OCULAR TOPICAL ANAESTHETICS, NSAIDS, ANTIHISTAMINES AND STEROIDS

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CONTENTS

This chapter includes a review of:

- Local anaesthetics
- Antihistamines
- NSAIDs
- Steroids

LOCAL ANAESTHETICS

- These drugs block the conduction of nerve impulses along nerve fibres. It is a reversible process without any permanent changes to tissue.
- They can block both sensory and motor nerves at different concentrations
- Pain fibres, which are the smallest fibres are blocked first, followed by touch and temperature and then pressure and then motor fibres at higher concentrations
- Not all local anaesthetics are suitable for topical use

Mechanism of Action

- Smallest fibres blocked first
- It does not seem to involve any specific type of receptor cell. Anaesthetics result in a general blockade of neural transmission
- Compounds are thought to affect the calcium and sodium channels and permeability
- Ion channels are blocked and the pain impulse is not transmitted to brain
- Different sensations are lost according to axons serving them
- Not all suitable for ocular use
    - E.g. Procaine is an excellent injectable agent, but has poor lipid solubility and crosses membranes slowly. Therefore it is not useful for ocular use.

Ideal Topical Anaesthetics

- Quick in onset of action
- Effective for reasonable duration
- Not affect pupil, accommodation or IOP
- No interaction with other drugs
- Comfortable
- No interference with healing
- Non-toxic
- No stinging

It may be possible to develop allergies to one local anaesthetic while not another. They may be different chemically. The duration of the anaesthesia is usually the time required to carry out the procedure and reverse the process completely to return patient to protection of sensitive eye.

Indications

Anaesthetics are used to facilitate procedures that would be difficult without the use of an anaesthetic. These include:

- Ophthalmology surgery
- Foreign body removal
- Tonometry
- Contact lens fitting
- Schirmer test
- Gonioscopy
- Prior to instillation of cycloplegic drug

The cornea and conjunctiva are very sensitive. There are several clinical techniques that are facilitated by use of a topical anaesthetic. In the case of a foreign body removal, the blepharospasm is removed. During contact tonometry, the cornea is desensitized allowing for the probe to make contact with the cornea. When assessing the tear function, Schirmer I and and Schirmer II are used. Schirmer I assess the total reflex and secretory levels of tearing without anaesthetic, while in Schirmer II, a local anaesthetic is instilled and, the reflex tear secretion is measured by irritating the unanaesthetized nasal mucosa with cotton tipped applicator. The Schirmer II test is performed by gently inserting the end of a cotton swab into the nose, where it stimulates the nasolacrimal gland reflex. The volume of tearing is measured by Schirmer paper strips without anesthesia. Anaesthetics can be used in the fitting if rigid permeable lenses during initial insertion and in the fitting of contact lenses in infants.

Advantages

- Ophthalmology and Optometric procedures may be uncomfortable/painful without the use of anaesthetics
- It relaxes the patient and ensures patient comfort
- Allows techniques to be carried out efficiently
    - Portable tonometers require an anaesthetic

Disadvantages

- Hypersensitivity reactions may occur (punctate staining)
- Initial stinging
- Eye surface insensitive: susceptible to damage from superficial foreign bodies

- May enhance effects of other drugs e.g. mydriatics, this is probably due to the action of preservative in multiuse bottles
- Delayed healing in cases of trauma to corneal epithelium

Mode of Action

- Sensory information passes along nerves as electrical impulses
- At rest, the nerve has negative charge
- Action potential generated by influx of sodium ions, which results in depolarization, causing a positive charge
- Local anaesthetics cause a return to resting potential by influx of potassium ions causing blockage of neural transmission

  - Influx of sodium ions causes depolarization (+ve charge)
  - Local anaesthetics cause a return to resting potential
  - Blockade of neural transmission: Small nerve fibres are more sensitive to blockade by local anaesthetics. Local anaesthetics interfere with neural permeability of Na and K ions and prevent transmission of impulses.

Cocaine

- Only non-synthetic local anaesthetic
- Not legally available for Optometrists in practice
- Controlled drug. It has a high toxicity, kills corneal cells
- May be prepared in hospital pharmacies
- May be used for ophthalmological procedures
- High toxicity
- Cocaine is the original local anaesthetic
- Abuse potential, CNS effects and eventual dependence
- Controlled by the Misuse of Drugs Act and The Medicines Act
- Also had a sympathomimetic action leading to mydriasis
- Detrimental effect on corneal epithelium
- All 4 level 1 exemption list. Prescription only medicine. (POM)
- Available for use (not supply)

Available to Optometrists (entry level – use only)
E= ester type of anaesthetic ; A= amide type

- Proxymetacaine (most comfortable) E
- Oxybuprocaine E
- Lignocaine A
- Amethocaine (least comfortable) E

Metabolism

- Ester type anaesthetics hydrolysed rapidly in plasma- short half lives (1 min)
- Amide type are hydrolysed by liver microsomal enzymes- slower elimination

Proxymetacaine hydrochloride

- White crystalline soluble powder
- Synthetic
- Optometry -1 drop 0.5% duration 15mins
- Ophthalmology – deep anaesthesia – one drop every 5-10 mins (max 5-7 drops)
- Time of onset 6-20 secs
- POM
- Concentration should be low as possible to produce a response. This improves recovery time
- Storage 2-8 degrees
- Causes deep anaesthesia (cataract extraction)
- Can be used for taking swabs: less antibacterial action than others
- Minims available
    - Must be kept refrigerated
- Multidose bottle discontinued in 1999
- Unstable and can deteriorate if exposed to light
- Also combination product available: Proxymetacaine (0.5%) and fluorescein (0.25%)
    - Also must be refrigerated
    - If not shelf life < 2/52

Oxybuprocaine hydrochloride

- Previously known as Benoxinate 0.4%
- Synthetic white crystalline powder
- Similar to proxymetacaine
- One drop is sufficient for contact tonometry
    - Can perform tonometry after 60 secs
    - With one drop sensitivity returns in 15 mins
- Three drops used for foreign body removal
    - After 3 drops sensitivity returns in one hour
- Bactericidal properties
- Less stinging than amethocaine
- POM minims 0.4%
- 10 ml bottle may also be available
- Kept cool but not in fridge

Lignocaine hydrochloride

- Also known as Lidocaine
- Crystalline white powder
- 2-4% solution
- POM
- Available with fluorescein
- Amide type (unlike other three which are ester type)
- POM minims lignocaine 4% with fluorescien 0.25%
- Used when longer anaethesia is required or minor surgical intervention is to take place

Amethocaine hydrochloride

- Also known as tetracaine
- White crystalline powder
- 0.25-1% solution
- Concentrations >1% may damage cornea
- Initial burning sensation
- Does not cause corneal desquamation in low concentration
- Foreign body removal 0.5% one drop
- Desquamation (losing outer layer)
- Burning sensation lasts about 30 secs
- Numb sensation persists for 10-15 mins
- Tonometry after one min
- POM minins 0.5% and 1% solutions
- Also 10ml bottle

Adverse Reactions

Topical anaesthetics rarely cause side effects (Doughty 2006). Punctate staining may occur even following routine use. This resolves within 24-48 hours. Rare side effects mentioned in the literature include:

- Corneal desquamation (Boljka et al 1994)
- Tear film stability unaffected (Cho and Brown 1995)
- Tear flow affected (Shiono 1989)
- Reduced IOP (Baudouin and Gastaud 1994)
- Increased corneal thickness (Herse and Sui 1992)
- Delay in wound healing (Morris and Tracey 1997)
- Theoretical effect systemically

Theoretical adverse effects of injected local anaesthetics:

- Cardiac toxicity and allergy
- Local anaesthetics can cause arteriolar dilation – adrenergic blockade on heart
- Cardiac anti-arrhythmic effects
- Allergy relates to bisulphates, which are included for stability of the solution.
- Severe allergic reaction (anaphylactic shock)
- In theory, in injected local anaesthetics, there is an adrenergic blockade that causes a inhibition of receptors normally stimulated by the sympathetic nervous system and noradrenaline, preventing nerve impulses reaching heart

INFLAMMATION

The body's primary response to injury or infection is called inflammation. The purpose of inflammation is to provide an environment around the injured or infected region that maximises repair and anti-infection processes. It does this by flooding the area with the materials and enzymes needed so that repair work can be done most effectively and infection fought. There are some side effects with this, though, such as stiffness, and pain due to compression of nerves.

Aim of inflammation

- Bring fluid, proteins, and cells from the blood into the damaged tissues
- Tissues are normally bathed in a watery fluid, extracellular lymph, that lacks most of the proteins and cells that are present in blood, as the majority of proteins are too big to cross the blood vessel endothelium
- Maximises repair and anti-infection process

Characteristics

- Response of body to a variety of stimuli e.g. infection, trauma, allergy etc.
- Reddening (vasodilation)
- Oedema
- Loss of function
- Pain

Significance

- Used to attack and destroy invading organisms but may also affect own body's cells e.g. arthritis, asthma.
- Immune system directs more blood towards area. This causes redness, warmth, swelling and pain.
- Pain occurs when the sensitive nerve endings become irritated by abundance of agents in area.
- Eye tissues are delicate and may scar, leading to a possible permanent loss of vision.

Inflammatory Response

Inflammatory response is initiated by an increase in (Hopkins and Pearson 2007);

- The production of prostaglandins and leukotrines and the release of histamine from mast cells
- Vascular effects
- Fibroblastic activity
- Increased leukocyte activity
- Prostaglandins mediate inflammatory reactions (vasodilators).
- Cause increased permeability of cells and causes oedema.
- Agents from cellular and plasma components of blood are increased in area to allow invading organism to be destroyed.
- Increase capillary permeability. Therefore loss of proteins causes an increase in osmotic pressure and increased oedema.
- Inflammation causes discomfort and may cause a loss of vision.
- Vascular effects – increase capillary permeability and interference with blood aqueous barrier leading to more particles in aqueous. Outflow impaired, which may cause secondary glaucoma.

- Increased leukocyte activity allows leukocytes to move to the specific area of inflammation and destroy invading cells.
- Histamine: antigen binds to the mast cell and stimulates the release of histamine.
- Histamine causes vasodilation of capillaries, loss of cells and protein causing an increase in osmotic pressure and oedema.
- Liberation of histamine from mast cells stimulates fibroblast activity, allowing wound repair and scar formation.

The four cardinal signs of inflammation are pain, oedema, redness and heat. The heat and redness are directly due to increased blood flow. Swelling of the tissues occurs due to fluid escaping from the capillaries into the interstitial spaces, causing inflammation and pain by pressure on nociceptors. A nociceptor is a sensory receptor that reacts to potentially damaging stimuli by sending nerve signals to the spinal cord and brain. This process, called nociception, usually causes the perception of pain. The pain and swelling may become so severe that a fifth sign, loss of function, occurs. Whereas higher doses of NSAIDs, such as aspirin and ibuprofen, relieve inflammation, paracetamol has little effect. One effect of prostaglandins is atropine resistant miosis in uveitis (cilary body etc are so inflammed that it is resistant to even atropine). Receptors normally have a high affinity for atropine.

Leukocytes kill invading cells. Prostaglandins exist or synthesise in every cell in the body. Prostaglandins are chemical messengers but do not move around. They work within the cell they are made in. They cause activation of the inflammatory response, producing pain and fever.

Another feature of inflammation is the release of histamine. Antigen binds to the mast cell and stimulates the release of histamine. Histamine causes vasodilation of capillaries, loss of cells and protein causing an increase in osmotic pressure and oedema. Liberation of histamine from mast cells stimulates fibroblast activity (wound repair and scar formation).

ALLERGIC REACTION

- An allergy is an inappropriate response of the immune system to a typically harmless substance i.e. pollen, dust, peanut protein.
- The hypersensitivity reaction or allergic reaction that forms, is typically marked by swelling and inflammation of tissues, commonly involving the skin.

Allergy

- Antibodies produced in answer to substances are not usually recognised as foreign
- Symptoms from cold-like to dangerous anaphylactic reaction
- Antibody IgE found both in bloodstream and membranes of mast cells

For example, in the presence of pollen or dust, plasma cells produce IgE in response to this foreign body. This binds to mast cells causing the release of histamine. When activated, a mast cell rapidly releases its characteristic *granules* and various hormonal mediators into the interstitium. Mast cells can be stimulated to degranulate by direct injury, either physical or chemical, binding of IgE to receptors, or by activated complement.

- IgE attaches to mast cells causing histamine to be released.
- Histamine increases capillary permeability and constricts airways (bronchospasm).
- Allergy injections- build up IgG antibodies that combine with allergen before reaching IgE.

Symptoms

- Skin reaction
- Rash/atopy (allergic hypersensitivity)

- Watery and itchy eyes
- Rhinitis
- Asthma – type reactions (bronchospasm)
- Anaphylaxis

Anaphylaxis

A severe allergic reaction. Anaphylaxis is a life-threatening medical emergency because of rapid constriction of the airway, often within minutes of onset, which can lead to respiratory failure and respiratory arrest.

- Extensive mast cell degeneration
- Release of pre-formed mediators
- Systemic effects
- Then late-phase reactions may occur hours later
- Asphyxiation- swelling of throat
- Bronchial constriction in lungs due to swelling
- Systemic shock due to drop in blood pressure.
- Tissue damage- due to degranulation of eosinophils/ neutrophils- release of lysosomal enzymes (neutrophils)

Course of events in anaphylaxis:

1. Histamine is stored in mast cells.
2. Particles recognised as foreign.
3. Allergen and IgE binds to surface mast cells.
4. Histamine is released.
5. Histamine acts on H1 and H2 receptors to produce its effects.
6. It causes degranulation of mast cells and release of histamine.
7. Vasodilation of arterioles and bronchospasm.

Treatment of Inflammation and Allergies

Depends on severity of reaction

- Mild to moderate such as itching and lacrimation: eye baths, decongestants, antihistamines are required.
- Moderate to severe allergic reaction such as hyperaemia, itching, lacrimation, mucous: mast cell stabilisers are indicated
- Severe allergic reactions such as chronic oedema, infiltrates, severe discomfort and foreign body sensation: Non-steroidal anti-inflammatory drug (NSAIDs) or topical corticosteroids are indicated.

ANTIHISTAMINES

- Method of antagonizing action of histamine – pharmacological antagonist – antihistamine
- There is a triple response to histamine: local vasodilation, oedema, raised red area, stimulation of pain and itch fibres
- H_1 and H_2 receptors
- H_1 receptors on surface of eye and other mucous membranes such as the nasal cavities
- Blocked by antihistamines like antazoline (e.g. Otrivine Antistin – prescription only (P))
- H_2 receptors are in the gastrointestinal system
- Blocked by cimetidine.

> The body produces a triple response to allergen. If histamine was injected the body produces a triple response: local vasodilation (direct action of histamine on blood vessels). H1 receptors involved in triple action.
>
> Some antihistamines have antimuscarinic activity. They may reduce tear secretions and interfere with contact lens wear. By using two forms of treatment, an antihistamine and vasoconstrictor, a more effective result is obtained. Levacobastine works quickly but has been discontinued.

Commercial antihistamine preparations

- Levacobastine (not available in UK) is a potent new H1 receptor blocker for allergic conjunctivitis.
- Azelastine 0.05% eye drops (POM) Optilast and (P) and Aller-eze Eye Drops (P).
- Antazoline (Otrivine-Antistin) 0.5% eyedrops (P)
- Levacobastine (Livostin) 0.05% eyedrops (POM) 4ml bottle or (P) 3ml bottle (not available in UK).

Azelastine is indicated for seasonal allergic conjunctivits and perennial conjunctivitis. H_1 blocking antihistamine. Antihistamines are not well studied in children in clinical trials, therefore it is not recommended if patient is younger than 12 years.

Additional Supply – Optometrists only

- Emedastine 0.05% H1 blocking antihistamine. (POM) Emadine 5ml bottle. Seasonal allergic conjunctivitis.
- Ketotifen 0.025%/ H1 blocking antihistamine. Mast cell stabilizing activity. Also available as Zaditen eye drops (POM). Seasonal allergic conjunctivitis
    - Zaditen not recommended for children under 3 years. There is limited clinical trial data for children with most of the above drugs.

NON-STEROIDAL ANTI-INFLAMMATORY DRUGS (NSAIDS)

- NSAIDs are an alternative to steroids, which were developed to eliminate the side effects caused by steroids including cataracts and raised IOP.
- Indications for use can be classified as surgical or non-surgical.
- During inflammation, fatty acids are converted to prostaglandins. Prostaglandins increase the permeability of the ciliary epithelium which causes flare and an increase in IOP. A specific mixture of prostaglandins is found in uveitis and can cause miosis.

- They have analgesic properties as well as anti-inflammatory properties.
- They are usually used to treat eye pain and photophobia.

Prostaglandin Formation Inhibitors

- Aspirin (P and General Sales Lists (GSL)) – oldest and most commonly used NSAID
- Indomethacin (POM)
- Oxyphenbutazone (POM)
- Ibuprofen (P and GSL)
- Diclofenac (POM Additional Supply Optometrists)
- Diclofenac sodium (VoltarolOphtha and Voltaren) Additional Supply Optometrists only
  - 0.1% single use preservative free eyedrops or 5ml form (POM)
  - Used for seasonal allergic conjunctivitis.
  - Also used as a topical analgesic and for pre and post surgical use.
  - Reduced production of prostaglandins.
- Flurbiprofen (Ocufen) 0.3% eyedrops
- Ketorolac (Acular) 0.5% eyedrops

Uses:

- **Asprin:** headache
- **Indomethacin:** first new generation of NSAIDs. It is used for cystoid macular oedema and non infectious conjunctivitis. Eye drops 0.1%
- **Oxyphenbutazone:** treatment of rheumatic disorders. 10% greasy eye ointments. Non-purulent inflammation of anterior eye. Not used systemically
- **Ibuprofen:** freely available OTC for analgesia and inflammation. It is not available as a topical ophthalmic preparation. Potent inhibitor of prostaglandins.
- **Diclofenac sodium:** it is used for post-operative inflammation. Cystoid macular oedema, vernal conjunctivitis, allergic conjunctivits. Analgesic properties are used after refractive surgery to cornea. Usually just for 2 days. Reduced need for analgesics. Unit doses are available for those with preservative allergies. Some others available. It can be used pre and post surgery, e.g. Cataract or strabismus surgery. It is not available for use by optometrists
- **Flurbiprofen and Ketorolac:** Used for prophylactic inflammation following cataract surgery

Mast Cell Stabilizers

- Reduces the release of histamine and reactions of white blood cells in conjunctiva to allergens
- Not used for occasional use or short-term relief. It is for regular and continuous doses. 4-6 x day.
- Sodium cromoglicate (Opticrom Allergy)
- 2% eyedrops (P or POM)
- Lodoxamide (Alomide Allergy)
- 0.1% eyedrops (P) or 0.1% eye drops (POM). Lodoxamide is an eosinophil inhibitor: it is a second-generation mast cell stabilizer with eosinophill inhibitor. It is indicated for use in seasonal, perennial and contact lens induced allergic conjunctivitis. It is for prophylactic use. Regular and continuous patient education is important. 2-4 weeks (4 x day) before effect.
- Nedocromil (Rapital) 2% eyedrops Additional Supply Optometrists. Nedocromil has a yellow colour and should not be used with soft contact lenses. It is not indicated for children under the age of 6.
- Sodium cromoglicate is indicated for use in seasonal and perennial allergic conjunctivitis. There are many products available, Boots, Optrex, Clarityn.

- Lodoxamide eosinophil inhibitor L – 2nd generation mast cell stabiliser with with eosinophill inhibitor.
- Alomide: indicated for use seasonal, perennial and contact lens induced allergic conjunctiva, but should not use with contact lensess. It is indicated for prophylactic use. Regular and continuous patient education is important. 2-4 weeks (4x) before effect is noted. Contains BKC as a preservative which can accumulate in contact lenses and cause irritation.

STEROIDS

- Adrenal cortex produces steroid hormones
  - Glucocorticoids
  - Mineralocorticoids
  - Sex hormones
- It is useful and has sight saving effects but also severe adverse ocular effects
- It reduces or inhibits the inflammatory response to many harmful stimuli e.g. radiation, chemical, mechanical, infections.
- Corticosteroids act as anti-inflammatories as well as having other effects on the body
- Mineralocorticoids affect electrolyte balance of the body
- Glucocorticoids affect glucose protein and bone metabolism and has anti-inflammatory properties
- Sex hormones include testosterone and oestrogen
- The adrenal cortex is the outer layer of adrenal gland. It reduces vasodilation and stabilizes mast cells, reducing the release of histamine. It maintains the normal permeability of blood and reduces oedema. It also inhibits the production of prostaglandins and aids with the prevention of proliferation of capillaries and scar formation.

Steroids work by decreasing inflammation and reducing the activity of the immune system. It plays a role in symptomatic relief. It prevents loss of transparency of the cornea. Most steroid drugs will mimic the action of hydrocortisol (natural). It blocks the production of prostaglandins. Scar formation impairs fibroblastic activity resulting in late manifestation of inflammation.

- Cortisone and hydrocortisone were the first steroids discovered
- Cortisone has anti inflammatory properties and mineralocorticoid properties also
- Cortisone use is limited to replacement therapy in adrenal insufficiency
- Hydrocortisone is used for topical skin treatment (P)
- Prednisolone is 5x more potent. It is used in chronic obstructive pulmonary disease, and has less mineralocortocoid action
- Beclomethasone is available as topical preparations or sprays. Beconase is a nasal spray for hayfever.
- Corticosteroids take a long time to take effect, as their action is intracellular
- Hydrocortisone can be taken orally or topically (hydrocortistab)

CORTICOSTEROIDS

Ophthalmic Use

- It prevents leakiness of the vasculature of anterior uvea and reduces rate of migration of white blood cells into tissues.
- Topical ocular corticosteroids are available as eye drops and ointments. Sometimes it is used in combination with anti-infective drugs.
- Present in body as a natural anti-inflammatory
- Most corticosteroids mimic the action of hydrocortisol

Adverse Effects

- Chronic chemical or drug irritation of eyelids e.g. severe allergy or allergic blepharitis.
- Chronic irritation of the palpebral or bulbar conjunctiva associated with allergies, either mechanical or chemical irritation
- Chronic irritation resulting in vernal conjunctivitis and giant pupillary conjunctivitis
- Superficial punctate keratitis of any aetiology which may be acute and associated with mechanical, chemical or bacterial trauma, especially for recurrent uveitis associated with systemic conditions
- In early stages of inflammation, it is managed by NSAIDs. If there is more substantial inflammation, hydrocortisol is used.
- Acute/ sub-acute/ chronic inflammatory conditions of sclera, anterior uveal tract, iris or cornea
- Adjunct in generalised iritis/ anterior uveitis
- Acute, subacute episcleritis, scleritis

Indications

- Generally used 4-6 hourly
- In severe cases e.g. following surgery, it is used twice hourly
- Treatment periods normally confined to less than 3 weeks
- Generally see improvement in 48 hours to 7 days
- Patients generally reviewed at day 3 and day 7 and every 4-7 days thereafter. Long-term steroids require a twice weekly review.
- Long-term treatment should not be discontinued abruptly. The dose should be tapered.
- 4-6 hourly, if mild to moderate
- Treatment periods should be short with a maximum 3/52
- Taper the dose, if reduced slowly, it will allow to see how inflamed the eye is and avoid an acute rebound action.

Contraindications

- Not on infected eye unless with appropriate antibiotic
- Not with purulent infection
- Not with active viral infection as it can exacerbate HSV keratitis
- Not with active fungal or protozoan infection (e.g. Acanthamoeba)
- Not with active tubercle infection as it can be exacerbated
- Corticosteroids can mask underlying infections. Reduced redness, discharge etc but the infection may still be present. Manage infection.
- Acanthamoeba can occur in contact lens wearers
- Turbercle infection can be exacerbated

Adverse effects (systemic)

- Imbalance in electrolyte levels
- Weight gain as there may be an increase in appetite
- Exacerbation of peptic ulcers
- Cataract

Excessive corticosteroid use may reduce natural healing and the resurfacing rate with progressive thinning of the cornea.

Adverse effects (topically)

- Inhibit wound healing and reduce body's response to infections
- Increase in IOP

Steroids are contraindicated in fungal and acanthaemoba keratitis and acanthaemoba. The inhibition of wound healing causes changes in collagen and cells and it can also impair fibroblastic activity. Steroid glaucoma is caused by increased resistance of outflow of aqueous humour, can occur due to morphological and biochemical changes. The mechanism for the rise in IOP is not known; however, it has been suggested that it is related to a biological effect mediated by activation of steroid receptors on the trabecular meshwork cells and the resulting deposition of extracellular material, including myocilin and collagen.

Prednisolone

- Marked anti-inflammatory activity with low mineralocorticoid effects.
- Used in treatment of bronchial asthma and respiratory diseases.
- Pred-forte drops 0.5-1.0%
- Minims
- Hydrocortisone – introduced in 50's
    - Not widely used now
    - Non-infectious, non-inflammatory, injury
    - POM 1% soln eye drops
    - POM 0.5%, 1%, 2.5% ointment

Betamethasone

- Marked anti-inflammatory action
- Used for moderate inflammation of lids, conjunctiva, cornea, anterior segment
- Betnesol 0.1% eye drops
- Vistamethasone 0.1% eye ointment

Clobetasone

- Less rise in IOP
- Less effective against uveitis
- Cloburate 0.1% eye drops
- Flurometholone. 0.1% used in mild to moderate inflammation.

PRODUCTS FOR TREATING MILD OCULAR IRRITATION AND REDNESS

Topical Ocular Astringents

- Used for mild irritation or discomfort
- Optrex eye drops (P) 10 ml bottle. Contains witch hazel.
- Optrex Fresh Eyes 10ml bottle. Contains witch hazel with glycerin and zinc sulphate.
- Largely replaced by antihistamines and decongestants
- Usually prn (as needed)
- Witch hazel – shrinks swollen tissue

Eye Brightener Products

- Used to reduce redness and to sooth tired or irritated eyes
- Some non-medicinal products are available
- Usually include astringents and decongestants
- Vital Eyes Brightener (SL) 10 ml bottle. Contains flower petal extract of lavender, orange flower and Euphrasia, witch hazel and zinc sulphate
- Optrex Fresh Eyes Brightener 8ml bottle. Contains borate buffer, witch hazel, glycerol and EDTA with naphazoline 0.01%. Preserved with benzalkonium chloride
- Some non-medicinal products available (not included in Medicines Act legislation)

Topical Direct Acting Decongestants

- Decongestant activity due to alpha-adrenergic action or direct histamine H1 blocking action.
- Will reduce vasodilation or may cause vasoconstriction.
- Also will reduce oedema and reflex lacrimation. If antihistamine, it will reduce itching

Eye Whiteners

- Eye whiteners are intended for occasional use
- 2-3 times per day
- May be over used by patients
- Irritation cause should be identified
- Efficacy questionable
- Excessive use may lead to a rebound effect
- Every 2 hours or 6x day excessive
- Products frequently over-used by patients.

Ocular Decongestants

- Contraindicated in narrow angle glaucoma
- Not recommended if blood pressure disorder, cardiac disorder, history of stroke, hyperthroidism or pregnant.
- Can be easily over-used. Should be carefully supervised in patients taking MAOI or other sympathomimetic agents.
- Avoid in patients with infected eyes.

- Carefully recommended or given to people whose IOP is unknown
- Pressor effect: producing increased blood pressure, especially via vasoconstriction with increased total peripheral resistance. Treat the cause, rather than symptoms
- Polymer included increasing contact time on eye.
- Naphazoline 0.01% is an alpha-adrenergic and preserved with benzalkonium chloride. Murine (P) 10ml.
- Xylometazoline 0.05% alpha-adrenergic in combination with antazoline (antihistamine). It is preserved with benzalkonium chloride. Otrivine-Antistin 10ml.

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