STATE BOARD OF OPTOMETRY
2450 DEL PASO ROAD, SUITE 105, SACRAMENTO, CA 95834
P (916) 575-7170 F (916) 575-7292 www.optometry .ca.gov

Continuing Education Course Approval Checklist

Title: Drops, Drops, Drops

Provider Name: USC Roski Eye Institute c/o Ms. Marithel Tesoro

☑Completed Application
Open to all Optometrists? ☑Yes ☐No
Maintain Record Agreement? ☑Yes ☐No

☑Correct Application Fee

☑Detailed Course Summary

☑Detailed Course Outline

☑PowerPoint and/or other Presentation Materials

☐Advertising (optional)

☑CV for EACH Course Instructor

☑License Verification for Each Course Instructor
Disciplinary History? ☐Yes ☑No

CALIFORNIA STATE BOARD OF OPTOMETRY

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CONTINUING EDUCATION COURSE APPROVAL APPLICATION

$50 Mandatory Fee

Pursuant to California Code of Regulations (CCR) § 1536, the Board will approve continuing education (CE) courses after receiving the applicable fee, the requested information below and it has been determined that the course meets criteria specified in CCR § 1536(g).

In addition to the information requested below, please attach a copy of the course schedule, a detailed course outline and presentation materials (e.g., PowerPoint presentation). Applications must be submitted 45 days prior to the course presentation date.

Please type or print clearly.

Course Title	**Course Presentation Date**
Drops, Drops, Drops	02/13/2017

Course Provider Contact Information

Provider Name

Lina (First) Poyzner (Last) (Middle)

Provider Mailing Address

Street 1450 San Pablo St **City** Los Angeles **State** CA **Zip** 90033

Provider Email Address lina.poyzner@med.usc.edu

Will the proposed course be open to all California licensed optometrists?	☑ YES ☐ NO
Do you agree to maintain and furnish to the Board and/or attending licensee such records of course content and attendance as the Board requires, for a period of at least three years from the date of course presentation?	☑ YES ☐ NO

Course Instructor Information

Please provide the information below and attach the curriculum vitae for each instructor or lecturer involved in the course. If there are more instructors in the course, please provide the requested information on a separate sheet of paper.

Instructor Name

Alena (First) Reznik (Last) (Middle)

License Number 113775	**License Type** MD
Phone Number (323) 442-6383	**Email Address** lina.poyzner@med.usc.edu

I declare under penalty of perjury under the laws of the State of California that all the information submitted on this form and on any accompanying attachments submitted is true and correct.

Signature of Course Provider 02/01/2017 *Date*

Glaucoma Medication Lecture: Drops, drops, drops…

Alena Reznik, MD

Summary

The goal of the lecture is to review 4 established medication classes for glaucoma treatment- beta blockers, alpha agonists, prostaglandin analogues and carbonic anhydrase inhibitors. I will review indications, strength, brand/generic formulations and side effects for each class. I will outline my approach to chosing an appropriate medication for each patient and reason behind escalating therapy and using combination formulations. I will also review an emerging class of Rho-kinase inhibitors and their application to glaucoma treatment. To conclude the lecture I will present two glaucoma patients and will go through their proposed medical treatment plan.

Outline for lecture: Drops, drops, drops. Medical Therapy in Glaucoma – 1 hour lecture

February 13, 2017 6pm – 7pm

Alena Reznik MD

1. Beta Blockers

•**Betaxolol** (Betoptic, Lokren, Kerlone)

•**Metipranolol** (OptiPranolol, Betanol, Disorat, Trimepranol)

•**Timolol** (Betimol, Blocadren, Istalol, Timoptic, Timoptic-XE, Timoptic OcuDose)

•**Carteolol** (Cartrol, Ocupress, Teoptic, Arteolol, Arteoptic, Calte, Carteabak, Carteol, Cartrol, Elebloc, Endak, Glauteolol, Mikelan, Poenglaucol, Singlauc)

•**Levobunolol** (AK-Beta, Liquifilm, Betegan)

•Concentrations & Dosing

•**Betaxolol** - 0.5% and 0.25%, BID

•**Metipranolol** - 0.1% and 0.3%, BID

•**Timolol** - 0.5% and 0.25% (solution or gel), BID or Daily gel

•**Carteolol** - 2%, BID

•**Levobunolol** - 0.25% and 0.5%, BID

•Mechanism of action

•Decrease aqueous production

•Inhibit cAMP production in ciliary epithelium

•Onset of action within 1 hour

•Slightly addictive effect of beta agonists and beta antagonists

•Systemic absorption, untreated eye IOP-lowering

•Nonselective: metipranolol, timolol, carteolol, levobunolol

•Selective B1 antagonist: betaxolol

•Efficacy

•Reduce aqueous humor secretion 20-50% (2.5 µL/min to 1.0 µL/min)

•Corresponding IOP reduction of 20-30%

•Onset of action within 1 hour

•May persist up to 4 weeks after stopping

•Decrease aqueous production more in day, less in sleep

•10-20% of patients fail to respond

•Efficacy dampened in patients taking systemic β-blocker

•Extended use reduced effect (long-term drift)

•Side effects

•**Ocular**

–Blurring

–Irritation

–Corneal anesthesia

–Punctate keratitis

–Allergy

–Possible aggravation of myasethenia gravis

•**Systemic**

–Increase LDL (carteolol least)

–Hypotension

–Bradycardia

–Heart block

–bronchospasm (betaxolol less)

–Decreased libido

–CNS depression

–Mood swings

–Reduced exercise tolerance

–Reduced glucose tolerance

2. Prostaglandins

•Brand names

–Xalatan - Latanoprost

–Lumigan - Bimatoprost

–Travatan -Travoprost

–Zioptan – Tafluprost

•Concentrations

–Xalatan (Generic) 0.005% (has benzalkonium)

–Lumigan (NO generic) 0.01% (has benzalkonium)

-Travatan (Generic) 0.004% (Travatan Z = benzalkonium free)

-Zioptan (NO generic) 0.0015% (preservative free)

•Dosing

–All qhs

•Prostaglandins

•Mechanism of Action

–Increasing uveoscleral outflow (although not exactly clear)

•Efficacy

–~30% IOP lowering.

•Indications

•Contra-indications

–No true CI's

•Prostaglandin Side Effects

•Increased melanosomes (NOT melanocytes)

–Permanent change

–Frequency depends on eye color at baseline

–Up to 33% at 5 years

–79% of green-browne irides and 85% hazel vs. 8% blue irides

•Hypertrichosis, Trichiasis, Distichiasis

•HSV exacerbations + CME + Uveitis – debatable. Avoid if present at baseline.

•Conjunctival injection

•Hyperemia – more common w bimatoprost and travoprost

•Prostaglandin Notes

•Latanoprost/Travoprost = prodrugs.

–Become active after **corneal esterase** hydrolize drugs

•BID dosing = **LESS** effective

•Some patients respond better to one drug than another in the SAME class

•Peak effect 10-14 hours post administration.

3. Carbonic Anhydrase Inhibitors

•Brand names

•Chemical names

•Concentrations

•Dosing

•Mechanism of Action

–Decrease aqueous

•Efficacy

–15% reduction in IOP

•Acetazolamide

–Diamox

•250mg PO QD – QID

–Diamox Sequels

•500mg PO QDAY / BID

•Methazolamide

–Neptazene

•50-100mg PO BID/TID

•Dichlorphenamide

–Daranide

•50mg PO TID

•Dorzolamide

–Trusopt

•2% BID

•Brinzolamide

–Azopt

•1% BID

•Carbonic Anhydrase Inhibitors

•Acetazolamide

•Indications

•Contra-indications

•Side-effects

•Indicated when MMT is not providing adequate IOP reduction

•Contraindicated in those with sulfa allergy

•Side Effects

–Hypokalemia

–Metabolic acidosis

–Kidney stones

–Depression

–Diarrhea

–Numbness / tingling (hands / feet / lips)

–Flat tasting soda (metallic)

–RARE: Aplastic anemia

•Methazolamide

•Indications

•Contra-indications

•Side-effects

•Indicated when MMT is not providing adequate IOP reduction

•Better tolerated in those with sulfa allergies

•Side effects similar to Acetazolamide except no metabolic acidosis

•Dorzolamide (Trusopt)

•Indications

•Contra-indications

•Side-effects

•IOP lowering medication

•Side Effects:

–Sting / burn/ itch

–Bitter taste

–SJS (sulfa)

–Corneal edema

•More acidic and more irritating

•Preservative free formulation available

•Brinzolamide (Azopt)

•Indications

•Contra-indications

•Side-effects

•IOP lowering medication

•Side Effects:

–Sting / burn/ itch

–Bitter taste

–SJS (sulfa)

–Corneal edema

•Less acidic and better tolerated

4. ALPHA AGONISTS

Selective (Alpha-2 Agonist)

•Clonidine

•Apraclonidine (Iopidine)

–0.5%, 1%

•Brimonidine (Alphagan)

–0.1%, 0.15%, 0.2%

Combo drugs

•Simbrinza: Brimonidine/Brinzolamide

•Combigan:
Brimonidine/Timolol

•Mechanism

Central vs Peripheral

•Mechanism?

1. Decreased aqueous production (additive with BB)

•G-protein-coupled receptor → ↓adenylate cyclase activity → ↓cAMP → production

2. Increased uveoscleral outflow

•Increased PGA release from alpha-adrenergic stimulation

•Efficacy and Dosing

25% (2 hours postdose) to 15% (trough 12 hours postdose) IOP reduction

TID (as monoagent) = BID (as adjunctive agent)

Equivalent to CAI and BB when used with PGA

http://www.ncbi.nlm.nih.gov/pubmed/20625041

Tachyphylaxis

Apraclonidine > Brimonidine

•Side effects

Conjunctivitis (follicular)

-Most common ocular side effect

-Apraclonidine (~40%) > brimonidine 0.2% (~15%) > brimonidine Purite (10%>)

•Side effects

Mydriasis / Miosis

-Peripheral Alpha-2 constricts pupils

-Alpha-1 and Central Alpha-2 dilate pupils

•Side effects

Lid retraction

-Alpha-1 effect (weak)

•Side effects

Dry eye / Dry mouth

-Most common systemic side effect

•Side effects

Respiratory depression

-Crosses BBB in neonates and infants (up to 5 years old)

-Decrease in sympathetic tone

•Side effects

Hypotension

-Decrease in sympathetic tone

-Clonidine > Apraclonidine >>>> Brimonidine

5. Miotics

•Brand names

•Chemical names

•Concentrations

•Dosing

•Mechanism of Action

•Efficacy

•Brand Names and

•Chemical Names

•Mechanism of Action:

•Efficacy

•Lowers IOP by 20-30%. Additive effect with BB, adrenergic agents, and CAIs.

•Melanin-bound, so higher doses necessary in pots with darkly pigmented irides.

•Although miotics lower IOP effectively, clinical use is limited by local ocular tolerance.

•Indirect muscarinic agonists are longer-lasting and more potent than direct agonists

•Direct + indirect acting muscarinic agonists = less effect than either alone

•Indications

•Elevated IOP

•Additional uses:

•Pilocarpine: 0.12% for Adie's

•Carbachol: induce miosis after IOL implantation; (systemic uses include stimulation of bladder emptying)

•Echothiophate: accommodative esotropia

•Physostigmine: crab louse infection of eyelashes; (systemic uses include Alzheimer's, delayed gastric emptying, orthostatic hypotension, myasthenia)

•Contraindications

•Ocular:

•Uveitic glaucoma (any significant ocular inflammation)

•Neovascular glaucoma

•Retinal breaks, RD

•PSC

•Pilo 4% (long-acting cholinesterase inhibitors) contraindicated in acute angle closure; can rotate CB forward and close the angle

•Aphakia, pre-presbyopia, concurrent use of prostaglandin analogs (relative contraindications)

•Systemic:

•Asthma

•Coronary insufficiency

•Gastroduodenal ulcers

•Incontinence

•Ester anesthetic (procaine) and succinylcholine use - increased potency and duration of action

•Side Effects

•Ocular:

•Brow ache

•Induced myopia /accommodative spasm (induced accommodation / move lens forward) - desirable in accommodative ET

•Cataractogenesis (anterior subcapsular)

•Inability to dark adapt

•Iris cyst formation

•Follicular conjunctivitis, allergic blepharoconjunctivitis, conjunctival injection

•Lid myokymia

•Retinal detachment

•Systemic: (rare)

•Excessive salivation

•Dyspepsia

•Diaphoresis

•Bronchial mucus secretion

•Bronchospasm

•Bradycarida

•Vasodilation

•Nausea/Vomiting (physostigmine), Diarrhea

•Seizures (physostigmine)

•Osmotics

•Glycerol (Osmoglyn) 50% solution 1 g/kg PO

•Mannitol (Osmitrol) 10% 1-1.5 g/kg at 3-5 mL/min

•Urea (Ureaphil) 30% 2-7 mL/kg

•Isosorbide (Ismotic) 45% 1.5-2 g/kg

•Mechanism of Action

•Increases blood osmolality → osmotic gradient → draws water from vitreous to blood

•Efficacy

•More the better

•Transient results

•Careful of rebound elevation

•Indications

•Acute IOP

•Peri-op IOP

•Critically shallow AC

•Contra-indications

•Renal failure

•CHF

•Side-effects

•Headache, confusion

•CHF, MI

•Hyperglycemia

•Extravasation of infusion

Drops, drops, drops

Alena Reznik MD
Assistant Professor of Ophthalmology
Glaucoma Service
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Financial Disclosure

- None

- No $ from Alcon, AMO, Novartis, Allergan, Glaukos, Pfizer, Bausch/Lomb, Merck, Regeneron, and so forth and so on….

Who we are

- Glaucoma service

- Beverly Hills (Wilshire/Doheny)
- Pasadena (Fair Oaks)
- Arcadia
- Downtown LA (Keck)

Emergency referral line : 323-442-EYES

USC Eye Institute

Outline

- When to treat and how to treat?

- Major groups: chemical structure and pharmacological action
- Brand names/generic names
- Side effects
- Step wise approach in my practice

Ocular HTN Treatment Study

- GS vs early POAG
- Risk factors: higher IOP, CCT, age, larger C:D, family h/o
- Efficacy and safety of IOP lowering: 22.5% decrease in IOP -> 9.5% to 4.4% at 5 years

- Iphone app: Glaucoma calc ($1.99)

Target IOP

- Type of glaucoma: NVG vs congenital vs POAG vs CACG
- Focus on POAG/CACG in this lecture
- 20% from baseline
- Advanced-> aggressive
- Reassess: repeat HVF/OCT/frequent visits

Beta Blockers

- **Selective: Betaxolol** (Betoptic, Lokren, Kerlone)
- **Metipranolol** (OptiPranolol, Betanol, Disorat, Trimepranol)
- **Timolol** (Betimol, Blocadren, Istalol, Timoptic, Timoptic-XE, Timoptic OcuDose)
- **Carteolol** (Cartrol, Ocupress, Teoptic, Arteolol, Arteoptic, Calte, Carteabak, Carteol, Cartrol, Elebloc, Endak, Glauteolol, Mikelan, Poenglaucol, Singlauc)
- **Levobunolol** (AK-Beta, Liquifilm, Betegan)

Concentrations & Dosing

- **Betaxolol** - 0.5% and 0.25%, BID
- **Metipranolol** - 0.1% and 0.3%, BID
- **Timolol** - 0.5% and 0.25% (solution or gel), BID or Daily gel
- **Carteolol** - 2%, BID
- **Levobunolol** - 0.25% and 0.5%, BID

Mechanism of action

- Inhibit cAMP production in ciliary epithelium-> Decrease aqueous production
- Onset of action within 1 hour, lasts up to 4 weeks
- Systemic absorption, untreated eye IOP-lowering
- Qday vs BID dosing, additive effect with others

- Nonselective B1+B2: metipranolol, timolol, carteolol, levobunolol
- Selective B1 antagonist: betaxolol

Efficacy

- Reduce aqueous humor secretion 20-50% (2.5 µL/min to 1.0 µL/min)
- Corresponding IOP reduction of 20-30%
- Decrease aqueous production more in day, less in sleep
- 10-20% of patients fail to respond
- Efficacy dampened in patients taking systemic β-blocker
- Extended use reduced effect (long-term drift)

Side effects

- **Ocular**
  - Blurring
  - Irritation
  - Corneal anesthesia
  - Punctate keratitis
  - Allergy
  - Possible aggravation of myasthenia gravis
- **Systemic**
  - Increase LDL (carteolol least)
  - Hypotension
  - Bradycardia
  - Heart block
  - bronchospasm (betaxolol less)
  - Decreased libido
  - CNS depression
  - Mood swings
  - Reduced exercise tolerance
  - Reduced glucose tolerance

Prostaglandins

- Brand names
  - Xalatan - Latanoprost
  - Lumigan - Bimatoprost
  - Travatan -Travoprost
  - Zioptan – Tafluprost
- Concentrations
  - Xalatan (Generic) 0.005% (has benzalkonium)
  - Lumigan (NO generic) 0.01% (has benzalkonium)
  - Travatan (Generic) 0.004% (Travatan Z = benzalkonium free)
  - Zioptan (NO generic) 0.0015% (preservative free)
- Dosing
  - All qhs

Prostaglandins

- Mechanism of Action
  - Increasing uveoscleral outflow (although not exactly clear)
- Efficacy
  - ~30% IOP lowering.
- Indications
  - Ummm…glaucoma….
- Contra-indications
  - No true CI's
  - Personal: actors/actresses

Prostaglandin Side Effects

- Increased melanosomes (NOT melanocytes)
  - Permanent change
  - Frequency depends on eye color at baseline
  - Up to 33% at 5 years
  - 79% of green-browne irides and 85% hazel vs. 8% blue irides
- Hypertrichosis, Trichiasis, Distichiasis
- HSV exacerbations + CME + Uveitis – debatable. Avoid if present at baseline.
- Conjunctival injection
- Hyperemia – more common w bimatoprost and travoprost

Prostaglandin Notes

- Latanoprost/Travoprost = prodrugs.
  - Become active after **corneal esterase** hydrolize drugs
- BID dosing = **LESS** effective
- Some patients respond better to one drug than another in the SAME class
- Peak effect 10-14 hours post administration.

Carbonic Anhydrase Inhibitors

Carbonic Anhydrase Inhibitors

- Brand names
- Chemical names
- Concentrations
- Dosing

- Mechanism of Action
  - Decrease aqueous
- Efficacy
  - 15% reduction in IOP
  - Onset 2-3 hours
  - Washout 2-3 days

- Acetazolamide
  - Diamox
    - 250mg PO QD – QID
  - Diamox Sequels
    - 500mg PO QDAY / BID
- Methazolamide
  - Neptazene
    - 50-100mg PO BID/TID
- Dichlorphenamide
  - Daranide
    - 50mg PO TID
- Dorzolamide
  - Trusopt
    - 2% BID
- Brinzolamide
  - Azopt
    - 1% BID

Dorzolamide (Trusopt)

- Indications
- Contra-indications
- Side-effects

- IOP lowering medication
- Side Effects:
  - Sting / burn/ itch
  - Bitter taste
  - SJS (sulfa)
  - Corneal edema
- More acidic and more irritating
- Preservative free formulation available

Brinzolamide (Azopt)

- Indications
- Contra-indications
- Side-effects

- IOP lowering medication
- Side Effects:
  - Sting / burn/ itch
  - Bitter taste
  - SJS (sulfa)
  - Corneal edema
- Less acidic and better tolerated

Acetazolamide

- Indications
- Contra-indications
- Side-effects

- Indicated when MMT is not providing adequate IOP reduction
- Contraindicated in those with sulfa allergy
- Side Effects
  - Hypokalemia
  - Metabolic acidosis
  - Kidney stones
  - Depression
  - Diarrhea
  - Numbness / tingling (hands / feet / lips)
  - Flat tasting soda (metallic)
  - RARE: Aplastic anemia

Methazolamide

- Indications
- Contra-indications
- Side-effects

- Indicated when MMT is not providing adequate IOP reduction
- Better tolerated in those with sulfa allergies
- Side effects similar to Acetazolamide except no metabolic acidosis

ALPHA-2 AGONISTS-selective

Selective (Alpha-2 Agonist)

- Clonidine
- Apraclonidine (Iopidine)
  - 0.5%, 1%
- Brimonidine (Alphagan)
  - 0.1%, 0.15%, 0.2%

Combo drugs

- Simbrinza: Brimonidine/Brinzolamide
- Combigan: Brimonidine/Timolol

USC Eye Institute
Children's Hospital Los Angeles
We Treat Kids Better
LAC+USC Healthcare Network

Mechanism

Central vs Peripheral

Clonidine

BBB

Mechanism?

1. Decreased aqueous production (additive with BB)

- G-protein-coupled receptor → ↓adenylate cyclase activity → ↓cAMP → production

2. Increased uveoscleral outflow

- Increased PGA release from alpha-adrenergic stimulation

Efficacy and Dosing

25% (2 hours postdose) to 15% (trough 12 hours postdose) IOP reduction

TID (as monoagent) = BID (as adjunctive agent)

Equivalent to CAI and BB when used with PGA

http://www.ncbi.nlm.nih.gov/pubmed/20625041

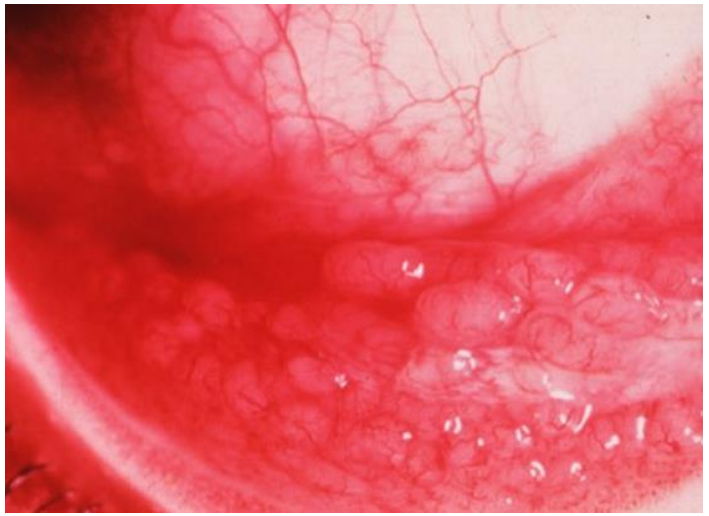
Tachyphylaxis

Apraclonidine > Brimonidine

Side effects

Conjunctivitis (follicular)

- Most common ocular side effect
- Apraclonidine (~40%) > brimonidine 0.2% (~15%) > brimonidine Purite (10%>)



Side effects

Mydriasis / Miosis

- Peripheral Alpha-2 constricts pupils
- Alpha-1 and Central Alpha-2 dilate pupils

Side effects

Lid retraction

- Alpha-1 effect (weak)

Side effects

Dry eye / Dry mouth

- Most common systemic side effect

Side effects

Respiratory depression

- Crosses BBB in neonates and infants (up to 5 years old)
- Decrease in sympathetic tone

Alpha Agonists cause ApneA

Side effects

Hypotension

- Decrease in sympathetic tone
- Clonidine > Apraclonidine >>>> Brimonidine

Miotics

- Brand names
- Chemical names
- Concentrations
- Dosing
- Mechanism of Action
- Efficacy

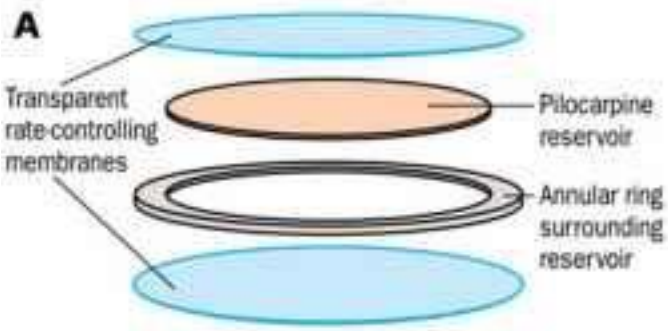
- Indications
- Contra-indications
  - Ocular
  - Systemic
- Side-effects
  - Ocular
  - Systemic

Miotics


NDC 17478-223-12
Pilocarpine Hydrochloride Ophthalmic Solution, USP
1%
15 mL
Sterile
℞ only
Akorn


Alcon
Isopto® Carbachol 3%
(carbachol ophthalmic solution)
15 mL Sterile


STERILE DILUENT FOR PREPARING
PHOSPHOLINE IODIDE®
(echothiophate iodide for ophthalmic solution)
EYEDROPS
5 mL (1/6 fl oz)
PHOSPHOLINE IODIDE®


A
Transparent rate-controlling membranes
Pilocarpine reservoir
Annular ring surrounding reservoir

Brand Names and Chemical Names

Cholinergics	***Pilocarpine***	Ocusert Pilo-40 Adsorbocarpine, Akarpine, Almocarpine, Isopto Carpine, Miocarpine, Pilagan, Pilocar, Pilocel, Pilagan, Pilomiotin, Piloptic, Pilostat	**20, 40 mcg** ***0.12, 1, 2, 3, 4, 6***	q 5-7 days ***QID***
	Carbachol	Carbastat, Carboptic, Isopto Carbachol, Miochol (Ach 1%), Miostat Intraocular	***0.1%, 0.75, 1, 3, 5***	***TID or QID***
Anti-cholinesterases	***Echothiophate iodide***	Phospholine Iodide, Echodide	***0.03-0.25***	***BID***
	Physostigmine	Eserine sulfate, Isopto Eserine	***0.25, 0.5***	***QID***
	Demecarium bromide	Humorsol Tosmilen (Bulgaria, Japan)	***0.03-0.25***	***QD or QOD***
	Di isopropyl fluorophosphate (DFP)	Floropryl	***0.01-0.1***	***1 instillation (lasts 15 d)***

Mechanism of Action:

Carbachol *(muscarinic + nicotinic agonist)*	***Direct Acting Muscarinic Agonists***	• ***Iris sphincter muscle contracts (miosis)*** • ***Longitudinal ciliary muscle contracts (pulls on scleral spur and opens trabecular meshwork)*** • ***Circular ciliary muscle contracts (accommodation)*** • ***Moves the lens diaphragm forward***
Pilocarpine *(non-specific muscarinic M3 agonist)*		
Echothiophate iodide (irreversible)	***Indirect Acting Muscarinic Agonists*** *[*	
Di isopropyl fluorophosphate (DFP) (irreversible)		
Physostigmine (reversible)		
Demecarium bromide (reversible)		

Efficacy

- Lowers IOP by 20-30%. Additive effect with BB, adrenergic agents, and CAIs.
- Melanin-bound, so higher doses necessary in pts with darkly pigmented irides.
- Although miotics lower IOP effectively, clinical use is limited by local ocular tolerance.
- Indirect muscarinic agonists are longer-lasting and more potent than direct agonists
- Direct + indirect acting muscarinic agonists = less effect than either alone

Indications

- Elevated IOP
- Additional uses:
  - Pilocarpine: 0.12% for Adie's
  - Carbachol: induce miosis after IOL implantation; (systemic uses include stimulation of bladder emptying)
  - Echothiophate: accommodative esotropia
  - Physostigmine: crab louse infection of eyelashes; (systemic uses include Alzheimer's, delayed gastric emptying, orthostatic hypotension, myasthenia)

Contraindications

- Ocular:
  - Uveitic glaucoma (any significant ocular inflammation)
  - Neovascular glaucoma
  - Retinal breaks, RD
  - PSC
  - Pilo 4% (long-acting cholinesterase inhibitors) contraindicated in acute angle closure; can rotate CB forward and close the angle
  - Aphakia, pre-presbyopia, concurrent use of prostaglandin analogs (relative contraindications)
- Systemic:
  - Asthma
  - Coronary insufficiency
  - Gastroduodenal ulcers
  - Incontinence
  - Ester anesthetic (procaine) and succinylcholine use - increased potency and duration of action

Side Effects

- Ocular:
  - Brow ache
  - Induced myopia /accommodative spasm (induced accommodation / move lens forward) - desirable in accommodative ET
  - Cataractogenesis (anterior subcapsular)
  - Inability to dark adapt
  - Iris cyst formation
  - Follicular conjunctivitis, allergic blepharoconjunctivitis, conjunctival injection
  - Lid myokymia
  - Retinal detachment
- Systemic: (rare)
  - Excessive salivation
  - Dyspepsia
  - Diaphoresis
  - Bronchial mucus secretion
  - Bronchospasm
  - Bradycarida
  - Vasodilation
  - Nausea/Vomiting (physostigmine), Diarrhea
  - Seizures (physostigmine)

Osmotics

- Glycerol (Osmoglyn) 50% solution 1 g/kg PO
- Mannitol (Osmitrol) 10% 1-1.5 g/kg at 3-5 mL/min
- Urea (Ureaphil) 30% 2-7 mL/kg
- Isosorbide (Ismotic) 45% 1.5-2 g/kg

Mechanism of Action

- Increases blood osmolality → osmotic gradient → draws water from vitreous to blood

Efficacy

- More the better
- Transient results
- Careful of rebound elevation

Indications

- Acute IOP
- Peri-op IOP
- Critically shallow AC

Contra-indications

- Renal failure
- CHF

Side-effects

- Headache, confusion
- CHF, MI
- Hyperglycemia
- Extravasation of infusion

My approach

- Beta blocker
- PGA
- SLT/ALT
- CAI
- Combination
- Alpha-2 agonists

- Surgery

Thank you!

- Dr. Rohit Varma
- Dr. Lernik Torossian

- Cell 310-980-6038
- alenarez@med.usc.edu
- Emergency referral line : 323-442-EYES

Vision is our Mission—Preserve, Protect, Restore

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Keck Medicine of USC

Nationally top ranked ophthalmology program — 22 consecutive years and counting!

J. Bradley Randleman, MD

Professor of Ophthalmology, Director, Cornea, External Disease, and Refractive Surgery Service

J. Bradley Randleman, MD is one of the nation's top corneal researchers and surgeons and an expert on everything from LASIK to the latest FDA approved treatments for corneal cross-linking surgery.

Alena Reznik, MD

Assistant Professor of Clinical Ophthalmology

Dr. Reznik specializes in early detection and treatment of glaucoma and cataracts as well as novel surgical techniques for advanced cases. Her research interests are minimally invasive glaucoma surgery and new approaches to eye emergencies. She is a principal investigator on clinical trials for glaucoma medications and surgical devices.

Damien C. Rodger, MD, PhD

Assistant Professor of Clinical Ophthalmology

Dr. Rodger's clinical interests include diabetic retinopathy, macular degeneration, medical retina, retinal detachment, uveitis and vitreoretinal surgery.He has conducted research on the design, fabrication, and testing of high-density microtechnologies for retinal and spinal cord prostheses, and has been instrumental in the development of other novel bioMEMS.

PLEASE JOIN US FOR

AN EDUCATIONAL EVENING WITH FRIENDS & NEIGHBORS

Private 2 Hour CME in Beverly Hills

Date: Monday, Februay 13, 2017
Time: 7:00pm
Location:
Maggiano's Little Italy at The Grove
189 The Grove Dr. Suite Z80
Los Angeles, CA 9036
RSVP: Lina Poyzner at
lina.poyzner@med.usc.edu

Program:

Glaucoma (Optic Nerve Cupping), presented by Dr. Reznik — 1 Hour

Retina (OCT Reading and OCT Enigmas), presented by Dr. Rodger — 30 min.

Cornea (Cross Linking), presented by Dr. Randleman — 30 min.

USC Roski Eye Institute • 323-442-6335 • www.usceye.org • Clinics conveniently located at:

Los Angeles Clinic
USC Roski Eye Institute
1450 San Pablo Street, 4th Floor
Los Angeles, CA 90033
323 442-6335

Beverly Hills Clinic
USC Roski Eye Institute
9033 Wilshire Boulevard, Suite 360
Beverly Hills, CA 90211
310-601 3366

Pasadena Clinic
USC Roski Eye Institute
625 S. Fair Oaks Avenue, Suite 400
Pasadena, CA 91105
626 796-0293

Arcadia Clinic
USC Roski Eye Institute
65 N. First Avenue, Suite 101
Arcadia, CA 91006
626 446 2122

CURRICULUM VITAE
ALENA REZNIK,MD
SEPTEMBER 19, 2016

PERSONAL INFORMATION:

Work

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Email: alena.reznik@med.usc.edu

EDUCATION AND PROFESSIONAL APPOINTMENTS

EDUCATION:

2005 *BS, Summa Cum Laude,Microbiology/Immunology/Molecular Genetics, UCLA, LA*
2009 *MD, Johns Hopkins University School Of Medicine, Baltimore*

POST-GRADUATE TRAINING:

2009-2010 *Internship in Internal Medicine, UC Davis Medical Center, Sacramento*

2010-2013 *Ophthalmology Residency, UC Davis Medical Center, Sacramento*

2013-2014 *Glaucoma Fellowship, Jules Stein Eye Institute, UCLA, LA*

HONORS, AWARDS:

2016	*Top Doctor 2016*	*Pasadena Magazine*
2016	*Rising Star 2016*	*Top Doctors*
2012	*ARVO Travel Grant*	*ARVO, Ft.Lauderdale, FL*
2007	*AFAR Research Fellow*	*Johns Hopkins Hospital, Baltimore, MD*
2008-2009	*The Roothbert Fund Fellow*	*Johns Hopkins Hosptal, Baltimore, MD*
2008-2009	*Marilyn and Marshall Butler Scholarship*	*Johns Hopkins Hospital, Baltimore, MD*
2007-2008	*William W.More, Ph.D. Memoria Scholarship[*	*Johns Hopkins Hospital, Baltimore, MD*
2007-2009	*HIAS Scholarship*	*NY*
2007-2009	*Ruth G White PEO Scholarship*	*Johns Hopkins Hospital, Baltimore, MD*
2007-2009	*Ethel O. Gardner PEOP Scholarship*	*Johns Hopkins Hospital, Baltimore, MD*
2007	*Travel Grant AGS*	*WA*

ACADEMIC APPOINTMENTS:

2014-current	*Assistant Professor of Ophthalmology*	*USC Eye Institute, USC, LA, CA*

TEACHING

DIDACTIC TEACHING:

Institution USC

2014	*Femtosecond Laser in Glaucoma Surgery*	*1Hr*	*Lecturer*
2015	*Novel Techniques in Glaucoma Surgery*	*2Hrs*	*Lecturer*
2015	*New Treatments in Advanced Glaucoma*	*2Hrs*	*Lecturer*
2015	*Glaucoma Curriculum (USC LAC Residency)*	*12Hrs*	*Lecturer*
10/2015	*Wet Lab "Minimally Invasive Glaucoma Surgery/Trabectome"*	*3Hrs*	*Lecturer*
11/2015	*Wet Lab "iStent and Angle Surgery"*	*3Hrs*	*Lecturer*
11/2015	*Wet Lab "Trabeculectomy"*	*2Hrs*	*Lecturer*
3/2016	*OKAP Review Lectures*	*4 Hrs*	*Lecturer*
3/2016	*Journal Club Glaucoma*	*2Hrs*	*Lecturer*

POSTGRADUATE MENTORSHIP:

2015-2016	*Benjamin Xu, MD, PhD*	*PGY4 2016*	*Career Guidance*
2014-2015	*Yohko Murakami, MD*	*PGY4 2015*	*Career Guidance*

SERVICE

DEPARTMENT SERVICE:

2014-current	*Complaince Committee*	*USC Eye Institute*
12/2015-current	*Residency Selection*	*USC Eye Institute*
07/2014-current	*Glaucoma Fellowship Selection*	*USC Eye Institute*
07/2014-current	*Postgraduate Education Committee*	*USC Eye Institute*

PROFESSIONAL SOCIETY MEMBERSHIPS:

2010-current	*American Academy of Ophthalmology*
2013-current	*American Glaucoma Society*
2010-current	*Women In Ophthalmology*
2010-current	*American Society of Cataract and Refractive Surgeons*

RESEARCH AND SCHOLARSHIP

EDITORSHIPS AND EDITORIAL BOARDS:

03/2015-current Editor Elsevier Editorial System

MAJOR AREAS OF RESEARCH INTEREST

Research Areas

1. Minimally Invassive Glaucoma Surgery
2. Novel Surgical Techniques in Glaucoma

PUBLICATIONS:

REFEREED JOURNAL ARTICLES:

Klimava, A, Akpek, E. Evaluation of Patients with Dry Eye Syndrome for Associated Medical Conditions. ARVO 2007. Lecture presentation, May 2007. Published in Cornea September 2010:29(9):1072.

Reznik J, Salz, J, **Klimava A**. Late Unilateral Corneal Ectasia After PRK With Preoperative Topography Suggestive of FFK. AAO Refractive Subspecialty Day, November 2006. Lecture presentation; Published in J Refract Surg. 2008 Oct;24(8):843-7.

Nagai N, **Klimava A**, Wen-Hsiang L, Handa J. CTGF is increased in Basal Deposits and Regulates Matrix Production through the ERK (p42/p44^{mapk}) MAPK and the p38^{mapk} signaling pathways. Published in Invest Ophthalmol Vis Sci. 2009 Apr;50(4):1903-10.

REFEREED JOURNAL ARTICLES IN PRESS:

Format: Authors, Title. *Journal.* Volume #(Suppl ##):Page-Page, Year. PMID#, PMCID#, *Narrative describing personal contribution.*

REFEREED REVIEWS, CHAPTERS, AND EDITORIALS:

Reznik, A, Varma, R. (12/2015). Ab-Interno Subconjunctival Glaucoma Implant for Advanced Open-Angle Glaucoma

CLINICAL COMMUNICATION: (CASE REPORTS, LETTERS)

Authors. Title. *Journal* Volume(Suppl ##):Page-Page, Year. PMID#, PMCID#

ON-LINE PUBLICATIONS:

Reznik A, Mukundum G, Sonu R, Lin L. Imaging in immunohistologically proven orbital tumors. Submitted for a publication in Radiographics, May 2012

BOOKS, MONOGRAPHS, AND TEXT BOOKS:

Authors. Title. *Publication* Volume(Suppl ##):Page-Page, Year.

LETTERS TO THE EDITOR:

Authors. Title. *Publication* Volume(Suppl ##):Page-Page, Year. PMID#, PMCID#

ABSTRACTS AND PRESENTATIONS:

Reznik A, Keltner J. Emergency department direct ophthalmoscopy and non-mydriatic funduscopic camera as a training tool. UC Davis research Symposium 2012. Lecture presentation.

Reznik A, Weber C, Telander D, Morse L, Thirkill C. Inflammatory reactions complicating exudative age-related macular degeneration. ARVO 2012. Poster presentation.

Akpek E, **Klimava A**, Thorne J, Martin D, Lekhanont K, Ostrovsky A. Evaluation of Dry Eye Patients for Presence of Underlying Sjogren's Syndrome. AAO 2007 meeting. Lecture presentation.

Gupta A, Sadeghi P, **Klimava A**, Akpek E. Occult thyroid eye disease in patients presenting with dry eye symptoms. Tear Film and Ocular Surface Society Annual Meeting, Taormina, Sicily, September 2007. Lecture presentation.

Reznik J, Salz, J, **Klimava A**. Late Unilateral Corneal Ectasia After PRK With Preoperative Topography Suggestive of FFK. AAO Refractive Subspecialty Day, November 2006. Lecture presentation; Published in J Refract Surg. 2008 Oct;24(8):843-7.

Klimava A, Handa J. Increased Connective Tissue Growth Factor in Basal Deposits of Bruch's Membrane of Human Maculae. American Geriatric Society Annual Meeting, May, 2007. Poster presentation.

Klimava A, Handa J. Connective Tissue Growth Factor Expression in ARMD. Johns Hopkins Summer Activities Symposium, October 2006. Poster presentation.

Reznik J, Kim A, **Klimava A**, Akpek E, Gatifloxacin 0.3% in treatment of bacterial keratitis; ARVO 2009. Poster presentation.