Utilization of Injections in Primary Eye Care

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Disclosures
• I have received honoraria from the following companies in the past 12 months:
  • Heidelberg Engineering
• The honoraria received have no relevant bearing on the content of the following presentation

Why Injections?
• Increases management options beyond topical and oral
  • eg: chalazia management
• Precise medication delivery placement
  • eg: chalazion
• Increases efficacy of treatment
  • eg: anaphylactic management
• Increases duration of action of the medication
  • eg: subconjunctival steroids

Why Injections?
• Sometimes preferred route of delivery
  • eg: gonococcal conjunctivitis
  • eg: anaphylaxis
• Titratable absorption rates

Why Injections?
• Increased efficacy over traditional methods
  • eg: chalazia management
• Decreases need for invasive procedures
  • eg: chalazia excision/I-C
• Can increase compliance
  • eg: uveitis management
General Pharmacological Considerations

Absorption of Drugs
- Solubility
- Concentration
- Circulation at Absorption Site
- Surface Area of Absorption
- Enteral (oral)
- Parenteral (Intravenous, Subcutaneous, Intramuscular)

Drug Reservoirs
- Plasma Proteins and Extracellular I
- Cellular Reservoirs
- Fat Reservoirs

Biotransformation
- Transformation into Less Active, More Easily Excreted Formula
- Non-Synthetic
  - Oxidation, reduction and hydrolysis
- Synthetic
  - drug coupled to endogenous substrate resulting in inactivation
  - liver

Excretion of Drugs
- Renal Excretion
- Biliary Excretion
- Fecal Excretion
General Pharmacological Considerations

**Miscellaneous Terminology**
- Potency
- Efficacy

Informed Consent

- Does not absolve you from litigation
- leaves a paper trail of communication between physician and patient
- Should cover:
  - the procedure itself
  - alternative treatments
  - risks and benefits of the procedure
  - expected results
  - potential complications

Intradermal/Subcutaneous Injections

**Introduction**
- Anatomy of Injection Sites
- Dermis Vs. Subcutaneous
- Vascularity = Absorption Rate

**Instruments Required**
- 1 to 3 ml Syringe
- 27 to 25/ 3/8 to 5/8 Inch Needle
- Alcohol Swabs
- Medication Ampule or Vial
- Disposable Gloves

**Patient Instructions**
- Signed Informed Consent
Intradermal/Subcutaneous Injections

**Technique**
- Wash Hands/Apply Disposable Gloves
- Select Site for Injection
- Sterilize Site with Alcohol Swabs
- Insert Needle to Desired Depth
- Aspirate to Avoid Intravascular Injection
- Inject Solution
- Withdraw Needle Quickly
- Discard Uncapped Needle

**Indications**
- Purified Protein Derivative to R/O TB
- Histoplasmin Skin Test
- Local Infiltration or Nerve Block Anesthesia
- Epinephrine Administration for Acute Anaphylaxis

**Contraindications**
- H/O Hypersensitivity
- Poor Quality Injection Site

**Complications**
- Anaphylaxis
- Systemic Toxicity
Intra/Para/Translesion Injection

Introduction

- Anatomy of Injection Sites
- Alternative to Surgery in the Management of Chalazia

Intra/Para/Translesion Injection

Instruments Required

- 1 cc Tuberculin Syringe
- 27 to 30 Gauge/ 3/8 to 5/8 Inch Needle
- Alcohol Swabs
- Medication Ampule or Vial
- Disposable Gloves

Patient Instructions

- Signed Informed Consent
- Direct Gaze Away From Injection Site

Technique

- Wash Hands and Apply Disposable Gloves
- Select Injection Site Depending on Location and Extent of Lesion
- Instill 1 gtt Proparacaine
- Clean Site with Alcohol Swab
**Intra/Para/Translesion Injection**

**Technique**
- Insert Needle Parallel to Globe
- Aspirate to Avoid Intravascular Injection
- Translesional approach negates aspiration
- Inject Solution to Desired Level
- Withdraw Needle and Clean Injection Site while Applying Pressure to Any Residual Bleeding
- Discard Uncapped Needle

**Indications**
- Internal/External Chalazia
- Periocular Hemangioma

**Contraindications**
- Hypersensitivity to Medication

**Complications**
- Residual Precipitate
- Hematoma/Abscess
- Superinfection of Gland and Surrounding Tissue
- Globe or Septum Perforation
- Intravascular Injection

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**Retrobulbar Injection**

**Introduction**
- Technique Used most Commonly to Anesthetize the Orbit for Intraocular Surgery
- The Most Risky of the Ophthalmic Injection Techniques.
- Produces Complete Akinesia and Anesthesia of the Orbit
- Anatomy of Injection Site
Retrobulbar Injection

**Instruments Required**
- 5 or 10 ml Syringe
- 23 to 25/1.5 to 2 inch blunt-tip needle
- Alcohol swabs
- Medication Vial
- Disposable gloves

**Patient Instructions**
- Signed informed consent
- Instruct to look up and in prior to injection

**Technique**
- Wash Hands and Apply Disposable Gloves
- Select Injection Site Above the Inferotemporal Orbital Rim
- Clean Site with Alcohol Swab
- Insert Needle Through Lower Lid and Septum 0.5 cm Medial to the Lateral Canthus and Direct to the Orbital Apex
- Aspirate Plunger to Avoid Intravascular Injection
- Inject Solution and Observe Development of Controlled Proptosis
- Withdraw Needle
- Massage Injection Site and Periorbital Area
- Discard Uncapped Needle
Retrobulbar Injection

- Indications:
  - Orbital anesthesia for intraocular surgery (ECCE, PRP, cryo)
  - Administer AB's for severe orbital infections
  - Administer 2cc absolute EtOH for chronic pain relief

Complications

- Retrobulbar Hemorrhage
- Conj/Lid Ecchymosis/Edema
- Transient Proptosis
- CRVO/CRAO
- Optic Atrophy
- EOM Palsies
- Pupillary Abnormalities
- Elevated IOP
- Globe Perforation
- Systemic Side Effects (Respiratory Arrest, Cardiovascular and CNS Toxicity)

Contraindications

- Hypersensitivity to Medication
- Compromised Injection Site

Intravitreal Injections

- Introduction
  - Typically performed by retinologists, though some general ophthalmologists occasionally perform them
  - Used to deliver a drug to the vitreous cavity
  - Since vitreous is avascular, generally slowly absorbed

- Instruments required:
  - 1cc syringe, 27 (Kenalog) or 30 (Avastin)ga needle
  - Topical anesthetics
  - Medication for injection and prophylaxis
  - Disposable gloves

- Patient Instructions
  - Informed consent
  - Have patient look away from the injection

Technique

- Wash Hands and Apply Disposable Gloves
- Select Injection Site at the temporal pars plana, usually above or below horizontal midline
Intravitreal Injections

• Technique:
  - Eye is anesthetized with topical anesthetic
  - 2 sets of topical antibiotics are placed on the eye
  - Pre injection of 2% lidocaine sub conj at injection site
  - (Paint injection site with 5% betadine)
  - Injection is made 3.0 mm (pseudophakes) and 3.5-4 mm (phakic) posterior to the limbus
  - IOP and VA measured

• Post injection instructions:
  - Warn patient they may see 'blobs' or spots
  - Slightly reduced VA and comfort is expected
  - Patient should call if significant reduction in VA or increase in pain
  - Discharge on topical AB X 3-5 days

• Indications:
  - Macular edema caused by
    - Diabetes, angiogenic AMD leakage, vein occlusions
  - Posterior Segment Inflammation
    - CME, posterior scleritis, chorioretinitis

• Medications used:
  - Kenalog
  - Macugen, Avastin, Lucentis, Anti VEGF agents

• Complications:
  - Retinal detachment, intraocular infection, intraocular inflammation, uveitis

Subconjunctival Injection

Introduction
  - Provides Prolonged Continual Drug Delivery
  - Increases Local Concentrations of Drugs with Use of Small Quantities
  - Increases Tissue Concentrations of Drugs Which have Poor Ocular Penetration, i.e., Antibiotics
  - Anatomy of Injection Site
**Subconjunctival Injection**

**Instruments Required**
- 1 cc Tuberculin Syringe
- Tothed Forceps
- Lid Speculum (Optional)
- 25 or Smaller Gauge 3/8 Inch Needle

**Patient Instructions**
- Informed Consent to procedure
- Direct to Look Up and In

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**Subconjunctival Injection**

**Technique**
- Wash Hands and Apply Disposable Gloves
- Apply Topical Proparacaine or Tetracaine (Soaked Cotton Pleget Optional)
- Apply Lid Speculum
- Tent the Conjunctiva with Toothed Forceps at the Site of the Injection

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**Subconjunctival Injection**

**Technique**
- Insert Needle into Subconjunctival Space at a Parallel Angle to the Globe
- No need to Aspirate the Plunger to Avoid Intravascular Injection
- Inject Solution to Desired Level and Remove Needle
- Discard Uncapped Needle
Subconjunctival Injection

**Indications**
- Severe or Recalcitrant Uveitis
- Poor Compliance to Topical Treatment
- Bacterial Ulcerative Keratitis
- S/P Intraocular Surgery

**Contraindications**
- Medication Hypersensitivity
- Active Scleritis

**Complications**
- Subconjunctival Hemorrhage
- Residual Precipitate
- Secondary Glaucoma
- Perforation of Globe

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Intramuscular Injection

**Introduction**
- Limited Use in Primary Eye Care Practice
- Good Route for Fast Vascular Absorption
- Anatomy of Injection Sites: Vastus Lateralis, Ventrogluteal, Dorsogluteal, and Deltoid
Intramuscular Injection

**Instruments Required**
- 2 to 3 ml Syringe
- 19 to 23 gauge 1 to 1 1/2 inch needle
- Alcohol Swabs
- Medication Ampule or Vial
- Disposable Gloves

**Patient Instructions**
- Signed Informed Consent

**Technique**
- Wash Hands and Apply Disposable Gloves
- Select Injection Site
- Clean with Alcohol Swab
- Insert Needle Quickly at 90 degree Angle
- Aspirate to Avoid Intravascular Injection
- Inject Entire Contents Slowly
- Withdraw Needle Quickly and Apply Alcohol Swab
- Massage Surrounding Skin and Apply Band-Aid
- Discard Uncapped Needle

**Indications**
- Systemic Infections with Ocular Manifestations
- Alleviation of Muscle Spasms, Contractures, and Nystagmus
**Intramuscular Injection**

- Botox botulinum toxin type A (Allergan)
- Myobloc botulinum toxin type B (Solstice Neurosciences)
- administered intramuscularly
- currently approved for:
  - All facial dystonias
  - strabismus
  - blepharospasm
  - glabellar lines
  - Primary axillary hyperhidrosis

**Botox**

- Using a 30-gauge needle, inject a dose of 0.1 mL into each of 5 sites,
  - 1 in each of the 4 corrugator muscles
  - 1 in the procerus muscle
- for a total dose of 20 U
- Typically the initial doses of reconstituted BOTOX® COSMETIC induce chemical denervation of the injected muscles one to two days after injection, increasing in intensity during the first week.
Botox: Hemifacial Spasm

Botox Ophthalmic Uses

- Intramuscular (EOM) Injection for strabismus
  - Use in one muscle (eg, MR) will result in increased contractility of contralateral muscle (eg LR), resulting in more alignment of the eyes after recovery of the injected muscle

Botox Ophthalmic Uses

- Induction of protective ptosis in cases of corneal compromise secondary to CN V or CN VII palsies, or in cases of upper lid retraction in GravesDz
- Reversal of spastic inwardly turning lower lid

Botox Ophthalmic Uses

- Ameliorating aberrant nerve regeneration problems, such as in:
  - Bells Palsy induced facial muscle aberrations
  - Aberrant regeneration to the lacrimal gland resulting in excessive lacrimation
  - Surgical facial wound healing
  - Reduces tension across the scar
Botox Ophthalmic Uses

- Reducing post herpetic neuralgia
- Blocks both:
  - Release of acetylcholine for neuromuscular transmission
  - Release of nociceptive neuropeptides (pain transmitting) involved in chronic inflammatory pain response
- Headache
  - Migraine, tension, chronic daily and cervicogenic headaches have all responded to Botox

Botox Complications

- Usually caused by poor injection technique or excessive dosing
  - Ptosis
  - Reduced blink reflex
  - Strabismus
  - Lagophthalmos
  - Ecchymosis
  - Drooling

Botox Contraindications

- Neuromuscular disorders
  - Myasthenia gravis
  - ALS
- Concurrent use of
  - Aminoglycosides
  - Succinylcholine anesthetics
  - Chloroquine
  - Pregnancy

Intramuscular Injection

**Contraindications**
- Medication Hypersensitivity
- Compromised Injection Site

**Complications**
- Anaphylaxis
- Local Hematoma or Abscess

Intramuscular Injection

- Provides Prolonged Continual Drug Delivery
- Increases Local Concentrations of Drugs with Use of Small Quantities
- Increases Tissue Concentrations of Drugs Which have Poor Ocular Penetration, i.e., Antibiotics
- Anatomy of Injection Site

Subtenons Injection
Subtenons Injection

Instruments Required
- 1 cc Tuberculin Syringe
- Toothed Forceps
- Lid Speculum (Optional)
- 25 or Smaller Gauge 3/8 Inch Needle

Patient Instructions
- Informed Consent to Procedure
- Direct to Look Up and In

Technique
- Wash Hands and Apply Disposable Gloves
- Apply Topical Proparacaine or Tetracaine (Soaked Cotton Pleget Optional)
- Apply Lid Speculum
- Perform Subconjunctival Injection of Lidocaine for Maximum Patient Comfort

- Insert Needle into Subtenons Space 2-3 mm from Inferotemporal Fornix at a Parallel Angle to the Globe
- Make Lateral Movements to Avoid Scleral Penetration
- Aspirate to Avoid Intravascular Injection
- Inject Solution to Desired Level and Remove Needle
- Discard Uncapped Needle
Subtenons Injection

Indications
- Severe or Recalcitrant Uveitis
- Poor Compliance to Topical Treatment
- Pars Planitis/Vitritis/Posterior Uveitis
- Iatrogenic CME

Contraindications
- Medication Hypersensitivity
- Active Scleritis

Complications
- Subconjunctival Hemorrhage
- Secondary Glaucoma
- Perforation of Globe

Intravenous Injection

Introduction
- Direct Route to Systemic Circulatory System
- Most Dangerous Route Due to Immediate Reaction to Medications
- Limited Use in Primary Eye Care
- Anatomy of Injection Sites; Median Cubital and Cephalic Veins
Intravenous Injection

**Instruments Required**
- 2 to 3 ml Syringe
- 21 to 25 Gauge Butterfly Needle
- Alcohol Swabs/Providone-Iodine Swabs
- Medication Ampule
- Tourniquet
- Disposable Gloves
- Cotton Balls/2X2 Gauze/Band-Aids

**Patient Instructions**
- Signed Informed Consent

**Technique**
- Apply Tourniquet 10 to 12 cm Above Injection Site
- Foster Distal Vein Dilation
- Clean Site with Alcohol Swab and/or Povidone-Iodine Prep
- Insert Needle into Vein at 20 to 30 Degree Angle with Bevel Up Distal to Venipuncture Site
- With Blood Return, Lower Needle and Advance Into Vein
- Uncap and Attach Syringe When Blood Has Reached End of Tube
- Remove Tourniquet and Inject Solution
- Withdrawal Needle Quickly and Apply Band-Aid
- Discard Needle with Syringe
Intravenous Injection

**Indications**
- Fluorescein Angiography
- Tensilon to R/O Myasthenia Gravis

**Contraindications**
- Hypersensitivity to Medications

**Complications**
- Infiltration at Injection Site
- Vessel Phlebitis
- Air Embolism
- Infection at Injection Site

Sometimes, things just don’t work out as planned

A Fine Line Between.....
Acute Anaphylaxis

• Signs and Symptoms
  • weak, rapid and thready pulse
  • dizziness
  • localized or diffuse swelling
  • flushing of the skin
  • urticaria
  • nausea
  • vomiting
  • constriction of the airway and difficulty breathing

• Mechanism:
  • medications act as allergens, and severity of the reaction is co-
  dependant on amount of allergen introduced and individual's
  sensitivity, generally measured as amount of IgE antibodies
  • antibody (reagin) - allergen reaction results in systemic wide
    release of:
    • histamine
    • lysosomal enzymes
    • other allergic cascade substances

• Histamine release:
  • widespread peripheral vascular dilation
  • increased capillary permeability
  • marked loss of plasma from the circulation
  • Death due to anaphylaxis is most often caused by circulatory shock

Injection Do’s and Don’ts

• Do Demonstrate Confidence In Techniques
• Do Use Designated Sharps Canisters and Waste Disposals
• Do Practice Sterile Techniques
• Do Use Signed Patient Consents
• Do Not Recap Needles

Questions?