Treatment and Management of Ocular Inflammation and Allergy

Blair Lonsberry, MS OD, MEd., FAAO
Pacific University College of Optometry
Portland, OR
blonsberry@pacific.edu

Disclosures

Paid consultant for:

Maculogix: Honoraria-Advisory Board

Sun Pharmaceuticals: Honoraria: Advisory Board

Allergic Conjunctivitis

Types of Allergic Eye Disease

- **Acute allergic conditions**
  - Seasonal Allergic Conjunctivitis (Hay Fever) - SAC
  - Perennial Allergic Conjunctivitis - PAC
- **Chronic allergic conditions**
  - Vernal Conjunctivitis - VKC
  - Atopic Conjunctivitis - AKC
  - Giant Papillary Conjunctivitis - GPC

SAC and PAC *are most commonly encountered by ODs*

Seasonal Allergic Conjunctivitis (SAC)

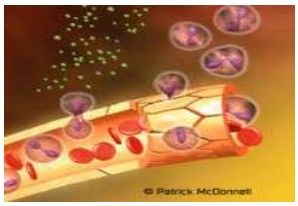
- Occurs during peak allergy seasons: (spring & fall)
- Primarily caused by outdoor allergens – pollen (ragweed, mountain cedar), grasses
- Produces hallmark signs and symptoms such as:
  - itching,
  - redness,
  - chemosis,
  - tearing and
  - lid swelling

Perennial Allergic Conjunctivitis (PAC)

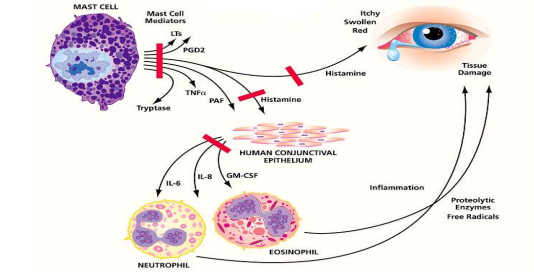
- Milder than SAC
- Occurs year round
- Primarily an indoor disease
  - -Environmental controls can be effective
- Can become more severe with higher pollen counts

Response to Histamine

- Vasodilation
  - Erythema
- Increased vascular permeability
  - Edema
- Neural stimulation
  - Itching
  - Reflex loop increasing vascular permeability



Mast Cell Cascade



Hallmark Clinical Signs

Hyperemia

Chemosis

Lid edema

Tearing

Treatment of Ocular Allergy

Medications:

- **Topical OTC drops**
- **Oral antihistamines** (prescription and OTC)
- **Topical NSAID drops**
- **Topical antihistamines**
- **Topical mast cell stabilizers**
- **Topical steroid drops**
- **Topical dual-action drugs** (antihistamine/mast cell stabilizers)

Ocular Allergy Medication Options

Tetrahydrazoline HCl	VISINE*, MURINE* Plus
Naphazoline HCl	NAPHCON® eye drops, VASOCON*
Phenylephrine HCl	PREFRIN*
Oxymetazoline HCl	VISINE L.R.*
Naphazoline/Antazoline	VASOCON*-A
Naphazoline/Pheniramine	NAPHCON-A® eye drops
Ketorolac	ACULAR*
Suprofen	PROFENAL® solution
Diclofenac	VOLTAREN*
Levocabastine	LIVOSTIN*
Emedastine	EMADINE® solution
Loteprednol	ALREX*
Rimexolone	VEXOL** suspension
Cromolyn	CROLOM*, MAXICROM™ solution
Lodoxamide	ALOMIDE® solution
Nedocromil	ALOCRIL*, TILAVIST*
Pemirolast	ALAMAST*
Azelastine	OPTIVAR*, LASTIN*
Ketotifen	ZADITOR*, ALAWAY*, ZYRTEC, CLARITIN
Epinastine	ELESTAT*
Olopatadine	PATANOL® PATADAY, PAZEO
Bepotastine	BEPREVE
Alcaftadine	LASTACAFT

* Trademarks are the property of their respective owners
**Vexol is a trademark of N.V. Organon

Vasoconstrictors

- Alpha-adrenergic agonists and are commonly used topically for the relief of conjunctival redness
  - E.g. Phenylephrine, Naphazoline, Tetrahydrozoline, Oxymetazoline
- well known and widely used
- limited duration (<2hours) limits their value when compared with the newer anti-allergy drops.
- do not interfere with the allergic reaction and do not relieve itching
- may also result in rebound hyperemia
  - E.g. Visine, Naphcon, AK-Con, Murine

Antihistamines

- Have traditionally been first line in the treatment of ocular allergy.
- H1-receptor competitive antagonists
- First generation have good safety record
  - limited duration and potency (pheniramine and antazoline). Available in OTC drops.

Antihistamines

- Newer H1 have longer duration (4-6 hrs) and are better tolerated than previous generation
  - Levocabastine (Livostin) bid-qid in patients ≥12
  - Emedastine (Emadine) bid-qid in patients >3
- FDA approved:
  - Bepotastine (Bepreve)
    - Twice day dosing for ocular itching in patients 2 or older
- Topical agents provide faster relief of ocular symptoms compared to oral agents
  - orals also have increased side-effects including dry mouth, dry eye, blurred vision, etc

Mast Cell Stabilizers

- Inhibit mast cell degranulation by interrupting normal chain of intracellular signals resulting from the crosslinking and activation by allergen.
- Several available for use in the eye:
  - cromolyn sodium 4% (Crolom)
  - nedocromil sodium 2% (Alocril)
  - Lodoxamide (Alomide)
  - Pemirolast (Alamast)

Mast Cell Stabilizers

- Cromolyn was first available
  - 1-2 drops and dosing is 4-6 times daily,
  - with a loading period of 7 days
  - has only partial inhibitory action and limited efficacy.
- Nedocromil is more potent
  - BID dosing.
- Lodoxamide
  - 2500 X more potent than cromolyn!!!
  - 1-2 drops tid-qid for up to 3 months in patients 3+
  - indicated for VKC and allergic conjunctivitis.
- Pemirolast
  - approved for QID dosing and proven to be effective in mast cell stabilization.

Dual-Action

- Trend is dual mechanism molecules
  - inhibit histamine release from mast cells
  - completely inhibits histamine binding to H1 receptors.
- Provides relief by immediate histamine receptor antagonism
  - also stabilizing future mast cell degranulation.
  - Olopatadine:
    - (Patanol [0.1%], Pataday [0.2%], Pazeo [0.7%]): Patanol and Pataday are now OTC
  - Bepotastine: Bepreve bid dosing
  - Alcaftadine: Lastacaft qd dosing

Tx: NSAID's

- Mechanism of action via inhibition of the COX enzyme
  - blocks the synthesis of prostaglandins (in particular PGD2) which is known to incite significant and immediate allergic symptomatology.
- Ketorolac (Acular) proved to be effective and well tolerated at QID dosing for 2 weeks and then bid-tid as needed for itching
  - Not as effective as olopatadine (qd or bid).
- Diclofenac sodium was also shown to have some effects in controlling S&S of seasonal and VKC.

Oral Antihistamines

- Oral medications may be indicated for ocular findings associated with additional systemic symptoms such as runny nose
- Studies have shown poor efficacy in the relief of ocular findings in comparison to topical treatment
- Options Include both OTC and Rx

Oral Allergy Medications

- Oral antihistamines (pills and liquids) ease symptoms such as:
  - swelling,
  - runny nose,
  - itchy or watery eyes, and
  - hives (urticaria).
- Some oral antihistamines may cause dry mouth and drowsiness.
- Older antihistamines such as diphenhydramine (Benadryl), chlorpheniramine (Chlor-Trimeton) and clemastine (Tavist) are more likely to cause drowsiness and slow reaction time.
  - these sedating antihistamines shouldn't be taken when driving or doing other potentially dangerous activities.

1st Gen Oral Antihistamines

- Classified According to Sedation Levels:
  - Mildly Sedating
    - Brompheniramine (Generic)
    - Chlorpheniramine (ChlorTrimeton)
  - Moderately Sedating
    - Clemastine (Tavist)
  - Strongly Sedating
    - **Diphenhydramine** (Benadryl)
    - Promethazine (Phenergan)
- Most appropriate optometric use is for controlling allergic symptoms during sleep due to heavy powers of sedation
- Use at night can result in "Drug Hangover" effect

1st Generation Antihistamines - Benadryl

- Beneficial for temporary treatment of acute case of contact dermatitis
  - Topical formulas are available.
- Dosage: 50 mg TID – QID adults
  - 25 mg TID-QID kids
- Onset: within minutes with peak at 1 hour and 6-12 hour duration of action
- Pregnancy category B

1st Generation Oral Antihistamines Contraindications

- Relatively contraindicated in patients with peptic ulcer disease, prostate hypertrophy, bladder obstructions, or **narrow angles** due to the anti-cholinergic properties
- Avoid mixing with:
  - **Anti-cholinergics and adrenergic agonists**
  - **CNS depressants** (barbiturates; benzodiazepines such as Valium and Xanax)
- Elderly and those with liver dysfunction have higher risks for side effects
- Nursing mothers?
  - Follow pregnancy categories closely and work with the patients OB/GYN

2nd Generation Oral Antihistamines

- Minimal cholinergic blocking and minimal sedation effects
  - 2nd generation antihistamines are less lipid soluble and cannot penetrate the blood brain barrier as effectively
  - Same side effects are still possible but usually much less than 1st gen drugs
- Include:
  - Fexofenadine (Allegra)
  - Loratadine (Claritin)
  - Desloratadine (Clarinex)
  - Cetirizine (Zyrtec)
  - Levocetirizine (Xyzal)

2nd Generation Antihistamines

- No major contraindications besides hypersensitivity
- Antacids may block absorption and erythromycin may increase bioavailability
- If taken in doses exceeding the recommended values, CNS side effects will likely occur
  - All may potentiate psychotropic medications to some degree
- Always use caution and consider dose adjustment in patients with kidney or renal failure
- If symptoms are not controlled with one 2nd generation antihistamine, often success can be found with another

Additional Use of Antihistamines

- Essential Myokymia (Eyelid Twitching)
  - Relatively mild contractions of the orbicularis muscle
    - Usually unilateral
  - Idiopathic; linked to:
    - Fatigue, stress, anxiety and caffeine
  - Findings are benign and not progressive
    - Frequently resolve in a few hours to weeks
  - Antihistamines have been clinically shown to cause relief of mild symptoms
    - Occurs by prolonging the refractory time of the orbicularis

Intranasal Medications

- Studies do confirm that ocular symptoms are relieved somewhat by nasal medications (corticosteroids)
- These studies show that nasal medications do give better relief of ocular symptoms than oral medications but not as beneficial as topical ophthalmic drugs
- Intra-nasal sprays plus ophthalmic drops give the more benefit and the fewer side effects than oral antihistamines

Steroids

Indications for Ocular Steroids

- *Eyelids* blepharitis, chalazia, dermatitis, burns
- *Conjunctiva* conjunctivitis (various types), mucocutaneous lesions, burns
- *Cornea* edema, graft rejection, rosacea keratitis, interstitial keratitis, herpes simplex (stromal) keratitis, herpes zoster keratitis, post-herpes zoster neuralgia, infiltrates, marginal ulcers, burns
- *Uvea* iridocyclitis, uveitis, traumatic hyphema, sympathetic ophthalmia
- *Sclera* episcleritis, scleritis
- *Retina* vasculitis, chorioretinitis
- *Optic Nerve* neuritis, temporal arteritis
- *Orbit* endophthalmitis, pseudotumor cerebri, Grave's ophthalmopathy

Contraindications of Steroid Use

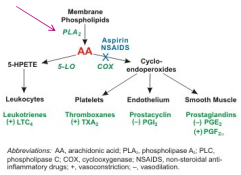
- Three instances in which we would NOT consider using steroids by themselves, although it may be appropriate to use a steroid-antibiotic combination:
  - 1. Avoid steroids when treating an acute bacterial or fungal infection, mainly because steroids do not possess antimicrobial properties.
  - 2. Steroids are contraindicated when there is a significant corneal epithelial defect.
  - 3. Steroids are contraindicated when you're unsure of the diagnosis.

Corticosteroids and Inflammation

- Anti-inflammatory agents that inhibit all aspects of the inflammatory response!
- Does not matter what the cause of the inflammation is – allergic, bacterial, viral, injury – always acts in a non-specific nature!
- Stop the inflammation but doesn't do anything to "fix" the underlying problem.

Specific Actions on Inflammation

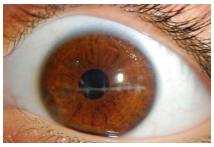
- Inhibit the actions of other cells that modulate inflammation
  - Inhibit the release of histamine from the basophils and mast cells
  - Inhibit phospholipase A_2 to block the production of arachidonic acid (NO PROSTAGLANDINS OR LEUKOTRIENES)



Abbreviations: AA, arachidonic acid; PLA_2, phospholipase A_2; PLC, phospholipase C; COX, cyclooxygenase; NSAIDS, non-steroidal anti-inflammatory drugs; +, vasoconstriction; –, vasodilation.

Specific Actions on Inflammation

- Influence tissue regeneration and repair
  - Reduce collagen deposition, thus reduce scarring
  - Decrease fibroblast proliferation
  - Decrease vascular permeability



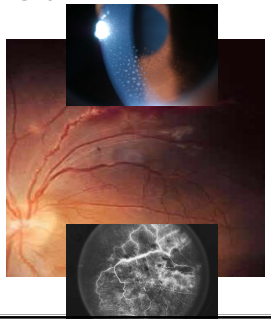
Ophthalmic Topical Steroids

Case

- 30 BF presents with eye pain in both eyes for the past several days
  - Severe pain (8/10)
  - Never had eye exam before
- PMHx:
  - Has chronic bronchitis
  - Rash on legs
  - Has recently lost weight and has a fever
  - Taking aspirin for pain

Ocular Health Assessment

- VA: 6/9 (20/30) OD, OS
- PERRL
- FTFC
- EOM"s: FROM with eye pain in all quadrants
- SLE:
  - 3+ injection,
  - 3+ cells and trace flare,
  - deposits on endo (see photo)
- IOP: 18, 18 mmHg
- DFE:
  - see attached fundus image and fluorescein angiography.



Helpful Mnemonic

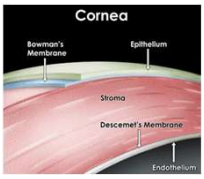
- Mnemonic for acute forms of non-granulomatous uveitis: BLAIR G
  - B: Behcet's disease
  - L: Lyme disease
  - A: Ankylosing spondilitis
  - I: Irritable bowel syndrome (Crohns)
  - R: Reactive arthritis
  - G: Glaucomatocyclitic crisis

Uveitis

- Clinical findings of:
  - circumlimbal hyperemia,
  - cells and flare in the aqueous and anterior vitreous, and
  - keratic and trabecular precipitates

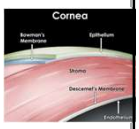
Bioavailability of Topical Steroids

- Ophthalmic steroids have vast differences in their ability to penetrate the cornea and in the distribution/metabolism they undergo once in the structures.
- Very important factor for topical therapy is the derivative the active medication is formulated in.



Topical Derivatives

- The derivative can significantly alter the solubility, ocular penetration, formulation, and efficacy of the active medication.
- Bioavailability will also depend on the status of the corneal epithelium.
- Commonly used derivatives include:
  - Acetate: Increased Lipophilic Nature (Acetate > Alcohol)
    - Should penetrate intact cornea better
  - Alcohol: Increased Hydrophilic Nature
    - Should penetrate an absent epithelium cornea better
  - Salts such as sodium phosphate or hydrochloride
- Ex) Prednisolone phosphate vs. prednisolone acetate.



Types of Topical Steroids

- Ketone Based
  - Ex) Prednisolone and Dexamethasone
  - Long half-life in tissues (body cannot break down ketones as easily)
  - Higher risk for side effects
- Ester Based
  - Ex) Loteprednol
  - Enzymatically degrated quickly in the body (due to high amounts of esterases)
  - Less risk for side effects

Prednisolone

- Synthetic analogue of cortisol.
- Formulated in acetate and sodium phosphate derivatives.
  - Acetate has greater efficacy due to increased affinity for the steroid to its receptor caused by the substitution on the 21st position.
- Available in 0.125% and 1% concentrations.
  - Increasing the concentration to higher levels than 1% does not enhance the anti-inflammatory effect.
  - Minimal use for 0.125% in clinical cases.

Prednisolone Acetate

- Drug of Choice for the Treatment of Uveitis.
- Available as a suspension only (must shake).
- Available generically and brand name.
  - Brand Names 1%:
    - Pred Forte (Allergan)
  - Brand Names for 0.125%
    - Pred Mild (Allergan)
- Available in 1, 5, 10, and 15 mL bottles.
- Use in Kids has not been established.

Prednisolone Phosphate

- Not used as commonly as Prednisolone Acetate due to decreased efficacy.
- Solution, unlike prednisolone acetate.
  - Available in 1% and 0.125%
- Primarily used to treat ocular surface conditions:
  - E.g. allergic conjunctivitis, episcleritis, punctate epithelial keratopathy

Dexamethasone

- Drug of second choice due to greater risk of side effects and less efficacy at available dosages.
  - Most commonly used in combination with antibiotics.
- Available in a 0.1% concentration in a drop and ointment.
  - Dexamethasone alcohol is a suspension
    - Brand Names: Maxidex 0.1%
  - Also available as implant (Ozurdex^{R})
- Management of steroid-responsive inflammatory conditions such as allergic conjunctivitis, iritis, or cyclitis; symptomatic treatment of corneal injury from chemical, radiation, or thermal burns, or penetration of foreign bodies. The ophthalmic solution is also indicated for otic use to treat steroid-responsive inflammatory conditions of the external auditory meatus.

Fluorometholone

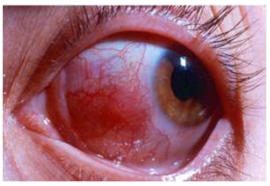
- Fluorinated structural analogue of progesterone.
- Moderate strength steroid in comparison with minimal risk of IOP spike, thus good for chronic therapy.
- Formulated as alcohol and acetate derivative in 0.1% and as alcohol derivative in 0.25% concentration.
  - FML Forte is fluorometholone alcohol 0.25% but it offers no clinical advantage over lower concentration and is rarely used.

Fluorometholone

- Fluoromethalone alcohol 0.1%
  - Suspension is Brand Name: FML
  - Ointment also available.
  - Okay for use in 2 years and up.
- Fluoromethalone acetate 0.1%
  - Suspension is Brand Name:
    - Flarex (Alcon)
- Clinically fluorometholone acetate is about at the ⅓ way point in efficacy compared to fluorometholone alcohol and prednisolone acetate.

Fluorometholone

- Frequently used for low grade inflammatory conditions such as episcleritis and chronic dry eye.



Rimexolone (Vexol®)

- Treatment of postoperative inflammation following ocular surgery; treatment of anterior uveitis
- Not as great of efficacy as Prednisolone acetate despite same concentration of 1%.
  - Less IOP response seen.
- Instill 1 to 2 drops in conjunctival sac of affected eye every hour during waking hours for the first week, then 1 drop every 2 hours during waking hours of the second week, and then taper until uveitis is resolved

Loteprednol Etabonate

- "Soft Drug" analogue of prednisolone.
  - Only ester based topical steroid available.
  - Acts quickly at site of inflammation, then quickly metabolized to its inactive form.
  - Decreased risk of side effects, although they do occur.
- Pregnancy Category C medications.
- Available in two concentrations: 0.2% and 0.5%

Loteprednol Etabonate 0.2%

- Brand Name: Alrex (Bausch and Lomb)
  - No Generic Available.
- Very Mild Steroid.
- FDA Approved:
  - Seasonal Allergic Conjunctivitis
  - Instill 1 drop into affected eye(s) 4 times daily.
- Available in 5 and 10 mL bottle.

Loteprednol Etabonate 0.5% Suspension

- Brand Name: Lotemax (Bausch and Lomb)
  - No Generics Available.
- FDA Indications:
  - Post Operative Inflammation
  - Any Eye Inflammation Responsive to Steroids
- Suspension available in 2.5, 5, 10, and 15 mL bottles.

Relative Efficacy Comparison

According to Melton and Thomas: Clinical Guide to Ophthalmic Drugs

Medication	Clinical Efficacy
Hydrocortisone 1%	1
Prednisolone 0.125%	2
Loteprednol 0.2% (Alrex)	2.5
★ Fluorometholone alcohol 0.1% (FML)	3
Dexamethasone 0.1%	4
★ Fluorometholone acetate 0.1% (Flarex)	4
Rimexolone 1%	4.5
★ Loteprednol 0.5% (Lotemax)	4.5
★ Prednisolone Acetate 1% (Pred Forte)	5

Durezol

- Difluprednate ophthalmic emulsion 0.05%
  - Ketone Based derivative of Prednisolone
- FDA Approved for Post Op Inflammation and Pain (first steroid with pain approval).
  - Dosage: QID X 2 weeks, BID X 1 week, Taper
- FDA approved for treating Uveitis
  - Dosage: One drop QID
- "Double the Strength of Pred Forte"
- Available in 5 mL bottle only.

Durezol

- Use for uveitis has shown great clinical success with less dosing frequency than PA1%.
  - Comparison of Durezol QID to Pred Forte q2hours showed equivalent resolution of anterior chamber cells.
  - Also showed increased resolution of pain and photophobia at this lower dosage.
- Side Effects are similar to other steroids, BUT increased likelihood of Acute IOP Spike.
  - Also included: Corneal Edema, Hyperemia, Reduced VA, and Ocular Discomfort

Patient Case

- 35 WM presents to clinic because his right eye doesn't feel right
  - Currently being treated by another clinic for an "undiagnosed" corneal problem and they couldn't work him into their schedule that day
  - Patient is taking Durezol QID OD and has been for past month
  - VA: 6/6 OU
  - SLE: unremarkable
  - IOP: 28 OD, 11 OS

Pearls to Prescribing Topicals

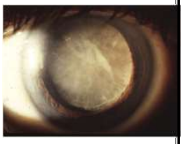
Topical Tapering

- Taper by about 50% once the inflammation is controlled.
  - Example:
    - If taking q1hour for 3 days
    - Begin q2hours for 3 days
    - QID for 3 days
    - TID for 3 days
    - BID for 3 days
    - Daily for 3 days
- Any rebound inflammation means you must return to the previous level where inflammation was under control.

Ocular Side Effects

Posterior Subcapsular Cataracts

- Frequency is directly related to dosage and duration of therapy, as well as the age/demographics of the patient.
  - Therapy for 1 - 4 years and incidence of cataracts:
    - Dosage of < 10 mg/day = 11%
    - Dosage of 10-15 mg/day = 30%
    - Dosage of > 15 mg/day = 80%
  - Cataracts occur faster and at lower doses in children receiving steroids and more frequently in Hispanics than other races.
  - Diabetes patients are also more at risk.



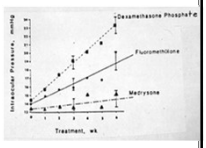
Ocular Side Effects

Ocular Hypertension or Glaucoma

- Increase in IOP occurs in both normal and glaucomatous eyes.
  - Greatest frequency is in eyes with POAG or in children of glaucoma patients.
- Degree of Response seems to have Genetic Link
  - ~70% of first degree offspring will have an IOP elevation of at least 5 mmHg
- Other Risk Factors Include:
  - Patient Age
  - Myopia of 5D or more
  - Krukenberg's Spindle

IOP Steroid Response

- Occurs much more frequently with topical therapy than systemic therapy.
  - Topical Steroids should be used with extreme caution in Glaucoma Patients (Must monitor IOP more closely).
- Usually within 2 – 8 weeks of initiating therapy.
- Generally reversible – return to original levels within 1-3 weeks after administration is terminated.
- Different Medications show different Results:
  - Factors Include: Bioavailability, Half-Life, Susceptibility to Metabolism, Concentration, Frequency of dosing, and Length of Administration.



Ocular Side Effects

Infection

- Prolongs Healing Time
- Masks Signs that the Condition is Worsening
- Enhanced risk of superinfections from bacteria, fungal, or viral causes.
- Contraindicated for Use In:
  - Herpes Epithelial Keratitis
  - Avoid in Significant Epithelial Compromise
  - Avoid in Acute Onset Bacterial Infections

Ocular Side Effects

Retardation of Corneal Epithelial Healing

- Occurs with both Systemic and Ocular Steroids
- WITH EXTREME CAUTION - Can be used during infectious process if used in combination with an antibiotic. Can help to prevent scarring.

Systemic Steroids

Anti-inflammatory Efficacy

- Cortisol (Hydrocortisone) is the standard of comparison for glucocorticoid potency and is always given a relative anti-inflammatory activity of 1.
- All of the other medications are given rankings that allow direct comparison.
  - Ex) Prednisone has a relative anti-inflammatory efficacy of 4.
- Much easier to compare for systemic medications than topical because of the vast differences in tear films, drop delivery, etc.

Anti-Inflammatory Efficacy

Generic Name of Medication	Anti-Inflammatory Activity	Equivalent Dose (mg)	Relative Sodium Retaining Activity
Hydrocortisone	1.0	20 mg	1.0
Prednisone	4.0	5 mg	0.8
Prednisolone	4.0	5 mg	0.8
Triamcinolone	5.0	4 mg	0.0
Methylprednisolone	5.0	4 mg	0.0
Dexamethasone	25.0	0.75 mg	0.0
Betamethasone	25.0	0.75 mg	0.0

Bioavailability of Systemic Steroids

- Corticosteroids are readily absorbed from the intestinal tract, which is why oral dosages are commonly used.
- Nearly every tissue in the body has a receptor for glucocorticoids.

Why Do We Taper Steroids?

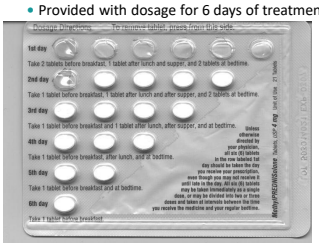
- Prevent Rebound Inflammation
  - Synthetic steroids result in less production of natural steroids.
  - Tapering allows the body to slowly begin producing again, without risking abnormally low levels in the body from occurring.
  - If any antigen is left a massive reaction will occur and lead to severe inflammatory responses.
  - Some patients will never be able to be fully tapered from their steroid medications.

Systemic Tapering

- If a reduction in dosage is followed by an increase in inflammation at any stage, dosage should be increased to the initial level & tapered more slowly.
- Reduction in dose in graduated decrements at intervals of 3 to 4 days.
  - 10 mg steps for larger doses
  - 2-5mg steps for smaller doses
- When 15-20 mg is reached should maintain dose for 1-2 weeks to prevent flare ups of the inflammation and continue with smaller decrements.
- When 5 mg/day of prednisone level is reached, steroid can be switched to hydrocortisone 20 mg/day with subsequent dosage reductions of 2.5mg/week of hydrocortisone (available in 5, 10, 20 mg tablets).

Tapering Systemic Medications

- Medrol Dose Pack (Methylprednisolone) – 4 mg pills
  - Provided with dosage for 6 days of treatment.



In Optometry, generally if we do an oral to a level that requires a taper we want dosages of higher than 24 mg to start and treatment for longer than 6 days.

Indications for oral and IV steroids

- Inflammation of the posterior segment, optic nerve, or orbital tissues
  - Stubborn anterior uveitis
  - Posterior uveitis and/or chorioretinitis
  - Scleritis
  - Arteritic Ischemic Optic Neuropathy – temporal arteritis
  - Optic neuritis
  - Orbital inflammatory pseudotumor
- Also recommended for hypersensitivity reactions
  - Contact dermatitis, etc

Systemic Corticosteroids

- Often grouped based on duration of action:
  - **Short acting**: Hydrocortisone and Cortisone
  - **Intermediate acting:** Prednisone, Prednisolone, Methylprednisolone, and Triamcinolone
  - **Long acting**: Dexamethasone
- The shorter-acting medications have less effect on the HPA axis.
- Most commonly used oral steroid by Optometrists:

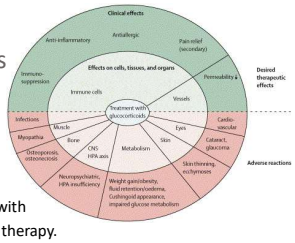
  Prednisone
- Most commonly used IV steroid by Optometrists:

  Methylprednisolone

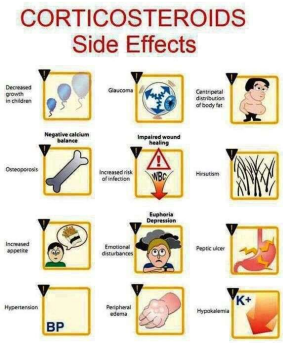
Systemic Corticosteroids

- Prednisone
  - Available as Oral: 1, 2.5, 5, 10, 20, 50 mg tablets and 1 and 5 mg/mL solution and syrup
- Ocular Treatment Guidelines:
  - Mild to Moderate: Initial dose of 20-40 mg
  - Moderate to Severe: 40 – 60 mg
  - Severe: Begin with 60 mg and increase if necessary
  - Specific Conditions: Giant Cell Arteritis
    - 80-100 mg Prednisone
    - Consider IV Methylprednisolone 250 mg IV q6hours for 12 doses

Side Effects of Systemic Corticosteroids



- Incidence increases with long-term high-dose therapy.
- Length of use has greater link to developing side effects than dosage amount.



Side Effects of Systemic Steroids

- Metabolic Effects:
  - HYPERglycemia can occur
  - Increased appetite, Weight Gain, and Redistribution of fat
  - Decreased calcium absorption – leads to Osteoporosis
  - Hyperlipidemia
- Mineralocorticoid Effects:
  - Fluid Retention (Increased Sodium Retention)
  - Hypertension
  - Edema (If liver/kidneys can't keep up)
- CNS Symptoms: Euphoria, Insomnia, Psychoses, Depression, and Restlessness

Thank You!

blonsberry@pacificu.edu