Drugs and the Eye

Proper Technique for Instilling Drops into the Eye:

- Instruct the seated patient to tilt the head back and look up
- Pull downward on the skin overlying the cheekbone and instruct the patient to look up to expose the palpebral conjunctiva
- Instill the medication into the conjunctival fornix and avoid touching the eye
- Instruct the patient to close both eyes for a few seconds and wipe away excess medication

Common Topical Diagnostic Drugs

**Fluorescein Dye**  
A water-soluble dye that becomes brilliant green under a cobalt-blue or fluorescent light. Used to detect defects in the corneal epithelium because fluorescein stains damaged epithelium.

**Anesthetics**  
Common medications are proparacaine HCl 0.5% and tetracaine 0.5%. These medications are effective in only 15 seconds and are used to facilitate examination of a damaged cornea that would otherwise be impossible. They are never to be prescribed to patients as they are toxic to the corneal epithelium and lead to corneal ulceration and permanent scarring.

**Mydriatics**

**Cholinergic-Blocking Drugs**  
These drugs (Cyclopentolate, Tropicamide, and Atropine) act by paralyzing the iris sphincter through muscarinic blockade. They not only produce mydriasis but also cycloplegia, paralysis of the muscles of the ciliary body, and are thus termed cycloplegics. Cycloplegia produces paralysis of accommodation such that near vision is blurred. Tropicamide is more commonly used in adults while Cyclopentolate is usually used to achieve more complete cycloplegia in children.

**Adrenergic-Stimulating Drugs**  
Phenylephrine hydrochloride 2.5% achieves its effect by acting as an alpha-adrenergic agonist on the dilator pupillae muscle. This drug has no effect on accommodation thus it is only a mydriatic and not a cycloplegic. The mydriasis produced still leaves the pupil reactive to light therefore it is commonly used in combination with a cycloplegic for maximum mydriasis. A serious side-effect of the medication in stronger concentrations is hypertension and even myocardial infarction in some patients.
Topical Ocular Therapeutic Drugs

Decongestants

These are weak adrenergic-stimulating drugs which temporarily whiten the conjunctiva through their vasoconstrictor effect. The most common drugs in this category are Naphazoline HCl 0.012%, Phenylephrine HCl 0.12%, and Tetrahydrozaline HCl 0.05%. It is commonly believed that these drugs constitute good ocular hygiene when in fact cool compresses to a closed eye can have as significant an effect as these medications. A frequent complication is rebound vasodilation of the conjunctival vessels that results from overuse. Also, an attack of acute angle-closure glaucoma may be precipitated as these medications can dilate the pupil.

Corticosteroids

These medications should only be prescribed by an ophthalmologist as serious complications may result. These include infection by viruses, bacteria, and fungi, development of glaucoma and cataract.

Antibiotics

Topical antibiotics are used for treating common bacterial conjunctivitis and may cause as a complication a red, teary eye due to topical sensitivity. The combination of antibiotics and corticosteroids should be administered and followed by an ophthalmologist because of the permanent damage an infection may cause.

Glaucoma Medications

Beta-Blockers

These medications reduce aqueous humor formation by the ciliary body and consequently reduce intraocular pressure. The most common medications used for this purpose are Timolol, Levobunolol, Metapranolol, and Carteolol. A serious systemic side-effect is bronchospasm and these drugs are thus contraindicated in patients with asthma or chronic obstructive pulmonary disease. These drugs may also worsen cardiac failure due to their negative inotropic effect. The β-1 selective antagonist Betaxolol circumvents the pulmonary complications of the other medications and is as effective as the other medications in lowering intraocular pressure.

Cholinergic-Stimulating Drugs

Pilocarpine HCl acts as a parasympathomimetic and increases aqueous humor outflow by constricting the pupil and opening the trabecular meshwork. It is more commonly used to treat acute angle-closure glaucoma due to the parasympathetic side effects (lacrimation, salivation, perspiration, nausea, vomiting, and diarrhea).
**Echothiophate**

This drug acts as a parasympathomimetic by blocking the action of anticholinesterase. Side-effects are the same as pilocarpine but are also more common. Patients taking this medication are susceptible to the effects of succinylcholine and procaine because the anticholinesterase hydrolyzes these agents. Consequently apnea and death have been reported with patients under anesthesia with low blood cholinesterase.

**Adrenergic-Stimulating Drugs**

Epinephrine and Dipivirfin increase outflow by acting as sympathomimetic alpha agonists. Systemic side-effects include hypertension and cardiac arrhythmias. Dipivirfin is a precursor of epinephrine with a lower incidence of side-effects.

**Ocular Side-Effects of Systemic Drugs**

**Corticosteroids**

Posterior subcapsular cataracts are commonly the side-effect of long-term adrenocorticosteroid usage, especially in asthmatic individuals, renal transplant recipients and patients with rheumatoid arthritis.