses, NOR therapy) are often the missing link to rehabilitation

Optometric Case Examples

- Compensatory - eliminate the perturbation
  - Stop moving, occlusion, others?
- Substitution and Guidance
- Habituation-Gaze Stabilization Therapy
- Lens and Prism Considerations (Binoc and BI)
- Binasal Occlusion
- Basic Visual Skill therapy – EOM, Binocularity

Substitution - Visual

- Peripheral awareness vs. being overly central
- Blinking during saccades, or with head turns
- While turning corner, add fixations or blink
- Driving considerations – applications to mirrors
- Hat, side shields or tints to reduce contrast and thus also motion
- Consider binasals, low plus, low base in prism

  *KEY is trial them !

Effects of Hat, Side Shields

- Can Decrease Symptoms
  - Visual Motion Hypersensitivity
  - Photosensitivity - fluorescents
  - *They are Proprioceptive Dependent
- But…Can Also Increase Symptoms
  - Vestibular Concern
  - *They are Visually Dependent

Disequilibrium Evaluation Example

- Head Movement – worsens with head movement
- Ocular-Motor Movement – blinking helps
- Sitting-5, hold chair 4, L finger thumb(FT) 2
- Standing-8 to 6
- Stand and Turn R/L-9 to 6
- Walking-6, feel floor 4
- Walk and Turn R/L-7, Feel Floor 5, Fixations 4
  (Fixations 3***After a week!)

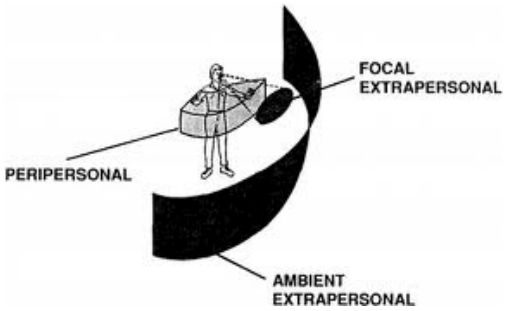
Case Presentation – Vestibular Concussion

- Substitution, Bean Bag and Habituation Activities are CRITICAL
- Consider Gaze Stabilization-to improve remaining vestibular function and central preprogramming
- To foster the use of saccadic or pursuit strategies and central preprogramming
- To foster central preprogramming (imaginary target)
- Modify postural stability, base support, etc.

Gaze Stabilization

- Size/Complexity of target
- 10X each, Right/Left and Up/Down rotations
- Range – narrow to wider
- Speed – slow to faster
- *Monitor symptoms
- Add other elements as needed:
  - Central/Peripheral, Depth (X,Y and Z)
  - Proprioception
  - Near vs. Far targets

Peri and Extrapersonal Space

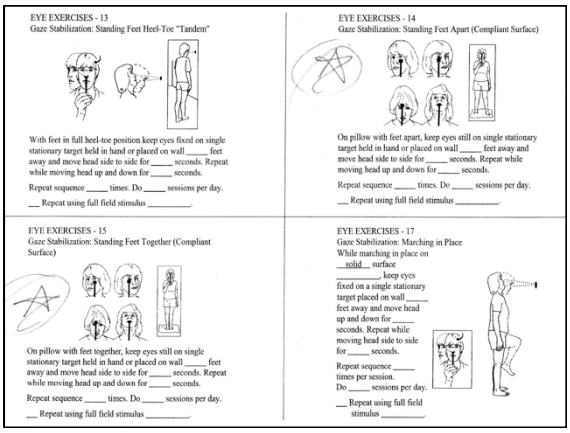


EYE EXERCISES - 4
Visuo-Vestibular: Head / Eyes Moving in Opposite Direction

Holding a single target, keep eyes fixed on target. Slowly move target _up-down_ while moving head in opposite direction of target for _____ seconds each direction.

Perform in _____ position. Repeat _____ times per session. Do _____ sessions per day.

___ Repeat using full field stimulus _____.



Case Presentation - Lenses

- Motion sensitive and/or dizziness
- Low plus lenses(+.50 to +.75), decrease minus
- Increased spatial awareness, where are the objects ?
- Increased VOR gain with plus lenses, thus stabilizing blur/motion with less cortical input

*Watch out for motion from Progressive Lenses !!!

Binasal Occlusion-Motion Sensitivity

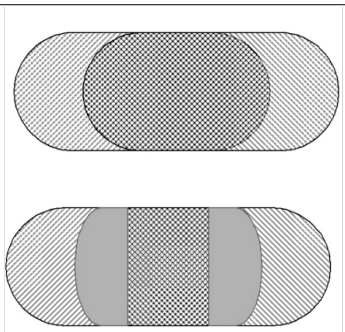
Effect of binasal occlusion (BNO) on the visual-evoked potential (VEP) in mild traumatic brain injury (mTBI).

Ciuffreda KJ, Yadav NK and Ludlam DP

Brain Injury 2013;27(1):41-47.

*It is speculated that mTBI attempt to suppress visual information to reduce their abnormal motion sensitivity. BNO negates the suppressive effect, thus an increase in VEP and decrease in symptoms

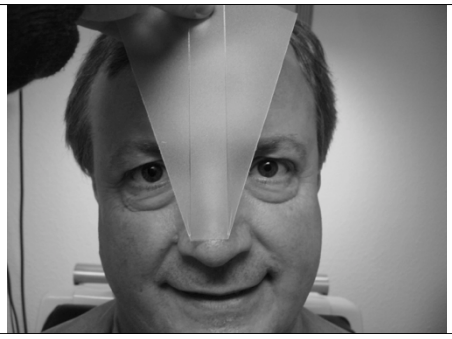
How Might Binasal Occlusion Work?



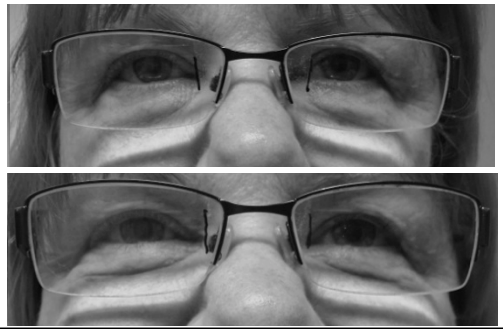
Motion Sensitivity-Binasal and Blinking

- Most motion sensitivity is across the horizon (width)
- Binasal if too wide is bothersome, thinner better
- Blinking also helps, but binasal with blink is best!
- Difficulty of movement in the environment !
- Television-Large TV worse, but farther away helps, but what about other things in visual field - z axis?
- In Bed, TV is smaller-closer, no movement between

Inexpensive Wedge for Binasal Testing…



Size Of Binasal Is Critical



Basic Visual Skills Therapy – VOR gain?

Vision and balance: the optometrist's role in managing patients with dizziness and vestibular dysfunction.

Mejia GA. J Behav Optom 2008;19(4):97-102.

*Overview and 2 case reports

Visual-vestibular interaction and treatment of dizziness: a case report.

Brennan M. J Behav Optom 2012;23(3):72-79.

*Case report of patient who had been helped with vestibular therapy, but had residual dizziness. Vision therapy decreased symptoms, and improved balance.

Pseudo-Vestibular Syndrome

Six adult cases with a pseudo-vestibular syndrome related to vergence.

Yang Q, Jurion F and Bucci MP

Neuro-Ophthalmology 2008;32:93-104

*Eye movement testing can be helpful in differential diagnosis of pseudo-vestibular syndrome. Oculomotor training is suggested for such subjects with vertigo/dizziness symptoms to improve their abnormal eye movements and reduce symptoms.

Summary Overview

- Evaluation and Guidance of dizziness with Substitution, Blinking, Fixation while turning, etc.
- Habituation Therapy (Gaze Stabilization)
  - Optometric Considerations
- Lenses, Prism Applications
- Selective Occlusion
- Basic Visual Skill Therapy (NOR)
- Combinations…

Thank You for the Opportunity to Share With You

References

- Balogh-Dizziness, Hearing Loss and Tinnitus
- Herdman-Vestibular Rehabilitation
- Leigh and Zee-Neurology of Eye Movements
- Suter and Harvey-Vision Rehabilitation
- Wong-Eye Movement Disorders

For more information :

- College of Optometrists in Vision Development
  www.covd.org
- Neuro-Optometric Rehabilitation Association
  www.nora.cc
- Optometric Extension Program Foundation
  www.oepf.org
- Vision Rehabilitation Section of AOA
  www.aoa.org

*Guidebooks, Beginning and Advanced courses

DRAFT

Terry E. Burris, MD
Northwest Corneal Services Portland/Tigard
Co-Medical Director, Lions VisionGift Oregon
Associate Clinical Professor of Ophthalmology, OHSU

Course Title: Infiltrative Keratitis: Diagnosis & Management

1. Complications of sight limiting corneal opacification (scarring 2nd most common cause of vision loss worldwide): Worldwide epidemic of corneal blindness from infectious keratitis: 330 transplants per year USA; Acanthameba: Increased frequency with soft lenses/ multipurpose solution
2. RSVP rule (Physician responsible to educate):
3. Post PRK infections rare after 3-5 days; Post LASIK infections may occur anytime
4. Epidemiology of Infectious Keratitis: Penetration of Ocular Defense; Biologic adhesion (injured epithelium, glycocalyx (epithelial); Bacterial glycocalyx & slime (e.g. pseudomonas): protection and adhesion;
5. Corneal Defense Mechanisms: Tear film; Cell membrane glycocalyx (carbohydrate rich zone with glycoproteins and proteoglycans w/ affinity for lectins); Mucus; corneal epithelium; Intact epithelial barrier: Exceptions: Neisseria gonorrhea, Listeria Corynebacterium diphtheria; Haemophilus aegyptius
6. Penetration of Ocular Defense: Diffusion of toxins, bacterial products (e.g. contact lenses); Stromal invasion;
7. Penetration of Ocular Defense: artillery: Host Enzymes from PMN's, monos; Damage to: epithelial cells; Keratocytes; Collagen; GAG's (mps's); Chemokines, cytokines, arachidonic acid cascade: leukotrienes, prostaglandins…
8. "Resting" PMN; Neutrophil Senses Chemoattractant; Chemotaxis; Phagocytosis; Degranulation into Lysosomes; PMN/ ECM Interactions; PMN Degranulation; PMN/ ECM Damage; Enzyme & Inflammatory Mediator Release; AA Cascade: Cyclooxygenase Pathway; Respiratory Burst Free Radical System;
9. Infiltrative Keratitis (suppurative): Central; marginal
10. Usually caused by infection: Bacterial; Fungal; Viral;
11. Infiltrative Keratitis: Non-Infectious
12. Bacterial Ulcers: Signs; Organisms: Gram positive: Gram negative:
13. Crystalline keratitis
14. Atypical mycobacteria: epidemics w/ LASIK

15. Infiltrative Keratitis: Infectious
16. Bacterial Ulcers: Gram+ Organisms; Gram- organisms
17. Atypical mycobacteria: Acid Fast Bacilli
18. Fungal Ulcers: Signs; Organisms
19. Viral Ulcers: Herpes simplex;
20. Endotheliitis; Treat with ganciclovir (Zirgan) +/- systemic ganciclovir
21. CMV (a herpes virus)
22. Necrotizing keratitis
23. Herpes Zoster (VZV varicella/ chickenpox)
24. Measles (Kwashiorkor, vit A deficiency)
25. Mumps
26. Parasites: Acanthamoeba spp: Microsporidia:
27. Microsporidiosis (Nosema, Brachiola algerae) parasites:
28. Catarrhal ulcers: Delayed Cell Mediated Immunologic reaction to lid margin organisms: Staphylococci; Rosacea keratitis/ ulcer; Responds to lid hygiene, steroids and tetracyclines, ± antibiotic
29. Phlyctenulosis: Mycobacteria; TB; Coccidioides; Candida
30. Can one predict proper treatment without cultures?
31. Laboratory Evaluation: Corneal smears; Gram stain (bacteria, some fungi); Acid fast stain (atypical mycobacteria- NTM); Giemsa stain, PAS, Gomori methenamine-silver (fungus); Calcofluor white (fungus, acanthameba); Inoculated media
32. Confocal Specular Microscopy
33. OCT/ Corneal module
34. Goals of Treatment: Rapidly stop replication of organisms; Prevent host tissue/ collagen destruction; Get epithelium to heal (stops corneal melting); Reduce scarring; Avoid neovascularization; Preserve vision
35. Central Corneal Ulceration: Emergency/ threat to vision & eye; Generally requires laboratory testing
36. Empiric treatment: Most practices treat with 3rd or 4th generation fluoroquinolone
37. Antibiotic Resistance: ARMOR STUDY (Antibiotic Resistance Monitoring in Ocular Microorganisms s
38. US Govt initiative to stem resistance; Target end of 2016; No “lacing” of feed for cows, hogs, poultry et al with medically important antibiotics to promote animal growth; Federally operated cafeterias to serve meat produced with responsible antibiotic use
39. HSV Treatment Update: Ganciclovir 0.15% FDA approved for HSV keratitis
40. Adenovirus Treatment Update: Prompt diagnosis and treatment reduce likelihood of subepithelial infiltrates (SEI’s)

The Glaucoma Grab Bag: Practical Guidelines for Effective Glaucoma Therapy

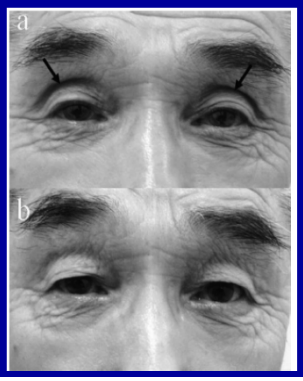
Danica J. Marrelli, OD, FAAO
University of Houston College of Optometry

Financial Disclosure

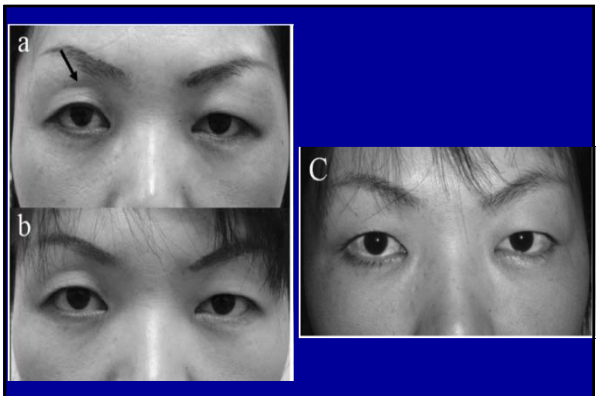
- I have received I have received speaking or consulting fees from:
- Alcon Laboratories
- Allergan
- Carl Zeiss Meditec

Prostaglandin Analogs (PGs)

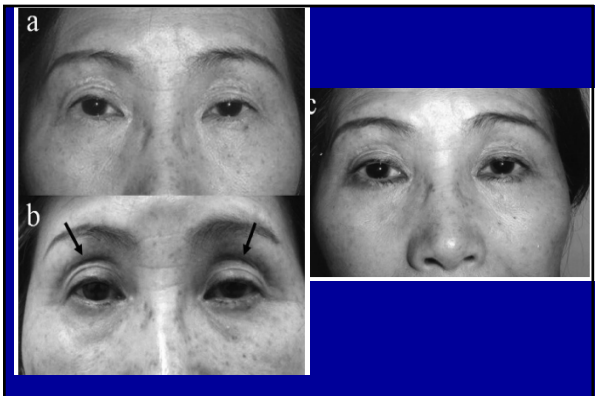
- Mechanism of action: increase uveosceral outflow
- Effect: excellent (25-35% reduction)
- Dosing: once daily (doesn't matter am/pm)
- Side effects:
  - Minimal systemic
  - Ocular:
    - Hyperemia
    - Hypertrichiasis
    - Hyperpigmentation – iris and periorbital skin
    - Prostaglandin-induced orbitopathy



Optometry and Vision Science, Vol. 88, No. 9, September 2011



Optometry and Vision Science, Vol. 88, No. 9, September 2011



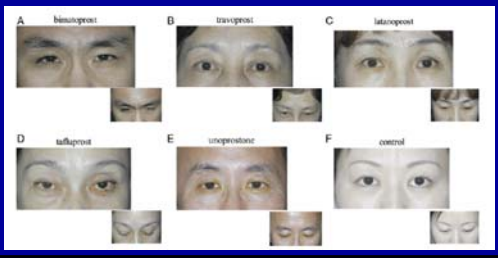
Optometry and Vision Science, Vol. 88, No. 9, September 2011

ORIGINAL STUDY

Deepening of the Upper Eyelid Sulcus Caused by 5 Types of Prostaglandin Analogs

Kenji Inoue, MD, PhD,* Minako Shiokawa, MD, PhD,* Masato Wakakura, MD, PhD,* and Goji Tomita, MD, PhD†

J Glaucoma • Volume 00, Number 00, ■■ 2012



Incidence of Prostaglandin-Induced Orbitopathy

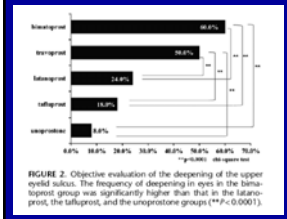


FIGURE 2. Objective evaluation of the deepening of the upper eyelid sulcus. The frequency of deepening in eyes in the bimatoprost group was significantly higher than that in the latanoprost, the tafluprost, and the unoprostone groups (**P < 0.0001).

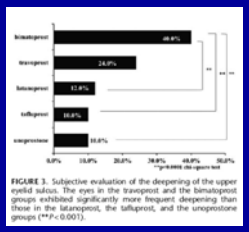


FIGURE 3. Subjective evaluation of the deepening of the upper eyelid sulcus. The eyes in the travoprost and the bimatoprost groups exhibited significantly more frequent deepening than those in the latanoprost, the tafluprost, and the unoprostone groups (**P < 0.001).

Glaucoma - Prostaglandins

- When to Use
  - POAG
  - Pigmentary glaucoma
  - Pseudoexfoliation glaucoma
  - Normal tension glaucoma
  - Ocular Hypertension

Glaucoma - Prostaglandins

- When to reconsider:
  - Acute rise in IOP
    - Acute angle closure
    - Posner-Schlossman syndrome
  - Pt with history of CME or risk of CME
  - Unilateral therapy
  - Pregnancy
  - Uveitic glaucoma (?)
  - Neovascular glaucoma (?)

UVEITIS

Am J Ophthalmol. 2008 Dec;146(6):876-82.

Flare-up rates with bimatoprost therapy in uveitic glaucoma.

Fortuna E, Cervantes-Castañeda RA, Bhat P, Doctor P, Foster CS.
Massachusetts Eye Research and Surgery Institute, Cambridge, Massachusetts 02142, USA.

Erratum in:
Am J Ophthalmol. 2009 Mar;147(3):565. Castañeda-Cervantes, Rene A [corrected to Cervantes-Castañeda, Rene A].

Abstract

PURPOSE: To evaluate the rate of flares in patients with uveitic glaucoma treated with topical bimatoprost and to assess its effect on intraocular pressure (IOP) in this subset of patients.

DESIGN: Retrospective case series.

METHODS: All patients seen at one subspecialty uveitis practice with history of uveitic glaucoma treated with topical bimatoprost were identified and the data collected, which included onset, type, duration of uveitis, onset of secondary glaucoma, and previous therapies for glaucoma. The time of onset of bimatoprost therapy, the IOP, and flare-up rate before and after initiation of treatment with bimatoprost were recorded at one week and one, three, and six months of follow-up.

RESULTS: Of the 42 patients (59 eyes) identified, 12 patients had used other topical lipid agents, which were replaced by bimatoprost. Twenty-three patients had not used any lipid agents and bimatoprost was added to their existing antiglaucoma regimen. Seven patients were newly diagnosed with uveitic glaucoma and were commenced with topical bimatoprost. The rate of uveitis flares while on other antiglaucoma therapy was 52 per 100 person-years follow-up, while on bimatoprost therapy it was 32.4 per 100 person-years follow-up (P = .206). The mean IOP prior to bimatoprost therapy was 27 +/- 13.2 mm Hg and after initiation of topical bimatoprost was 15 +/- 5.5 mm Hg at the end of six months (P = .0008).

CONCLUSION: These data suggest that bimatoprost is an effective IOP-lowering agent in patients with uveitic glaucoma in whom the uveitis is controlled on immunomodulatory therapy, and it does not increase the rate of flares of uveitis in these patients.

PMID: 19027422 [PubMed - indexed for MEDLINE]

Br J Ophthalmol. 2006 Jul;90(7):916-21. Epub 2006 May 8.

Use of ocular hypotensive prostaglandin analogues in patients with uveitis: does their use increase anterior uveitis and cystoid macular oedema?

Chang JH, McCluskey P, Missotten T, Ferrante P, Jalaludin B, Lightman S.

Department of Clinical Ophthalmology, Institute of Ophthalmology, Moorfields Eye Hospital, City Road, London, UK.

Abstract

AIM: A retrospective comparative case series was studied to determine whether the use of prostaglandin (PG) analogues to treat raised intraocular pressure (IOP) in patients with uveitis resulted in an increase in the frequency of anterior uveitis or cystoid macular oedema (CMO).

METHODS: 163 eyes of 84 consecutive patients with uveitis and raised IOP treated with a PG analogue at two tertiary referral uveitis clinics were identified over a 3-month period. Control eyes were selected as those uveitic eyes of the same patients, which were treated with topical IOP-lowering agent(s) other than a PG analogue. Pretreatment IOP was compared with the mean IOP during PG analogue treatment. The frequency of anterior uveitis and CMO during PG analogue treatment was compared with the frequency of these complications in the control eyes during non-PG IOP-lowering treatment.

RESULTS: Significant IOP reductions were observed during PG analogue treatment. There was no significant difference in the frequency of anterior uveitis in those eyes treated with PG analogues and those treated with non-PG agents ($p = 0.87$, Fisher exact test). None of the 69 uveitic eyes without a previous history of CMO developed this complication. There was no increase in the frequency of visually significant CMO during PG treatment compared with that during non-PG treatment ($p = 0.19$, Fisher exact test).

CONCLUSION: This study demonstrates that PG analogues are potent topical medications for lowering raised IOP in patients with uveitis and are not associated with increased risk of CMO or anterior uveitis.

PMID: 16460537 [PubMed - indexed for MEDLINE]

Publication Types, MeSH Terms, Substances

Cystoid Macular Edema
following cataract surgery

J Ophthalmol. 2010;2010:690707. Epub 2010 Nov 7.

Prostaglandin-induced cystoid macular edema following routine cataract extraction.

Agange N, Mosead S.

Department of Ophthalmology, University of California, Irvine, CA 92697, USA.

Abstract

To our knowledge, we are reporting the first case of a 59-year-old man who developed recurrent CME with three separate trials of three different prostaglandin class drugs following uncomplicated phacoemulsification with intraocular lens implantation. Despite multiple reports of individual prostaglandin (PG) analogues being suggested as the cause of CME, there are no recommendations regarding withholding these medications in the perioperative period. Our patient first developed CME OD 4-months post uncomplicated cataract extraction. XALATAN (Latanoprost) had been restarted after surgery and discontinued at onset of CME. While off XALATAN (Latanoprost), the patient's CME resolved, but his IOP rose. The patient was started on LUMIGAN (Bimatoprost) to control the IOP, but within weeks his CME recurred. The patient's CME was again treated and his IOP remained acceptable, but then progressively increased. TRAVATAN (Travoprost) was attempted, but he presented with a third round of CME. Definitive conclusions about causal relationships cannot be made without well-designed, prospective clinical trials addressing this issue.

PMID: 21076526 [PubMed - in process] PMCID: PMC2975071 Free PMC Article

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Display Settings: Abstract Send to:

Eur J Ophthalmol. 2012 Sep-Oct;22(5):709-13. doi: 10.5301/ejo.5000109.

Impact of ocular hypotensive lipids on clinically significant diabetic macular edema.

Patel AS, Patel CC, Goyal A, Anchala A, Adrean S, Hughes B, Mahmoud TH.

Kresge Eye Institute, Department of Ophthalmology, Wayne State University School of Medicine, Detroit, Michigan, USA.

Abstract

PURPOSE: To study the impact of ocular hypotensive lipids (OHL) on the incidence, progression, and response to treatment of clinically significant diabetic macular edema (CSDME).

METHODS: A total of 379 patients (232 female, 147 male) with a history of diabetes mellitus (DM) and primary open-angle glaucoma (POAG) were identified and included in the study. Patients were stratified into groups based on CSDME development and OHL exposure. Main outcome measures included time to development of CSDME, total duration of OHL exposure, and duration of DM and POAG.

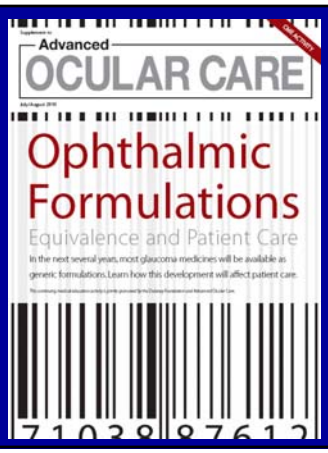
RESULTS: Seven patients (1.8%) developed CSDME after OHL exposure (group 1A). 15 (4.0%) developed CSDME prior to OHL exposure (group 1B), and 197 (52.0%) were treated with OHL but never developed CSDME (group 2). Of patients not exposed to OHL, 22 (5.8%) developed CSDME (group 3) and 138 (36.4%) did not (group 4). Mean duration of DM was longer ($p<0.0001$) in patients who developed CSDME (20.2 years) compared to patients who did not (12.4 years). There was no difference ($p=0.67$) in the amount of OHL exposure between patients who developed CSDME (4.1 years) and patients who did not (4.6 years). Once developed, there was no difference in the interval until CSDME resolution between OHL treated (17.8 mo) and untreated (12.7 mo) patients ($p=0.36$).

CONCLUSIONS: The CSDME development correlated most strongly with the duration of diabetes, irrespective of OHL use. Ocular hypotensive lipids treatment of POAG seems not to affect the incidence, progression, or response to treatment of CSDME in diabetes.

PMID: 22267469 [PubMed - indexed for MEDLINE]

Glaucoma - Prostaglandins

- **Drugs:**
  - **latanoprost (Xalatan® and generic)**
  - **travoprost (Travatan-Z ® and generic)**
  - **bimatoprost (Lumigan ® 0.01%)**
  - **tafluprost (Zioptan ®)**
- **How do they compare?**
  - **Efficacy**
  - **Side effects**
  - **Cost**




The Making of Generic Medicines

As more ophthalmic drugs become available as generics, what we know about generic requirements will help us make informed decisions when prescribing for glaucoma.

BY ROBERT J. NOECKER, MD, MBA, AND STEVEN T. SIMMONS, MD

- **To gain FDA approval, a generic drug must:**
  - **Contain the same *active* ingredient**
  - **Be identical in strength, dose form, and route of administration**
  - **Be bioequivalent (80-120% of branded product)**
    - **Not the same thing as therapeutic effect**
  - **Have the same indications for use**
  - **Meet the same batch requirements for identity, strength, purity, and quality**
  - **Have a similar shelf life**


The Making of Generic Medicines

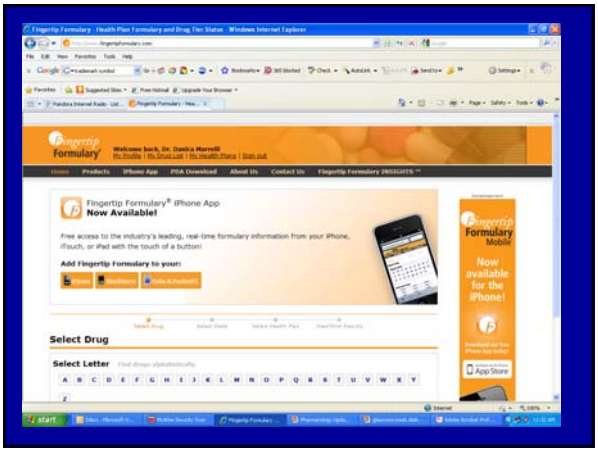
As more ophthalmic drugs become available as generics, what we know about generic requirements will help us make informed decisions when prescribing for glaucoma.

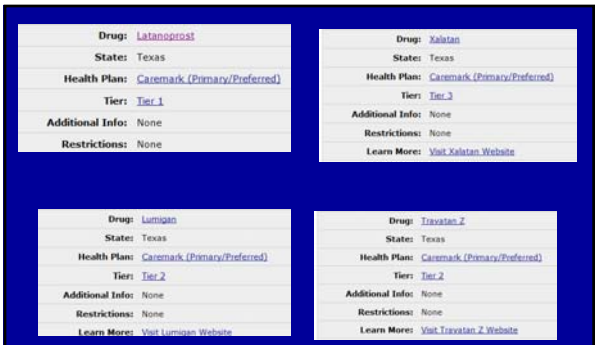
BY ROBERT J. NOECKER, MD, MBA, AND STEVEN T. SIMMONS, MD

- We don't know about:
  - Loss of control with long term use
  - Tolerability
  - Efficacy
- Multiple companies can make a generic; differences may not be apparent on bottle
- Cannot know for sure which company the pharmacy will have
- Patient's confidence in generics varies
- Somewhat difficult to understand efficacy due to slow nature of disease

How Do We Deal with Generics in Glaucoma?

- **Research cost savings for patients**
  - **www.fingertipformulary.com**
  - **www.goodrx.com**
- **Early glaucoma**
  - **Monitor more closely with generics, more frequent visits**
- **Mod/severe glaucoma**
  - **If loss of control for even a short time is undesirable, continue to write "dispense as written"**





Glaucoma – beta-adrenergic antagonists (beta blockers)

- **Mechanism of action: decrease aqueous production**
- **Efficacy: very good (25-30% reduction)**
- **Dosing: once vs twice daily**
- **Side effects:**
  - **Minimal ocular side effects**
  - **Systemic:**
    - **Bradycardia**
    - **Bronchial constriction**
    - **** CHECK EXISTING MEDS, VITALS**
- **Short term escape & long term drift**

Glaucoma – beta blockers

- When to use:
  - First line therapy for patients with contraindications to prostaglandins
  - Need rapid lowering of IOP
  - Cost (generic is cheap)
  - Added drug for prostaglandin users
    - Different mechanism of action
- When to reconsider:
  - Symptomatic bradycardia
  - CHF patient
  - Patient on oral bb (+/-)

Glaucoma – beta blockers

- Available drugs:
  - timolol maleate (Timoptic®, Timoptic-XE ®, generics, Istalol ®)
  - timolol hemihydrate (Betimol ®)
  - levobunolol (Betagan ®)
  - metipranolol (Optipranolol ®)
  - carteolol (Ocupress ®)
  - betaxolol (Betoptic-S ®)

Glaucoma – alpha-adrenergic agonist

- Mechanism of action:
  - Decrease in aqueous production
  - Increase in uveoscleral outflow
- Efficacy: good (20-25% reduction)
- Dosing: tid vs bid
- Side effects:
  - Systemic:
    - Somnolence
    - Dry mouth
  - Ocular:
    - allergy

Glaucoma - brimonidine

- Allergy:
  - Original brimonidine ® 0.2% generic
    - 30%+ allergy rate
  - Alphagan-P 0.15% (only available in "generic" with Polyquad ® preservative)
    - 20% allergy rate
  - Alphagan-P ® 0.1% (Purite ® preservative)
    - 10-15% allergy rate
  - Combigan ® (0.2%, with 0.5% timolol, BAK)
    - 5% allergy rate (?)
  - Simbrinza® (0.2% with 2% dorzolamide, BAK) -- ??? Allergy rate

Glaucoma - brimonidine

- When to use
  - Excellent additivity with prostaglandin
  - Good additivity with beta-blocker
  - Rapid IOP lowering (esp in combo)
  - Preservative toxicity/allergy
  - Category B pregnancy (D/C in breastfeeding)
- When to reconsider
  - Monotherapy (dosing)
  - Hx of allergy (any form of brimonidine)
  - CHILDREN (contraindication)

A Randomized Trial of Brimonidine Versus Timolol in Preserving Visual Function: Results From the Low-pressure Glaucoma Treatment Study

THEODORE KRUPIN, JEFFREY M. LIEBMANN, DAVID S. GREENFIELD, ROBERT RITCH, AND STUART GARDINER, ON BEHALF OF THE LOW-PRESSURE GLAUCOMA STUDY GROUP

AMERICAN JOURNAL OF OPHTHALMOLOGY

APRIL 2011

LoGTS

- Randomized, double-masked clinical trial to compare brimonidine 0.2% vs timolol 0.5% in preserving visual function in normal tension glaucoma patients
  - brimonidine 0.2% bid
  - timolol maleate 0.5% bid
  - Followed with VF every 4 months for minimum of 4 years

LoGTS

- Results:
  - No significant difference in IOP
  - Significant dropout in brimonidine group (allergy)
  - Significan/dramatic difference in visual field progression
    - 9% for brimonidine group
    - 39% for timolol group
- Question: what does this mean?

Glaucoma – carbonic anhydrase inhibitors

- Mechanism of action: decreased aqueous production
- Efficacy: excellent (oral – 40-50%+); good (topical – 15-20%)
- Dosing: bid – tid
- Side effects:
  - Topical:
    - Bitter taste
    - Stinging
    - Hyperemia
    - Corneal endothelium

Glaucoma - CAIs

- When to consider:
  - Good addition to prostaglandin
  - Brimonidine allergy
- When to avoid:
  - Fuchs corneal endothelial dystrophy
  - Pregnancy
  - Sulfa allergy (???)
- Available:
  - Dorzolamide (Trusopt® and generic)
  - Brinzolamide (Azopt®)
  - dorzolamide/timolol (Cosopt® and generic)
  - dorzolamide/brinzolamide (Simbrinza®)

Glaucoma - acetazolamide

- Typically used in emergency/acute situations rather than long term due to systemic side effects:
  - Paresthesia
  - Kidney stones
  - Metabolic acidosis
  - Blood dyscrasia
- Typical use:
  - Post-surgical IOP elevation
  - Acute angle closure
  - Extremely elevated IOP
- Dosing:
  - 250 mg tablets qid
  - 500 mg time-released capsules (Sequels ®) bid

Glaucoma - pilocarpine

- Mechanism of action – increase trabecular outflow
- Efficacy: good (25%)
- Dosing: qid
- Side effects:
  - Accommodative spasm
  - Browache
  - Bronchial constriction
- Use: acute angle closure (low concentration)

Fixed Combination Medications

- dorzolamide/timolol (Cosopt® and generic; Cosopt PF®)
  - Bid dosing
- brimonidine/timolol (Combigan®)
  - 5% allergy rate
  - Bid dosing
- brinzolamide/brimondine (Simbrinza®)
  - First non-beta blocker fixed combination
  - BAK-preserved
  - TID dosing

Simbrinza®

- brinzolamide 1%, brimonidine 0.2% suspension (BAK)
- FDA approved for glaucoma
- Contraindications:
  - Known sensitivity to one of the components
  - Neonates and children under 2 years old
- Warnings/cautions:
  - Sulfa allergy
  - Low corneal endothelial cell count
  - Children 2-7 years old

Pivotal Clinical Trials - Simbrinza®

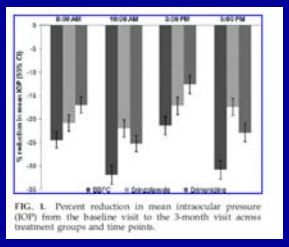


FIG. 1. Percent reduction in mean intraocular pressure (IOP) from the baseline visit to the 3-month visit across treatment groups and time points.

Generic MMT

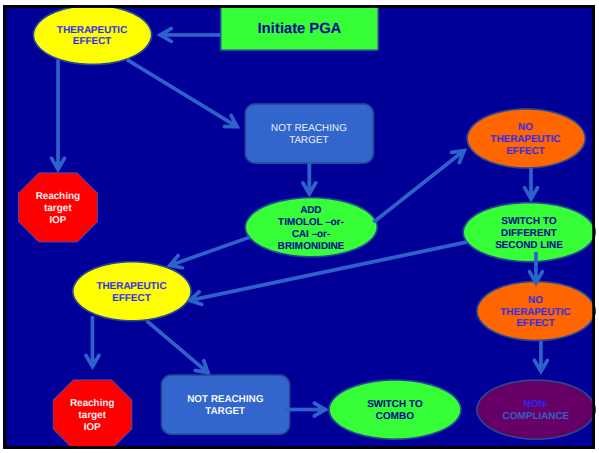
- **timolol maleate**
- **latanoprost –or- travoprost**
- **brimonidine 0.15% -or- 0.2%**
- **dorzolamide**
- **(dorzolamide/timolol)**

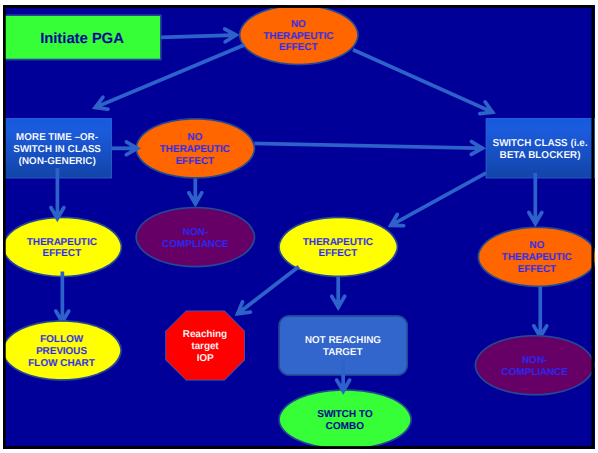
BAK-free MMT

- **Timoptic PF ®**
- **Travatan-Z ® or Zioptan ®**
- **brimonidine 0.15% -or- Alphagan-P ® 0.1%**
- **Cosopt PF®**

Preservative-free MMT

- **Timoptic PF ®**
- **Zioptan ®**
- **Cosopt PF ®**



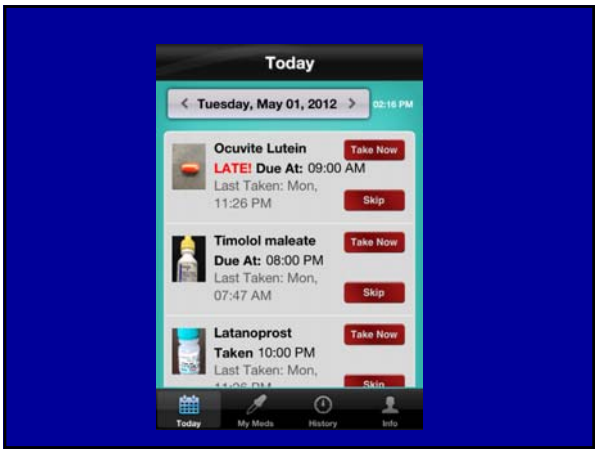


What Else is in the Bag?

- Laser trabeculoplasty (ALT, SLT, MDLT, TSLT)
- Incisional/filtering surgery
  - Trabeculectomy
  - Glaucoma Drainage Device
- Minimally Invasive Glaucoma Surgery (MIGS)
  - Endocyclophotocoagulation (ECP)
  - Trabectome
  - iStent

Glaucoma – what's next?

- **Novel drug trials**
  - **RhoK Inhibitor**
- **Drug Delivery System (DDS)**
  - **Contact lens delivery**
  - **Punctal plug delivery**
  - **Injectable**
    - **Sub-conjunctival**
    - **vitreous**



Thank you for your attention!

DMarrelli@uh.edu

Optometric Insights and Therapeutic Interventions for CVI – COPE 44826-FV

Curtis R. Baxstrom,MA,OD,FCOVD,FNORA

Optometric Insights and Therapeutic Interventions for Cortical Visual Impairment
Curtis R. Baxstrom,OD

Disclosure Statement:
No current financial or commercial relationships with any of the products or companies mentioned in this course

Causes of Blindness in Children

-Cortical Visual Impairment (18%)
-Retinopathy of Prematurity (15%)
-Optic Nerve Hypoplasia (14%)
-Congenital Anomalies (microphthalmos, coloboma, 6%)
-Leukocoria-cataract, persistent hyperplastic primary vitreous, or retinoblastoma
-Others

Definitions

- Cortical Visual Impairment
  - Original term, primarily looked at acuity issues
- Cerebral Visual Impairment
  - Europeans typically use this vs. Cortical
- Neurological Visual Impairment
  - My preference, some east coast children's hospitals

Important Considerations of CVI

- Timing of brain insult – inutero/postnatal
- Stage of brain development
- Location of insult
- Severity – diffuse vs. localized
- Duration of insult
- Previous treatment

Common Causes of CVI

- Asphyxia
- Hypoxia
- Ischemia
- Developmental Brain Defects
- Hydrocephalus
- Head Injury
- Stroke
- Infections – meningitis, encephalitis

Visual Considerations – Performance

- Visual Motor Disturbances
  - Moving the eyes to direct visual attention to the target
  - Dorsal pathway
- Visual Spatial Disturbances
  - Localization of objects, judgment of direction and distance of objects, orienting body to world
  - Dorsal pathway
- Visual Perceptual Disturbances (info processing)
  - Discrimination, recognition and integration of images
  - Ventral pathway, Visual cognitive issues with good VA?

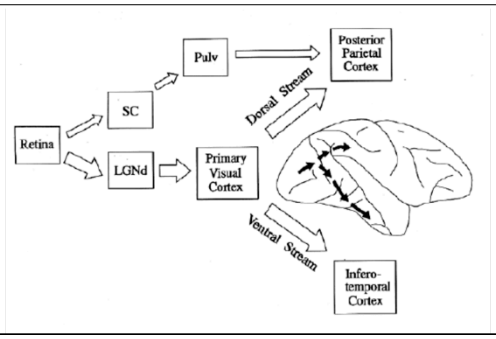
"Eyes don't tell people what to see, people tell eyes what to look for."

Lawrence MacDonald, OD

Three Visual Networks – beyond VA

- Dorsal Pathway
  - Primary visual cortex, posterior parietal lobe-beyond
  - Visual spatial abilities, input from a crowded visual scene with visually guided movement
- Mirror Pathway (dorsal?)
  - F5 area of premotor cortex-in observer and actor
  - Allows infants to understand and anticipate actions long before they can move their limbs sufficiently well
- Ventral Pathway
  - Lower temporal and inferior temporal
  - Visual Recognition – Often chief concern in CVI

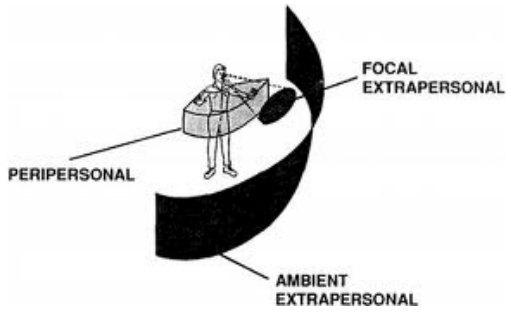
Dorsal and Ventral Paths



Other Important Neural Networks

- Peri-personal and Extra-personal Space
- Ambient-Peripheral Pathway (magno)
  - Brainstem mediated, localization, quick acting
- Focal-Central Pathway (parvo)
  - Cortically mediated, higher cognitive, slower acting
- Interhemispheric Processing
  - R/L processing, example of sequential/simultaneous
  - Example of reading, numerosity, draw a clock tests
- Others

Peri and Extrapersonal Space



On the Visual Development Side

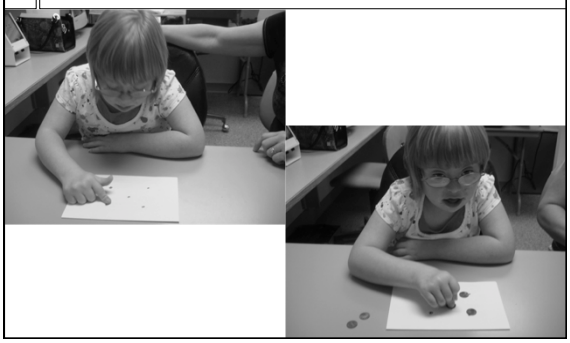
- The visual world of an infant is generally considered as inward and developing outward over time. (Distance to mom's face and breast)
- Prescribe from findings at one distance or multiple distances? Full prescription or partial?
- Example – At 20 inches (autorefractors) I've seen 4 diopters hyperopia, move into 12-14 inches and see +.75 lag. This is the experiential world of an infant. We should be careful of overprescribing plus at near as it may lock the patient inward.

Right and Left Hemisphere Processing

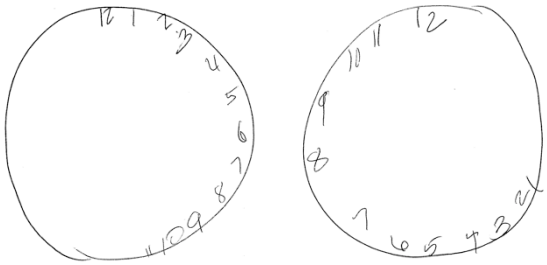
RIGHT	LEFT
Spatial	Language
Big Picture / Whole	Details / Part
Simultaneous	Sequential
Intuitive	Analytical
Random	Orderly

Specialization and Cooperation is KEY !!!

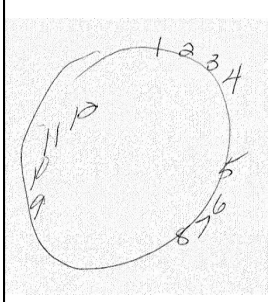
Simultaneous and/or Sequential ?

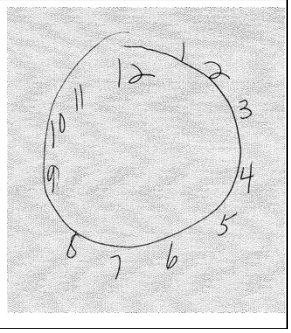


USI - Draw a Clock – CW vs. CCW



Increasing R-L Integration, Alternation





Testing and Evaluation

- Observations and Case History
- Visual Acuity, Refraction
- Visual Fields, Pupils
- Visual Acquisition Skills
  - Eye Movements, Accommodation, Binocularity
- Visual Information Processing Skills
  - Visual memory, figure/ground, closure, etc.
- Anterior/Posterior Segment Health
- Visually Evoked Potential

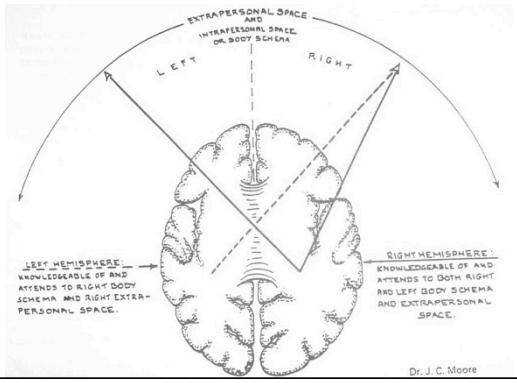
Eye Movement Considerations

- Fixation
- Optokinetic Nystagmus/Motion Processing
- Pursuits – smooth tracking
- Saccades – jumps to targets
- Vergence
- EOM Conditions- nystagmus, range of movement, gaze palsy, etc.

Visual Considerations – Basic VF

- Hemianopia/Quadrantopia
- Visual Neglect/USI – 20% minification in affected field, does this also occur in CVI ?
- Field evaluation should thus include size, motion and spatial aspects (including peri and extrapersonal space)

USI – Allocation of Attention

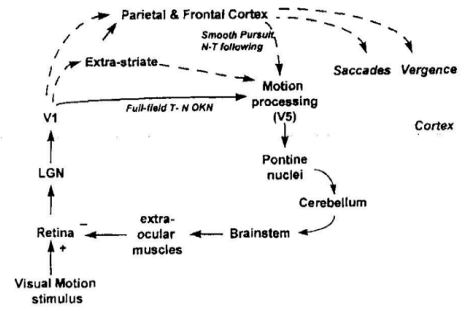


Testing Background Can Be Critical

Overlapping Diagnostic Entities

- Delayed Visual Maturation
- Autism Spectrum
- Severe bilateral central scotoma
- Dyskinetic Eye Movement Disorders
- Profound Mental Retardation
- Amblyopia ? Aniso vs. Isometropic

Delayed Visual Maturation



Visual Characteristics of CVI

- Variable level of vision loss, fluctuations based on environment, fatigue, arousal, etc.
- Poor sustained attention to visual stimuli, especially complex stimuli
- Delay in response to visual stimuli
- Improved visual function in familiar settings and with familiar objects

Visual Characteristics of CVI

- Preference for looking at lights versus objects
- Preference for viewing objects at close range and odd angles
- Better vision with moving vs. static objects
- WHAT DO THESE SUGGEST ?
- Purely visual acuity issues and/or considerations of visual performance ?

Common Interventions - Compensatory

- Large, high contrast, lighted, reflective, moving targets
- Touch or sound added to object
- Simple vs. complex presentations, but avoid overstimulation
- Bring in from different angles, views
- Target and environmental lighting
- Extra time and patience by observer

Optometric Interventions

- Visual Guidance – based on needs
- Lenses – multiple possible benefits
- Prism – yoked, Peli for hemianopsia
- Selective Occlusion – improves VEP
- Vision Therapy/Rehabilitation

"Spatial perceptions are by no means purely visual but are rather visual-muscular-labyrinthine."
-Sherrington

Visual Guidance – beyond typical

- Compensatory strategies noted earlier, but what else might one try ?
- Move objects from peri- to extrapersonal space (z-axis), include multi-sensory inputs
- Modify figure/ground relationships to improve contrast and attentional components
- Brimmed hat to reduce stimuli, side shields
- Infant/Toddler massage, Vestibular input
- Others

Vestibular Input – A Missing Piece ?

- Linear Stimulation
  - Calming, 15 minutes = 8 hours of serotonin release
- Rotational Stimulation
  - Increased Arousal, Extensor tone increased-posture
  - Better foundational basis to begin localization ?
- Clinical Applications
  - Testing-the upset child
  - Treatment-facilitates interaction and arousal, and can also be helpful in eye movement dysfunctions

Massage and Visual Function

- Guzzetta A, et.al. Massage accelerates brain development and the maturation of visual function. The Journal of Neuroscience 2009;29(18):6042-6051.
- Demonstrates the importance of massage to accelerate the maturation of electroencephalo-graphic (EEG) activity and of visual function, in particular visual acuity. OT's often use deep touch !

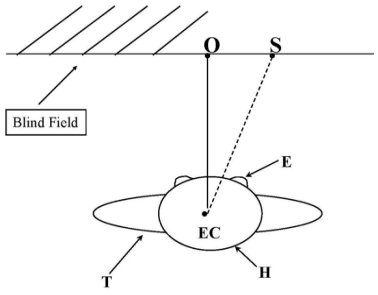
Value of Lens Application

- Refractive – typically the main use…but…
- Accommodative – low in amblyopes, others
- Spatial – size and distance perception
  - Move spatial aspects inward/outward?
- Increases Peripheral Awareness/Motion
- Modifies VOR gain – effects upon a clear image with head movement and also increased arousal

Yoked Prisms

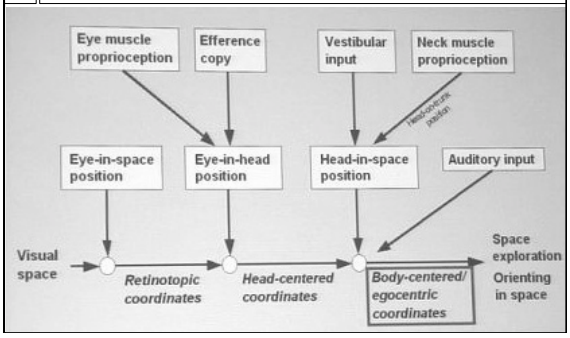
- Effects of shifting of space, and of rotation which results in emphasizing or deemphasizing visual space. This results in changes in relationships of figure ground in the environment
- Treatment of Visual Neglect/Unilateral Spatial Inattention(USI)
- Dynamic changes in VOR gain. Arousal ? Extensor tone ? (Watch for toewalkers, head upright)
- Modify the Nullpoint for Nystagmus
- Effects upon Postural Control, Mobility - Padula

What is Abnormal Egocentric Localization ?



From Suchoff, Ciuffreda, et.al.-2001

Karnath – Phil Trans Royal Soc 1997

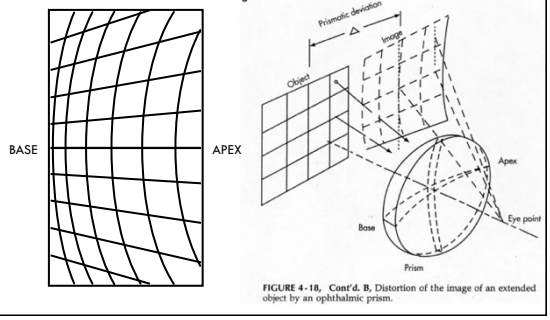


20% Horiz. Minification in Neglected Field

Neglected Field

Non-Neglected Field

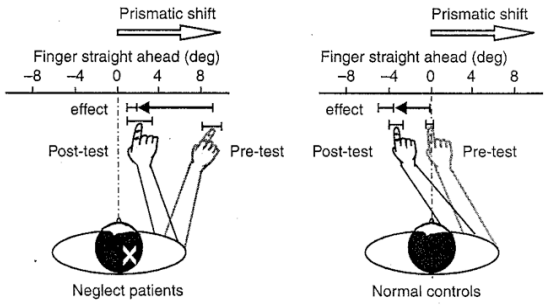
Prism Base – Optical Field Distortion



Prism in Left USI – 2 Applications

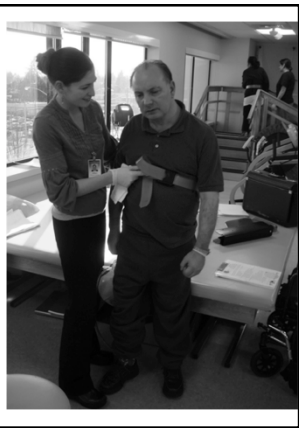
- Directional and Expansion/Compression
- Compensatory – Direct Effect – Base R
  - Visually shift egocenter to midline-Karnath
- Therapeutic – Indirect – Base L
  - Creates mismatch, patient resets egocentric localization with visual, motor, vestibular - Rosetti

Rossetti 1989 study on yoked prism



Modifying postural adaptation following CVA through prismatic shift of visuo-spatial egocenter

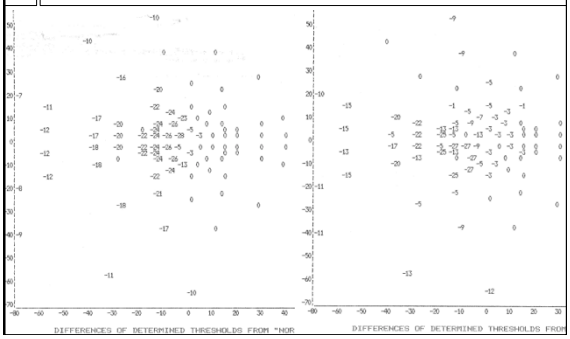
Padula, et.al.
Brain Injury 2009;
23(6):566-76.



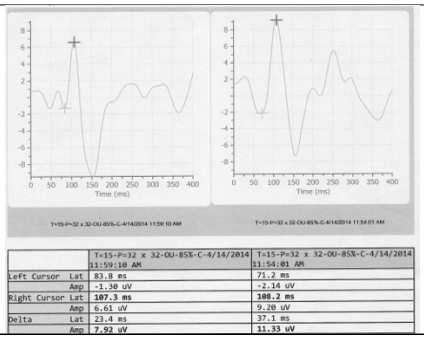
PELI Prism, Field Expansion Prism

- With loss of visual field in hemianopsia, a prism can provide access to the non-seen visual field without scanning
- Can show improved visual field over time, if you discontinue prism, the loss may return
- Can show changes in postural control and mobility

L Hemianopsia, 6 weeks with PELI



VEP Without and With Binasal

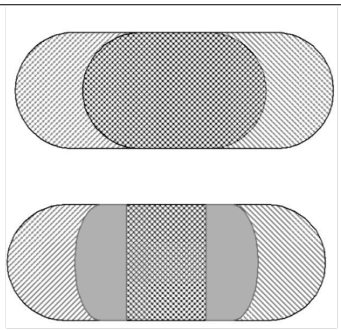


		T=15-P=32 x 32-OU-85%-C-4/14/2014 11:59:10 AM	T=15-P=32 x 32-OU-85%-C-4/14/2014 11:54:01 AM
Left Cursor	Lat	83.8 ms	71.2 ms
	Amp	-1.30 uV	-2.14 uV
Right Cursor	Lat	107.3 ms	108.2 ms
	Amp	6.61 uV	9.20 uV
Delta	Lat	23.4 ms	37.1 ms
	Amp	7.92 uV	11.33 uV

Binasal Effects with mTBI

- Ciuffreda, Yadav and Ludlam. Effect of binasal occlusion on the visual-evoked potential in mild traumatic brain injury. Brain Injury 2013;27(1):41-7.
- TBI demonstrate reduced amplitude VEP's
- The use of binasal is believed to decrease the aberrant motion sensitivity, thus reduce noise in processing. This allows the VEP to become normalized.

Selective Occlusion - Binasal



Optometric Interventions - Summary

- Visual Guidance – based on needs
- Lenses – multiple possible benefits
- Prism – yoked, Peli, impact on mobility
- Selective Occlusion – modifies processing
- Vision Therapy/Rehabilitation
- KEY – each patient has specific visual needs, treat with any combination above

Vision Therapy/Rehabilitation Cases

- Septo-Optic Dysplasia
- Anoxic brain injury at birth
- Methamphetamine Exposure Inutero
- Cerebral palsy

Septo-Optic Dysplasia Concerns

- Sensory Concerns-Sensory Integration OT
- Decreased Visual Acuity-Optic nerve hypoplasia
  - Holds objects up close
- Minimal Sustained Fixation
- Tipping head down to see in primary gaze
- Left Gaze Preference
- Left exotropia, increases in Right gaze

Septo Optic Dysplasia Goals

- More upright posture, eyes primary gaze
- Increase working distance
- Increased Sustained Fixation
- Increase Down gaze-to decrease head down
- Increase Right gaze-to decrease head turn
- Increase bilaterality, decrease left exotropia

Septo-Optic Dysplasia Treatment

- Horizontal Vestibular Input-L gaze preference
  - Slow Rotations to Left 10X-eyes go Right
  - Fast Rotations to Right 5X-eyes go Left, add reaching for cortically directed movement
- Vertical Vestibular Input-Up gaze preference
  - Slow Rotations toward head 10X-eyes go Up (sidelying)
  - Fast Rotations toward feet 5X-eyes go Down after you stop, add reaching for cortically directed movement

Overview of CVI

- More involved than simply visual acuity
- Importance of Multiple Visual Pathways
- Young CVI vs. Older developed with mTBI
- Consider:
  - Visual Motor Disturbances
  - Visual Spatial Disturbances
  - Visual Perceptual Disturbances (VIPS)
- KEY – Look at basic development and subcortical/cortical pathways to help achieve maximum independence and performance

References

- Dutton G and Bax M. Visual impairment in children due to damage to the brain. Clinics in Develop Medicine No. 186; 2010.
- Hyvarinen L and Jacob N. What and how does this child see ? 2011.
- Roman-Lantzy, C. Cortical visual impairment-an approach to assessment and intervention. AFB Press 2013.
- Taub, et.al. Visual Diagnosis and Care of the Patient with Special Needs. Lippincott Press 2012.

Thank You !

Pharmacology Update for the Primary Care Optometrist

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University of Houston College of Optometry

Financial Disclosure

I have received I have received speaking or consulting fees from:

- Alcon Laboratories
- Allergan
- Carl Zeiss Meditec

Topics

- Anti-infectives
- Anti-inflammatory agents
- Allergy
- Horner Syndrome

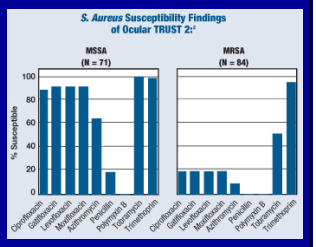
Anti-infective Agents

Anti-infective Agents

- Resistance Studies
  - Ocular TRUST
  - ARMOR

Ocular TRUST

- "Tracking Resistance in U.S. Today"
- Over 50 participating centers and ONE reference laboratory
- 2006: of staph aureus isolates, 16.8% MRSA
- 2008: of staph aureus isolates, 48.1% MRSA



ARMOR

Monitoring Antibiotic Resistance in Ocular Microorganisms: Results From the Antibiotic Resistance Monitoring in Ocular MicRorganisms (ARMOR) 2009 Surveillance Study

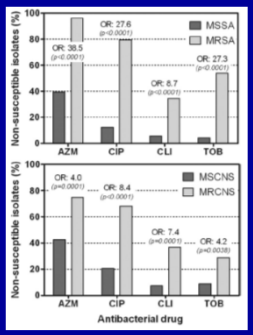
AMERICAN JOURNAL OF OPHTHALMOLOGY

OCTOBER 2011

ARMOR

- 592 ocular isolates studies by same lab
  - 200 staph aureus
  - 144 coag-neg staph aureus
  - 75 strep pneumonia
  - 73 haemophilus influenzae
  - 100 pseudomonas aeruginosa
- Tested against commonly used classes of antibacterial drugs
  - macrolides (azithromycin)
  - fluoroquinolones (ciprofloxacin)
  - lincosamides (clindamicin)
  - aminoglycosides (tobramycin)

ARMOR



ARMOR

- **39% of staph aureus isolates were MRSA**
  - **Much more likely to be resistant to other drug classes than MSSA**
- **80% of MRSA showed resistance to fluoroquinolones**
  - **besivance showed least resistance of FQs**
- **Pseudomonas –**
  - **13% resistant to ciprofloxacin**
  - **7% resistant to tobramycin**
- **Multiple organisms were resistant to multiple drugs**

Antibacterial Agents - topical

- **polymyxinB/trimethoprim (Polytrim® and cheap generic)**
  - **Does anyone use it anymore?**
  - **Good broad spectrum antibiotic**
  - **Very mild, non-toxic**
  - **Good for childhood conjunctivitis, antibiotic prophylaxis**

Topical Fluoroquinolones

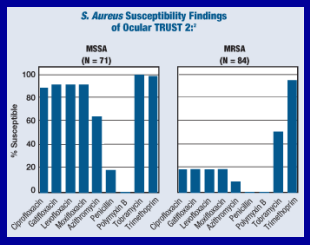
- **Ciprofloxacin (solution, ointment)**
- **ofloxacin**
- **gatifloxacin (Zymaxid®) – q2h x 2d, then qid x 5 d**
- **moxifloxacin (Vigamox®, Moxeza®) – tid for Vigamox, bid for Moxeza for conjunctivitis**
- **besifloxacin (Besivance®) – tid for conjunctivitis**

Oral Antibiotics

- Preseptal cellulitis
- Dacryocystitis
- Canaliculitis
- Chlamydia
- Meibomian gland dysfunction/dry eye

Oral Antibiotics

- Ocular TRUST



Penicillins

- dicloxacillin, cloxacillin – good choice for many soft tissue infections
  - Good in pregnant patients
  - NOT GOOD for MRSA (definition)
  - Poor dosing schedule
- Augmentin (amoxicillin + clavulanic acid)
  - Good spectrum of activity (some gr -)
  - Well tolerated
  - 500mg BID-TID -OR- 875mg BID

Cephalexin (Keflex ®)

- 1st generation cephalosporin
- Effective against many gr (+) organisms
- Slight crossover risk with PCN allergic patients – use alternative if h/o severe PCN allergy
- Dose for soft tissue infections:
  - 500mg BID

Trimethoprim/sulfamethoxazole

- Bactrim® DS or Septra ®
- Excellent choice for MRSA suspicion
- Inquire about sulfa allergy
- Dose: 1 DS tablet po q 12h

Azithromycin

- Z-pack (250mg tabs; take 2 tabs on day 1, then 1 tab on days 2-5)
  - No MRSA or MSSA coverage
  - Good for compliance (once daily dosing)
- For adult inclusion conjunctivitis (chlamydia): single 1g dose
- Topical (Azasite) – indications, off-label use

doxycycline

- Advantages over tetracycline:
  - Less GI upset, can take with food/dairy
  - Longer acting, better dosing
- Use in meibomian gland dysfunction
  - Long term use; often start with higher dosing and then move to maintenance dose
- Remember photosensitivity, esophagitis
- CONTRAINDICATED in pregnancy, lactation, and children <8yo

doxycycline

- Low dose forms:
  - 50-100mg BID, then move to 1x/d
  - Oracea ® (FDA-approved for rosacea)
    - 40 mg (30 immediate + 10 sustained release)
    - Once daily dosing
    - Very expensive (even generic)

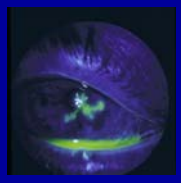
Antiviral Therapy

Zirgan ® (ganciclovir 0.15% ophth gel)

- 09/16/2009: FDA approval for treatment of active epithelial (dendritic) HSK (ages 2yrs +)
- 04/26/2010: Sirion Therapeutics began shipping Zirgan ® to pharmacies
- 06/2010: B&L acquires manufacturing rights

Zirgan ® (ganciclovir 0.15% ophth gel)

- Mech of Action: competitive inhibition of DNA polymerase AND direct incorporation into viral DNA primer strand
- Dosing:
  - 1 drop 5x/d until epithelial defect is healed, then 1 drop 3x/d for 7 days
- Adverse effects:
  - Blur
  - Irritation
  - Punctate keratitis
  - Conjunctival hyperemia



HSK Options

<u>Trifluridine (Viroptic®)</u>

- Works on all cells
- Potential for more toxicity
- 9x/d dosing
- Refrigeration required prior to opening
- Thimerosol preservative
- Available generic
  - $75-135

<u>Ganciclovir(Zirgan®)</u>

- Works only in infected cells
- Minimal toxicity
- 5x/d dosing
- No refrigeration
- BAK preserved
- No generic available
  - $290-310

Zirgan ® (ganciclovir 0.15% ophth gel)

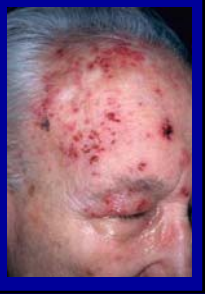
- Potential off-label use: Treatment of EKC
  - Rapid resolution
  - Lower incidence of keratitis
  - Important to use early in condition

Oral Antivirals in HSK

- In lieu of topical (or in addition to) in acute epithial disease:
  - acyclovir 400mg 5x/d x 10 days
  - valacyclovir (Valtrex®) 500mg TID x 7d**
  - famciclovir (Famvir®) 250mg TID x 7d**
- Suppression:
  - acyclovir 400mg bid
  - valacyclovir 500 qd
  - famciclovir 250 qd

Herpes Zoster Ophthalmicus

- acyclovir 800mg 5x/d x 10 d
- valacyclovir (Valtrex®) 1g tid x 10 d
- famciclovir (Famvir®) 500mg tid x 10 d
- START DOSING AT FIRST SYMPTOMS



Anti-Inflammatory Agents

NSAIDs

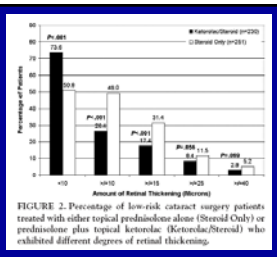
- Prostaglandin release in various types of ocular insult (trauma, allergy, uveitis)
- NSAIDs block prostaglandin synthesis
- NSAIDs effective in post-surgical inflammation/pain, CME

Available Topical NSAIDs

- Bromfenac (Prolensa®, Bromday®, and generic twice daily bromfenac)
  - Bromday and Prolensa are once daily
- Nepafenac (Ilevro®, Nevanac ®)
  - Ilevro: qd dosing
  - Nevanac: TID dosing
  - Exceptional corneal penetration
- Ketorolac
  - Acular, Acular PF, Acular LS, Acuvail, generic
- Diclofenac (Voltaren ® and generic)

NSAIDS Indications

- Post-cataract surgery CME
  - Cause of reduced vision in uncomplicated cataract surgery (up to 12%)
  - In part due to prostaglandin-induced BRB breakdown
  - Typically occurs 4-6 weeks post-op



A randomized, masked comparison of topical ketorolac 0.4% plus steroid vs steroid alone in low-risk cataract surgery patients.

Collaborators (15)

Abstract

PURPOSE: To evaluate whether adding perioperative topical ketorolac tromethamine 0.4% improves cataract surgery outcomes relative to topical steroids alone in patients without known risk factors for cystoid macular edema (CME).

DESIGN: Prospective, randomized, investigator-masked, multicenter clinical trial.

METHODS: Patients scheduled to undergo phacoemulsification and with no recognized CME risks (diabetic retinopathy, retinal vascular disease, or macular abnormality) were randomized to receive either prednisolone acetate 1% 4 times daily (QID) alone (steroid group; n = 278) or prednisolone 1% QID plus ketorolac 0.4% QID (ketorolac/steroid group; n = 268) for approximately four weeks postoperatively. In the ketorolac/steroid group, patients also received topical ketorolac 0.4% QID for three days preoperatively. In both groups, patients received four doses of ketorolac 0.4% one hour before surgery. Patients with capsular disruption or vitreous loss intraoperatively were exited from the study. Outcome measures included CME incidence, retinal thickness as measured by optical coherence tomography (OCT), best-corrected visual acuity, and contrast sensitivity.

RESULTS: No patients in the ketorolac/steroid group and five patients in the steroid group had clinically apparent CME ($P = .032$). Based on OCT, no ketorolac/steroid patient had definite or probable CME, compared with six steroid patients (2.4%; $P = .018$). In the ketorolac/steroid group, mean retinal thickening was less (3.9 microm vs 9.6 microm; $P = .003$), and fewer patients had retinal thickening of more than 10 microm as compared with the steroid group (26% vs 51%; $P < .001$).

CONCLUSIONS: This study suggests that adding perioperative ketorolac to postoperative prednisolone significantly reduces the incidences of CME and macular thickening in cataract surgery patients already at low risk for this condition.

American J Ophthalmol 2008;146(4):554-560

FIGURE 2. Percentage of low-risk cataract surgery patients treated with either topical prednisolone alone (Steroid Only) or prednisolone plus topical ketorolac (Ketorolac/Steroid) who exhibited different degrees of retinal thickening.

- Over 500 patients randomized to receive post-op prednisolone only vs post-op prednisolone plus ketorolac
- Adding NSAID to post-op regimen reduced the incidence of CME

Topical Corticosteroids

- prednisolone acetate 1% (Pred Forte®) – avoid generic if possible
- lotepredno l etabonate 0.5% (Lotemax ® gel or suspension; unpreserved ointment)
- difluprednate (Durezol ® emulsion)

Difluprednate (Durezol®)

- Emulsion formulation – don't worry about particle size or shaking bottle
- Very potent/effective against inflammation
- Higher incidence of IOP elevation

PubMed.gov

Durezol (Difluprednate Ophthalmic Emulsion 0.05%) compared with Pred Forte 1% ophthalmic suspension in the treatment of endogenous anterior uveitis.

Abstract

PURPOSE: The aim of this study was to evaluate the efficacy and safety of difluprednate ophthalmic solution 0.05% (Durezol; Alcon Laboratories, Fort Worth, TX) compared with prednisolone acetate ophthalmic suspension 1% (Pred Forte; Allergan, Inc., Irvine, CA) for endogenous anterior uveitis.

METHODS: In this phase 3, multicenter, randomized, noninferiority trial, 90 patients with endogenous anterior uveitis [>10 anterior chamber (AC) cells and an AC flare score of ≥2 in at least 1 eye] received either difluprednate 4×/day (QID) (n=50) or prednisolone 8×/day (n=40) for 14 days, followed by a 2-week tapering regimen. The main outcome measure was change from baseline in AC cell grade on day 14.

RESULTS: At day 14, mean AC cell grade improvement for difluprednate-treated patients was similar to prednisolone-treated patients (2.1 vs. 1.9, respectively), proving noninferiority. At day 14, 58.8% of difluprednate patients had AC cell clearing (grade 0 × 1cell) compared with 61.5% of prednisolone patients. In the prednisolone-treated group, 12.5% of patients were withdrawn because of investigator-determined lack of efficacy; no difluprednate-treated patients were withdrawn for this reason (P=0.01). Clinically significant intraocular pressure elevation occurred in 3 difluprednate-treated patients (6.0%) and 2 prednisolone-treated patients (5.0%).

CONCLUSIONS: Difluprednate administered QID is at least as effective as prednisolone administered 8x/day in resolving the inflammation and pain associated with endogenous anterior uveitis. Difluprednate provides effective treatment for anterior uveitis and requires less frequent dosing than prednisolone acetate. Clinical trial registration: Trial NCT00051579 was registered at the National Institutes of Health Registry in July 2007 (http://clinicaltrials.gov/ct2/show/NCT00051579?term=sirion&rank=4).

Publication Types, MeSH Terms, Substances, Secondary Source ID

PubMed.gov

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Display Settings: Abstract — Send to:

Optometry. 2010 Dec;81(12):658-62.

Intraocular pressure elevation from topical difluprednate use.

Meehan K, Vollmer L, Sowka J.

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Abstract

INTRODUCTION: Difluprednate ophthalmic emulsion 0.05% (Durezol™, Alcon, Fort Worth, Texas) is a topical difluorinated derivative of prednisolone with potent anti-inflammatory activity. Difluprednate 0.05% has a reported associated increase in intraocular pressure (IOP) in 3% of patients. Although the occurrence may be low, the possible elevation in IOP may be substantially higher than commonly encountered with other topical steroids.

CASE REPORTS: A 49-year-old black man presented with a traumatic anterior uveitis recalcitrant to traditional prednisolone acetate 1% treatment. The patient was switched to difluprednate 0.05% in an attempt to better control the ocular inflammation. Although the patient did not exhibit an IOP response after 4 weeks of treatment with prednisolone acetate 1%, he did experience a pressure response within 2 weeks of initiating difluprednate treatment, resulting in an IOP increase from 9 mmHg to 48 mmHg with subsequent microcystic edema. A 44-year-old black woman presented with recurrent scleritis resistant to topical prednisolone acetate, loteprednol etabonate, and oral nonsteroidal anti-inflammatory therapy. Topical loteprednol 0.5% was replaced by difluprednate 0.05%. All evidence of ocular inflammation was eradicated with the changed therapy. IOP rose in the difluprednate-treated eye from 18 mmHg to 34 mmHg over the course of 18 days. In both cases, the IOP elevation was managed rapidly with the discontinuation of difluprednate and temporary use of IOP-reducing agents with no lasting adverse effects.

CONCLUSION: Difluprednate 0.05% is a new topical therapeutic option indicated for the treatment of inflammation and pain management associated with ocular surgery with an off-label potential for treatment of other anterior segment inflammatory conditions. However, clinicians need to be aware of the potential risk for significant and potentially rapid onset of IOP increase with this medication and manage patients accordingly.

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PMID: 21111374 [PubMed - indexed for MEDLINE]

Publication Types, MeSH Terms, Substances

loteprednol etabonate (Lotemax® and Alrex ®)

- Ester-based “site-specific” steroid
- Effective anti-inflammatory effect
- Significantly reduced incidence of IOP elevation
- Now available in gel and in unpreserved ointment
- Also available with tobramycin (Zylet ®)

loteprednol etabonate (Lotemax®)

- Loteprednol use associated with elevated IOP (ARVO 2010)
  - 50 chart reviews of patients on Zylet ® (loteprednol/tobramycin) or Lotemax ® (loteprednol etabonate 0.5%) who experienced IOP elevation
  - Mean IOP pre-tx: 15.5 (+/- 3.2mmHg)
  - Mean IOP post- tx: 24.7 (+/- 6.5)
  - 72% had no hx of glaucoma or OHTN
  - 30% were being treated for DES

Arch Ophthalmol. 2012 Feb;130(2):143-150. Epub 2011 Oct 10.

Corticosteroids for Bacterial Keratitis: The Steroids for Corneal Ulcers Trial (SCUT).

Srinivasan M, Mascarenhas J, Rajaraman R, Ravindran M, Lalitha P, Glidden DV, Ray KJ, Hong KC, Oldenburg CE, Lee SM, Zegans ME, McLeod SD, Lietman TM, Acharya NR; for the Steroids for Corneal Ulcers Trial Group

Francis I. Proctor Foundation for Research in Ophthalmology, Room S309, 513 Parnassus Ave, University of California, San Francisco, San Francisco, CA 94143-0412. nisha.acharya@ucsf.edu

Abstract

OBJECTIVE: To determine whether there is a benefit in clinical outcomes with the use of topical corticosteroids as adjunctive therapy in the treatment of bacterial corneal ulcers.

METHODS: Randomized, placebo-controlled, double-masked, multicenter clinical trial comparing prednisolone sodium phosphate, 1.0%, to placebo as adjunctive therapy for the treatment of bacterial corneal ulcers. Eligible patients had a culture-positive bacterial corneal ulcer and received topical moxifloxacin for at least 48 hours before randomization.

MAIN OUTCOME MEASURES: The primary outcome was best spectacle-corrected visual acuity (BSCVA) at 3 months from enrollment. Secondary outcomes included infiltrate/scar size, reepithelialization, and corneal perforation.

RESULTS: Between September 1, 2006, and February 22, 2010, 1769 patients were screened for the trial and 500 patients were enrolled. No significant difference was observed in the 3-month BSCVA (-0.009 logarithm of the minimum angle of resolution [logMAR]; 95% CI, -0.085 to 0.068; P = .82), infiltrate/scar size (P = .40), time to reepithelialization (P = .44), or corneal perforation (P > .99). A significant effect of corticosteroids was observed in subgroups of baseline BSCVA (P = .03) and ulcer location (P = .04). At 3 months, patients with vision of counting fingers or worse at baseline had 0.17 logMAR better visual acuity with corticosteroids (95% CI, -0.31 to -0.02; P = .03) compared with placebo, and patients with ulcers that were completely central at baseline had 0.20 logMAR better visual acuity with corticosteroids (-0.37 to -0.04; P = .02).

CONCLUSIONS: We found no overall difference in 3-month BSCVA and no safety concerns with adjunctive corticosteroid therapy for bacterial corneal ulcers. Application to Clinical Practice: Adjunctive topical corticosteroid use does not improve 3-month vision in patients with bacterial corneal ulcers. Trial Registration: clinicaltrials.gov Identifier: NCT00324168

Allergy Medications

Ocular Allergies

- Seasonal allergic conjunctivitis (SAC)
- perennial allergic conjunctivitis (PAC)
- Vernal keratoconjunctivitis (VKC)
- Atopic keratoconjunctivitis (AKC)
- Giant papillary conjunctivitis (GPC)

Type 1 hypersensitivity

- Phases:
  - Sensitization
  - Activation phase (early stage)
  - Late phase
- Hallmark symptoms:
  - Itching
  - Redness
  - Chemosis

Allergy Treatment

- Non-pharmacologic
  - Avoid allergen (???)
  - AC (mold)
  - Shower before bed
  - Undress in room other than bedroom
  - Tears
  - Cold compresses

Allergy Treatment

- Pharmacologic Measures:
  - Decongestants
  - Antihistamine/decongestant combination
  - Antihistamines (topical, oral)
  - Mast cell stabilizing/ "Dual Action" antihistamines
  - Mast cell stabilizers
  - Topical NSAIDS
  - Corticosteroids

Weigh Risk/Benefits

- Limitations:
  - Decongestants: only really affect redness & chemosis
  - Antihistamines: only effective for early phase signs/symptoms
  - Mast cell stabilizers: lag time
  - NSAIDS: not effective against early mediators
  - Corticosteroids: adverse effects

Olopatadine

- Pazeo 0.7%
- Pataday 0.2%
- Patanol 0.1% BID
- qd dosing (is this enough?)
- Dual action (mast cell stabilizer/antihistamine)
- Rapid relief
- 2.5ml bottle (Pazeo, Pataday)
- 5ml bottle (Patanol)

Bepotastine (Bepreve ®)

- Potent H1 receptor blocker
- Effective mast cell stabilization
- Inhibits eosinophil migration
- Inhibits other non-histamine inflammatory mediators (IL-5, LTB4)
- Originally used in Japan as oral medication (safe)
- BID dosing
- 2.5, 5, or 10 ml bottle
- 10ml bottle = 60 days bilateral therapy

Alcaftadine (Lastacaft ®)

- Dual acting
- Once daily dosing (competes with Pataday)
- 3ml bottle
- Pregnancy category B

Other dual action antihistamines

- azelastine (Optivar ®, generic)
  - BID dosing
  - Available in unit dose unpreserved packs
- Epinastine (Elestat ®, generic)
  - BID dosing

Allergy Medications

- News about existing medications:
  - Ketotifen OTC several years ago
    - Zaditor ®
    - Alaway ®
    - Claritin ® Eye Drops
    - Zyrtec ® Eye Drops
    - Visine All Day Itch ®

Corticosteroid Therapy

- Loteprednol etabonate 0.2% (Alrex®)
  - Only FDA-approved steroid for allergic conjunctivitis
  - Very low propensity to elevate IOP
  - Rapid relief of allergy symptoms
  - Still need to follow patient for complications

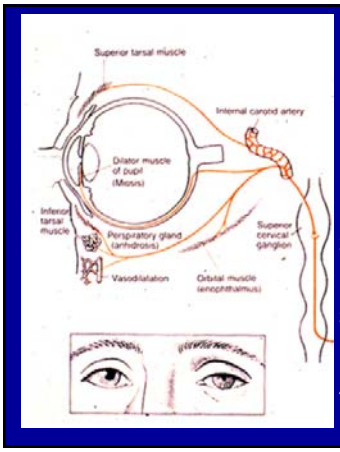
New Use of "Old" Medication

- Use of apraclonidine (Iopidine ®) in the diagnosis of Horner Syndrome

45 YR OLD LADY WITH ACUTE ONSET OF PAINFUL RIGHT PTOSIS X 2 DAYS

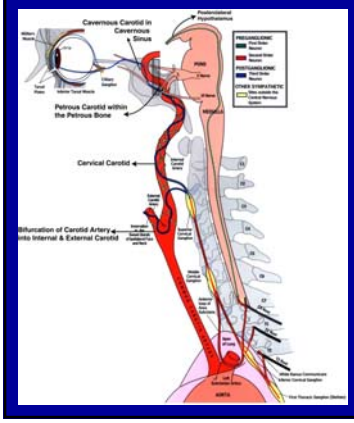
- RT PTOSIS
- ANISOCORIA (RIGHT PUPIL MIOSIS)
- DIAGNOSIS?

HORNER SYNDROME (AKA OCULAR SYMPATHETIC DENERVATION)



Structures innervated by Sympathetic Nervous System

1. Dilator muscle (almost exclusively alpha-1)
2. Mueller's muscle in upper lid & lower lid
3. Sweat glands of ipsilateral face.
4. Blood vessels



Normal Anatomy : Sympathetic Innervation

- **Remarkable unilateralization (ipsilateral)**
- **Central (first order) neuron**
- **Pre-ganglionic (2nd order) neuron**
- **Post -ganglionic (3rd order) neuron**

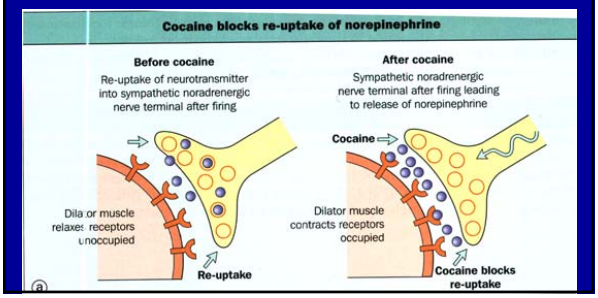
HORNER SYNDROME

- **DIAGNOSIS**
  - **Clinical examination**
    - **Observation**
    - **Pupil dilation lag test**
  - **Pharmacologic Testing**
- **LOCALIZATION**
  - **History (associated symptoms)**
  - **Clinical (associated signs)**
  - **Pharmacologic Testing**

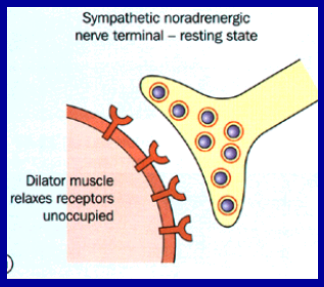
Diagnosis: Pupil Dilation Lag Test

- Normal pupil: begins to dilate after 0.5-1sec, with maximum dilation at 5sec
- In sympathetic denervation, the pupil dilates much more slowly – takes 10-15 sec to reach maximum diameter in the dark
- MAXIMUM anisocoria should occur @ approximately 5 seconds, followed by diminished anisocoria
- Variable test – highly specific, less sensitive

Cocaine testing-Normal Pupil Dilates



Cocaine Testing-Horner's Pupil : No dilation



- No NE molecules available in pre-synaptic area.
- Hence there is no NE available for re-uptake or release from PRE- synaptic vesicle.
- Therefore pupil does not dilate.

Cocaine (4% or 10% solution)

– Cocaine inhibits the re-uptake of norepinephrine from the synaptic cleft. Two drops of 4% or 10% cocaine solution are instilled into each eye.

– Maximum response 40-60 minutes

Cocaine (4% or 10% solution)

– Normal causes the pupil to dilate.

– Sympathetically denervated pupil dilates poorly to cocaine
  - regardless of the level

The disadvantages of cocaine drops are as follows:

– They are difficult to obtain because they must be made at a compounding pharmacy

– they are relatively expensive

– they can give equivocal results.

Apraclonidine

Apraclonidine (0.5% or 1%)

– Apraclonidine is an ocular hypotensive agent.

» direct-acting alpha receptor agonist with primarily alpha-2 (but weak alpha-1) activity.

» Apraclonidine has little to no effect on a normal pupil.

» In Horner Syndrome, the alpha-1 receptors upregulate and become supersensitive to stimulation, thus the Horner pupil dilates to apraclonidine.

Apraclonidine (0.5% or 1%)

Pre-Apraclonidine Post-Apraclonidine

– The pupil in the affected eye dilates in response to apraclonidine. Lid goes up too.

– Reversal of anisocoria occurs after bilateral instillation of apraclonidine.

Apraclonidine (0.5% or 1%)

- Advantages over cocaine:
  - – Inexpensive
  - – Readily available
  - – Not a controlled substance
- Disadvantage:
  - – Lag time for supersensitivity to develop
    - May result in false negative

How we localize the lesion in Horner's syndrome

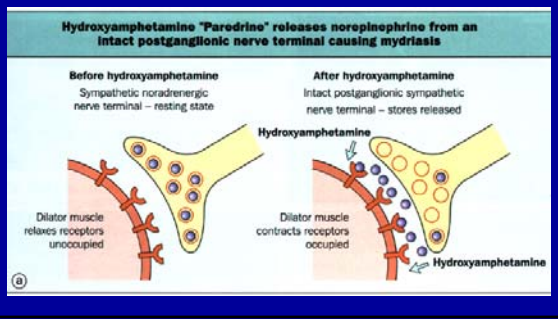
Historical : based on associated symptoms.
Clinical: Based on associated signs.
Based on pharmacological testing.

Hydroxyamphetamine

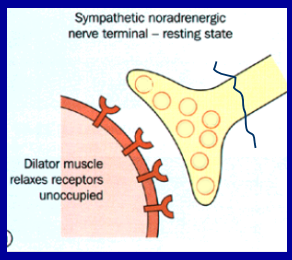
Hydroxyamphetamine

- Releases norepinephrine from the stores in the post-ganglionic neuron.

Hydroxyamphetamine testing-First, second order neuron (Pre-ganglionic) & Normal pupil response



Hydroxyamphetamine Test- In Postganglionic Horner's lesion : No dilation



- Damage to post-ganglionic neuron results in no norepinephine release.
- Hence pupil DOES NOT dilate confirming we are dealing with a POST GANGLIONIC (THIRD ORDER) Horner's.

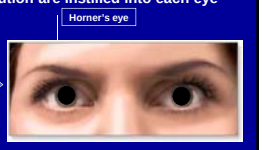
Hydroxyamphetamine

First and second order neuron pupil DILATES with paredrine as the normal pupil does.

Third order neuron pupil does NOT dilate.

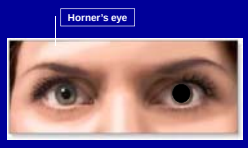
Two drops of 1% hydroxyamphetamine solution are instilled into each eye

Pre-ganglionic lesion



Dilates the Horner's pupil to an equal or greater extent

Paredrine test.



Post-ganglionic lesion

Does **not dilate** the Horner's pupil

ETIOLOGY OF HORNER SYNDROME

- First Order:
  - Demyelinating disease
  - Tumor of pons/ III ventricle/cervical sc/pituitary
  - Cerebrovascular disease (infarct)
  - Cervical trauma

ETIOLOGY OF HORNER SYNDROME

- Second Order:
  - Tumor of chest apex
  - Aortic aneurysm
  - Thyroid enlargement
  - Neck surgery

ETIOLOGY OF HORNER SYNDROME

- Third Order (post-ganglionic)
  - **Internal carotid A. dissection** - Acute unilateral headache or facial pain.
  - **Cluster headache**- Transient post-ganglionic Horner's syndrome with episodes of excruciating hemicranial headaches.
  - **Trauma**- base of skull fractures
  - **Cavernous sinus Lesion**

45 YR OLD LADY WITH ACUTE ONSET OF PAINFUL RIGHT PTOSIS X 2 DAYS

- Don't wait!
- Apraclonidine probably won't work (too soon)
- Can't wait to get cocaine testing

IMMEDIATE REFERRAL FOR NEURO IMAGING!!!

Thank you for your attention!

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Confident Management of Medical Emergencies that Present in the Optometric Practice

Tad Buckingham, OD, EMT-P

-

May 2014

Disclosure

Tad Buckingham OD, EMT-P does not receive any type of reimbursement or other benefits from any manufactures, dealers, or groups represented in this lecture.

Objectives

- Understand the value of proper preplanning for medical emergencies.
- Feel confident about the medical emergency exam
- Understand the likely medical emergencies that may occur in your practice.
- Know the process for verbalizing a patient care transfer.

Case Review

- 23 y/o male with a family history of OAG. "Hates Doctors"
- Staff state the pt. got sweaty and anxious during Autorefraction but recovered during the 30-2 visual fields. Goldmann Tonometry for pressures.
- Pt. is calm and compliant during VAs, Cover tests, and EOMS

Case Review cont.

- Pt. again gets anxious when asked to get positioned into the slit lamp. You talk about the importance of accurate IOPs and "He will try".
- As you get in position you see him sweating and breathing more rapidly. As you get ready to stop the exam you notice instead of exhaling he bears down, his eyes dilate and roll back and he starts shaking in minor movements

Case Review cont.

- The patient shakes with full body, very low amplitude, muscle contractions as the slit lamp is moved away.
- The full body movement lasts approx 5-10 seconds. The pt. is unconscious.

As the Physician, what do you do?

Introduction

- As Optometric Physicians we are the primary care providers for a diverse patient base. This gives us the opportunity to provide treatment for both genders through the various milestones of their lives. Many of these patients are healthy but many will experience acute or long lasting systemic illnesses in their lifetime.
- Mitigation of medical emergencies, in your practice, uses the knowledge that you have already obtained. This guide is broken down to the types of exam practices and equipment needed for medical emergencies, the emergency exam sequence needed, and the most common systemic medical emergencies that can occur in your office.

Overview

- Not all medical maladies require 911
- Medical emergencies require a team approach to mitigate. The whole office needs to take an active role.
  - The 911 caller
  - The scribe
  - The assistant
- Emergency Medical Services (EMS) professionals (both Fire and Ambulance) are bound by Federal HIPPA regulations.
- Paramedics are highly trained medical professionals.
- What occurs when 911 is called?

Medical Emergency Activation Guideline

- Emergency Activation phone number (911)
  - Type of medical emergency
  - Patient status
- American Association of Poison Control Centers Phone Number: **1-800-222-1222**
- Local Hospital phone numbers
- List of chart notes/face sheet to be copied for EMS
- The "Face Sheet" should include:
  - Name, Address, DOB
  - Contact phone number, Emergency contact name and number
  - Primary Care Physician, list of allergies (drug and environmental)
  - List of current medications, ocular and past medical history

MEDICAL EMERGENCY PATIENT EVALUATION

What is an acute Medical Emergency?

- An intrinsic or extrinsic influence that has acute durational (and not transient) effects on the:
  - Level of Consciousness (LOC)
  - Respiratory system (A, B)
  - Cardiovascular system (C)

*The Primary Exam is the core exam used for evaluating a medical emergency.

Primary Exam-LOC, ABCs

- LOC (Level Of Consciousness)
  - What is the patient's level of consciousness?
- Airway
  - Is the airway open? Can the patient talk?
- Breathing
  - Is the patient moving air?
    - Mechanical evidence of chest rise/fall or abdominal movement.
- Circulation
  - Is there evidence of circulation?
    - Color?
    - Evidence of Capillary refill?
    - Distal pulses present?

Level of Consciousness

Determine the level of Consciousness

- AVPU
  - Alert
  - Verbal (responds to …)
  - Pain (responds to …)
  - Unresponsive

What is the patient's normal baseline?

Alert

- Patient is conscious and aware of their surroundings
- An alert patient is further evaluated to assess any levels of confusion
  - Four specific questions are asked
    - Alert to "Person"; What is your full name?
    - Alert to "Place"; What city are you in now?
    - Alert to "Time"; What month is it now?
    - Alert to "Event"; Why are you here?
- If the patient is not 4/4 the are considered confused.
  - Describe the confusion level; "Pt. is confused 2/4"

Altered Consciousness

- Verbal
  - Patient appears unconscious but responds to loud verbal stimuli.
    - Patient is stuporous responding to verbal stimuli
- Pain
  - Patient appears unconscious but responds to a shake or sternal rub stimuli.
    - Patient is stuporous responding to physical stimuli.
- Unresponsive
  - The patient is unconscious and will not respond to any stimuli
    - The patient is comatose.

*To determine the depth/length of coma check for incontinence

The AMS(Altered Mental Status)

- Causes
  - Diffuse Brain Dysfunction
    - Generalized severe metabolic or toxic disorders depress/inhibit overall brain function (Alcohol abuse, Diabetes, sedative drugs, uraemia, or septicemia).
  - Direct effect within the brainstem
    - A lesion within the brainstem itself damages/inhibits the RAS(Reticular Activating System)
  - Pressure effect on the brainstem
    - A mass lesion within the brain compresses the brainstem inhibiting the ascending RAS(Reticular Activating System).

The AMS(Altered Mental Status)

- S/Sx
  - The patient will present with an altered mental status that will vary from confusion to frank coma.
    - The deeper the coma the more probable urinary incontinence

Airway

Airway problems

- Conscious
  - Partial Choking – Encourage coughing
  - Complete Choking – Heimlich maneuver
- Unconscious
  - Is pt. snoring – Tongue is obstruction
    - Head tilt chin lift
  - Secretions/saliva
    - Position patient on their side to promote drainage from the mouth

Respiratory

Respiratory

- Inadequate Breathing may be compensated by body positioning and accessory muscle use.
- A rapid respiratory rate that starts to brady down with accompanied patient fatigue is an indication of impending respiratory failure!
- Listen to the lung sounds. Can you appreciate wheezes or wet lung sounds?
- Is the respiratory pattern regular? How is the Tidal volume?
- Does the patient also have chest pain?

Respirations

- Rate
  - Normal respiratory rate for healthy adults is 12 – 20 per minute.
- Rhythm
  - Regular or irregular
- Depth
  - Shallow or deep breaths
- Use of accessory muscles
  - Nasal flaring, use of neck or intercostal muscles, and Body positioning.
- Lung sounds – Do you hear:
  - Clear, Wheezing (spastic airway), or Wet – bubbly or gurgling (Pulmonary edema)

Respiratory - Hyperventilation

- S/Sx

Hyperventilation

- Common causes are emotions, anxiety, and panic disorders.
- May be compensation for acidosis
- Most commonly seen in women between the ages of 14 and 40. Rarely observed in pediatrics and patients over 40 years old. If the pt. is suffering from Hyperventilation:

- Tx
  - If etiology is not anxiety, 911 as indicated.
  - Place patient in the position of comfort
  - Calm patient with voice and mannerisms
  - Coach pt.'s respirations with breathing "in through the nose and out from the mouth"

Respiratory Distress

Circulation

Pulse

- Location – gives you an estimate of the BP
  - Radial
    - Radial pulse cannot be felt: <80 mm Hg systolic BP
  - Carotid
    - Carotid pulse cannot be felt: <60 mm Hg systolic BP
- Rate (per min.)
  - < 60 = Bradycardia (normal, heart block, MI, Pharmacopeia)
  - > 100 = Tachycardia (exercise, emotion, pain, fever/infection, blood loss, pharmacopeia)
- Rhythm
  - Regular(normal) or Irregular(arrhythmia)
- Strength
  - Bounding(high BP), Regular, Thready(low BP), Absent

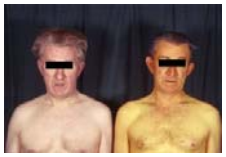
Blood Pressure

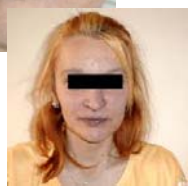
- Acute Hypotension
  - Symptomatic patient with a systolic BP < 100 mm Hg (blood loss, poor cardiac output, metabolic imbalance) – weak, dizzy, lightheaded.
- Acute Hypertension
  - Symptomatic patient with a systolic BP > 210 mm Hg or a Diastolic of > 120 mm Hg (Malignant HTN) – < 20% 1 year survival rate without Tx

Skin

- Temperature – assessed by touch
  - Hot, Warm (normal), cold
- Color
  - Red, Flushed, Jaundiced, Pink(normal), Cyanotic, pale
- Moisture
  - Dry, normal, moist (diaphoretic)
- Capillary Refill time
  - Can be used to evaluate Circulation when assessing ABCs.
  - Blanch skin with skin pressure. When pressure is released color return within 2 seconds indicates normal perfusion.

Abnormal Skin Colors





Common Chief Complaints

- Allergic reactions / Anaphylaxis
- Altered mental status (AMS)
- Breathing difficulty
- Diabetic emergencies
- Stroke
- Seizures
- Chest pain
- Cardiac Arrest

ALLERGIES/ANAPHYLAXIS
-
SEIZURES
-
CARDIAC ARREST

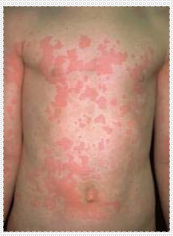
ALLERGIES/ANAPHYLAXIS

Allergies/Anaphylaxis

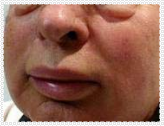
****Anaphylaxis - A severe type of allergic reaction that involves two or more body systems (e.g. Urticaria and difficulty breathing)*

- S/Sx
  - Diffuse or focal Pruritus (Itching)
  - Urticaria (Hives)
  - Angioedema (Dermal and subdermal swelling)
  - Nausea/Vomiting
  - Abdominal Cramps/Diarrhea
  - Anxiety
  - Shortness of breath/Bronchospasms
  - Dizziness/Hypotension
  - Tightening airway/facial and laryngeal edema

Urticaria



Angioedema



Allergies/Anaphylaxis

- Tx profile depends on timing, severity and location of the reaction
- Local reactions tend to be more mild compared with diffuse reactions
- Mild Cutaneous reaction (Pruritis, Urticaria, slight Angioedema)
  - Occurs > 1 hour after allergy exposure
  - Usually Mild
  - Tx with OTC topical or oral antihistamines

Allergies/Anaphylaxis

- Rapid Cutaneous reactions (Pruritis, Urticaria, slight Angioedema)
  - Occur 20 minutes - 1 hour of allergy exposure
  - Monitor closely for increasing severity
  - Oral antihistamines may be helpful in Sx alleviation.
  - Follow up with the patient's primary care physician may be appropriate

Allergies/Anaphylaxis

- Severe histamine related reactions and anaphylaxis
  - Occur in 5 – 10 minutes of allergy exposure
  - Cause bronchiolar constriction (wheezing), increased capillary permeability, and vasodilatation without airway compromise
    - "chest feels tight" "hard to get air in"
  - 911
  - Position of comfort and 100% oxygen administration
  - Consider Administering 0.3mg of Epinephrine 1:1000 IM with an adult Epipen Autoinjector (>30 Kg) or Epipen Jr. autoinjector (15-30 Kg)

Allergies/Anaphylaxis

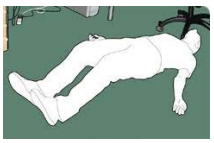
- Respiratory distress with airway edema or hypotension with a systolic BP < 90.
  - Position patient on supine, if tolerated, if systolic BP is < 90.
    - Will not be tolerated with frank respiratory distress
  - 100% Oxygen administration
  - Administer 0.3mg of Epinephrine 1:1000 IM with an adult Epipen Autoinjector (>30 Kg) or Epipen Jr. autoinjector (15-30 Kg)
  - Consider injectable Dyphenhydramine
  - Repeat vital signs
  - If no improvement is seen in 3-5 minutes one repeat dose of epinephrine may be given.

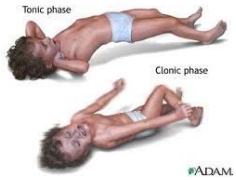
SEIZURE ACTIVITY - VASOVAGAL SYNCOPE

Seizures

- Three seizure types are:
  - Generalized (Epileptic)
    - A Generalized seizure presents, sometimes following a vague warning, as a loss of consciousness with tonic clonic movement .
    - The patient may bite their tongue and often are **incontinent of urine** or feces.
    - This may last from a few seconds to several minutes
    - This type of seizure is usually followed by a post ictal phase characterized by drowsiness, confusion, or coma lasting from minutes to an hour.

Generalized seizures





Seizures

- Partial Seizures
  - Simple or complex
    - Simple partial seizures are focal seizures without impairment of consciousness.
    - Complex partial seizures are seizures with an impairment of consciousness.
- Unclassified Seizures
  - Present as seizures that do not fit into on of the above categories.

Seizures

- Tx
  - 911 as indicated
  - During the seizure clear the area around the patient so they do not injure themselves during the tonic clonic phase. Protect the head and neck. DO NOT attempt to place a bite stick or other device, in the patient's mouth, during the tonic clonic phase.
  - Monitor the patient's level of consciousness and ABCs post seizure.
  - While the patient is unconscious, post seizure, place in the "recovery position".
  - Assess the patient's CBG
  - Place appropriate 100% oxygen administration device in accordance with the presenting oxygen saturations.
  - Reassess vitals

Post Seizure positioning

Vasovagal Syncope

Vasovagal Syncope

- Vasovagal Syncope, known as fainting, may likely occur in the office setting. It often occurs, in highly anxious patients, as a response to certain office procedures such as eye drop administration or Goldmann tonometry.
  - Tingling extremities, dizziness, dropping BP
  - Diaphoresis, skin pallor, and eyes may roll upward with pupil dilation and a loss of consciousness.
  - Myoclonic jerks, which quickly resolve, may be seen.
    - Do not misdiagnose these movements as seizures
  - Vasovagal syncope WILL NOT cause incontinence!

Vasovagal Syncope

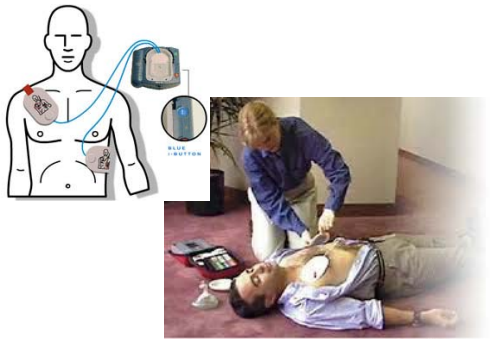
- Tx
  - Perform emergent evaluation
  - Immediate recumbent recovery, with Vasovagal syncope, will be seen.
  - If Coma does not resolve.
    - Call 911 and assess ABCs.
    - Position the patient supine
    - Place appropriate 100% oxygen administration device in accordance with the presenting oxygen saturations.
    - Check patients CBG
    - Reassess vital signs

CARDIAC ARREST

Cardiac Arrest

- Follow the AHA guidelines
- 75% of all cardiac arrests are caused by either Ventricular Fibrillation or Pulseless Ventricular Tachycardia
  - These arrhythmias are readily treated with IMMEDIATE defibrillation
  - Defibrillation is used to convert these arrhythmias to a life supporting rhythm
- AHA studies show that immediate CPR and defibrillation within 3-5 minutes can achieve 48-74% survival for adults with sudden witnessed VF cardiac arrest.
- PLEASE have a defibrillator in your office.

CPR and the AED



Recommended Medical evaluation equipment and pharmacopeia

****Need is governed by available resources*

- Anaphylaxis treatment
- Automated External Defibrillator
- Testing/Monitoring equipment
- Oxygen and oxygen administration

Anaphylaxis Tx Supplies

EPINEPHRINE

Used to treat Anaphylaxis

Injectable
Prescription only

- Administer 0.3mg of Epinephrine 1:1000 IM with an adult Epipen Autoinjector (>30 Kg) or Epipen Jr. autoinjector (15-30 Kg)
- Pediatrics < 15 Kg 0.01 mg/kg/dose

DIPHENHYDRAMINE HCL

Used to treat severe allergies and Anaphylaxis

Oral and Liquid
- OTC
- Follow manufacture recommended dosages

Injectable
- Prescription required
- 1.0mg/kg to a maximum of 50mg IM

Sharps Containment

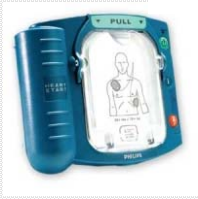
Cardiac Arrest Tx Supplies

Barrier Devices

- Gloves
- Pocket Mask or BVM
- Scissors/Trauma shears
- Drying towel

AUTOMATED EXTERNAL DEFIBRILLATOR

- The Defibrillators are either fully automated or guide the operator with voice prompts.
- For every minute defibrillation is delayed, in VF and pulseless VT, patient survival decreases 10%
- AED may require a prescription



Testing/Monitoring Equipment

BLOOD PRESSURE MONITORS

Manual and automatic BP cuffs are available.

Most Automated BP systems also evaluate the pulse rate

GLUCOMETER

Measures Capillary Blood Glucose (CBG) levels from a small blood sample.

Acute Low CBG level:
< 60 mg%

Acute High CBG level:
> 250 mg%

Your office may need a CLIA (Clinical Laboratory Improvement Amendments***) waiver to perform and bill for the procedure.

OXYGEN SATURATION(SAO2) MONITOR

SaO2 uses light technology to evaluate hemoglobin saturation. It cannot determine what is binding with the hemoglobin.

Normal SaO2 Levels:
96% - 100%
(consider nasal cannula)

Mildly decreased SaO2 levels:
91% - 95%
(nasal cannula)

Levels indicating Resp. failure:
<91%
(mask)

Oxygen and Oxygen Administration

OXYGEN

- 100% Oxygen
- Used to treat generally all medical emergencies
- Does not require an Rx
- Life-threatening medical emergencies are usually accompanied by low tissue oxygen levels (not enough oxygen to tissue and organs).
- All patients suffering from a medical emergency will benefit from supplemental oxygen

OXYGEN ADMINISTRATION

Nasal Cannula
1-6 LPM 24% - 44%

Mask
6 – 15 LPM 35% - 55%

Bag Valve Mask (BVM)
12 – 15 LPM > 90%

The Patient Transfer

PUTTING IT TOGETHER

The efficient patient transfer

- Introduce yourself to the Emergency responders
- Introduce the patient by name and age
- State a brief but direct Chief Complaint
- Describe the pt.'s LOC and ABCs
- Describe vital signs taken
- Further description of Chief Complaint
- Mitigation actions and patient reactions to therapy

An Example

- "Hi, my name is Tad Buckingham, Optometric Physician. This is my patient John Doe. John is 55 years old and has a chief complaint of new onset left sided weakness. John is alert and oriented ¾. He is confused about his current location. John's ABCs are all intact. His Blood pressure is 208/110 with a pulse that is strong and regular at 110. His respiratory rate is at 24min. with room air SaO2 of 90. John's skin is sweaty. His left side is weak and he is slurring his speech. John also reports a severe headache. I had him placed in a position of comfort with supplemental oxygen at 10 lpm. His SaO2 rebounded to 98% and he had a CBG of 112. Here is his copied "face sheet." Do you have any questions?

After the Medical Emergency

- Optometric Physicians/Staff members may experience short or extended duration emotional trauma depending on the type of medical incident. Talk with your staff!
  - Was the Medical emergency involving:
    - A patient?
    - A patient's family member or RP?
    - A Walk-in?
    - A Staff member?
    - The Optometric Physician?
- Contact your local Fire Department for resources that will help resolve these issues.

Questions?

Capt. Tad Buckingham, OD EMT-P
sightseeing@comcast.net
(503) 459-9247

UPCOMING EVENTS

Tulalip CE

Sunday, Sept 20, 2015
Tulalip Resort Casino,
Tulalip, Washington
6 hours, $250
Dina Erickson & Beth Kinoshita

Homecoming CE

Jefferson Hall, Pacific University
Saturday, October 3, 2015
6 hours, $100 (special homecoming rate)

GLAUCOMA SYMPOSIUM

Saturday, January 9, 2016
Willows Lodge, Woodinville, Washington
7 hours with Howard Barnebey & Murray Fingeret
For more information contact FREDERIM@pacificu.edu

2016 ISLAND EYES CONFERENCE

January 17 - 23, 2016
Sheraton Maui Resort
Up to 29 hours of OD Education $700 - $800
Nate Lighthizer, Leo Skorin, Denise Goodwin, Stanley Teplick, and featured speakers from Waterloo Class of 1994

Coeur d'Alene CE

April 29 & 30, 2016
The Coeur d'Alene Resort, Idaho
10 hours $350

2016 VICTORIA CONFERENCE

July 21 – 24, 2016
Delta Ocean Pointe, Victoria, BC
20 hours of education $450 - $550

For more conference Information contact: JEANNE@pacificu.edu