

Ocular Complications of Common Systemic Medications

Tamara Petrosyan, O.D.

Associate Clinical Professor
SUNY College of Optometry
NYC Health + Hospitals/Gotham Health

Disclosures

Tamara Petrosyan is financially affiliated with Anteo Health, Emergent, and Bernell Corp., and The Armenian Eye Care Project but has no direct financial or proprietary interest in any companies, products or services mentioned in this presentation or received commercial support.

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Outline

Review pharmacology

Review ocular anatomy and physiology

Overview of ocular side effects
of systemic drugs

References:

FDA, Drugs.com, Epocrates, Rx List, WebMD

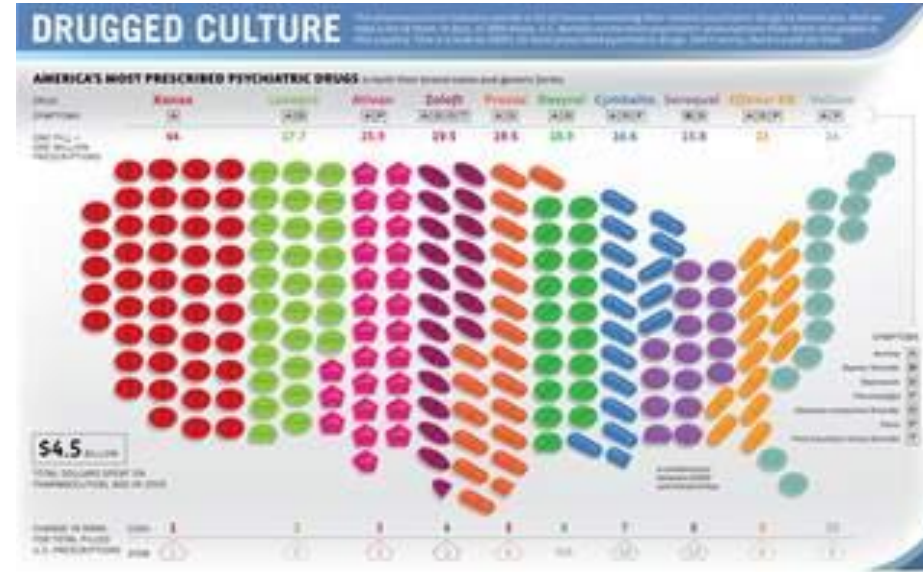


Why review adverse drug reactions?

64% of visits to the physician end in a Rx (FDA)

72% outpatient hospital

80% emergency room

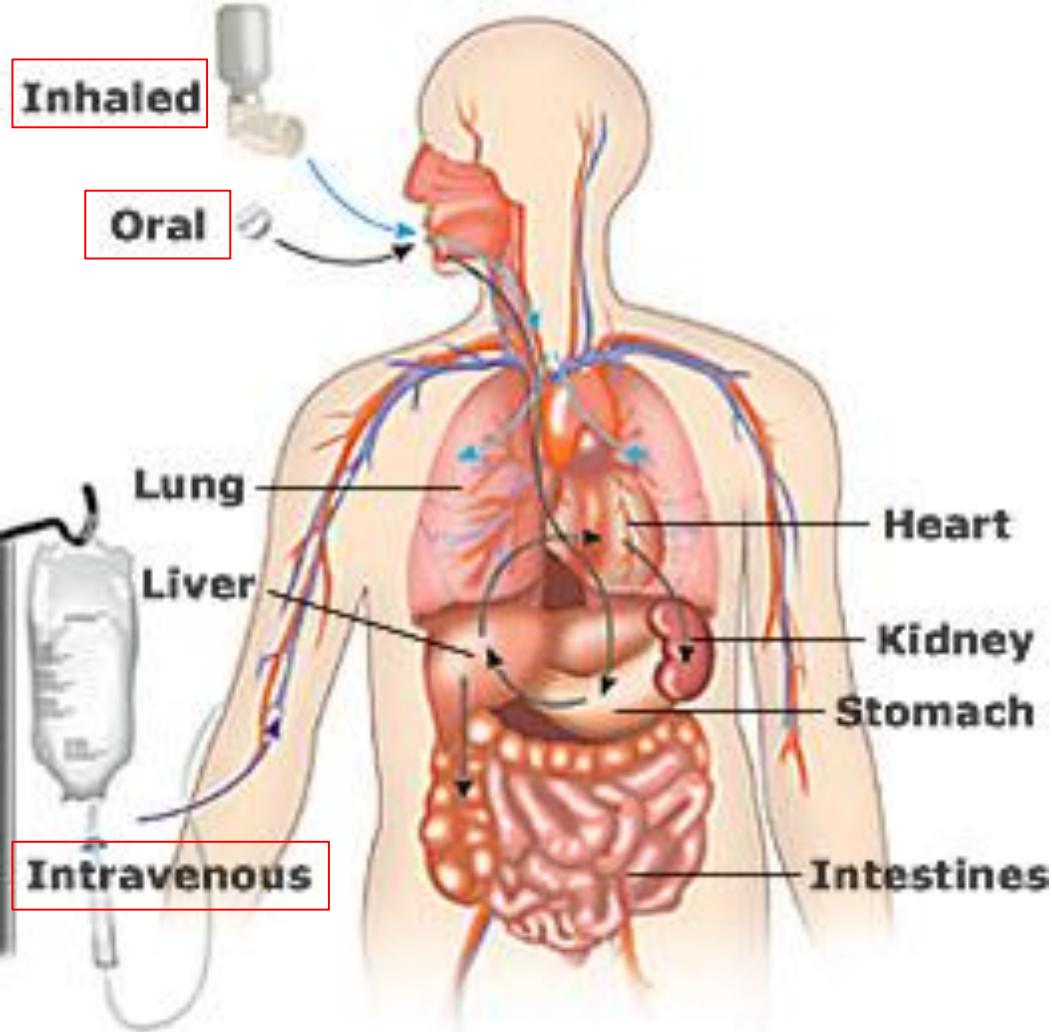


2009 number of prescriptions dispensed ~3.95 billion

2021 number of prescriptions dispensed ~6.47 billion

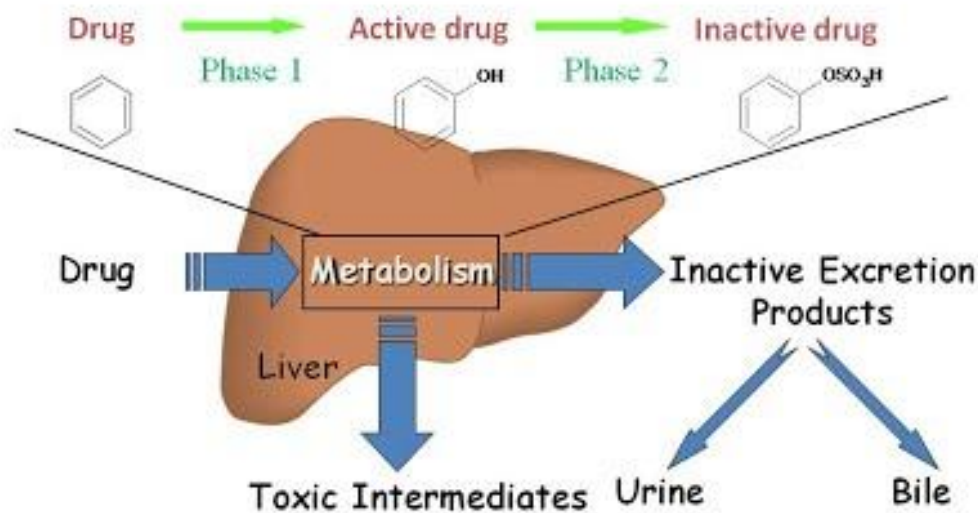
Why review adverse drug reactions?

- Seniors → more chronic diseases and multiple conditions
→ use more prescription and over-the-counter drugs.
 - > 77% of seniors 65 and 79 suffer from one or more chronic diseases.
 - 85% for age > 80yo
- ADR are among **top five** greatest threats to health of seniors
 - ADR and noncompliance are → 28% of elderly hospitalizations.



HOW A DRUG MOVES THROUGH THE BODY

Drug Metabolism

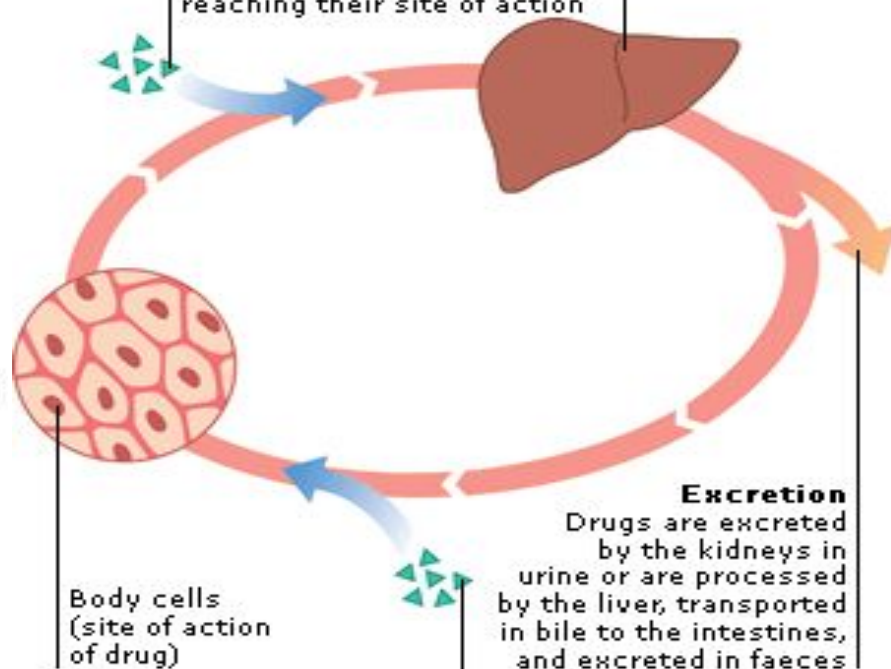


Oral drug

Drugs taken orally enter the bloodstream through the intestines and pass through the liver before reaching their site of action

Liver

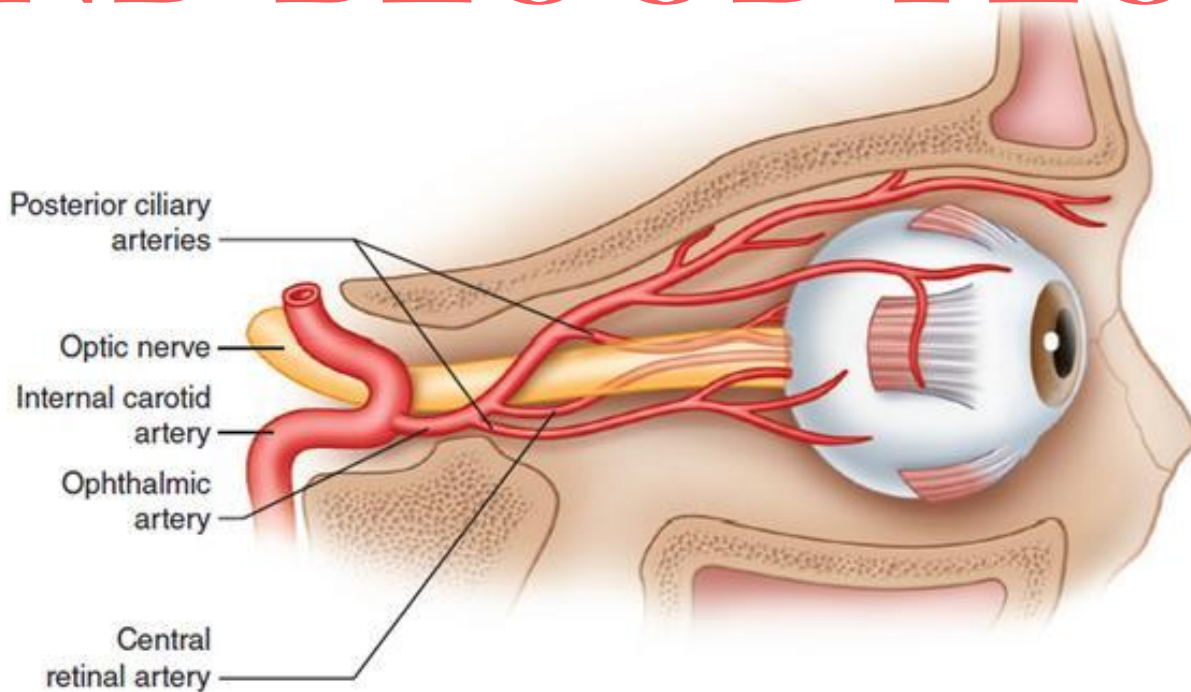
The liver is the main site of drug transformation and breakdown

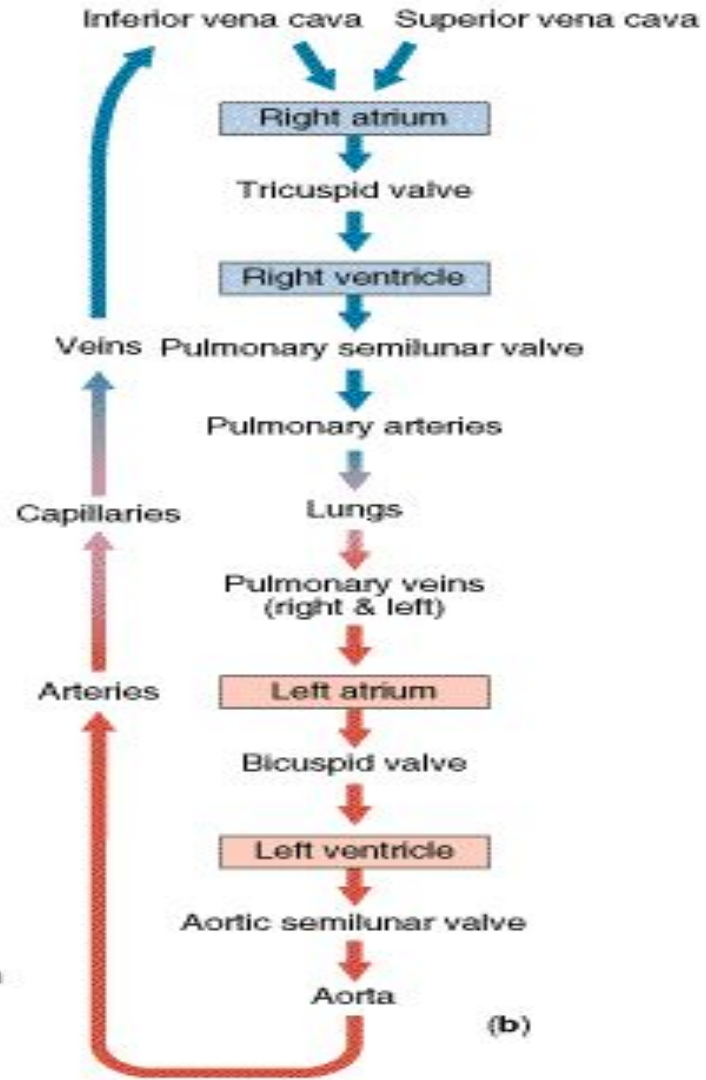
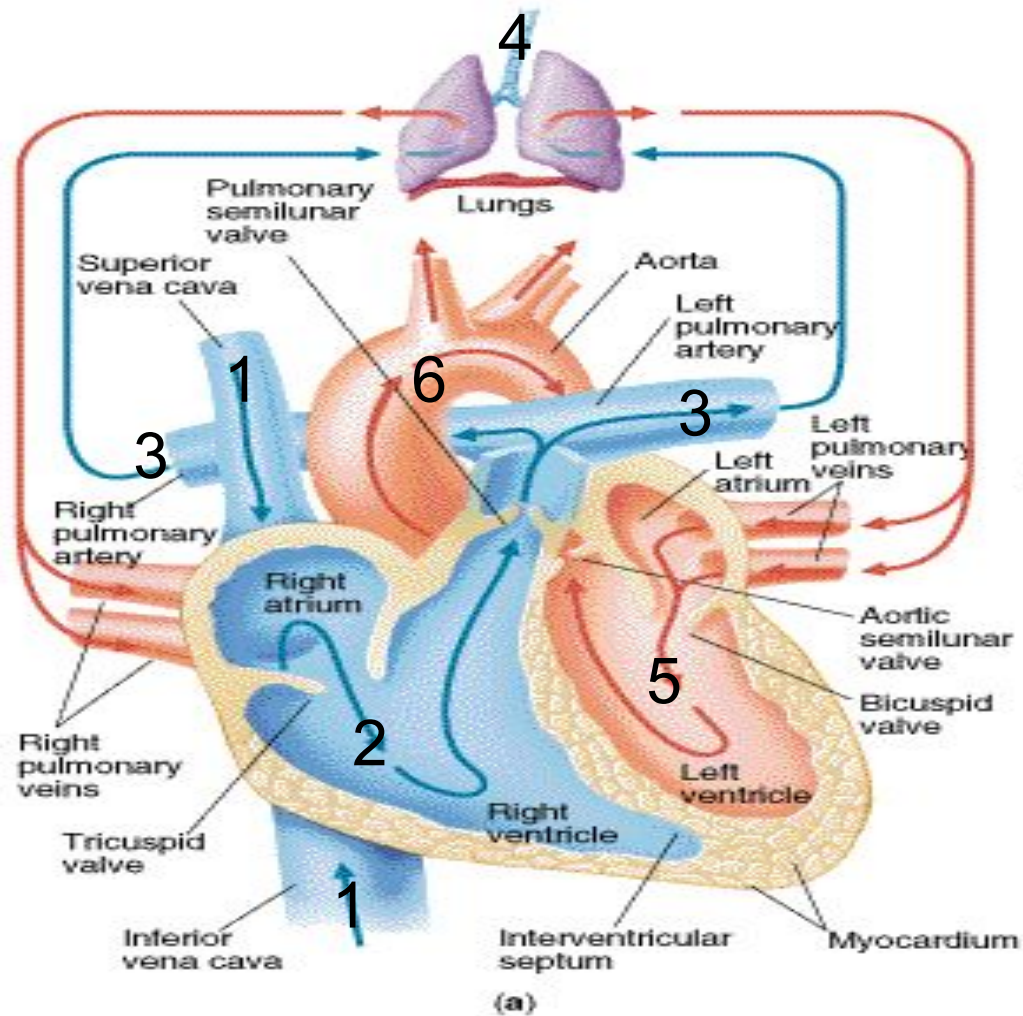


Nonoral drug

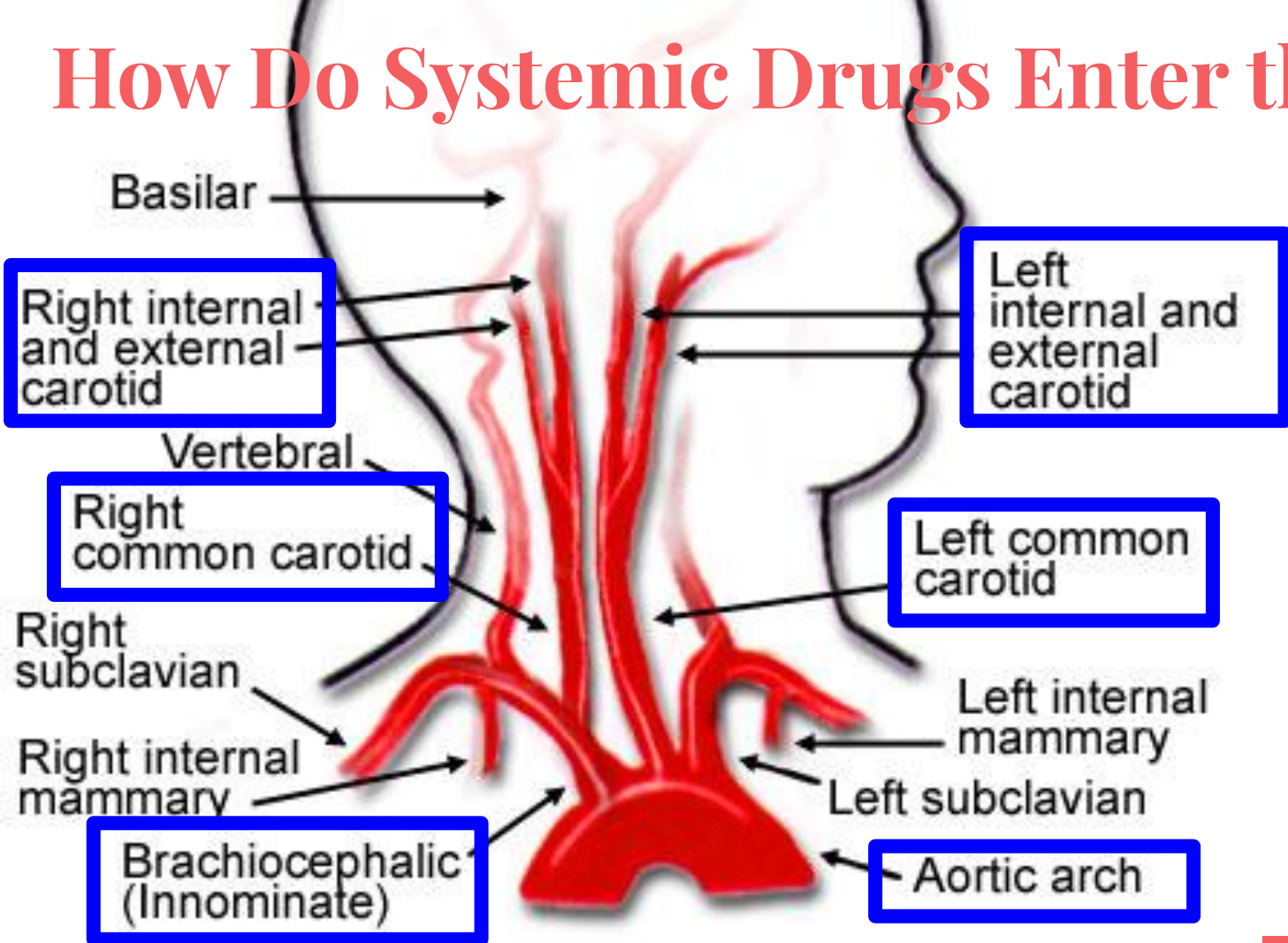
Drugs given by nonoral routes travel in the bloodstream to the site of action without passing through the liver first

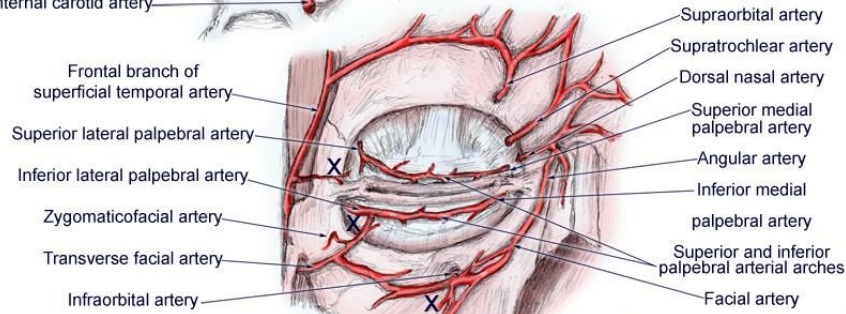
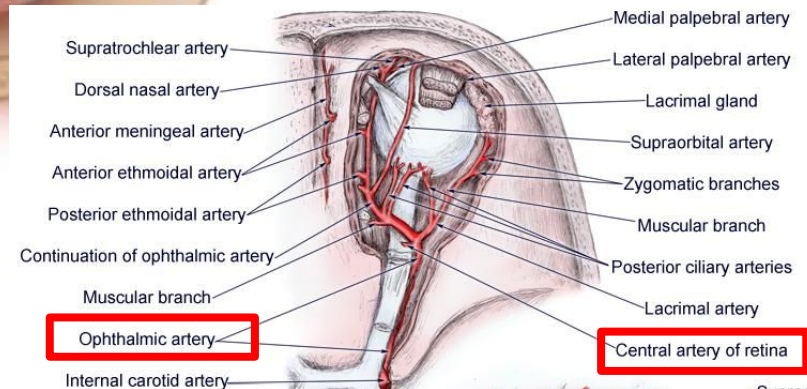
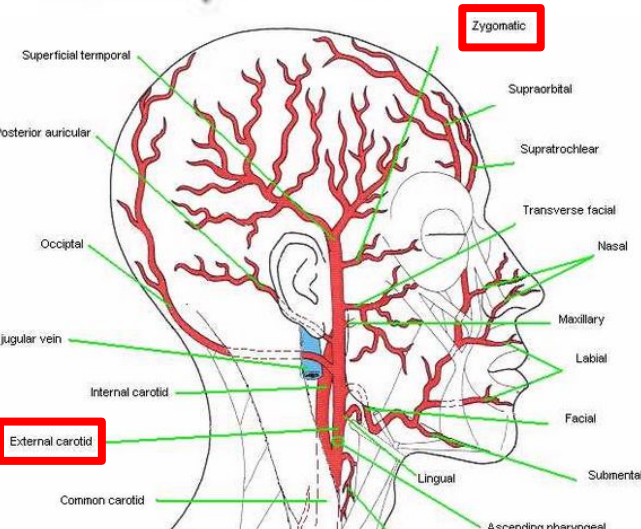
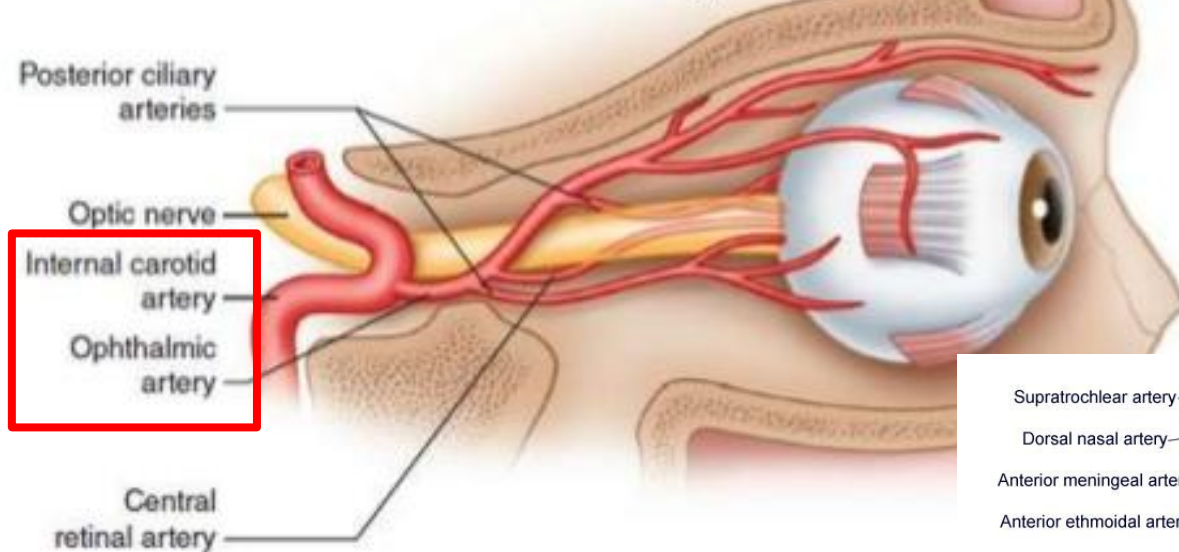
OCULAR ANATOMY AND BLOOD FLOW





How Do Systemic Drugs Enter the Eye

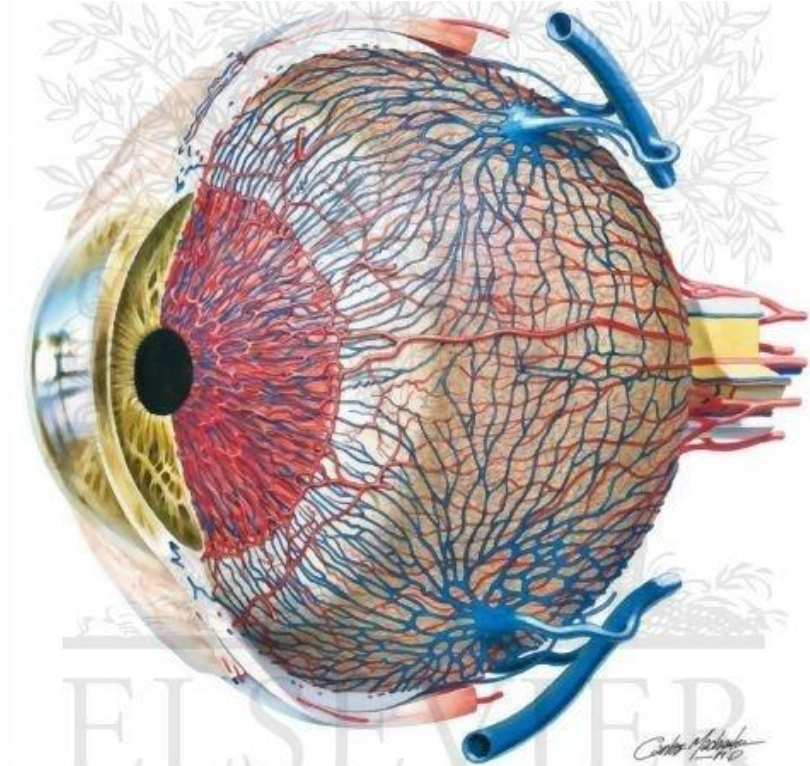




(X = anastomosis of vessels from external and internal carotid arteries)

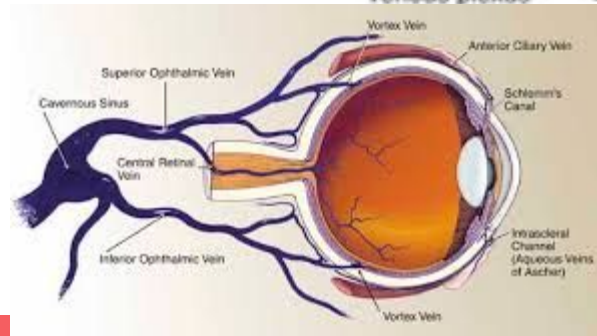
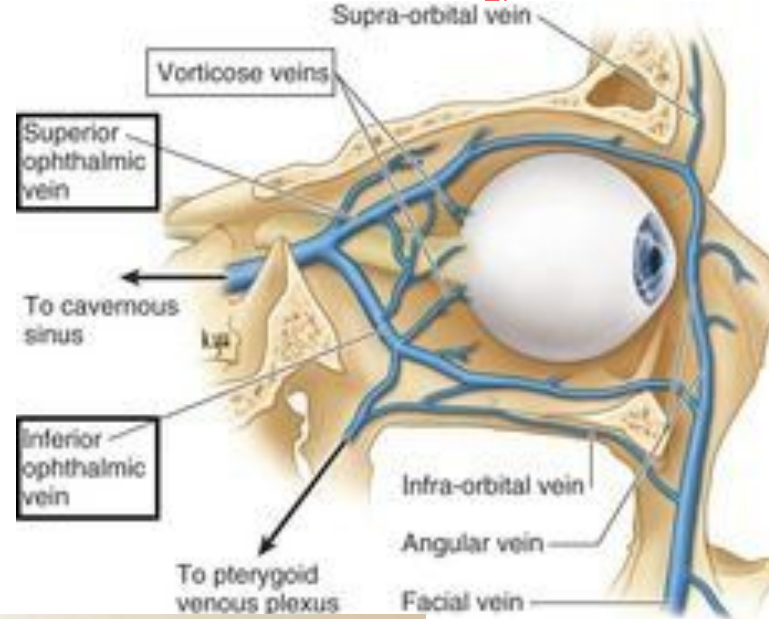
How Do Systemic Drugs Enter the Eye

The eye is composed of many different types of tissue and has a **very rich blood supply** for its relatively small mass



How Do Systemic Drugs Enter the Eye

- Enter via uveal circulation exit from Canal of Schlemm, ciliary body, or diffusing into adjacent structures
- Enter via retinal circulation exit via retinal vein, diffuse into vitreous and anatomical structures, or get actively transported out

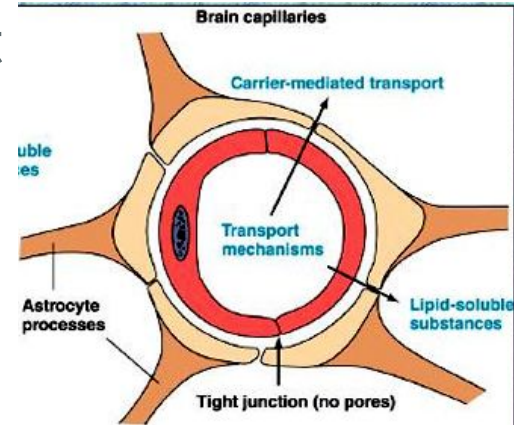


How Do Systemic Drugs Enter the Eye

Drug's ability to penetrate major vessel barriers will determine its likelihood to affect the ocular tissues and visual function

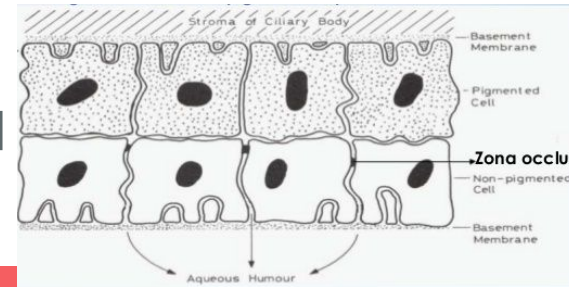
Blood-Brain barrier

Tight junctions (zonula occludens) of endothelial cells in the retinal blood vessels restrict large molecular weight drugs



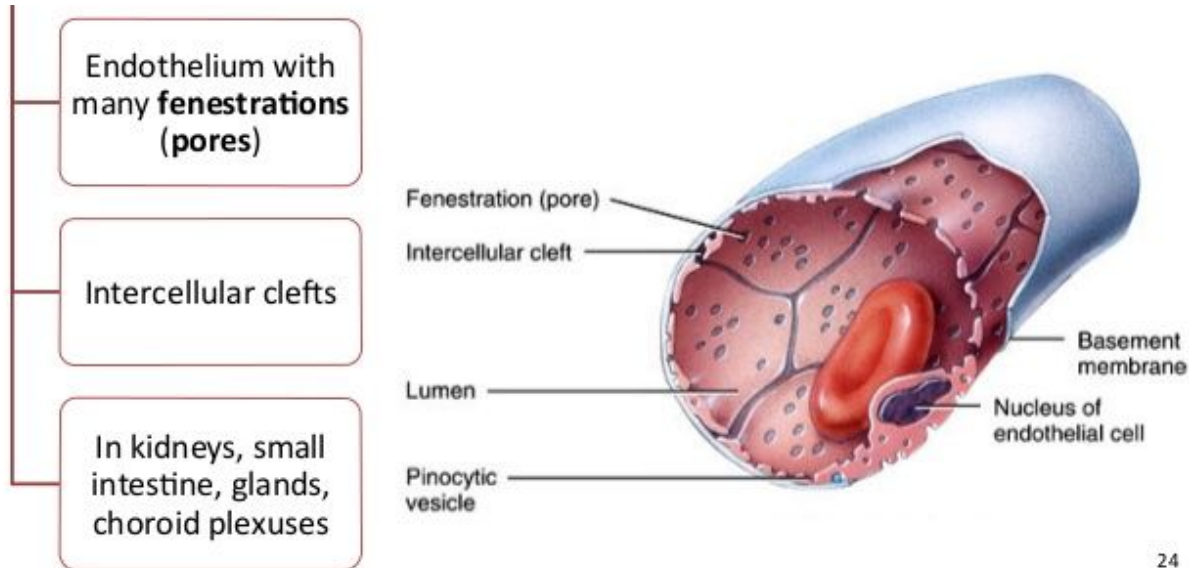
Blood-Aqueous barrier

Fenestrations prevent large molecules and lipid insoluble compounds from passing



How Do Systemic Drugs Enter the Eye

Choroid, sclera, and ciliary body → small lipid soluble drug molecules can easily pass → diffuse into the avascular structures (lens, cornea, and trabecular meshwork)



How Do Systemic Drugs Enter the Eye

A drug molecule that enters the eye will accumulate in ocular tissues or exit the eye

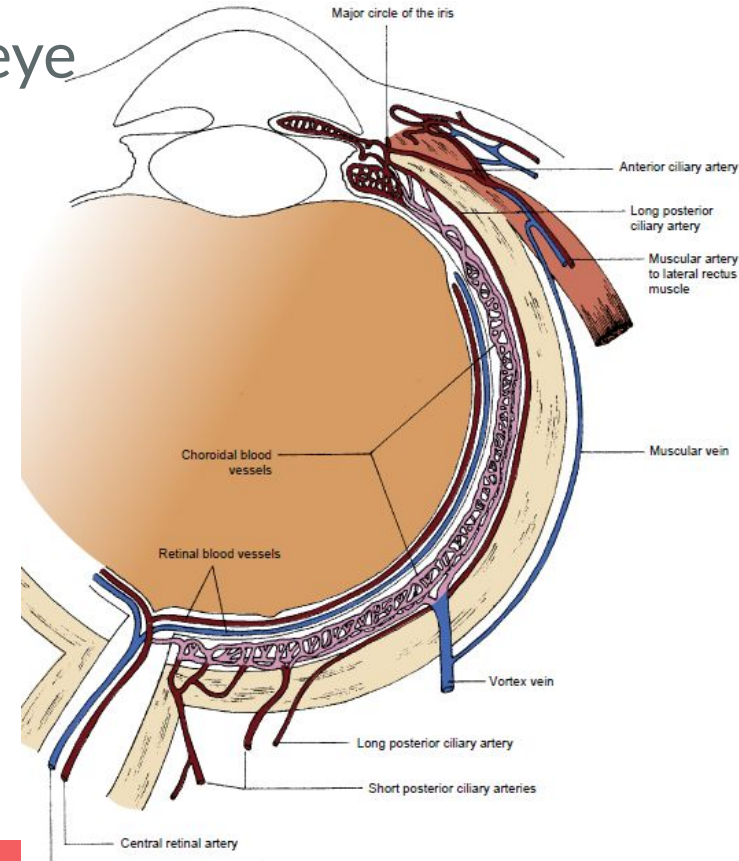
Major accumulation sites:

Cornea

Lens

Vitreous

Retina



Determinants of Adverse Drug Reactions

Nature of drug

Dose of medication

Duration of drug use

Administration route

Allergy to drugs

Drug-Drug interaction (polypharmacy)

Rate of ADR increases exponentially after 4 meds

Absorption, distribution, metabolism, excretion

Age and Gender of patient

Liver / Kidney / Health

Individual patient response



The Optometrist's Role

- Be familiar with associated ocular and visual side effects of common systemic medications - the prescribing doc might not be
- Concise and detailed case history, including medication history (OTC and Rx)
 - Medication name, dosage, duration of treatment
 - Identify what condition the drug is being used for (off label?)
- Can zone in on the problem and direct testing

The Optometrist's Role

- ~28 new drugs come out every year (FDA)
 - Familiarize yourself with the class of medication vs. the brand names
- Do not suggest discontinuation or changing dose of medication without discussing with **prescribing** physician - co-manage / suggest other class of medication
- Often benefit of drug outweighs the side effects

The Optometrist's I

General Rules:



- Goal is to
 - Manage ADR so patient can continue using the meds
 - Evaluate for vision threatening ADR
- Bilateral (asymmetric)
- ADR resolve after d/c of medication unless permanent damage to cells and tissue
 - ADR onset in couple weeks to months
 - Most ADR resolve several days to weeks after d/c of medication unless permanent damage to tissue
 - ADR can be dose and time dependant

- amil: calcium channel blockers
- caine: local anesthetics
- dine: anti-ulcer agents (H2 histamine blockers)
- done: opioid analgesics
- ide: oral hypoglycemics
- lam: anti-anxiety agents
- oxacin: broad spectrum antibiotics
- micin: antibiotics
- mide: diuretics
- mycin: antibiotics
- nuim: neuromuscular blockers
- olol: beta blockers
- pam: anti-anxiety agents
- pine: calcium channel blockers
- pril: ace inhibitors
- sone: steroids
- statin: antihyperlipidemics
- vir: anti-virals
- zide: diuretics

What are these medications used for?

CARDIOVASCULAR

HTN, HLD, AFib

PSYCHIATRIC

Depression, ADHD, Anxiety

GENITOURINARY

ED, BPH, GERD

ENDOCRINE

DM, Thyroid, Contraceptives

CHEMOTHERAPEUTIC

Breast Cancer

NEUROLOGIC

Seizures, Migraines

BONE DISEASE

Osteoporosis

RHEUMATOLOGIC

RA, SLE, Malaria

IMMUNOMODULATING

Hep C

ANTI-INFLAMMATORY

Steroids, NSAIDs

ANTI-INFECTIVE

Bacterial infections, Acne, TB

ANTI-ALLERGY

Seasonal allergy, Decongestants

VITAMINS / SUPPLEMENTS

Most Common Ocular / Visual Side Effects of 40 Classes of Systemic Drugs

Blurry Vision

Dry Eye Syndrome

Visual Field Defects

Color Vision / Contrast Defects

Optic Neuropathy

Diplopia

Photophobia

Pseudotumor Cerebri

Cataract

Increased IOP

Mydriasis

Accommodative Dysfunction

Conjunctivitis

Macular Edema

Ptosis

Retinal Changes

Myopia

Whorl Keratopathy

Retinal Hemes

Nystagmus

Visual and Ocular ADR of Common Systemic Meds

| | | | Blur | DEs | VF Defects | CV Defects | Optic Neuropathy | Diplopia | Photophobia | Pseudotumor (PTC) | Cataract | IOP | Mydriasis | Acc. Dysfunct. | Conjunctivitis | Macular Edema | Prosis | Retinal Changes | Myopia | Whorl Keratopathy | Retinal Heme | Nystagmus |
|-----------------------------|--|---|------|-----|------------|------------|------------------|----------|-------------|-------------------|----------|-----|-----------|----------------|----------------|---------------|--------|-----------------|--------|-------------------|--------------|-----------|
| CARDIOVASCULAR | | | | | | | | | | | | | | | | | | | | | | |
| statin | lovastatin, niacin, atorvastatin, simvastatin | Mevacor, Advicor, Niaspan, Lipotor, Zocor | x | x | | | | | | | x | | | | | x | x | | | | | |
| beta blocker | acebutolol, atenolol, betaxolol, meroprolol | Sectral, Tenormin, Kerlone, Lopressor | | x | | | | | | | | | | | | | | | | | | |
| glycoside | digoxin | Digox, Lanoxin, Cardoxin, Lenoxin | x | | x | x | x | | | | | | | | | | | | | | | |
| amiodarone | amiodarone | Cordarone, Pacerone | x | | | x | x | | x | | x | | | | | | | | | | x | |
| thiazide and diuretic | hydrochlorothiazide, furosemide | Microzide, HydroDIURIL, LASIX | x | x | | | | | | | | | | | | | | | x | | | |
| anticoagulant | warfarin, heparin, clopidogrel, aspirin | Coumadin, Hemochron, Plavix | x | | x | | | | | | | | | | | | | | | | | x |
| PSYCHIATRIC | | | | | | | | | | | | | | | | | | | | | | |
| phenothiazines | thioridazine, chlorpromazine | Mellaril, Thorazine | x | x | | x | | | x | | x | x | x | x | | | | | x | | | |
| benzodiazepine | alprazolam, diazepam | Xanax, Valium | x | x | | | | x | x | | | | x | x | x | | | | | | | |
| SSRI | fluoxetine HCL, sertraline, paroxetine, citalopram | Prozac, Zoloft, Paxil, Celexa, Effexor | x | x | | | | x | x | | | | x | x | x | | | x | | | | |
| CNS stimulant | methylphenidate, amphetamine | Ritalin, Adderall | x | x | | | | | x | | | | | x | | | | | | | | |
| GENITOURINARY | | | | | | | | | | | | | | | | | | | | | | |
| alpha 1 antagonist | tamsulosin, terazosin, alfuzosin | Flomax | | | | | | | | | | | floppy | | | | | | | | | |
| phosphodiesterase inhibitor | sildenafil citrate, vardenafil, tadalafil | Viagra, Levitra, Cialis | x | | x | x | x | | | | | | | | | | | | | | | |
| histamine 2 blocker | ranitidine | Zantac, Deprizine | x | | | x | | | x | | | | | x | | x | | | | | | |
| ENDOCRINE | | | | | | | | | | | | | | | | | | | | | | |
| hormone replacement | levothyroxine | Synthroid, Levoxyl, Levothyroid | x | | x | x | x | x | | x | | | | | | | | | x | | | |
| thiazolidinedione | rosiglitazone, pioglitazone hydrochloride | Avandia, Actos | x | | x | | | | | | | | | | | | x | | | | | |
| contraceptive | estrogen and pregestin | Ortho-Novum, Levora, Laziant, Ocella | x | x | x | x | x | x | | x | | | | | | | x | | | | | x |
| CHEMOTHERAPEUTIC | | | | | | | | | | | | | | | | | | | | | | |
| estrogen antagonist | tamoxifen | Nolvadex | x | | x | x | x | x | | x | x | | | | | | | | x | | x | |
| immunosuppressant | methotrexate | Trexall, Rasuvo | x | x | | | | x | | x | | | | | | x | | | | | | |
| anticholinergic | scopolamine | Scopace, Transderm-Scope | x | | | | | | x | | | x | x | x | | | | | | | | |
| NEUROLOGIC | | | | | | | | | | | | | | | | | | | | | | |
| anticonvulsant | topiramate | Topamax | x | | x | | | x | | | x | x | | | | | | | x | | | x |
| anticonvulsant | lamotrigine | Lamictal | x | | | | | x | | | | | | | | | | | | | | x |
| GABA analog | gabapentin | Neurontin | x | | x | | x | x | | | | | | | | | x | | | | | x |
| BONE DISEASE | | | | | | | | | | | | | | | | | | | | | | |
| bisphosphonate | alendronate, risedronate, tiludronate, pamidronate | Fosamax, Actonel, Skelid, Aredia, Boniva | x | x | | | | | | | | | | | | x | | | | | | |
| RHEUMATOLOGIC | | | | | | | | | | | | | | | | | | | | | | |
| quinoline | chloroquine, hydroxychloroquine | Aralen, Plaquenil | x | | x | x | | | | x | | | | x | | | | | x | | | x |
| IMMUNOMODULATING | | | | | | | | | | | | | | | | | | | | | | |
| signaling protein | interferon | Intron A, Avonex, Pegasys | x | x | x | x | x | | | x | | | | | x | | | | x | | | x |
| INFLAMMATORY | | | | | | | | | | | | | | | | | | | | | | |
| steroid | corticosteroids | Deltason, Kenalog, Dexasone, Pred-Pak | x | | x | x | x | x | | x | x | x | | | | | x | | | | | |
| NSAID | NSAIDs, Indomethacin | Ibuprofen, Indocin | x | x | x | x | x | x | | x | | | | | | | | | | | | x |
| ANTIINFECTIVE | | | | | | | | | | | | | | | | | | | | | | |
| cycline | tetracycline, doxycycline | Sumycin, Vibramycin | x | | x | | | x | x | x | | | | | | | | | | | | |
| minocycline | isotretinoin | Accutane, Roaccutane | x | x | x | x | x | x | | x | | | | | | x | | | x | x | | |
| sulfacetamide | sulfacetamide | Klaron, Ovace | x | x | | | | | | | | | x | | | x | | x | | x | | |
| antimycobacterial | ethambutol, isoniazid | Myambutol, Hydra, Isonit | x | | | x | x | | | | | | | | | | | | | | | |
| ANTIALLERGY | | | | | | | | | | | | | | | | | | | | | | |
| antihistamine | certirizine, loratadine, diphenhydramine | Zyrtec, Claritin, Benadryl | x | x | | | | | | | | | x | x | x | | | | | | | |
| decongestant | pseudoephedrine | Sudafed | x | x | | | | | | | | | | | x | | | | | | | |
| VITAMINS | | | | | | | | | | | | | | | | | | | | | | |
| vitamin A analog | vitamin A | Aquasol A | x | x | x | x | x | x | | x | | | | | | | | | | | | |
| niacin | vitamin B3 | Niacor, Niaspan | x | x | | | | | | | | | | | | | x | x | | | | |

What are these medications used for?

CARDIOVASCULAR

HTN, HLD, AFib

PSYCHIATRIC

Depression, ADHD, Anxiety

GENITOURINARY

ED, BPH, GERD

ENDOCRINE

DM, Thyroid, Contraceptives

CHEMOTHERAPEUTIC

Breast Cancer

NEUROLOGIC

Seizures, Migraines

BONE DISEASE

Osteoporosis

RHEUMATOLOGIC

RA, SLE, Malaria

IMMUNOMODULATING

Hep C

ANTI-INFLAMMATORY

Steroids, NSAIDs,

ANTI-INFECTIVE

Bacterial infections, Acne, TB

ANTI-ALLERGY

Seasonal allergy, Decongestants

Common ADR of Cardiovascular Meds

Blurry Vision (5/6)

Dry / Irritated Eyes (3/6)

Color Vision Changes (3/6)

Visual Field Disturbance (3/6)



Cardiovascular Agents

Statins



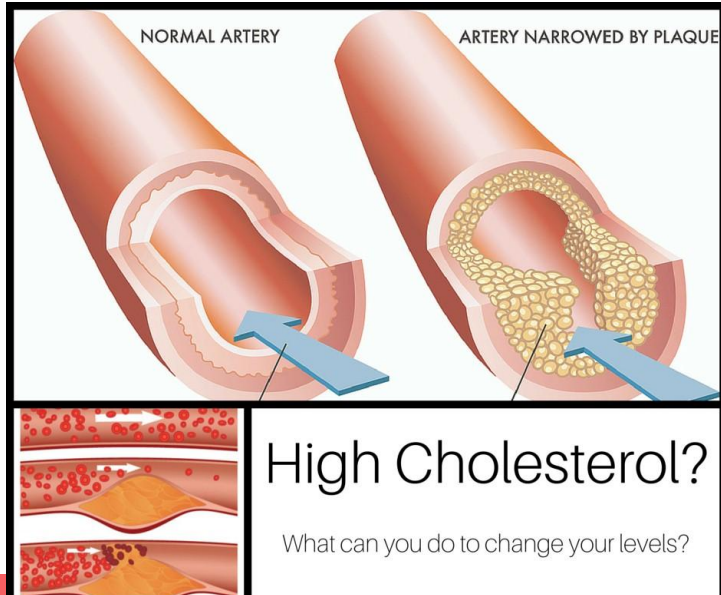
Brand Name: Mevacor, Advicor, Niaspan, Lipitor, Zocor

Generic: lovastatin, niacin, atrovastatin, simvastatin

Cardiovascular Agent – statins

Prescribed for:

- High cholesterol /HLD
- Cardiovascular disease



Cardiovascular Agent – statins

Mechanism of Action

- inhibit HMG-CoA reductase enzyme → decrease production of cholesterol in the liver
- Peripheral vascular dilator
- Can cause muscle weakness, mechanism unknown

Cardiovascular Agent – statins

Visual / Ocular ADR

- Vasodilation

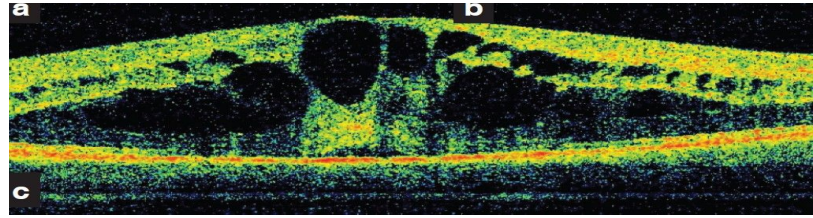
Pseudo-cystoid macular edema

Most in men between 30-50 yo

Vision loss reversible 1-2 days after d/c

Eyelid edema / Ptosis

- Eye irritation / Dry eye (20%)
- Muscle Weakness
Ptosis and EOM restriction
- Blurry vision → Cataract ???



Cardiovascular Agents

Beta-Blockers



Brand Name: Sectral, Tenormin, Kerlone, Lopressor

Generic: acebutolol, atenolol, betaxolol, metoprolol

Cardiovascular Agents – beta blockers

Prescribed for:

- Hypertension , Congestive heart failure, Angina
- Arrhythmia
- Hyperlipidemia



Cardiovascular Agents – beta blockers

Mechanism of action:

- Block norepinephrine and epinephrine (adrenaline) from binding to beta receptors → dec. heart rate and BP
 - beta-1 (β_1) receptors in the heart, **eye**, and kidneys
 - beta (β_2) receptors in the lungs, gastrointestinal tract, liver, uterus, blood vessels, and skeletal muscle
 - beta (β_3) receptors in fat cells

Cardiovascular Agents – beta blockers

Visual / Ocular ADR

- Dry eye
 - Reduce tear lysozyme levels and immunoglobulin A (IgA) → reduction in tear secretion → dry eye
- Decrease IOP
 - Block the beta 2 receptors on the nonpigmented ciliary epithelium → reduced aqueous formation by ciliary processes



Cardiovascular Agents

Glycosides

Brand Name: Digox, Lanoxin, Cardoxin,

Generic: digoxin



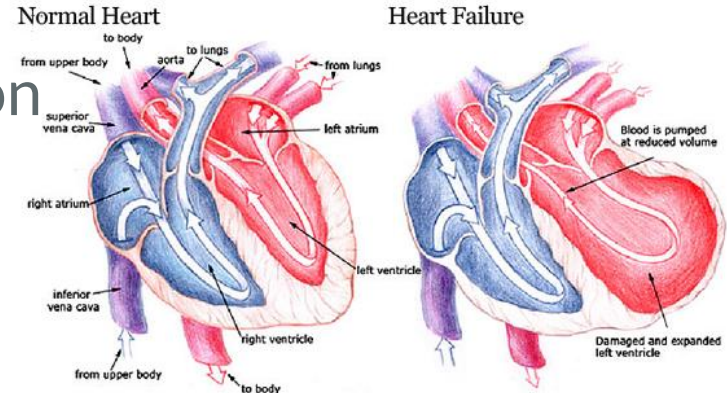
Cardiovascular Agents – glycosides

Prescribed for:

- Congestive heart failure
- Cardiac arrhythmia, fibrillation

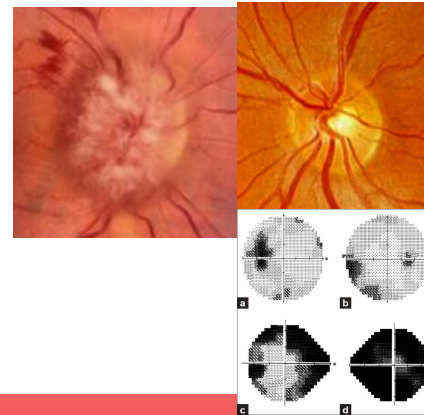
Mechanism of action:

- Inhibits sodium and potassium ATPase
 - Strengthen heart contractions and reduce heart rate



Cardiovascular Agents - glycosides

- Visual / Ocular ADR
 - Decrease of aqueous humor production (low IOP)
 - Inhibition of Na^+/K^+ -ATPase in the ciliary epithelium leads to reduced aqueous secretion and IOP
 - Scotomas
 - Inhibition of Na^+/K^+ -ATPase pump alters potassium levels which creates electrical disturbance
 - ERG: prolonged B-wave = bipolar and Muller
 - Retrobulbar optic neuritis
 - Pain, vision blur, VF defects, CV changes



Cardiovascular Agents - glycosides

Visual / Ocular ADR (reversible) (11-25%)

- Cone dysfunction
 - Flickering or flashes of light
 - Snowy, hazy, or dimming vision
 - Red-green color defects
 - Yellow tinged vision (xanthopsia)



Cardiovascular Agents

Antiarrhythmic

Brand Name: Cordarone, Pacerone

Generic: amiodarone

AMIODARONE

An effective antiarrhythmic agent

CORDARONE[®]
amiodarone



Cardiovascular Agents- antiarrhythmic

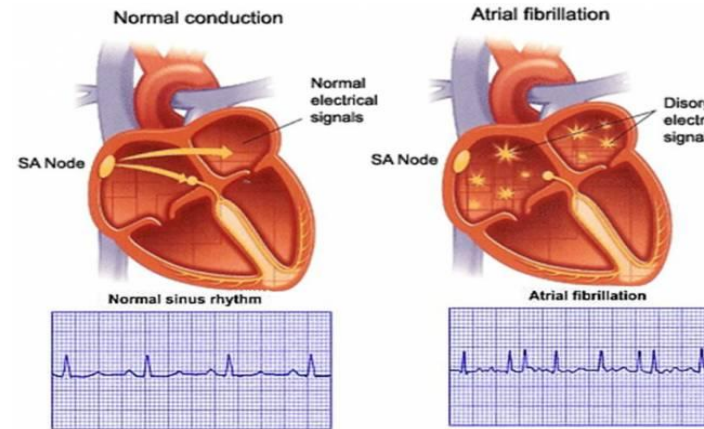
Prescribed for:

- Atrial and ventricular arrhythmia

Most commonly prescribed anti-arrhythmic in USA

- Mechanism:

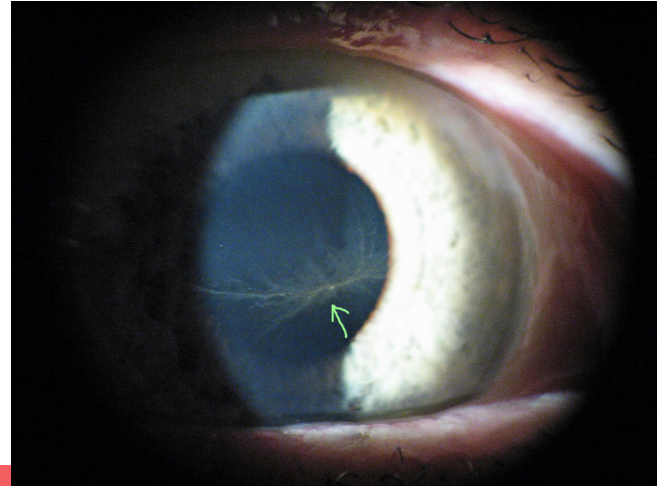
- Prolongs cardiac action potentials
- Structurally similar to thyroxine (T4)
 - Simulate over active thyroid function



Cardiovascular Agents- antiarrhythmic

Visual / Ocular ADR

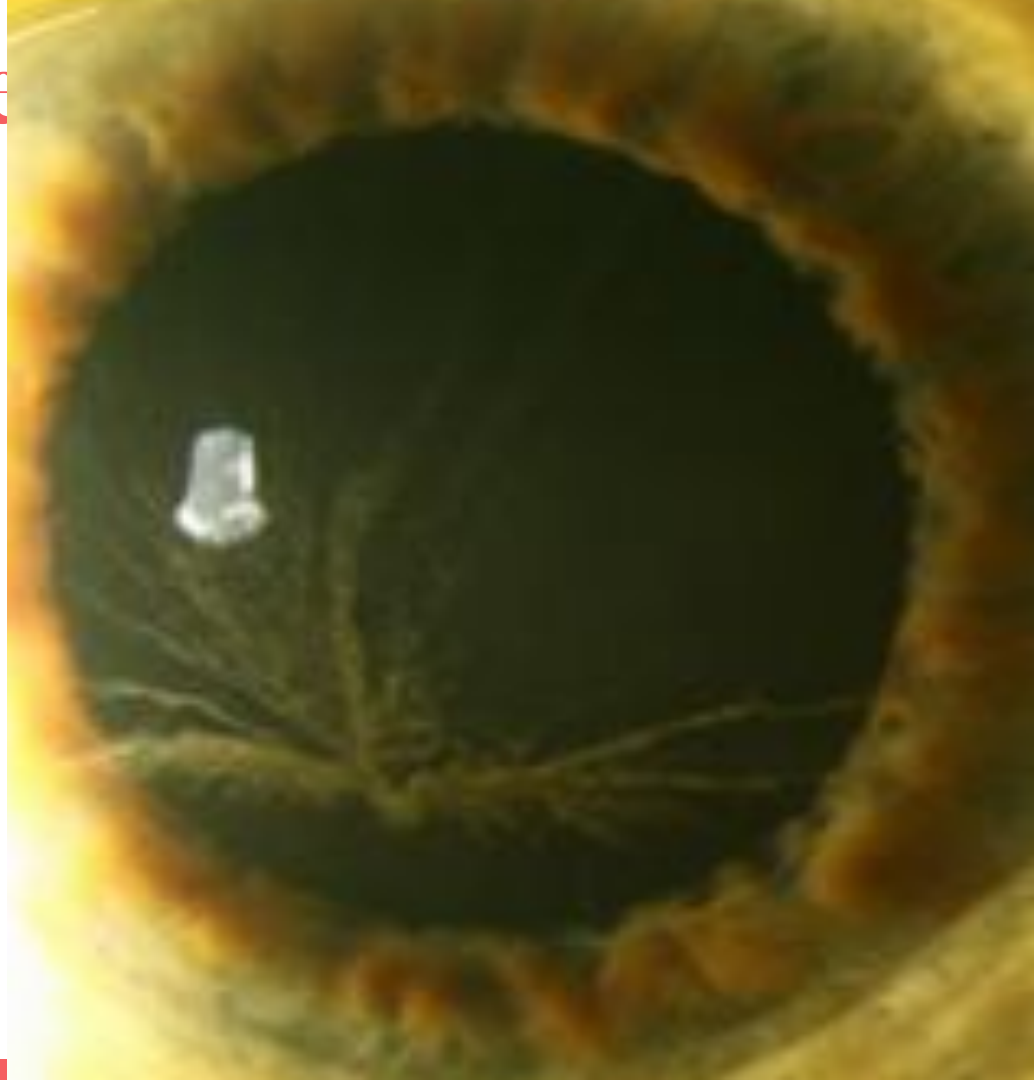
- Corneal whorl keratopathy deposits
 - nearly 100% of patient using longer than 6 months
 - UV light fixates drug's metabolites to lipids within epithelial cells
 - Golden brown deposits appear whorl like because epithelial cells migrate centripetally from the limbus



Cardiovascular Age

Corneal whorl keratopathy

- Severity dose dependent
(100 – 200 - mg/d minimal effect; 400 - 1,400 mg/d - more advanced keratopathy)
- Resolves 6-8 months after drug d/c



Four stages of whorl keratopathy

Grade I – Faint horizontal line appears in interpalpebral fissure at junction of middle and lower third of cornea. It consists of golden brown microdeposits in the epithelium just anterior to Bowman's layer

Grade II – Transition occurs by 6 months, during which time the deposits become aligned in more linear pattern and extend toward limbus

Grade III – Deposits increase in number and density, and lines extend superiorly to produce a whorl-like pattern into visual axis

Grade IV – Irregular, round clumps of deposits characterize this grade

Keratopathy resolves within 6-8 months after d/c of drug. Amiodarone-induced lens deposits occur within the pupillary area and limited to the superficial anterior subcapsular area

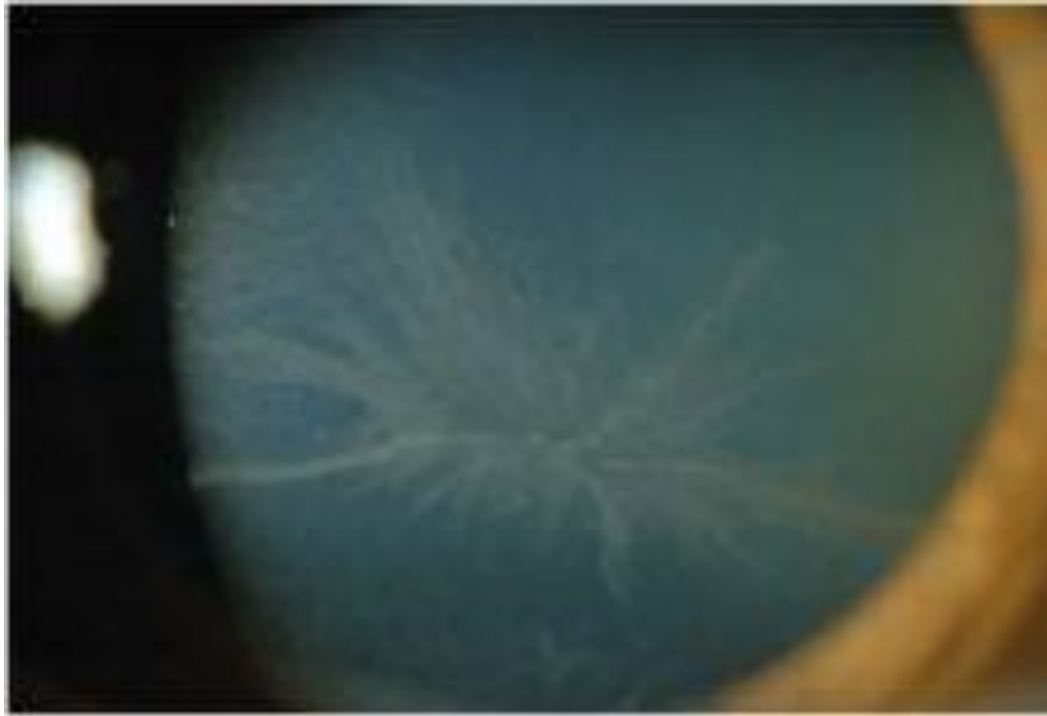
Fabry's Disease

Corneal whorl keratopathy

Lysosomal storage disease

Progressive cardiovascular,
cerebrovascular, and
renal disease

Drug binds to lipids and accumulates
in lysosomes - presence of these
complex lipid deposits is a
drug-induced lipid storage disease



Cardiovascular Agents- antiarr

Visual / Ocular ADR

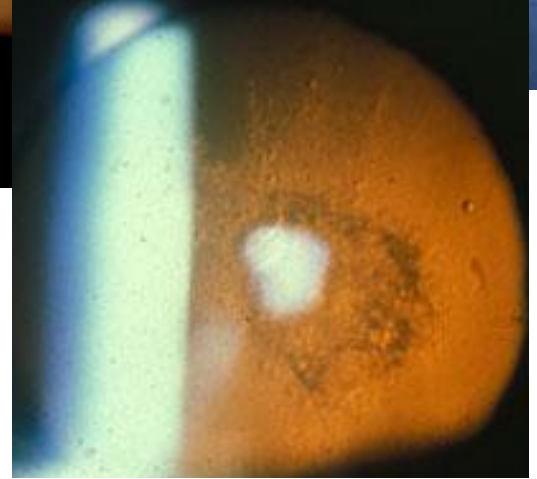
- Whorl keratopathy

Photophobia (57%)

Blue-green rings around lights

Blurred vision

- Anterior subcapsular lens opacities within pupillary area



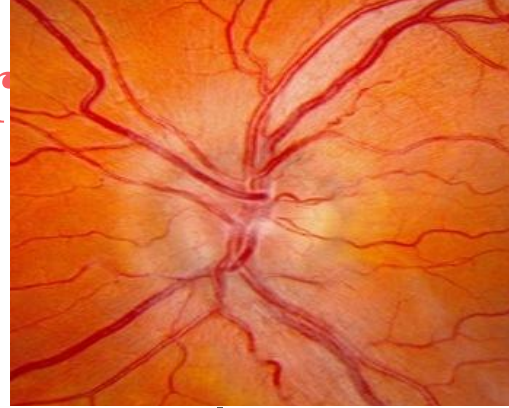
Cardiovascular Agents- antiarr

Visual / Ocular ADR

- Anterior Ischemic Optic Neuropathy (1.8%)
 - Decreased axoplasmic flow → accumulation of inclusions in optic nerve axons → optic nerve edema

? due to drug or patient's medical health status

ONH edema may last months after medication d/c due to amiodarone's long half life



*amiodarone can cause increase in digoxin levels → Retrobulbar optic neuritis

Cardiovascular Agents

Thiazides and Diuretics



Brand Name: Microzide, HydroDIURIL
LASIX,

Generic: hydrochlorothiazide (HCTZ)
furosemide

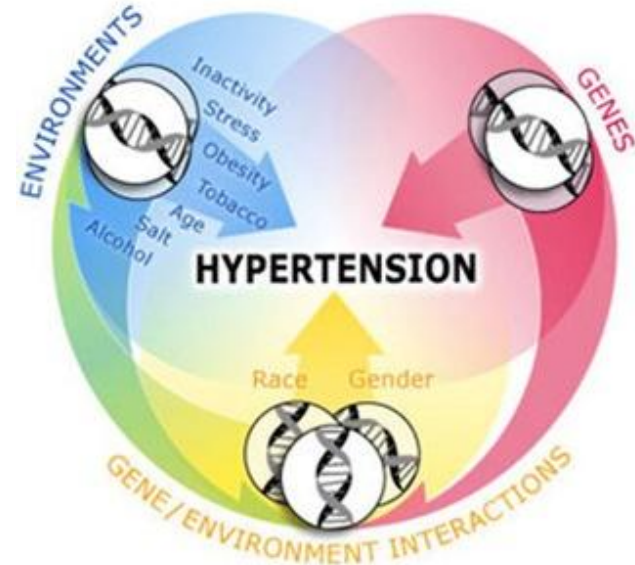
Cardiovascular – thiazide and diuretics

Prescribed for:

- Congestive heart failure
- Hypertension

Mechanism of action:

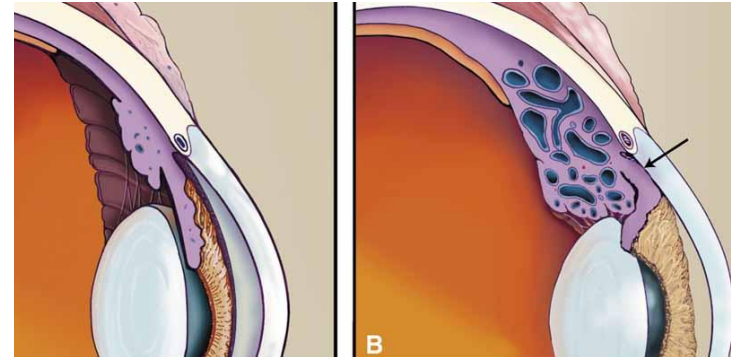
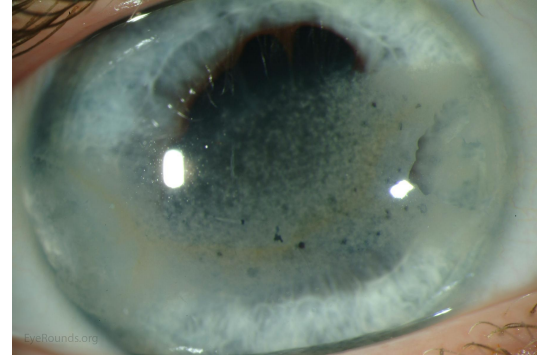
- Prevent reabsorption of sodium and chloride in the kidneys
- Increase excretion of water from the body



Cardiovascular – thiazide and diuretics

Visual / Ocular ADR

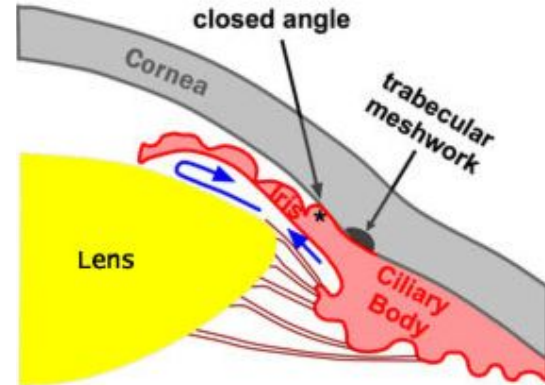
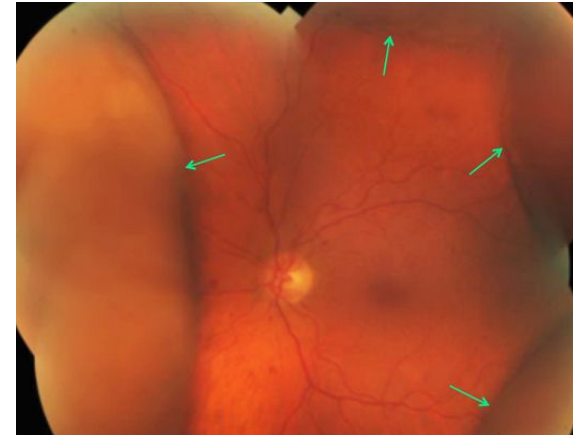
- Dry eye
- Band keratopathy
- Myopic shift and pupillary block (rare)



Cardiovascular – thiazide and diuretics

Visual / Ocular ADR

- Acute bilateral myopia (6-8D) and Secondary angle closure glaucoma due to choroidal effusion (rare)
 - Headache, eye pain, decreased vision
 - Choroidal effusion/leakage → ciliary body edema → anterior displacement of lens and iris → shallow anterior chamber → angle closure → IOP spike



Choroidal Effusion

Treatment

- **Topical IOP** lowering agents
- **Cycloplegics** - relax CB and move iris-lens posteriorly
- **Steroid** - reduces supraciliary effusion by stabilizing cell membranes

Avoid

- **Miotics** - Pilocarpine further displaces ciliary body forward
- **Sulfa-derivatives** - acetazolamide (Diamox) can further induce effusion
- **Peripheral Irodotomy** - not a traditional pupillary block so no therapeutic benefit

Cardiovascular Agents

Anticoagulants



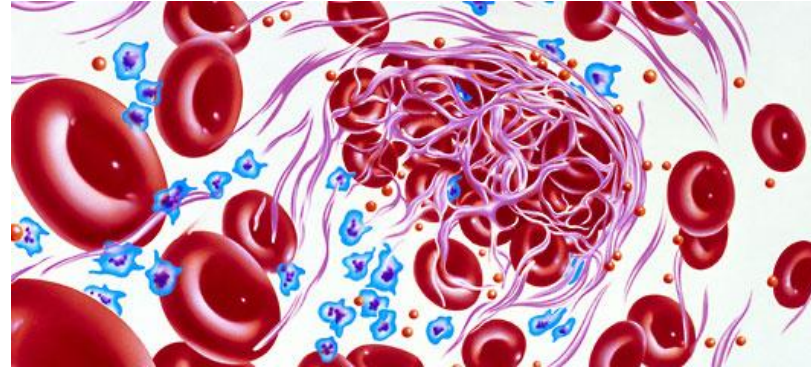
**Brand Name: Coumadin, Hemochron,
Plavix**

**Generic: warfarin, heparin, clopidogrel,
aspirin**

Cardiovascular Agents - anticoagulants

Prescribed for:

- Prevent clot formation in atrial fibrillation
- Treat and prevent thrombosis



Mechanism of action

- Prevents synthesis of clotting factors

Cardiovascular Agents - anticoagulants

Visual / Ocular ADR

- Subconjunctival hemorrhage (common)
- Retinal hemorrhage (less common)



Can cause blurred vision or VF defects

- Wet AMD patients
 - ?aspirin use may be associated with increased risk of neovascular AMD
- Consideration in eye surgery

Common ADR of Cardiovascular Meds

Blurry Vision (5/6)

Dry / Irritated Eyes (3/6)

Color Vision Changes (3/6)

Visual Field Disturbance (3/6)



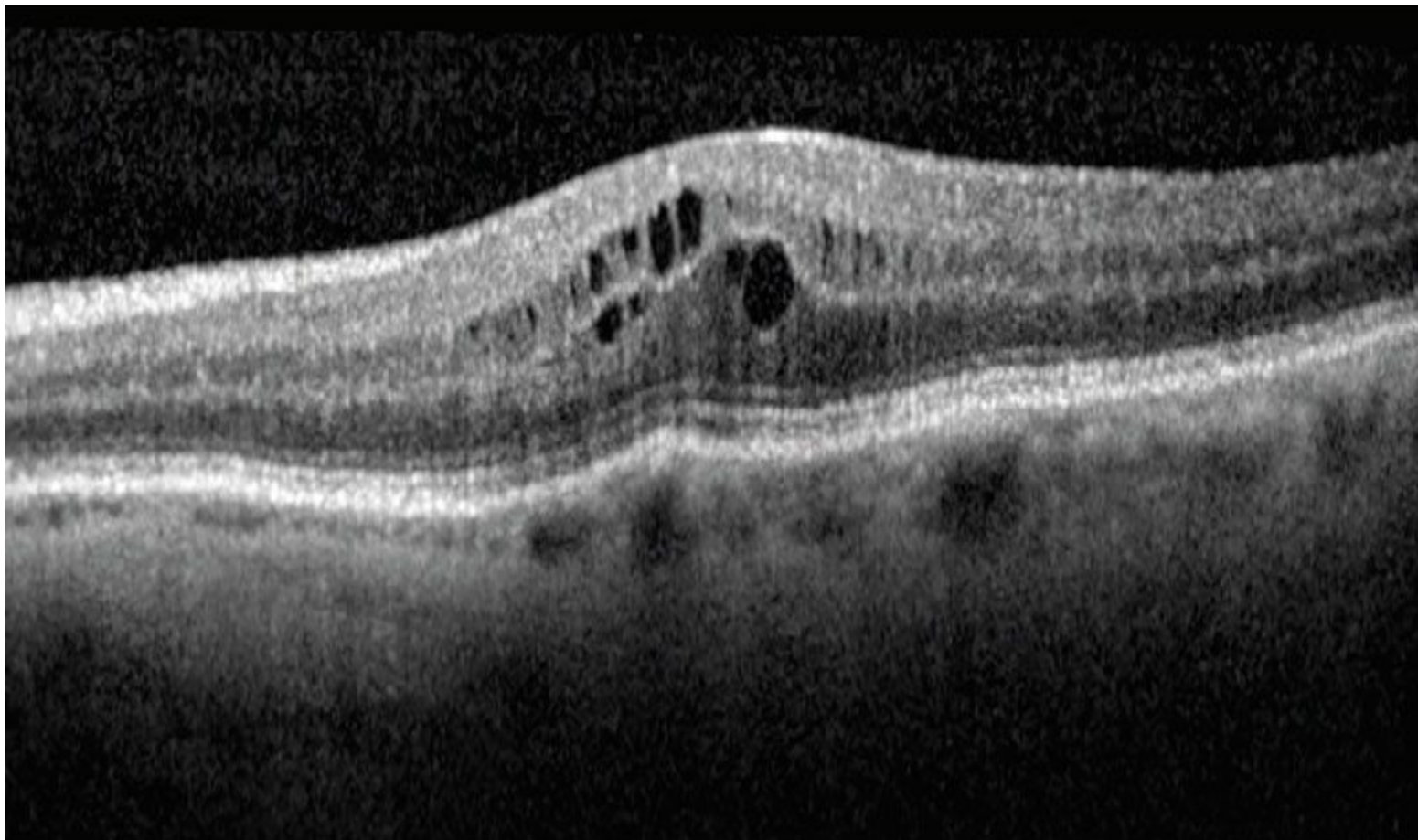
Case 1

- 48yo BM c/o DV and NV blur with specs OD x 5 mos
 - No other visual / ocular complaints
- LEE: 1 year ago with you
 - Ocular Hx: myopia, presbyopia, early nuclear cataract
- LME: 6 months ago
 - HCL x 6 years well controlled with simvastatin
 - HTN x 15 years well controlled with metoprolol
- All other Hx unremarkable

Case 1

- Entrance testing normal
- BCVA
 - 20/40 OD -2.75DS PH NI
 - 20/20 OS -2.00DS
- SLE: mild SPK OU with decreased TBUT
- DFE:

Case 1



Case 1

- Assessment:
 - a. Cystoid macular edema OD
 - b. DES OU

Case 1

- Assessment:
 - a. Cystoid macular edema OD
 - b. DES OU
- Plan:
 - a. Co-manage with pt's PCP, write letter regarding simvastatin as likely cause for macular edema, ? switching to a different class of med
 - RTC 3 mos for f/u
 - b. Likely due to use of statin and beta blocker. Pt asymptomatic. Ed re ATS QID OU PRN.

What are these medications used for?

CARDIOVASCULAR

HTN, HLD, AFib

PSYCHIATRIC

Depression, ADHD, Anxiety

GENITOURINARY

ED, BPH, GERD

ENDOCRINE

DM, Thyroid, Contraceptives

CHEMOTHERAPEUTIC

Breast Cancer

NEUROLOGIC

Seizures, Migraines

BONE DISEASE

Osteoporosis

RHEUMATOLOGIC

RA, SLE, Malaria

IMMUNOMODULATING

Hep C

ANTI-INFLAMMATORY

Steroids, NSAIDs,

ANTI-INFECTIVE

Bacterial infections, Acne, TB

ANTI-ALLERGY

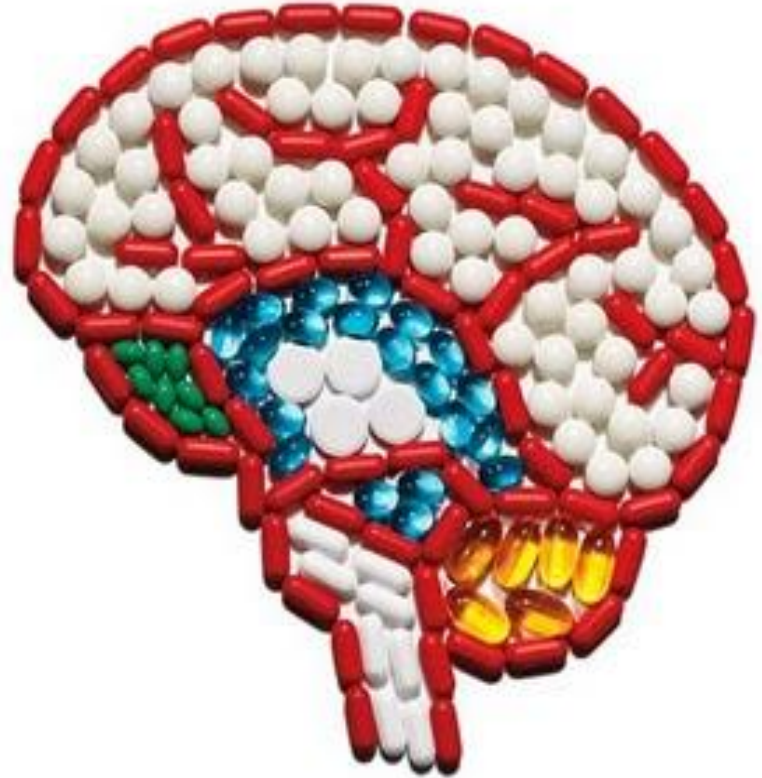
Seasonal allergy, Decongestant

Common ADR of Psychiatric Meds

Blurry Vision (9/9)

Dry / Irritated Eyes (9/9)

Mydriasis and Photophobia (9/9)



Selective Serotonin Reuptake Inhibitors (SSRI)



**Brand Name: Prozac, Zoloft, Paxil,
Celexa, Effexor**

**Generic: fluoxetine hydrochloride, sertraline,
paroxetine, citalopram, venlafaxine
hydrochloride**

Antidepressants – SSRIs

Prescribed for:

- Depression, OCD, PTSD, Anxiety, Bulimia
- PMS, Menopause

*SSRI have

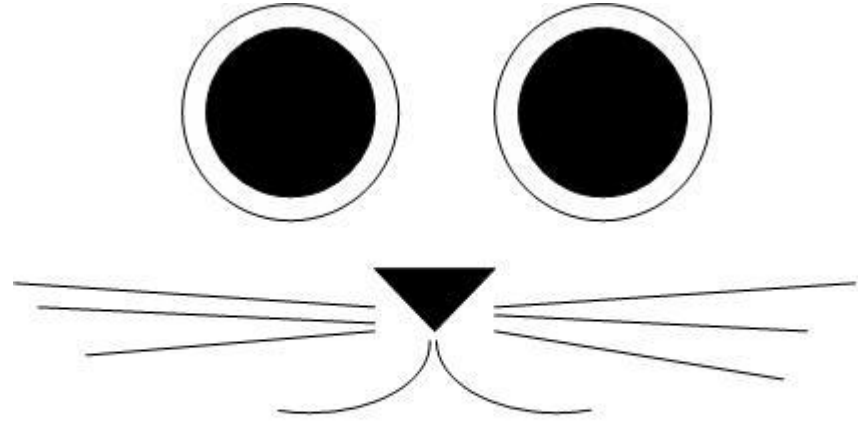
anticholinergic properties*



Antidepressants - SSRIs

Visual / Ocular ADR

- 2* Anticholinergic effects
 - Mydriasis / Narrow Angle
 - Photophobia
 - Dry eye
 - Cycloplegia / Blurred Vision
- Conjunctivitis
- Diplopia
- Ptosis



Antihistamines



Used to treat allergies



Relieves itching, motion sickness, and hyperalgesia



Also used for anxiety, mood disorders, even opioid or opiate withdrawals

Brand Name: Atarax, Alamon, Durrax, Vistaril, Equipoise, Masmorra, and Paxistil

Generic: hydroxyzine hydrochloride, hydroxyzine pamoate

HYDROXYZINE ABUSE, DEPENDENCE AND ADDICTION

- Induces euphoria and feelings of relaxation
- Does not hold the same addictive and dependency potentials as other drugs do
- Mainly teenagers fall under the abuse of hydroxyzine



Antihistamines

Prescribed for:

- Anxiety, Tension, Psychoneurosis
- Premedication as a sedative for operative procedures
- Motion Sickness, Itchiness

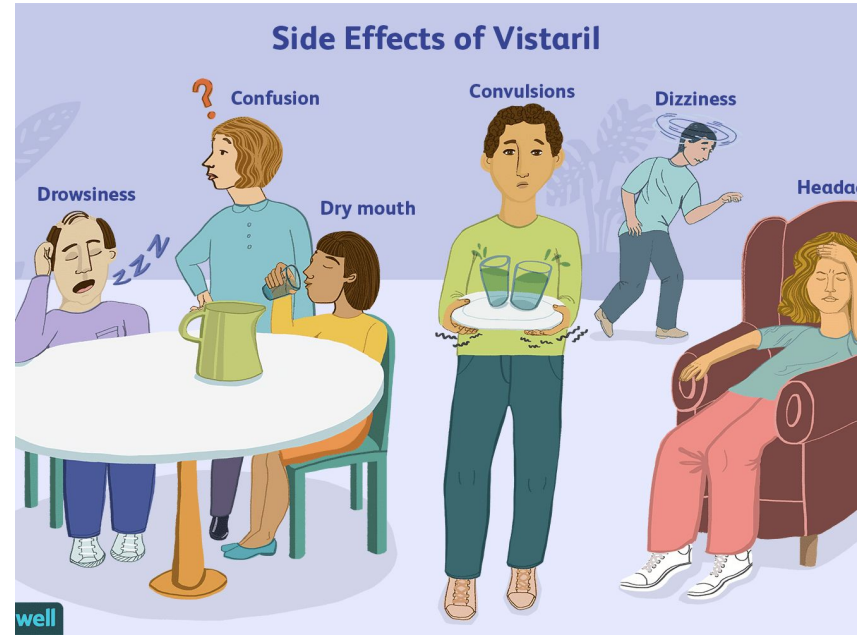
Mechanism of action:

- Blocks histamine (H1) action to regulate/calm normal neuronal function and some serotonin antagonistic properties

Antihistamines

Visual / Ocular ADR

- 2* Anticholinergic effects
 - Mydriasis / Narrow Angle
 - Photophobia
 - Dry eye
 - Cycloplegia / Blurred Vision
 - Elevated IOP



Drowsiness, Dizziness, Constipation

Benzodiazepines



**KEEP
CALM
AND
TAKE A
XANAX**

Brand Name: Xanax, Valium, Ativan

**Generic: alprazolam, diazepam,
bromazepam, lorazepam**

Tranquilizers – benzodiazepines

Prescribed for:

- Extreme tension and anxiety
- Sleeping disorders

Mechanism of action

- Enhances action of GABA (the chief inhibitory neurotransmitter)
 - Decreases neuronal firing throughout CNS
- Anticholinergic properties



Tranquilizers – benzodiazepines

Visual / Ocular ADE (dose dependent)

- GABA (neuron inhibition)

Saccadic and Smooth Pursuit dysfunction

Diplopia

- Anticholinergic effects

Mydriasis 2* pupil sphincter relaxation

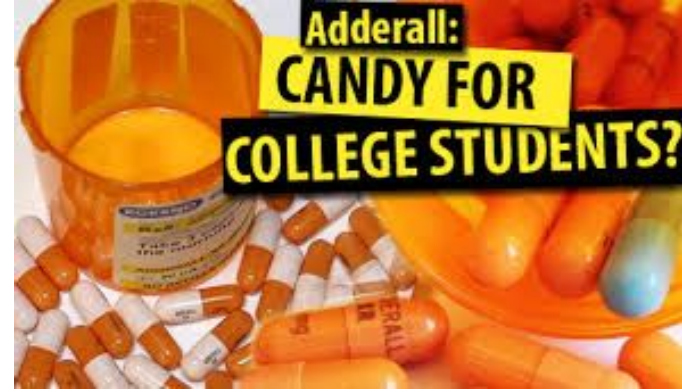
Blurred vision, Dry Eye, Photophobia, Narrow Angle, IOP



CNS Stimulant

Brand Name: Ritalin, Adderall

Generic: methylphenidate,
amphetamine



CNS stimulants - amphetamine

Prescribed for:

- ADHD
- Narcolepsy

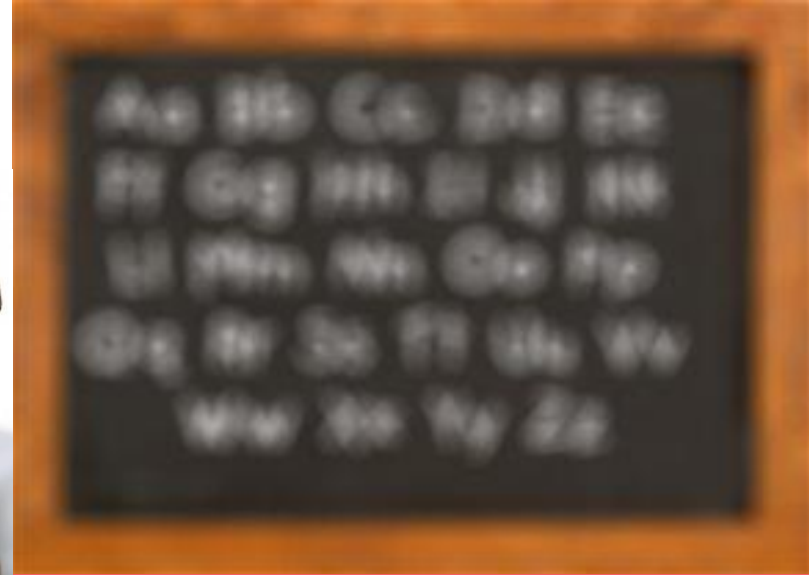


CNS stimulants - amphetamine

- Mechanism of action
 - Mild cortical stimulant → increasing concentrations of dopamine and norepinephrine → stimulate sympathetic nervous system

Visual / Ocular ADR

- Blurred vision
- Mydriasis
- Dry eyes



Non-CNS Stimulant



Brand Name: Kapvay (ER), Tenex, Intuniv (ER)

Generic: clonidine, guanfacine



Non-CNS stimulants - clonidine

Prescribed for:

- ADHD
- Withdrawal (alcohol, opioids)

Mechanism of action

- Alpha adrenergic agonist (sympathomimetic)



Non-CNS stimulants - clonidine

Visual / Ocular ADR

- Blurred vision
- Alpha 2 agonist
 - Decrease IOP (decrease AQ production and increase US outflow)
 - Miosis
- Alpha 1 agonist
 - Mydriasis → IOP increase, photophobia
 - Dry eyes (eyelid retraction, decreased secretion)
 - Vasoconstriction

Non-CNS Stimulant

Brand Name: Strattera

Generic: atomoxetine



Non-CNS Stimulant – atomoxetine

Prescribed for:

- ADHD
- Off label - mood disorders, eating disorders, cognitive dysfunction, addictions



Mechanism of action

- Selective Norepinephrine Reuptake Inhibitor (SNRI) in the prefrontal cortex → increase in adrenergic neurotransmission



Non-CNS Stimulant - atomoxetine

Visual / Ocular ADR

- Blurred vision
- Mydriasis → IOP increase, photophobia
- Dry eyes (eyelid retraction, decreased secretion)
- Vasoconstriction



Phenothiazines



Brand Name: Mellaril, Thorazine

Generic: thioridazine, chlorpromazine

Antipsychotics – phenothiazines

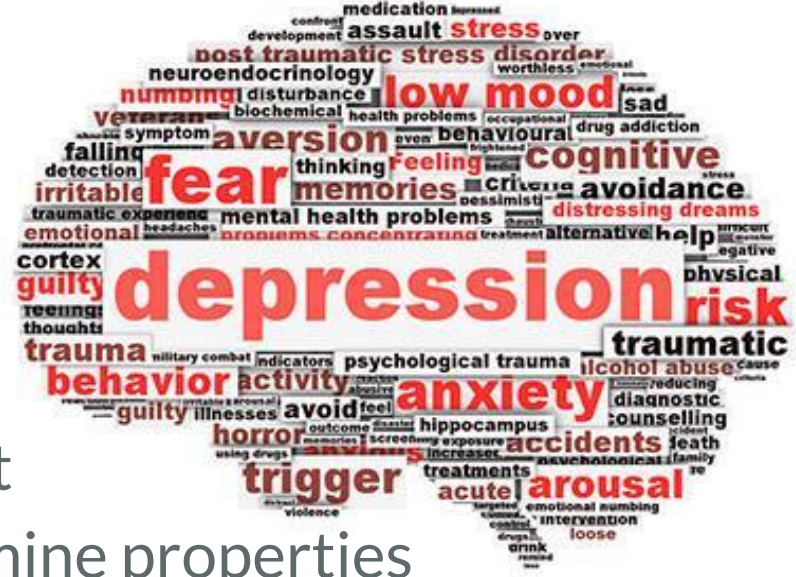
Prescribed for:

- Depression with anxiety
- Schizophrenia

Mechanism of action:

- Dopamine receptor antagonist
- Anticholinergic and Antihistamine properties

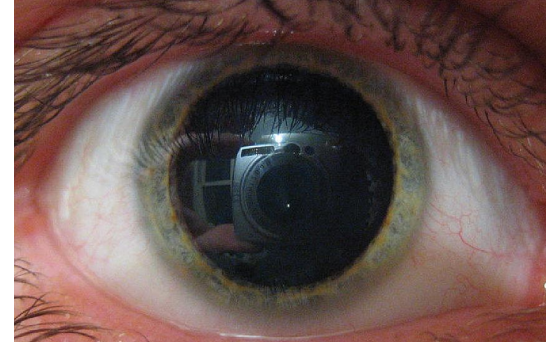
Compound is phototoxic = tissue damage when compound exposed to UV



Antipsychotics – phenothiazines

Visual / Ocular ADR

- Anticholinergic effects
 - Cycloplegia / Decreased vision
 - Decreased accommodation
 - Mydriasis (narrow angle)
 - Dry eye from reduced tearing



- Phototoxic effects
 - Nyctalopia (poor scotopic vision)
 - 'Brown vision' / Dyschromatopsia



Antipsychotics – phenothiazines

Visual / Ocular ADR

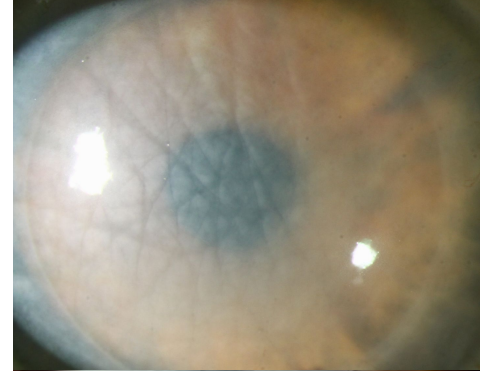
- Vision blur

Phototoxic lysis of the corneal endothelium →
impaired endothelial pump → severe corneal
edema and consequent severe visual effects

- Pigment deposition on lens, lids, cornea

Drug accumulates in tissue → drug is phototoxic →
photosensitization of the tissue proteins occurs

- Stellate anterior subcapsular cataract (78%)



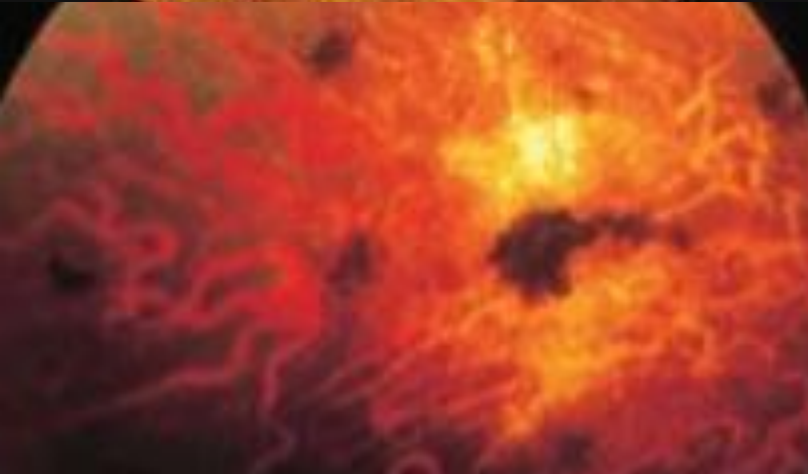
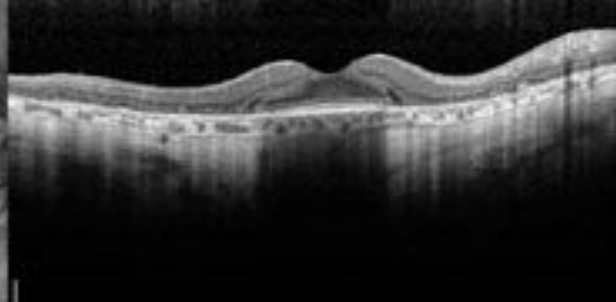
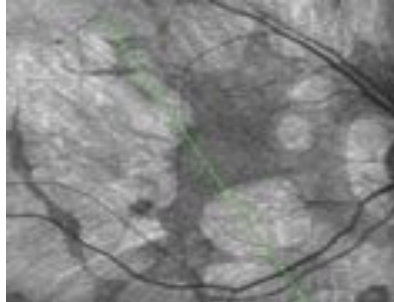
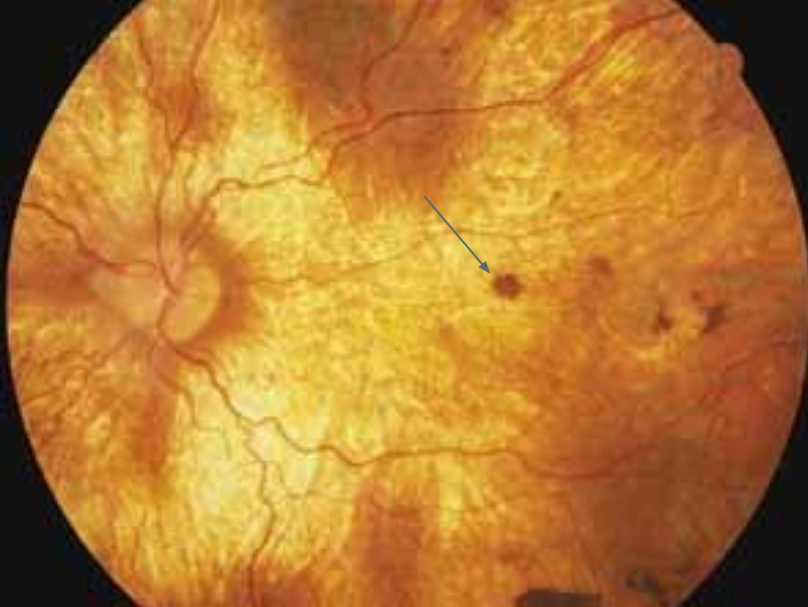
Antipsychotics – phenothiazines

Visual / Ocular ADR

- Loss of RPE and choriocapillaris causing salt/pepper fundus appearance
 - pigmentary retinopathy and irreversible vision acuity loss and visual field loss

Normal dose 150-600mg/day

High dose > 800mg/day



Atypical Antipsychotics

Brand Name: Clozaril

Generic: clozapine



Atypical Antipsychotics – clozapine

Prescribed for:

Schizophrenia

Reduce risk of suicidal behavior

- Mechanism of action:
 - ? Dopamine and serotonin receptor antagonist ? and decrease activity in mesolimbic pathway (reward pathway)



Atypical Antipsychotics – clozapine

Visual / Ocular ADR

Uncontrolled muscle movements (blinking, oculomotor)

Headache and Nausea

Antimuscarinic/Anticholinergic properties - mydriasis,
photophobia, blur, narrowing of angle

Atypical Antipsychotics

Brand Name: Risperdal, Abilify, Zyprexa

Generic: risperidone, aripiprazole, olanzapine



Atypical Antipsychotics – risperidone

Prescribed for:

Schizophrenia

Bipolar disorder

Irritability in Autism

- Mechanism of action:
 - ? Dopamine and *serotonin* receptor antagonist ?
 - 2nd generation of clozapine with less systemic ADR



Atypical Antipsychotics – risperidone

Visual / Ocular ADR

Uncontrolled muscle movements (blinking, oculomotor)

Dry eye

Antimuscarinic properties

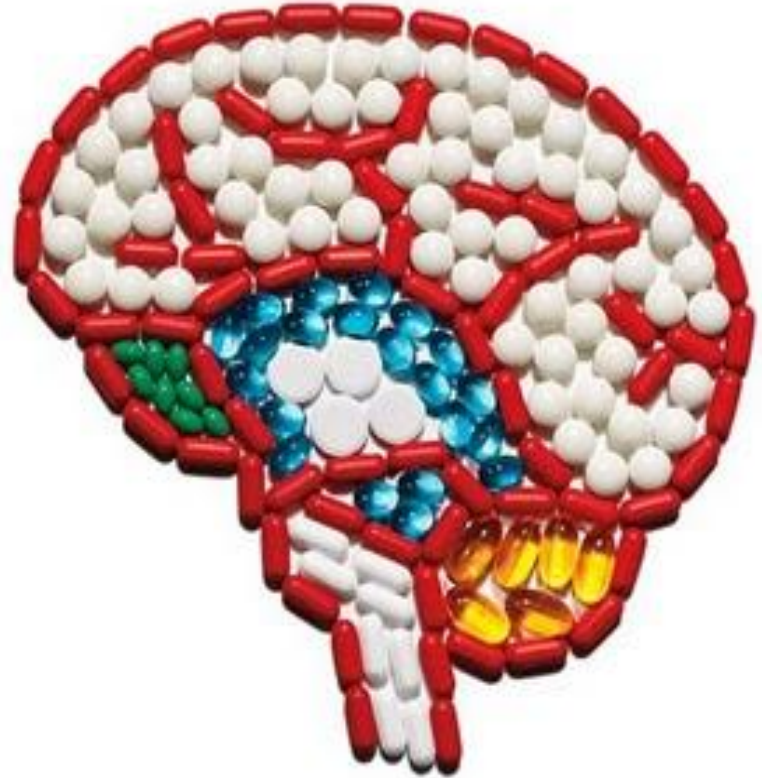
| Class | Brand Name | Generic Name | Use | Mechanism | Ocular ADR |
|-----------------------------------|--|---|---|--|--|
| Mood Stabilizer (GABA Analogs) | Neurontin, Divalproex, Lamictal | gabapentin, depakote, lamotrigine | Bipolar disorder, Acute depression, Seizure disorder | Increase GABA concentration | Nystagmus, Diplopia, Macular edema, Optic neuritis |
| Mood Stabilizer (anticonvulsants) | Topamax | topiramate | Mood stabilizer, Bipolar disorder, Seizures, Epilepsy, (Migraine HA, Weight loss) | Enhances GABA receptor action | Myokemia, Nystagmus, Diplopia, Cataracts, Visual field defects, Choroidal effusion, Refractive shifts |
| Mood Stabilizer (antimanics) | Eskalith, Lithane | lithium | Bipolar disorder, Manic depression, Schizophrenia, Anorexia, Bulimia | Increases activity of chemical messengers | Hallucinations, Uncontrolled eyelid and oculomotor movements, Pseudotumor cerebri, Dry eye |
| Antidepressant (SSRIs) | Prozac, Zoloft, Paxil, Celexa, Effexor, Lexapro | fluoxetine hydrochloride, sertraline, paroxetine, citalopram, venlafaxine hydrochloride, escitalopram | Depression, OCD, PTSD, Anxiety, Bulimia, PMS | Selective Serotonin Reuptake Inhibitor - Increases serotonin concentration | Anticholinergic effects, Conjunctivitis, Diplopia, Ptosis |
| Tranquilizer (benzodiazepines) | Xanax, Valium, Ativan | alprazolam, diazepam, lorazepam | Extreme tension and anxiety,Sleep disorders | Enhances GABA action and Anticholinergic properties | Anticholinergic effects, Diplopia, Saccadic and Smooth Pursuit dysfunction |
| CNS Stimulants | Ritalin, Adderall | methylphenidate, amphetamine | ADHD, Narcolepsy | Cortical stimulant of sympathetics | Blurred vision, Mydriasis, Dry eye |
| Non CNS Stimulants | Kapvay, Tenex, Intuniv | clonidine, guanfacine | ADHD, Withdrawal | Alpha adrenergic agonist | Blurred vision, Decreased IOP, Dry eye, Vasoconstriction, Miosis and Mydriasis |
| Non CNS Stimulants | Strattera | atomoxetine | ADHA, (Mood disorders, Eating disorders, Cognitive dysfunction, Addictions) | Selective Norepinephrine Reuptake Inhibitor - increases adrenergic neurotransmission | Blurred vision, Mydriasis, Dry eyes, Vasoconstriction |
| Antipsychotics (phenothiazines) | Mellaril, Thorazine | thioridazine, chlorpromazine | Depression with Anxiety, Schizophrenia | Dopamine receptor antagonist, Anticholinergic and Antihistamine properties | Anticholinergic effects, Nyctopia, Dyschromatopsia, Blurred vision, Pigment deposition, Cataract, Salt and Pepper fundus |
| Atypical Antipsychotics | Clozaril, Risperdal, Abilify, Zyprexa | clozapine, risperidone, aripiprazole, olanzapine | Schizophrenia, Suicidal tendencies, Bipolar mania, Autism irritability | Dopamine and serotonin receptor antagonist | Anticholinergic effects, Uncontrolled eyelid and oculomotor movement, Headache, Nausea |
| Antihistamine | Atarax, Alamon, Aterax, Durrax, Vistaril, Equipose, Masmoran, Paxistil | hydroxyzine hydrochloride, hydroxazine pamoate | Anxiety, Tensio, Psychoneurosis | Antihistamine and Anti Serotonin | Anticholinergic effects |

Common ADR of Psychiatric Meds

Blurry Vision (9/9)

Dry / Irritated Eyes (9/9)

Mydriasis and Photophobia (9/9)



What are these medications used for?

CARDIOVASCULAR

HTN, HLD, AFib

PSYCHIATRIC

Depression, ADHD, Anxiety

GENITOURINARY

ED, BPH, GERD

ENDOCRINE

DM, Thyroid, Contraceptives

CHEMOTHERAPEUTIC

Breast Cancer

NEUROLOGIC

Seizures, Migraines

BONE DISEASE

Osteoporosis

RHEUMATOLOGIC

RA, SLE, Malaria

IMMUNOMODULATING

Hep C

ANTI-INFLAMMATORY

Steroids, NSAIDs,

ANTI-INFECTIVE

Bacterial infections, Acne, TB

ANTI-ALLERGY

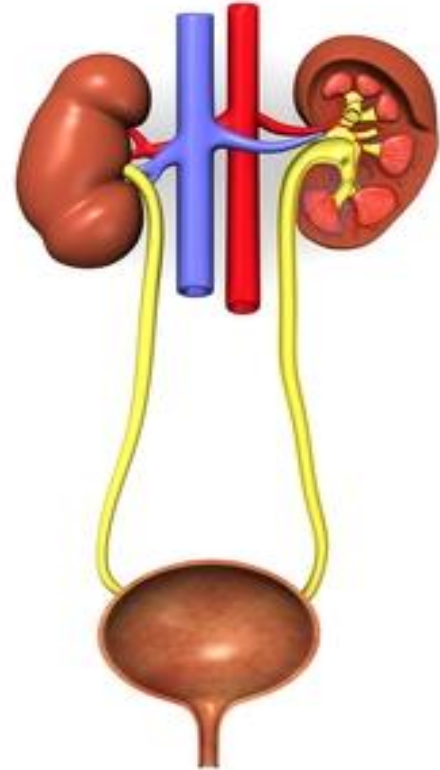
Seasonal allergy, Decongestants

Common ADR of Genitourinary Meds

Pupil anomalies (3/3)

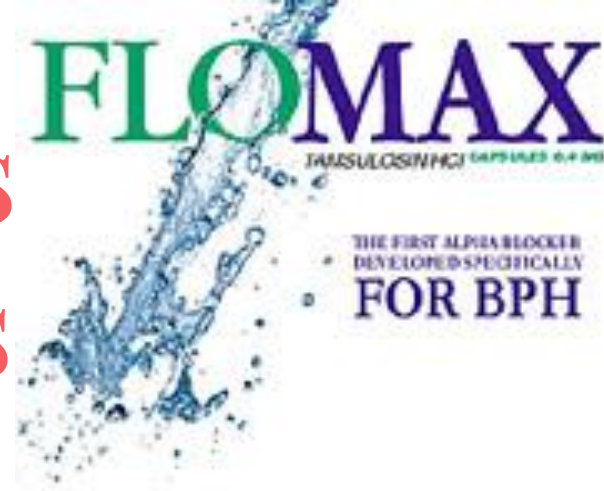
Blurry Vision (2/3)

Color Vision Changes (2/3)



Genitourinary Agents

Alpha-1 antagonists



Brand Name: Flomax

Generic: tamsulosin, terazosin, alfuzosin

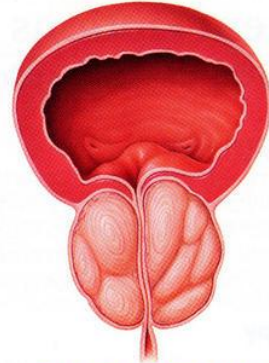
Genitourinary Agents - Alpha 1 antag.

Prescribed for:

- Benign prostate hypertrophy (BPH) - improve urinary flow
- Improve urinary retention (men and women)
- Mechanism of action:
 - Selective systemic alpha-1a antagonist
 - Relaxes smooth muscle



Normal Prostate



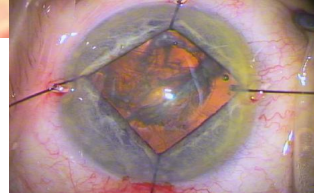
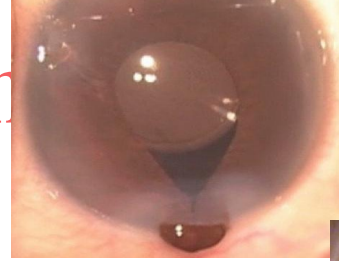
Enlarged Prostate

Genitourinary Agents - Alpha Blockers

Visual / Ocular ADR

- Loss of tone to iris dilator smooth muscle → poor dilation of pupil (Floppy Iris Syndrome)
 - Ocular surgery complications (Cataract Extractions)
 - iris prolapse into incision site, vitreous loss, posterior capsule rupture
 - Progressive iris miosis → iris hooks to maintain large pupil during surgery

Surgeon may ask patient to stop Flomax 2 weeks before surgery but can still cause intraoperative problems after d/c



Genitourinary Agents - Alpha 1 antag.

- Visual / Ocular ADR
 - Intraoperative Floppy Iris Syndrome
 - <6mm pupil increases likelihood of surgical complications
 - Use cholinergic antagonist (atropine) for dilation
 - Inject epinephrine or phenylephrine to displace tamsulosin from alpha receptors
 - New devices have setting for IFIS patients (less aggressive irrigation and aspiration)

Genitourinary Agents Phosphodiesterase Inhibitors



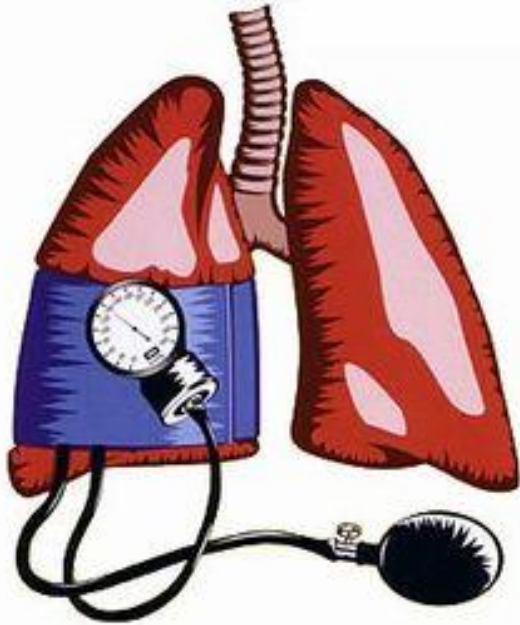
Brand Name: Viagra, Levitra, Cialis

Generic: sildenafil citrate, vardenafil, tadalafil

Genitourinary Agents - phosphodiesterase inhib

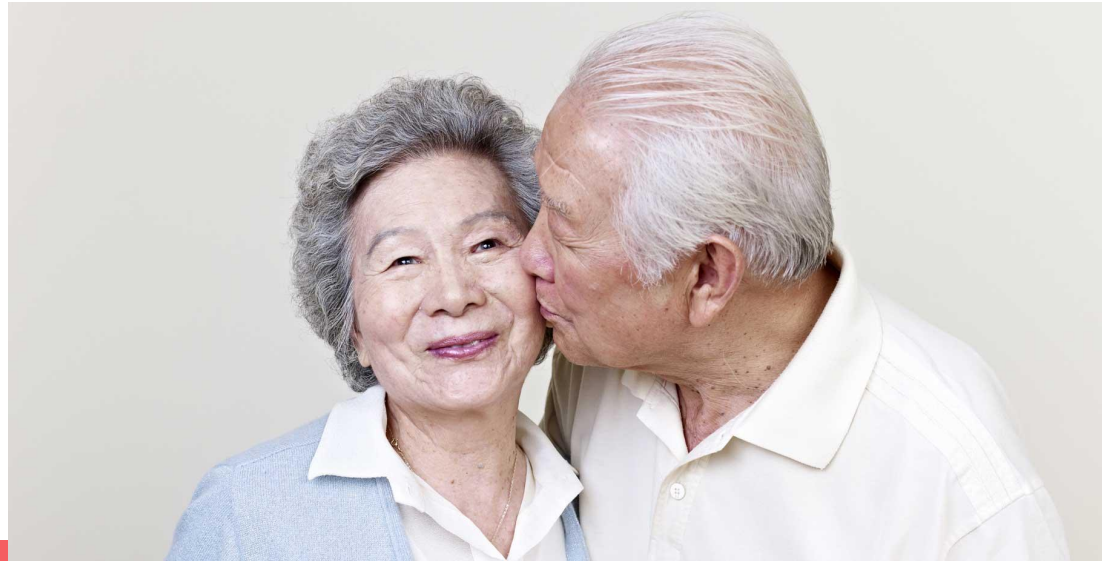
Prescribed for:

- Erectile dysfunction
- Pulmonary hypertension



Mechanism of Action:

prevents inactivation of
cAMP intracellular
messengers



Genitourinary Agents - phosphodiesterase inhib

Visual / Ocular ADR

- Cyanopsia - perceive a blue haze 1- 4 hour after administration (>100mg)
 - Drug blocks hyperpolarization of photoreceptors and phototransduction



Simulation of cyanopsia



Normal colour vision

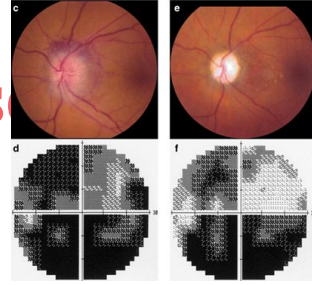
Genitourinary Agents - phosphodiesterase

Visual / Ocular ADR

- Nonarteritic ischemic optic neuropathy (NAION) due to decreased ONH perfusion
 - Blurred vision / amaurosis fugax lasting several minutes to hours → permanent vision loss, APD, and visual field defects



- Occurred in 11% of men taking 100mg dose - all patients had at least one arteriosclerotic risk factors (HTN, DM, HDL) and a small ONH with small c/d
- Some patients with RP have genetic disorders of retinal phosphodiesterase → meds should be avoided

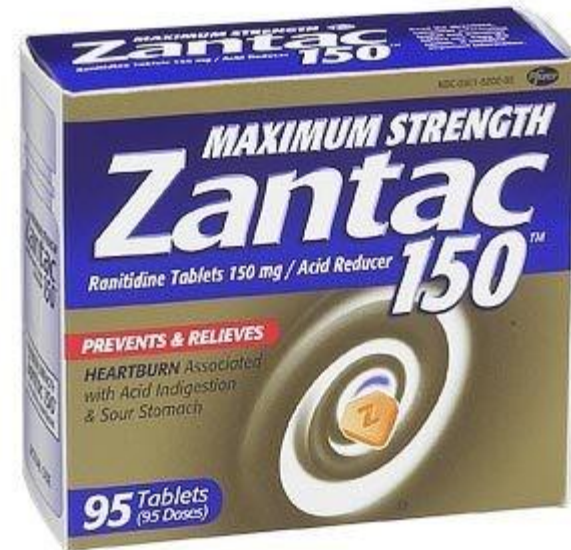


Genitourinary Agents

Histamine 2 Blockers

Brand Name: Zantac, Deprizine

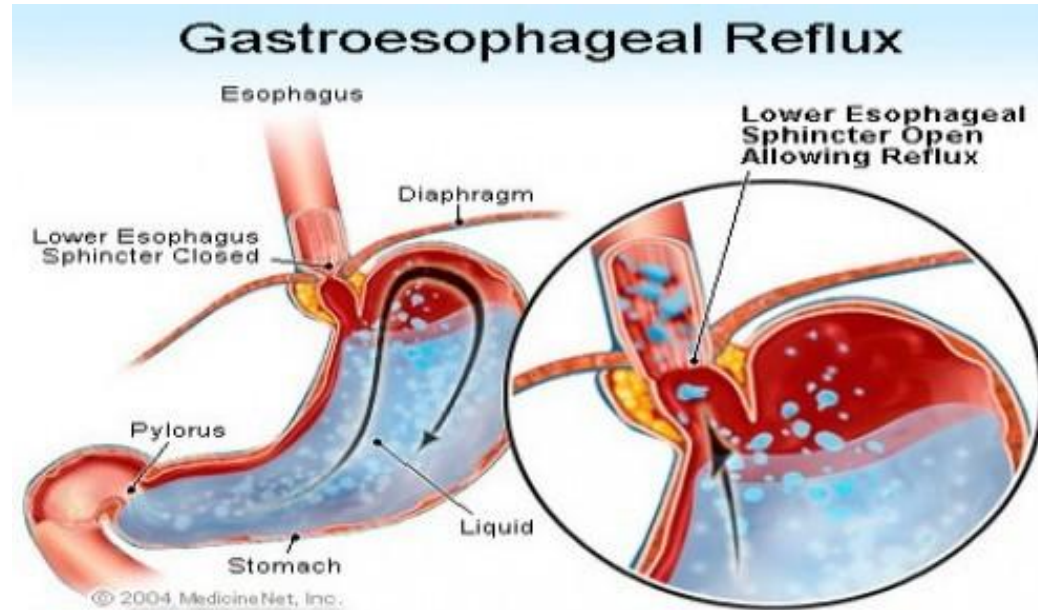
Generic: ranitidine



Genitourinary Agents - histamine 2 block

Prescribed for: (OTC)

- Gastroesophageal reflux disease (GERD)
 - Heartburn
- Mechanism of action
 - Blocks histamine-2 receptors in stomach to reduce acid production



Genitourinary Agents - histamine 2 block

Visual / Ocular ADR

- Cycloplegia / Blurred vision
- Mydriasis / IOP increase
- Photophobia
- Conjunctivitis
- Color changes

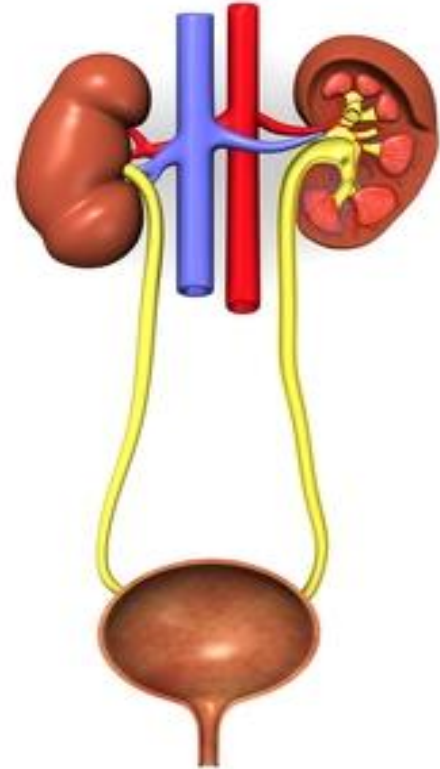


Common ADR of Genitourinary Meds

Pupil anomalies (3/3)

Blurry Vision (2/3)

Color Vision Changes (2/3)



What are these medications used for?

CARDIOVASCULAR

HTN, HLD, AFib

PSYCHIATRIC

Depression, ADHD, Anxiety

GENITOURINARY

ED, BPH, GERD

ENDOCRINE

DM, Thyroid, Contraceptives

CHEMOTHERAPEUTIC

Breast Cancer

NEUROLOGIC

Seizures, Migraines

BONE DISEASE

Osteoporosis

RHEUMATOLOGIC

RA, SLE, Malaria

IMMUNOMODULATING

Hep C

ANTI-INFLAMMATORY

Steroids, NSAIDs,

ANTI-INFECTIVE

Bacterial infections, Acne, TB

ANTI-ALLERGY

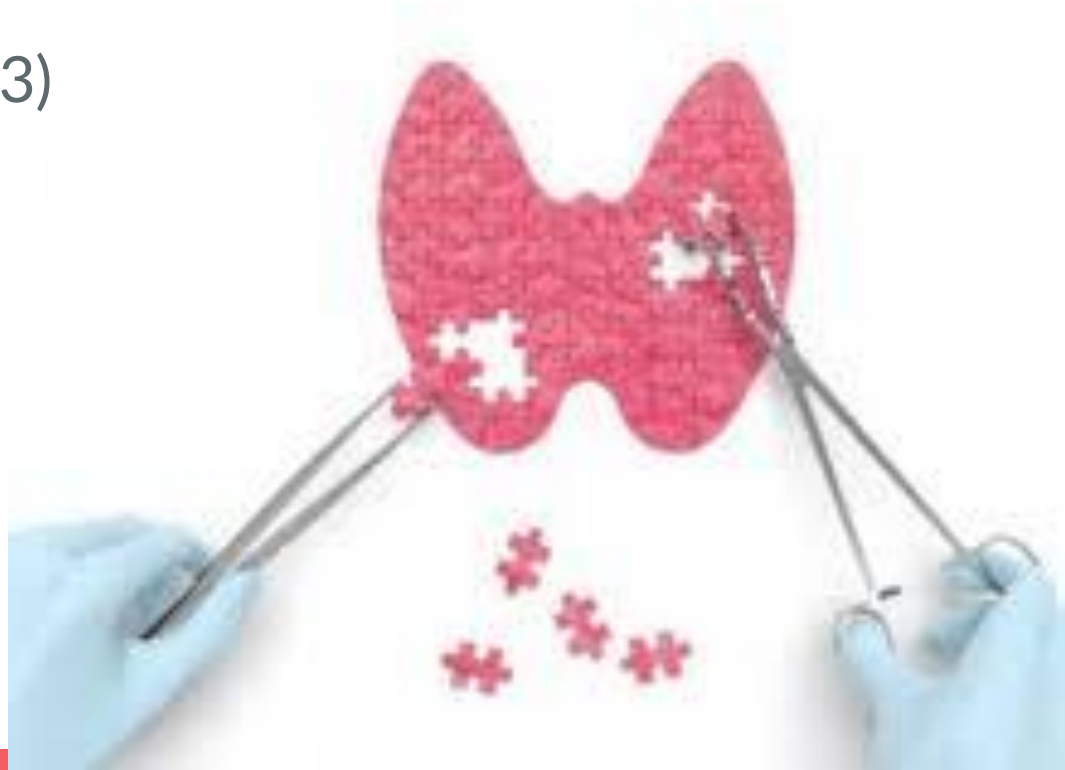
Seasonal allergy, Decongestants

Common ADR of Endocrine Meds

Blurry Vision (3/3)

Visual Field Disturbances (3/3)

Double Vision (2/3)



Endocrine Agents

Hormone Replacement

Brand Name: Synthroid, Levoxyl, Levothyroid

Generic: levothyroxine



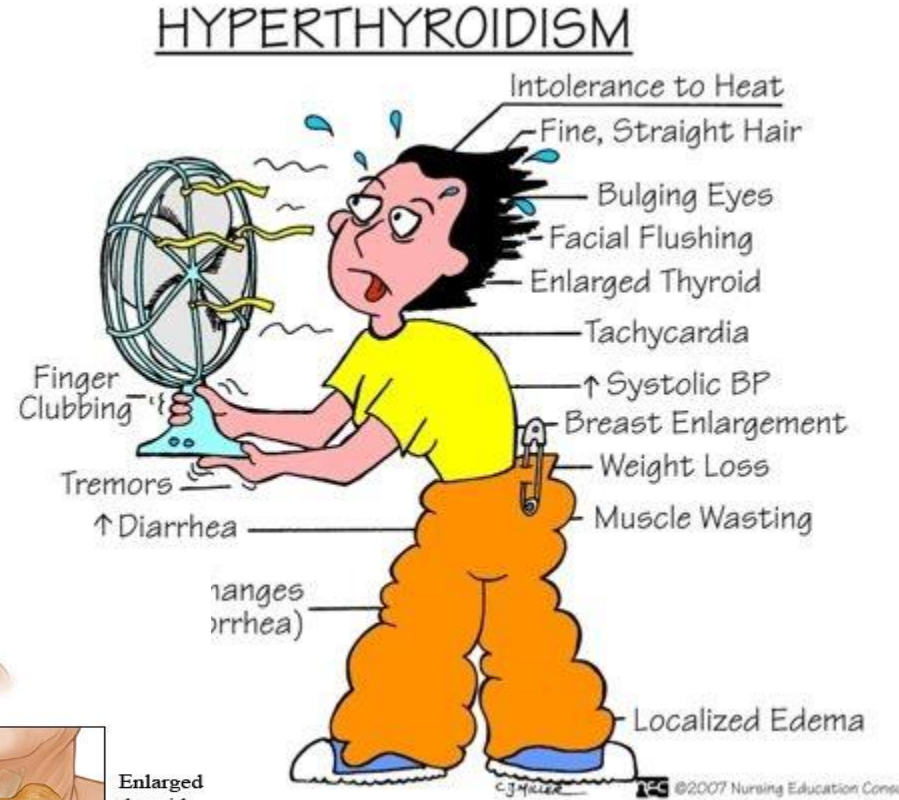
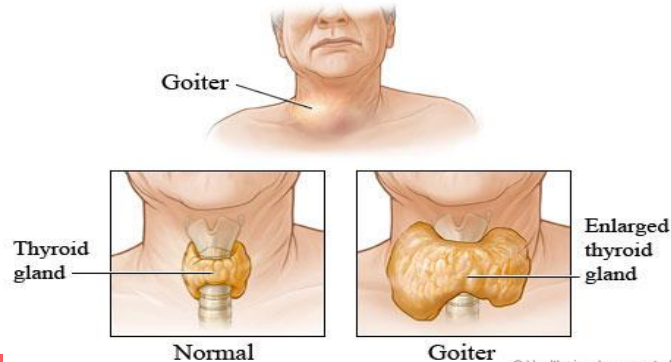
Endocrine Agent - hormone replacement

Prescribed for:

Hyperthyroidism

Mechanism of action:

- Replaces thyroxine that should be produced by the thyroid



Endocrine Agent - hormone replacement

Visual / Ocular ADR

- Pseudotumor cerebri



HA, tinnitus, nausea, blur, diplopia (CN VI palsy), ON edema, APD, VF defects

- Myasthenia like symptoms - from excess hormone

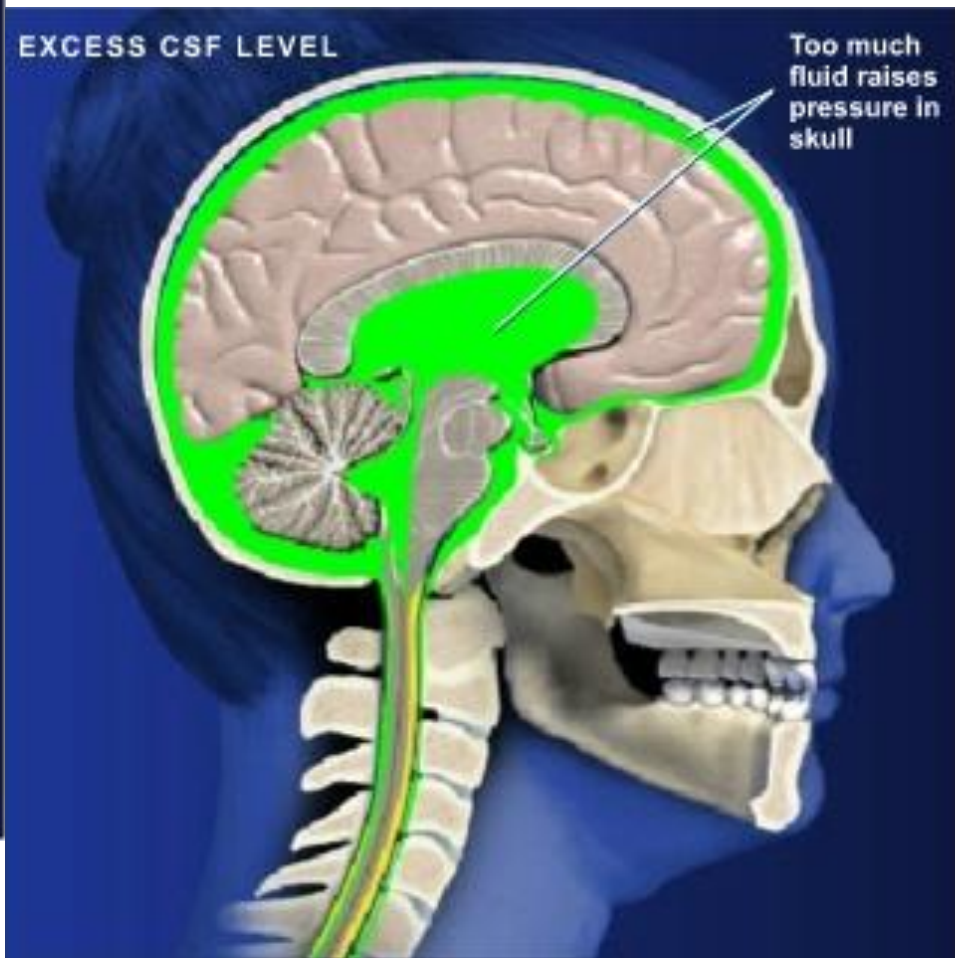
Diplopia, ptosis, paralysis of EOMs

NORMAL CSF LEVEL

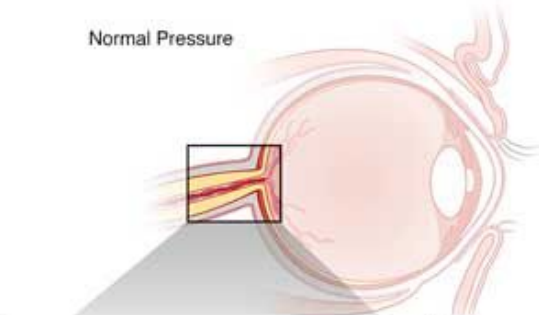


Pseudotumor cerebri

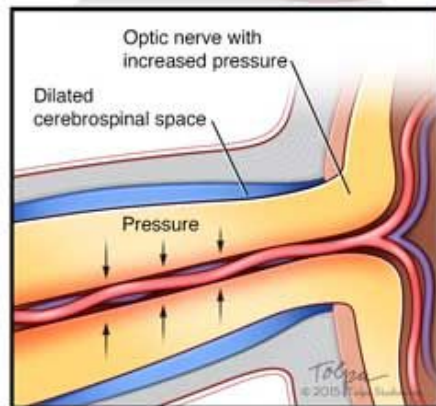
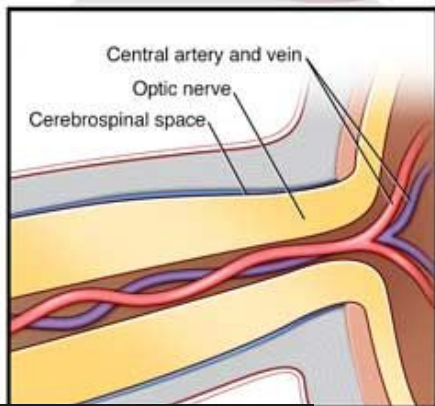
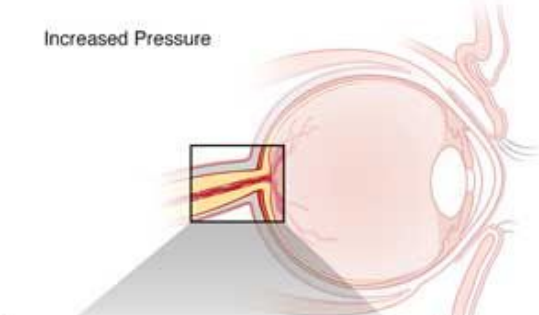
EXCESS CSF LEVEL



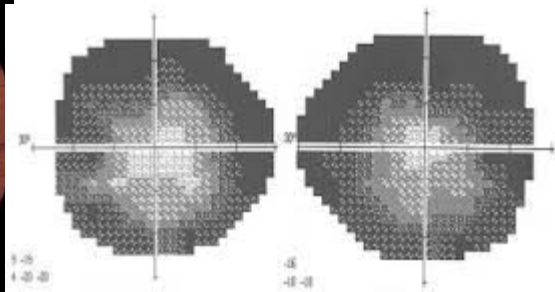
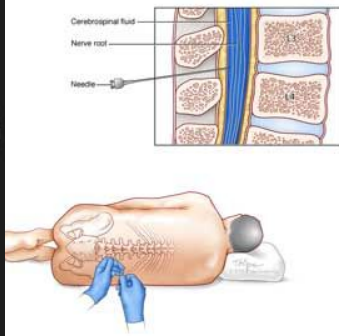
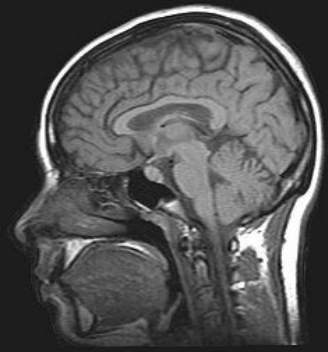
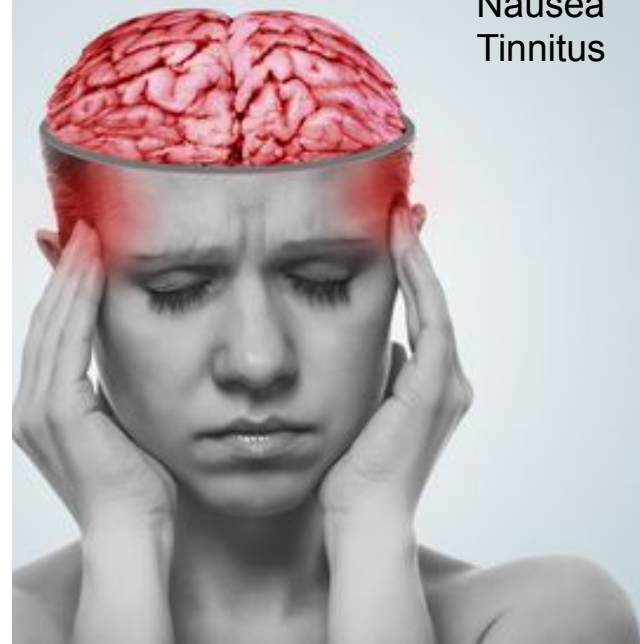
Normal Pressure



Increased Pressure



HA
Nausea
Tinnitus



Endocrine Agents

Thiazolidinedione



Brand Name: Avandia, Actos

**Generic: rosiglitazone, pioglitazone
hydrochloride**

Diabetes

Prescribed for:

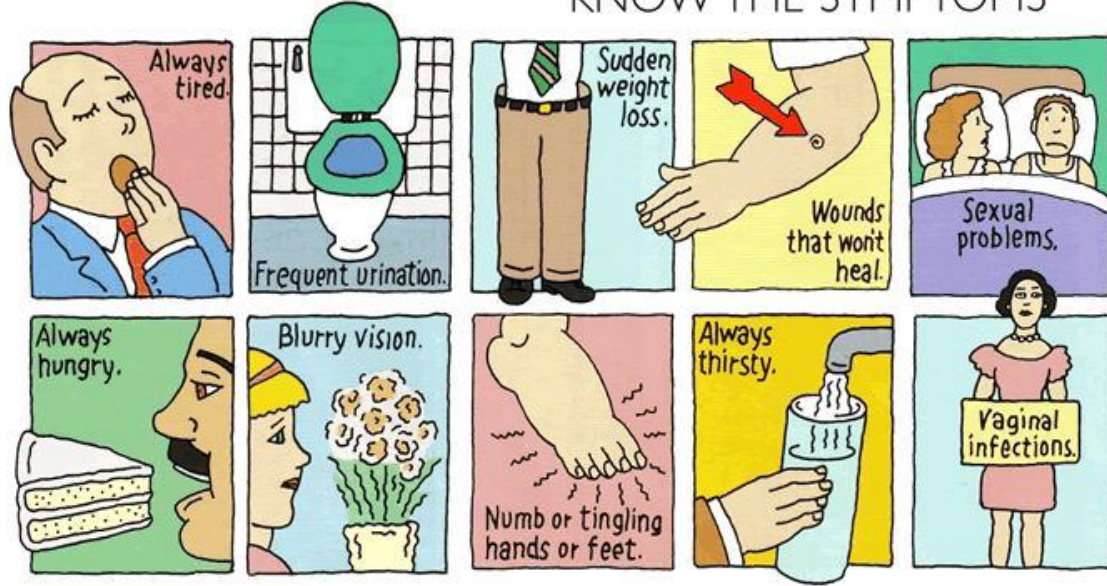
- Diabetes Mellitus

Mechanism of action:

- Increases sensitivity to insulin

DIABETES

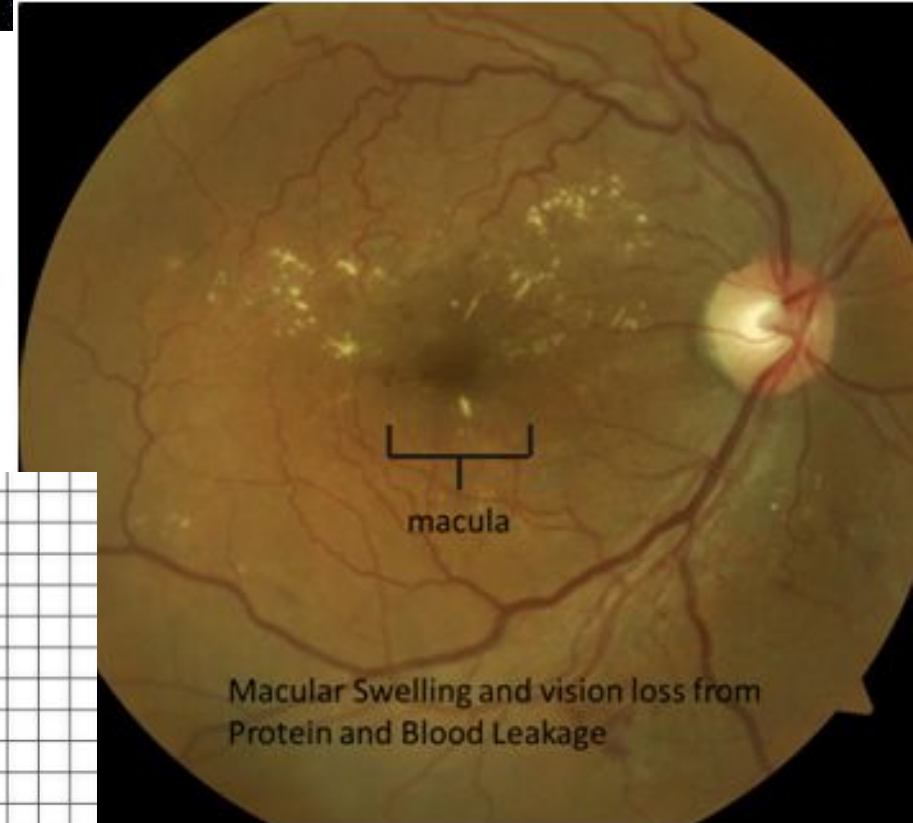
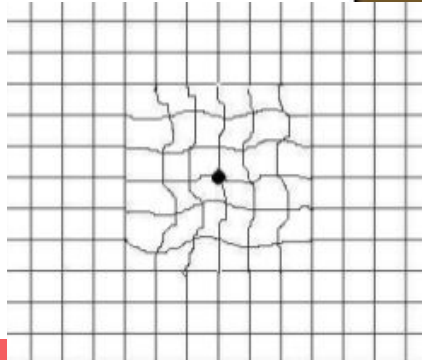
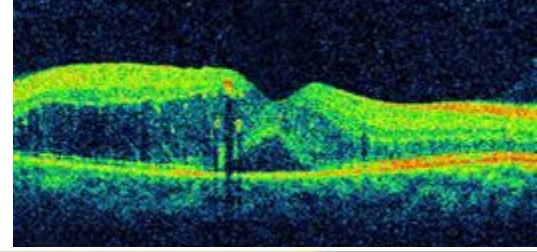
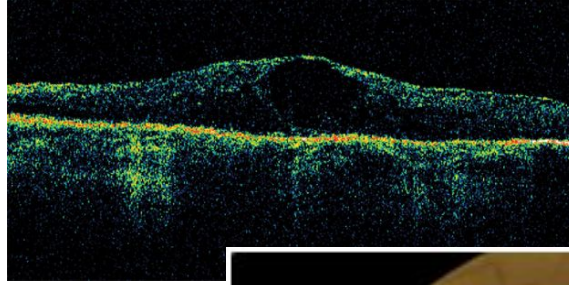
KNOW THE SYMPTOMS



Diabetes

Visual / Ocular ADR

- Macular edema
 - Blurry vision
 - Wavy vision
 - Central VF defects
 - Decreased contrast



A collection of various medical supplies and pharmaceuticals, including pills, capsules, a syringe, a toothbrush, a dental mirror, and a dental chair, arranged on a white surface.

1, Levora, Laziant, estin

Generic: estrogen and progestin

Endocrine Agents – contraceptives

Prescribed for:

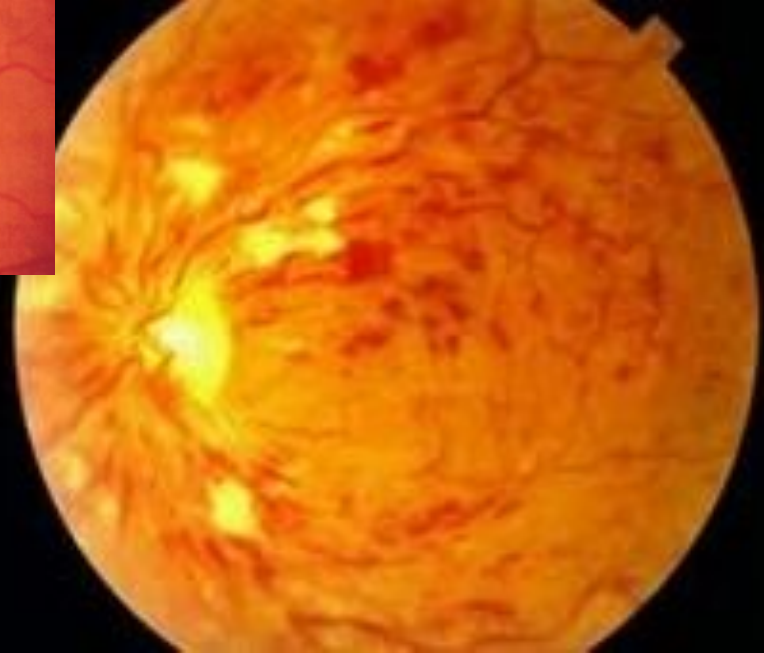
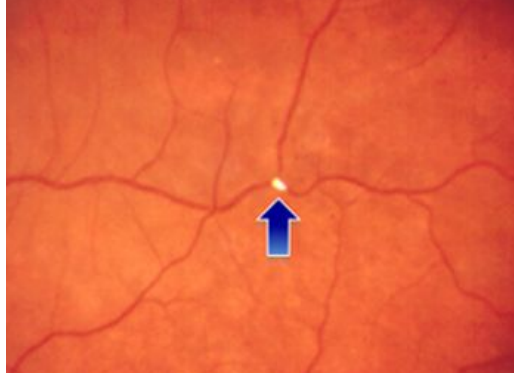
- Pregnancy prevention
- Menstrual cycle management
- Hormone replacement for menopause
 - Mechanism of action:
 - Increase systemic hormone
 - Changes in systemic vasculature
 - Enhanced platelet adhesiveness
 - Increased fibrinogen and clotting factor



Endocrine Agents - contraceptives

Visual / Ocular ADR

- Dry eye / CL intolerance (decreased tear secretion)
- Headaches
- Macular edema
- Retinal thrombosis
- Optic neuritis
- Transient ischemic attacks
- Pseudotumor cerebri

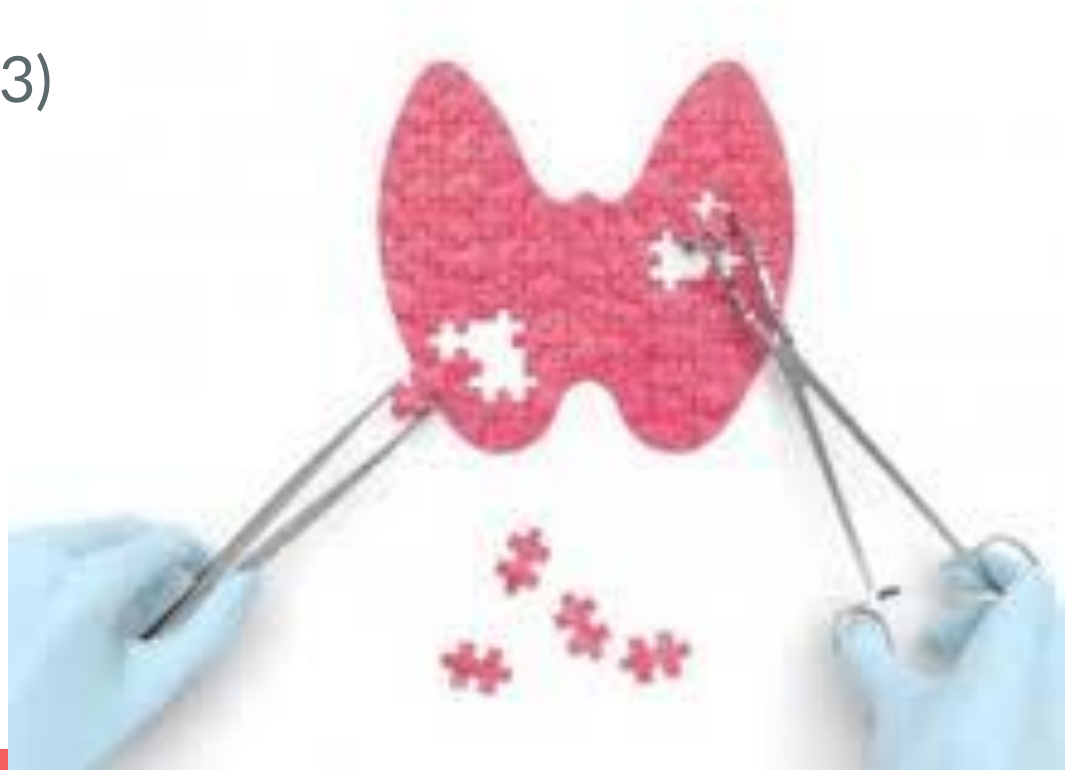


Common ADR of Endocrine Meds

Blurry Vision (3/3)

Visual Field Disturbances (3/3)

Double Vision (2/3)



What are these medications used for?

CARDIOVASCULAR

HTN, HLD, AFib

PSYCHIATRIC

Depression, ADHD, Anxiety

GENITOURINARY

ED, BPH, GERD

ENDOCRINE

DM, Thyroid, Contraceptives

CHEMOTHERAPEUTIC

Breast Cancer

NEUROLOGIC

Seizures, Migraines

BONE DISEASE

Osteoporosis

RHEUMATOLOGIC

RA, SLE, Malaria

IMMUNOMODULATING

Hep C

ANTI-INFLAMMATORY

Steroids, NSAIDs,

ANTI-INFECTIVE

Bacterial infections, Acne, TB

ANTI-ALLERGY

Seasonal allergy, Decongestants

Common ADR of Chemotherapeutic Meds

Blurry Vision (2/2)

Macular edema (2/2)



Chemotherapeutic Agents

Estrogen Antagonist


Brand Name: Nolvadex

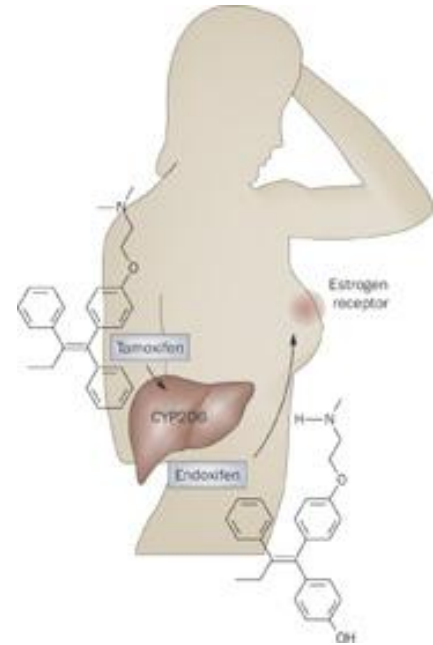
Generic: tamoxifen



Chemotherapeutic Agent - Antiestrogen

Prescribed for :

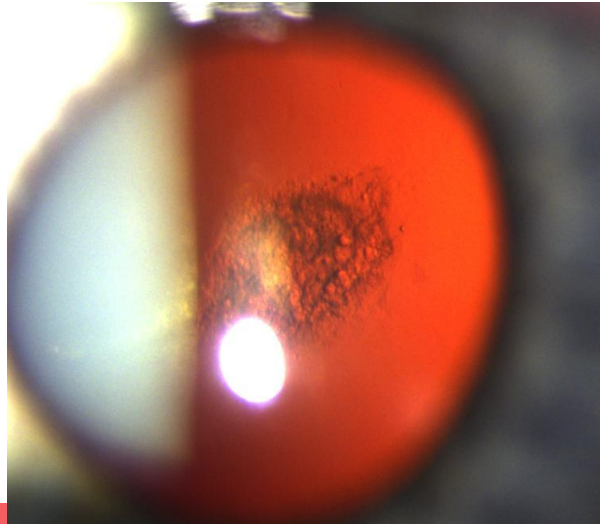
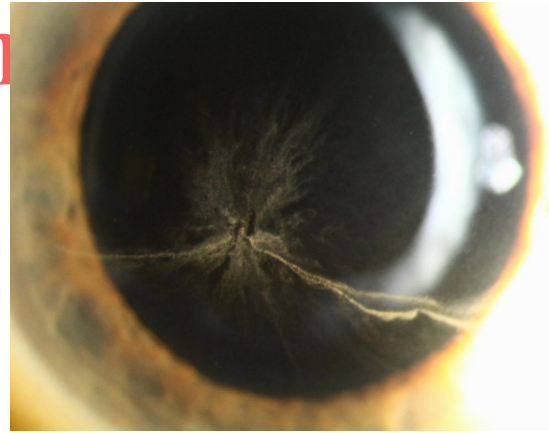
- Nonsteroidal anti-estrogen used for metastatic breast and ovarian carcinoma
 - Preventative measure in high risk patients
 - Mechanism of action:
 - Selective modulation and occupation of estrogen receptors
- 
- The diagram shows the chemical structure of Tamoxifen, a nonsteroidal anti-estrogen. It features a central carbon atom bonded to a phenyl ring, a 1,1-dimethyl-2-phenylethyl group, and a 4-(4-methoxyphenyl)-1,3-phenylene group. The structure is labeled 'Tamoxifen'. Below the structure, a liver is depicted with the label 'CYP2D6', indicating the enzyme involved in its metabolism.



Chemotherapeutic Agent - An

Visual / Ocular ADR

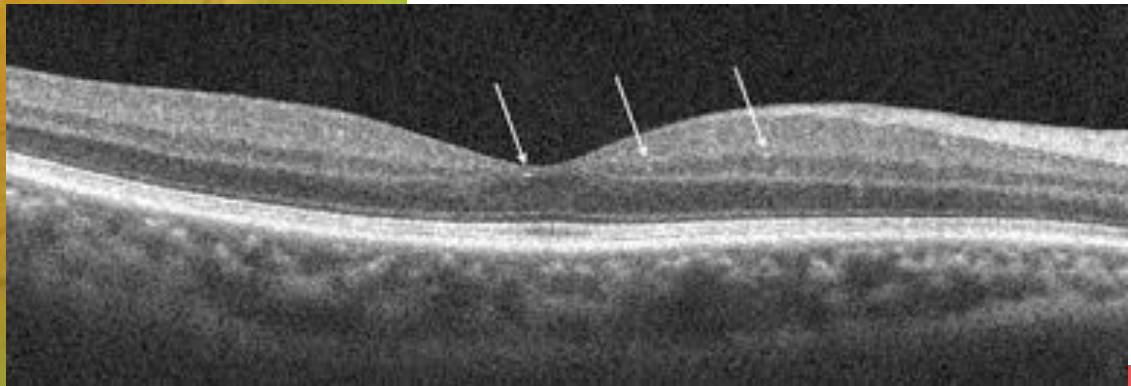
- Corneal epithelium whorl-like keratopathy
- Posterior subcapsular cataract
 - 40% higher incidence after 5 years
 - PSC usually progresses even after medication d/c



Chemotherapeutic Agent – Antiestrogen

Visual / Ocular ADR :

- Crystalline retinopathy (rare 0.6%, non-reversible)
 - Refractile crystals (products of axonal damage / degeneration) accumulate in the nerve fiber and plexiform layers of retina
 - Cluster mainly around the macula → decreased vision in severe cases
 - Can be associated with cystoid macular edema



Chemotherapeutic Agents

Antimetabolite Immunosuppressant

Brand Name: Trexall, Rasuvo

Generic: methotrexate



Chemotherapeutic Agent – Antimetabolite

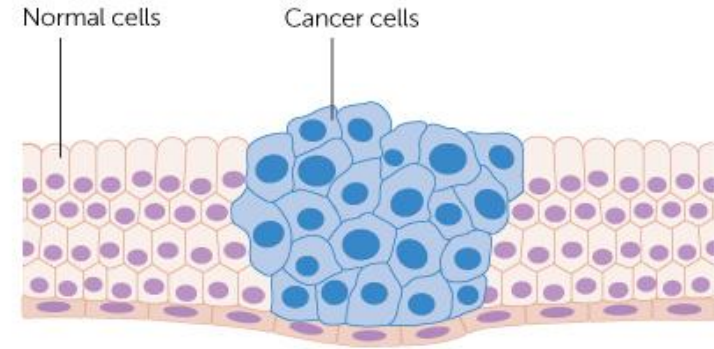
Prescribed for :

- Cancer

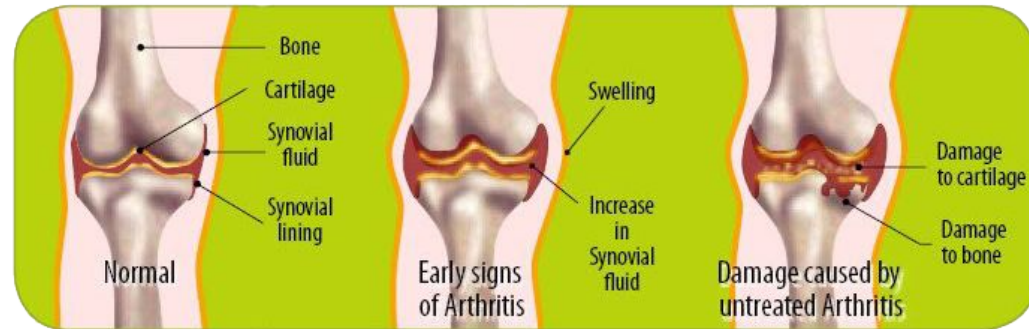
Blood, bone, lung,
breast, neck

- Rheumatoid Arthritis
- Psoriasis

Mechanism of Action:
competitively inhibits binding
site of certain receptors



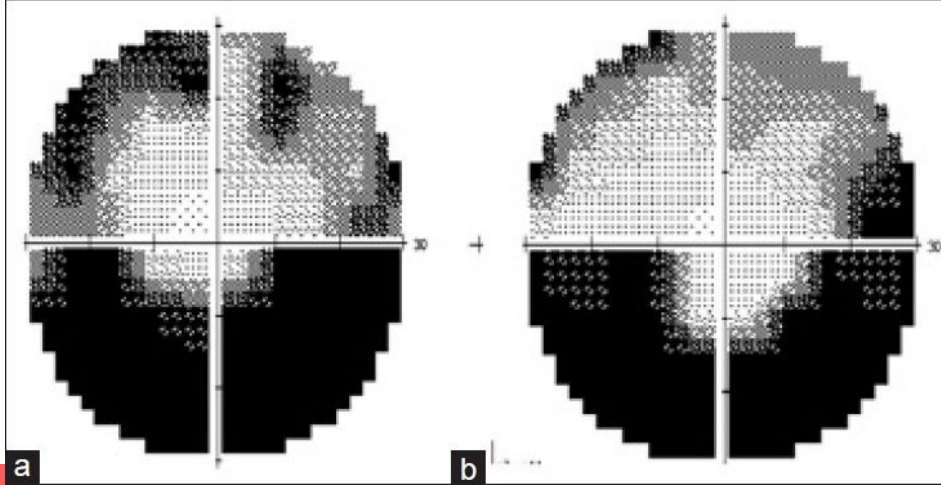
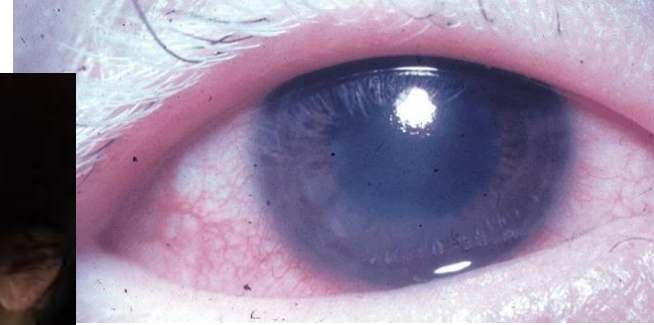
Cancer Research UK



Chemotherapeutic Agent - Antimetabolite

Visual / Ocular ADR

- Ocular inflammation
 - Ocular pain
 - Vision blur
 - Photophobia
 - IOP
- Dry / Irritated eyes
- NAION



Antiemetic Agents

Anticholinergics

Brand Name: Scopace, Transderm-Scope

Generic: scopolamine



Antiemetic Agent - Anticholinergic

Prescribed for: (OTC and Rx)

- Antiemetic
 - Motion sickness
 - Postoperative / post chemo nausea

Mechanism of Action:

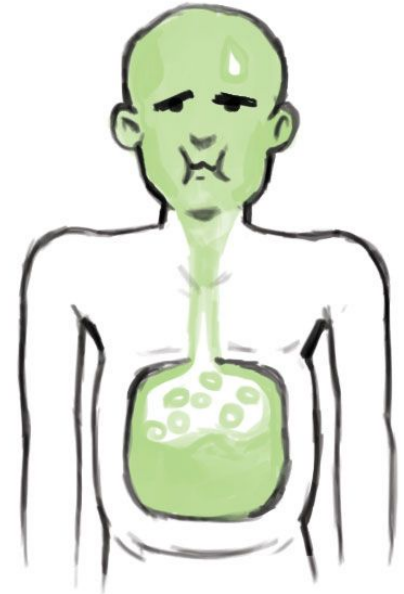
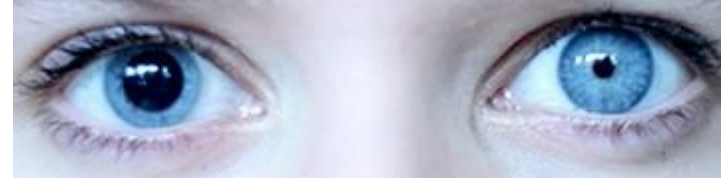
- Competitive inhibitor at postganglionic muscarinic receptor sites of PNS
- Acts on smooth muscles that respond to acetylcholine but lack cholinergic innervation



Antiemetic Agent - Anticholinergic

Visual / Ocular ADR

- Mydriasis (Anisocoria if unilateral)
- Cycloplegia / Vision blur
- Increased IOP



Common ADR of Chemotherapeutic Meds

Blurry Vision (2/2)

Macular edema (2/2)



Case 2

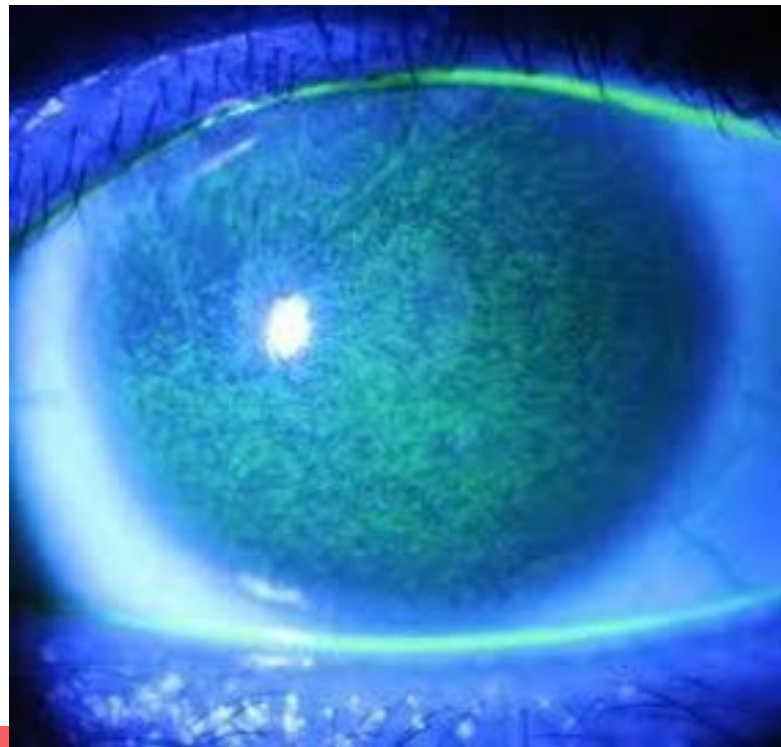
- 32yo WF c/o NV blur without specs x 1 year
 - Never worn specs
 - No other visual / ocular complaints
- LEE: never
- LME: 3 months ago
 - Anxiety controlled with Xanax
 - Birth Control - unsure of name
- All other Hx unremarkable

Case 2

- Entrance testing unremarkable
- Pupils equally round, mydriatic, poorly reactive to light
(-) APD
- BCVA Distance
 - 20/20 OD -0.50 DS
 - 20/20 OS -0.50 DS
- BCVA Near
 - 20/20 OU with +2.50 ADD
 - NRA +0.50 PRA -0.75

Case 2

- IOP 23 OD/OS
- SLE and DFE:
 - All unremarkable OU except
 - Von Herick angles 1+ OU
 - Diffuse SPK OU



Case 2

- Assessment:
 - a. Accommodative Insufficiency, likely due to Xanax
 - b. Moderate-Severe DES OU, likely due to Xanax and birth control

Case 2

- Assessment:
 - a. Accommodative Insufficiency, likely due to Xanax
 - b. Moderate-Severe DES OU, likely due to Xanax and birth control
- Plan:
 - a. Rx NVO specs
 - b. Rx (your preferred dry eye treatment)

Write letter to psychiatrist and PCP regarding ADR and your management plan. No need to d/c meds at current time.

What are these medications used for?

CARDIOVASCULAR

HTN, HLD, AFib

PSYCHIATRIC

Depression, ADHD, Anxiety

GENITOURINARY

ED, BPH, GERD

ENDOCRINE

DM, Thyroid, Contraceptives

CHEMOTHERAPEUTIC

Breast Cancer

NEUROLOGIC

Seizures, Migraines

BONE DISEASE

Osteoporosis

RHEUMATOLOGIC

RA, SLE, Malaria

IMMUNOMODULATING

Hep C

ANTI-INFLAMMATORY

Steroids, NSAIDs,

ANTI-INFECTIVE

Bacterial infections, Acne, TB

ANTI-ALLERGY

Seasonal allergy, Decongestants

Common ADR of Neurologic Meds

Blurry Vision (2/2)

Diplopia (2/2)

Nystagmus / Oscillopsia (2/2)



GABA Analog



**Brand Name: Neurontin, Divalproex,
Lamictal**

**Generic: gabapentin, depakote,
lamotrigine**



Neurologic Agents – GABA analog

Prescribed for:

- Bipolar disorder
- Acute depression
- Seizure
- Post-herpetic neuralgia

Mechanism:

increase GABA concentration

GABA:
chief inhibitory
neurotransmitter -
reduces neuronal
excitability throughout
the nervous system

THE PHASES OF A "TONIC-CLONIC" SEIZURE



THE "AURA" PHASE
~ LIGHT-HEADEDNESS
~ DIZZINESS
~ CONFUSION
~ HEADACHES



THE "TONIC" PHASE
~ SKELETAL MUSCLES TIGHTEN UP
~ JERKY MOVEMENT
~ USUALLY LASTS 10-20 SECONDS



THE "CLONIC" PHASE
~ CONVULSIONS
~ VIOLENT TWEEDS
~ UNCONTROLLABLE TWEEDS/TWEEDS
~ SOMETIMES BREATHING STOP



POSTICTAL SLEEP
~ CONFUSION
~ ANGER
~ AND NEURALgia BECAUSE OF CONVULSIONS

Neurologic Agents – GABA analog

Visual / Ocular ADR

- Nystagmus (8-11%)
- Myokemia
- Diplopia (6%)
- Macular edema
- Optic neuritis, VF defects



Neurologic Agents

Anticonvulsant

Brand Name: Topamax

Generic: topiramate



Neurologic Agents – anticonvulsant

Prescribed for:

- Seizure / Epilepsy
- Mood stabilizer / Bipolar disorder
- Migraine HA (off label)
- Weight loss (off label)

Mechanism of action:

- Blocks sodium channels → inhibits glutamate release → enhances GABA receptor action → inhibits neurotransmission

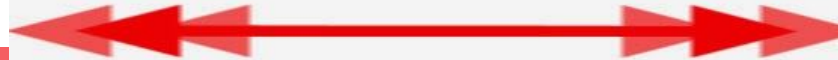


Neurologic Agents - anticonvulsant

Visual / Ocular ADR

Sx's occur soon after starting treatment

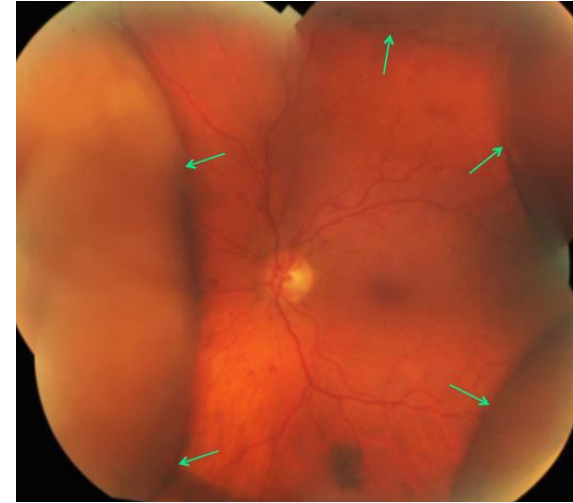
- Myokymia
- Nystagmus
- Diplopia
- Cataracts
- Visual field defects
- Refractive shifts (going on & off)



Neurologic Agents - anticonvulsant

Visual / Ocular ADR

- Acute bilateral myopia (6-8D) and Secondary angle closure glaucoma due to choroidal effusion
 - Headache, eye pain, decreased vision
 - Choroidal effusion/leakage → ciliary body edema → anterior displacement of lens and iris → shallow anterior chamber → angle closure → IOP spike
 - Retinal striae due to vitreoretinal traction



* NO Diamox/Pilo/PI

*DO dilate/steroid/ drop IOP

Common ADR of Neurologic Meds

Blurry Vision (2/2)

Diplopia (2/2)

Nystagmus / Oscillopsia (2/2)



POOH CORNER Rx



Patient: Winnie the Pooh

Symptoms: Binge Eating

Prescription: Sibutrex ®



Patient: Piglet

Symptoms: Anxiety

Prescription: Cymbalta ®



Patient: Eeyore

Symptoms: Depression

Prescription: Zoloft ®



Patient: Tigger

Symptoms: ADHD

Prescription: Ritalin ®



Patient: Christopher Robin

Symptoms: Hallucinations

Prescription: Clozaril ®



What are these medications used for?

CARDIOVASCULAR

HTN, HLD, AFib

PSYCHIATRIC

Depression, ADHD, Anxiety

GENITOURINARY

ED, BPH, GERD

ENDOCRINE

DM, Thyroid, Contraceptives

CHEMOTHERAPEUTIC

Breast Cancer

NEUROLOGIC

Seizures, Migraines

BONE DISEASE

Osteoporosis

RHEUMATOLOGIC

RA, SLE, Malaria

IMMUNOMODULATING

Hep C

ANTI-INFLAMMATORY

Steroids, NSAIDs,

ANTI-INFECTIVE

Bacterial infections, Acne, TB

ANTI-ALLERGY

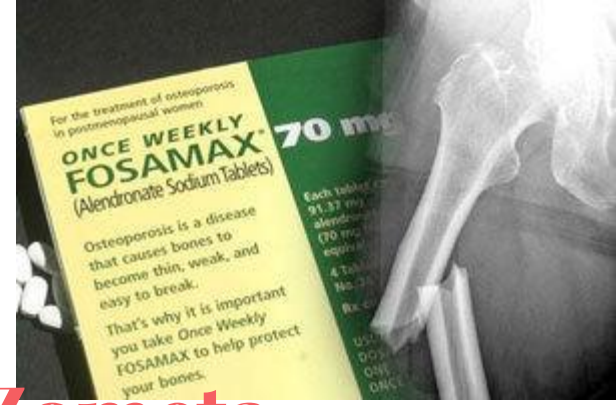
Seasonal allergy, Decongestants

Osteoporosis Agents

Bisphosphonate

Brand Name: Fosamax, Actonel, Zometa,
Didronel, Skelid, Aredia,
Boniva

Generic: alendronate, risedronate,
zoledronic acid, etidronate,
tiludronate, pamidronate, ibandronate



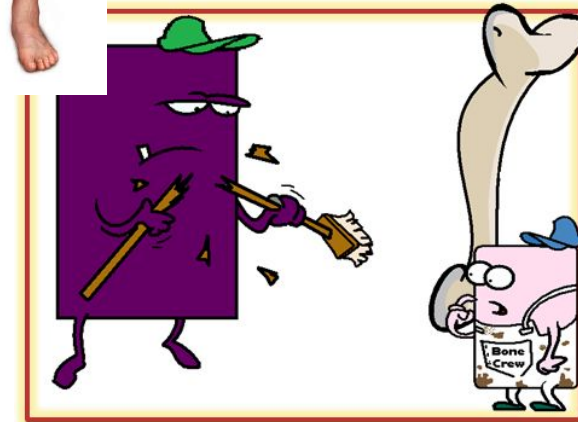
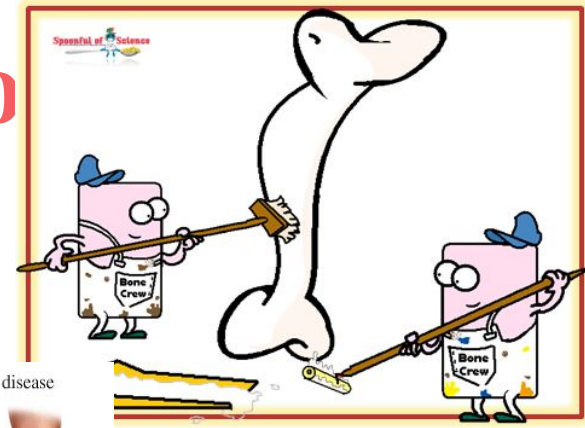
Osteoporosis agents – bispho

Prescribed for: (54 million Americans)

- Men and post menopausal women to prevent calcium bone loss (osteoporosis)
- Hypercalcemia, Bone metastases
- Paget's disease

Mechanism of action:

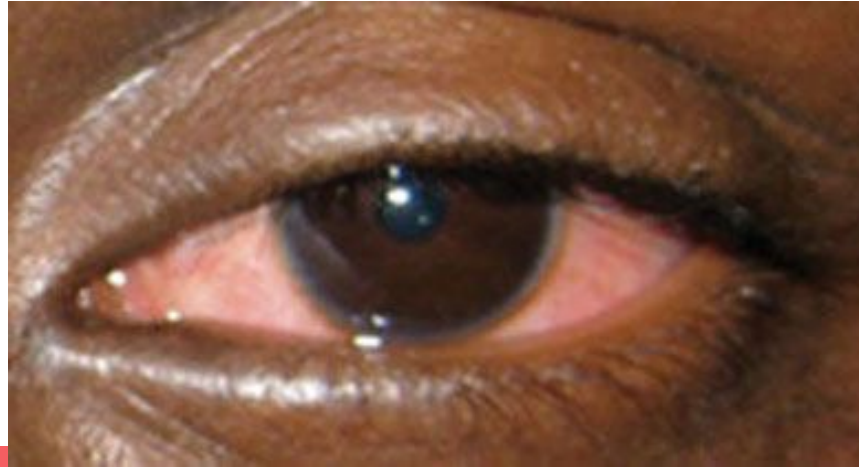
- Binds to surface of bones and slows the osteoclasts (bone-eroding cells) → allows osteoblasts to work more effectively



Osteoporosis agents – bisphosphonate

Visual / Ocular ADR (low incidence)

- Usually start when initially prescribed (within 2 weeks)
- Reversible with d/c of medication
 - Ocular Inflammation
 - Conjunctivitis, uveitis, episcleritis, scleritis (rare)
 - Blurry vision
 - Conjunctival irritation / Dryness
 - Conjunctival hyperemia



What are these medications used for?

CARDIOVASCULAR

HTN, HLD, AFib

PSYCHIATRIC

Depression, ADHD, Anxiety

GENITOURINARY

ED, BPH, GERD

ENDOCRINE

DM, Thyroid, Contraceptives

CHEMOTHERAPEUTIC

Breast Cancer

NEUROLOGIC

Seizures, Migraines

BONE DISEASE

Osteoporosis

RHEUMATOLOGIC

RA, SLE, Malaria

IMMUNOMODULATING

Hep C

ANTI-INFLAMMATORY

Steroids, NSAIDs,

ANTI-INFECTIVE

Bacterial infections, Acne, TB

ANTI-ALLERGY

Seasonal allergy, Decongestants

Rheumatologic Agents

Quinoline

Brand Name: Aralen, Plaquenil

Generic: chloroquine, hydroxychloroquine



Rheumatologic Agent - quinoline

Prescribed for:

- Rheumatoid arthritis
- Systemic lupus erythematosus
- Collagen diseases
- Malaria

Mechanism of action:

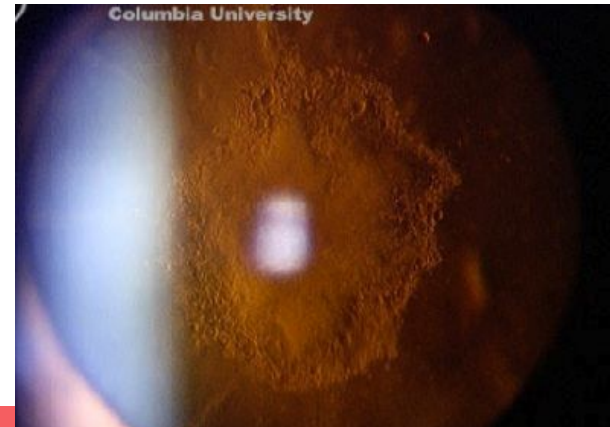
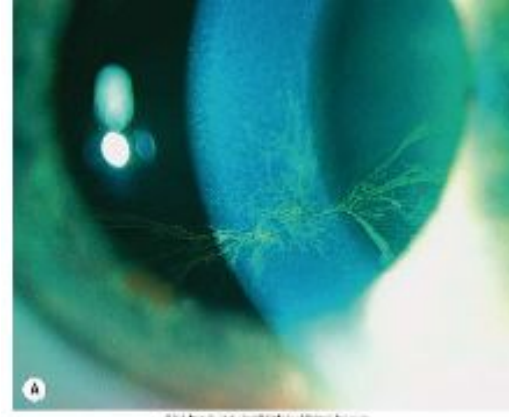
- ? Decreases stimulation of and communication between immune complex cells



Anti-Rheumatologic - quinoline

Visual / Ocular ADR

- Whorl-like corneal deposits
- Reduced corneal sensation (50%)
- Decreased accommodation (NV blur)
- White, flakelike posterior subcapsular lens opacity



Rheumatologic Agent – quinoline

Visual / Ocular ADR

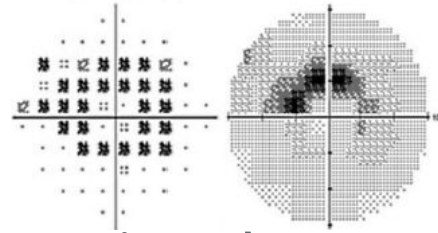
- Bull's Eye Maculopathy
 - Drug binds to melanin in the retina → degenerative changes and pigment clumping of the RPE
 - Irreversible retinal damage (dose dependent)

Vision blur/Metamorphopsia

Central/Paracentral VF loss

SD-OCT RPE loss

- Catch before visible changes occur



Cumulative risk of retinopathy over time

American Academy of Ophthalmology Statement

Recommendations on Screening for Chloroquine and Hydroxychloroquine Retinopathy (2016 Revision)

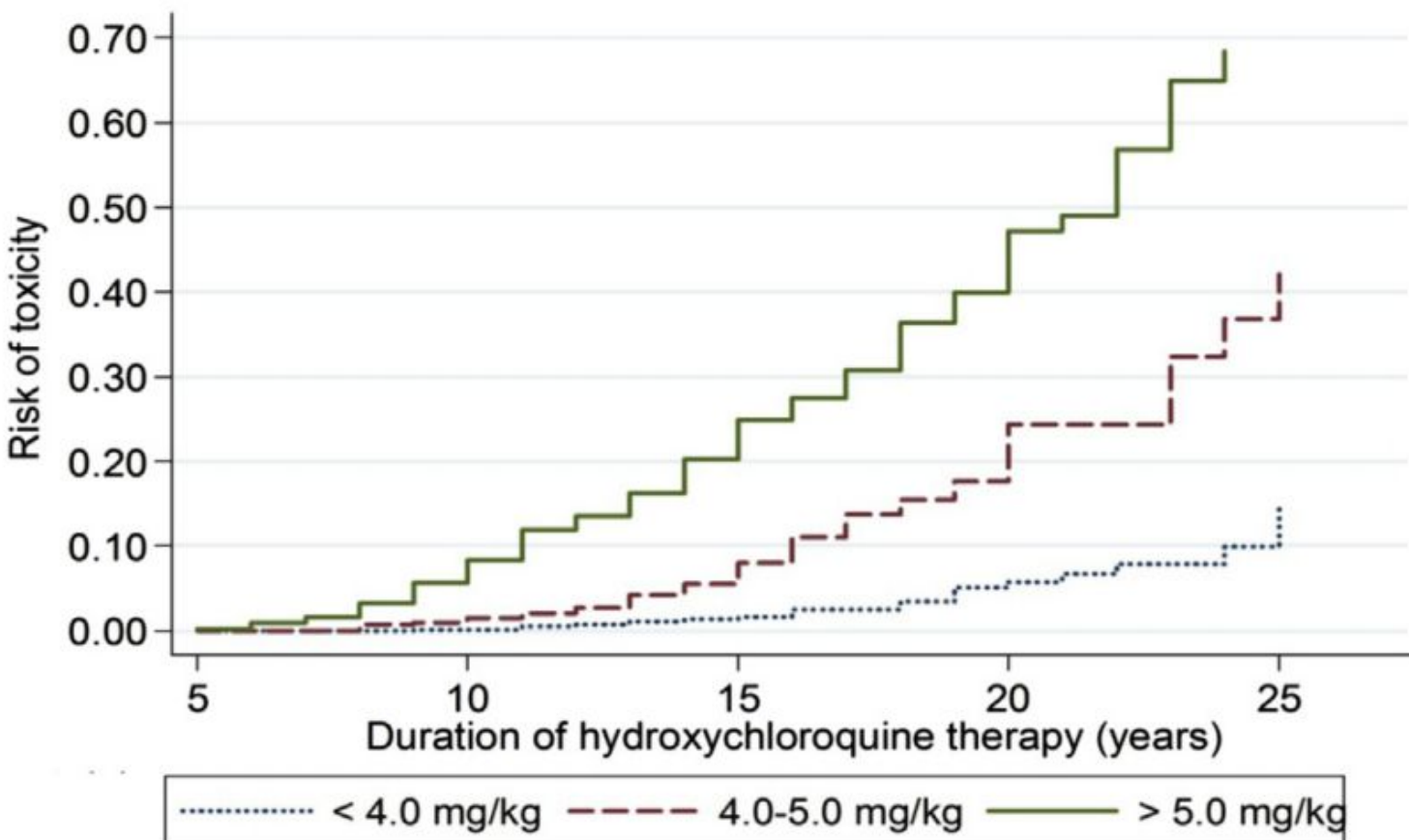


Table 1. Major Risk Factors for Toxic Retinopathy

| | |
|-------------------|---|
| Daily dosage | |
| HCQ | >5.0 mg/kg real weight |
| CQ | >2.3 mg/kg real weight |
| Duration of use | >5 Yrs, assuming no other risk factors |
| Renal disease | Subnormal glomerular filtration rate |
| Concomitant drugs | Tamoxifen use |
| Macular disease | May affect screening and susceptibility to HCQ/CQ |

CQ = chloroquine; HCQ = hydroxychloroquine.

With a proper dose, a normal initial evaluation, and in the absence of major risk factors, annual screening can be deferred until there has been 5 years of exposure. Yearly after that.

Table 3. Clinical Examination Techniques

Recommended Screening Tests

Primary tests: ideally do both

Automated visual fields (appropriate to race)<sup>30-2 Asians
10-2 non-Asians</sup>

SD OCT

Other objective tests (as needed or available):

mfERG

FAF

Newer tests of possible value in future

Microperimetry

Adaptive optics retinal imaging

Not Recommended for Screening

Fundus examination

Time-domain OCT

Fluorescein angiography

Full-field ERG

Amsler grid

Color testing

EOG

Case 4

- 28yo WM with Hx of SLE referred from rheumatologist for ocular health evaluation before initiating Plaquenil treatment
 - Pt to be started on 3mg/kg ASAP
 - First eye exam
 - No other visual / ocular / medical problems or concerns

Case 4

- Scenario A - All exam findings including BCVA, DFE, 10-2 and SD OCT unremarkable
 -
- Scenario B - Normal BCVA, 10-2 and SD OCT, 1-2 drusen in macula OS
 -
- Scenario C - SD OCT and DFE show moderate AMD OD
 -

Case 4

- Scenario A - All exam findings including BCVA, DFE, 10-2 and SD OCT unremarkable
 - Letter sent to rheumatologist with normal exam findings and have patient return in 5 years for repeat DFE, 10-2, SD OCT and yearly thereafter
- Scenario B - Normal BCVA, 10-2 and SD OCT, 1-2 drusen in macula OS
 - Letter sent to rheumatologist with abnormal findings, OK to proceed with treatment but have patient return in 6mos-1year for repeat testing
- Scenario C - SD OCT and DFE show moderate AMD OD
 - Send letter to rheumatologist noting macular disease and the debilitating effect that may have on the ability to pick up early signs of toxic retinopathy and/or the susceptibility to the medication. Recommend use of alternative therapy if available

Case 4

- Scenario D - Patient is Asian
 -
- Scenario E - Patient starting dose is 5mg/kg
 -
- Scenario F - Patient has subnormal glomerular filtration rate
 -

Case 4

- Scenario D - Patient is Asian
 - All testing the same except HVF must be a 30-2
- Scenario E - Patient starting dose is 5mg/kg
 - Letter sent to rheumatologist with normal exam findings and have patient return in 1 year for repeat DFE, 10-2, SD OCT
- Scenario F - Patient has subnormal glomerular filtration rate
 - Letter sent to rheumatologist with normal exam findings, noting that no ocular indications for a different class of medication but reminding them of suboptimal kidney function and need to have patient return in 1 year for repeat DFE, 10-2, SD OCT

What are these medications used for?

CARDIOVASCULAR

HTN, HLD, AFib

PSYCHIATRIC

Depression, ADHD, Anxiety

GENITOURINARY

ED, BPH, GERD

ENDOCRINE

DM, Thyroid, Contraceptives

CHEMOTHERAPEUTIC

Breast Cancer

NEUROLOGIC

Seizures, Migraines

BONE DISEASE

Osteoporosis

RHEUMATOLOGIC

RA, SLE, Malaria

IMMUNOMODULATING

Hep C

ANTI-INFLAMMATORY

Steroids, NSAIDs,

ANTI-INFECTIVE

Bacterial infections, Acne, TB

ANTI-ALLERGY

Seasonal allergy, Decongestants

Immunomodulating Agents Signaling Proteins

Brand Name: Intron A, Avonex, Pegasys

Generic: interferon



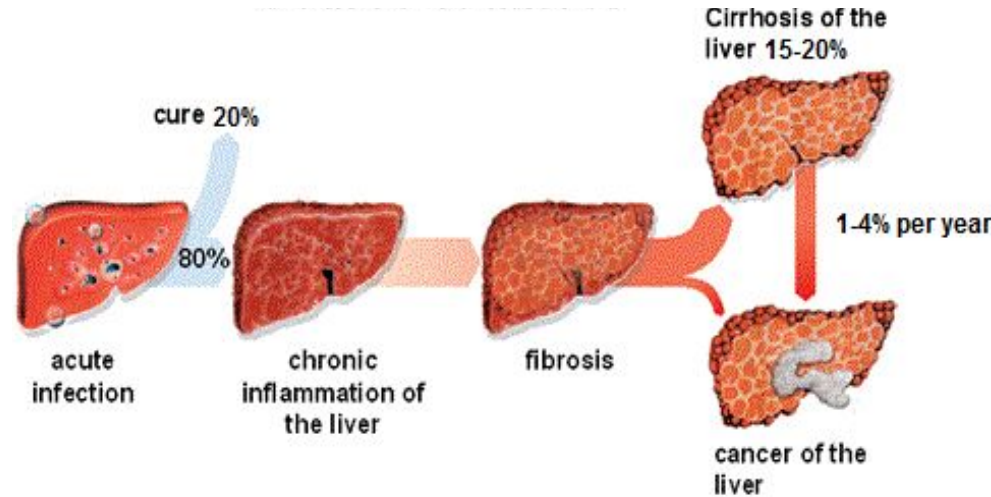
Immunomodulating agents-signaling proteins

Prescribed for:

- Hepatitis

Hep C is leading cause of liver disease in US

- Mechanism of action:
 - Modulates activity of immune system and inhibits cell proliferation
 - Has anti-viral effects



Immunomodulating agents-signaling proteins

Visual / Ocular ADR

- Conjunctivitis (4%)
- Blurry vision
- Dry eye
- Ocular pain
- Cataracts
- Decreased color vision
- Optic neuritis
- Retinal artery or vein occlusion



Immunomodulating agents-signaling proteins

Visual / Ocular ADR

- Interferon retinopathy
 - 2-15 weeks after treatment initiation due to hypoxia
 - Retinal hemorrhages
 - Cotton wool spots
 - Cystoid macular edema
- Asymptomatic unless affects macula
- Usually resolves 3 months after d/c



What are these medications used for?

CARDIOVASCULAR

HTN, HLD, AFib

PSYCHIATRIC

Depression, ADHD, Anxiety

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ED, BPH, GERD

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Bacterial infections, Acne, TB

ANTI-ALLERGY

Seasonal allergy, Decongestants

Common ADR of Anti Inflammatory Meds

Blurry Vision (2/2)

Diplopia (2/2)

Color Vision / Contrast Changes (2/2)

Visual Field Defects (2/2)

Pseudotumor Cerebri (2/2)



Anti-Inflammatory Agents

Steroids

**Brand Name: Deltasone, Kenalog,
Decadrone, Dexasone,
Pred-Pak**

Generic: Corticosteroids



Anti-Inflammatory – corticosteroids

Prescribed for:

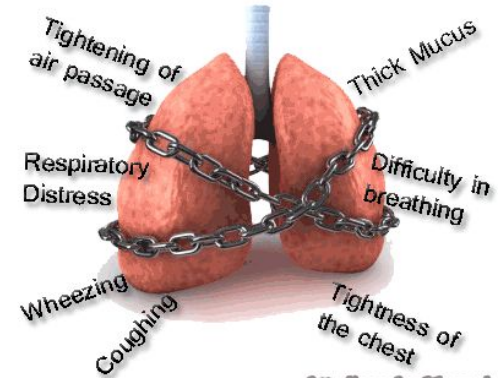
- Rheumatoid arthritis
- Lupus
- Immune-mediated diseases
- Severe allergies
- Chronic obstructive pulmonary disease
- Asthma

Mechanism of action

controls synthesis of proteins that regulate all aspects of inflammation



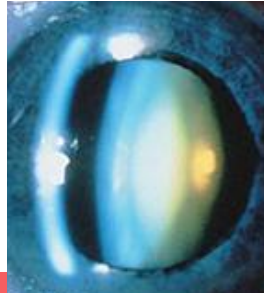
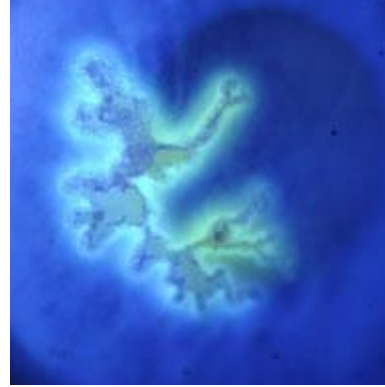
What is Asthma



Anti-Inflammatory – corticosteroids

Visual / Ocular ADR

- Exacerbation of herpetic keratitis
- PTC / Papilledema (HA, tinnitus, diplopia, blur, VF)
- Posterior subcapsular and nuclear cataract
- Central serous macular detachment
- Elevated IOP
- Hyperpigmentation of periorbital area



Anti-Inflammatory Agents

Non-Steroidal

Brand Name: Ibuprofen, Indocin

Generic: Nonsteroidal antiinflammatory drugs (NSAIDS), Indomethacin, aspirin



Anti-Inflammatory – NSAIDs

Prescribed for: (OTC and Rx)

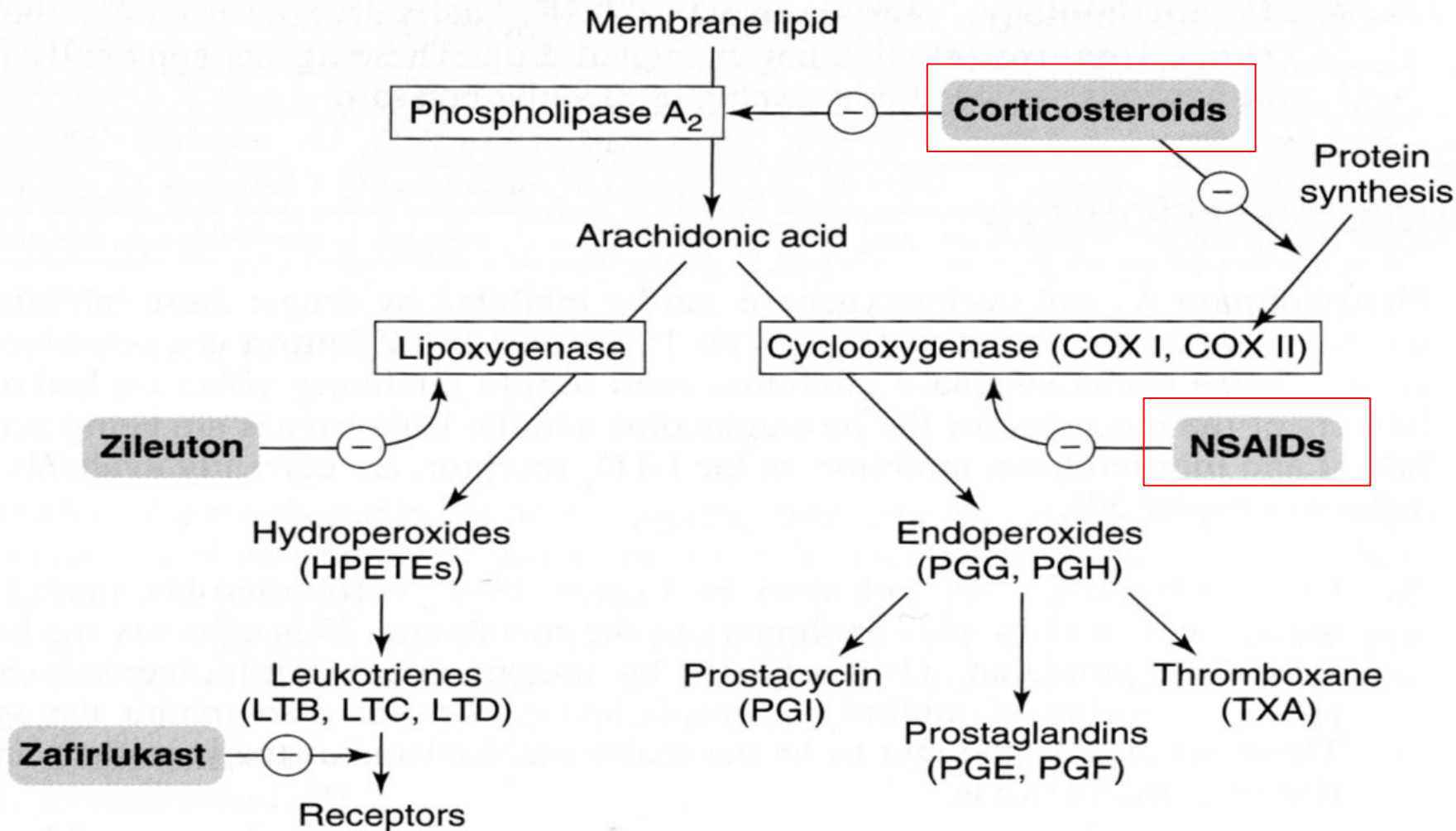
- Pain
- Arthritis
- Fever
- Swelling

Mechanism of action:

- inhibit cyclooxygenase

(COX) prostaglandin synthase

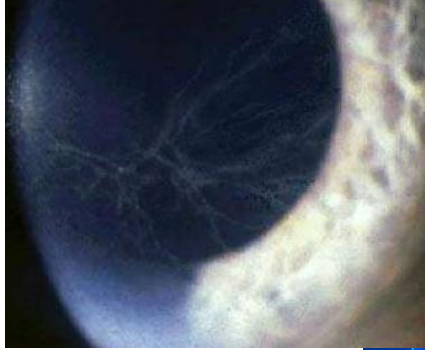




Anti-Inflammatory – NSA

Visual Signs and Symptoms

- Pseudotumor cerebri
- Color vision changes
- Dry eye
- Whorl-like keratopathy



Common ADR of Anti Inflammatory Meds

Blurry Vision (2/2)

Diplopia (2/2)

Color Vision / Contrast Changes (2/2)

Visual Field Defects (2/2)

PTC / Papilledema (2/2)



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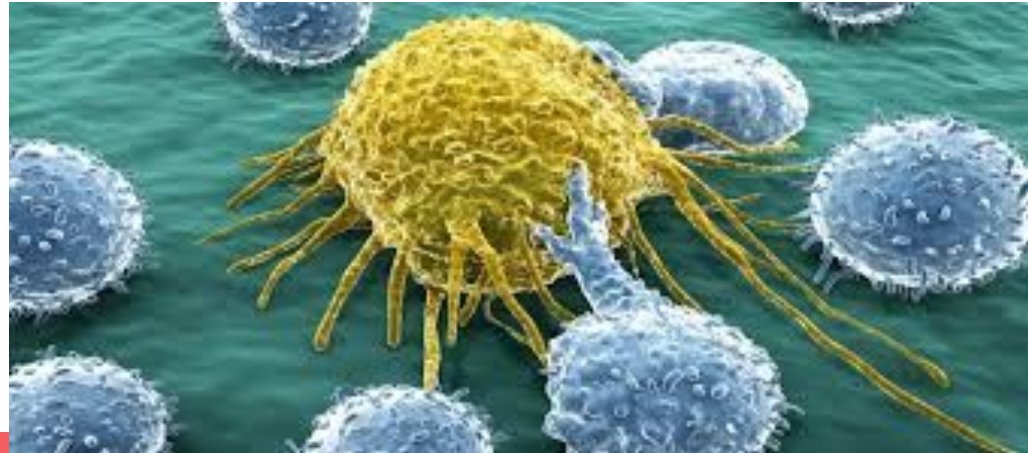
Seasonal allergy, Decongestants

Common ADR of Anti-Infective Meds

Blurry Vision (4/4)

Visual Field Defects (4/4)

Pseudotumor Cerebri (2/4)



Anti-Infective Agents

Cyclines



Brand Name: Sumycin, Doryx, Minocin

**Generic Name: tetracycline, doxycycline,
minocycline**



Antiinfective Agents – cyclines

Prescribed for:

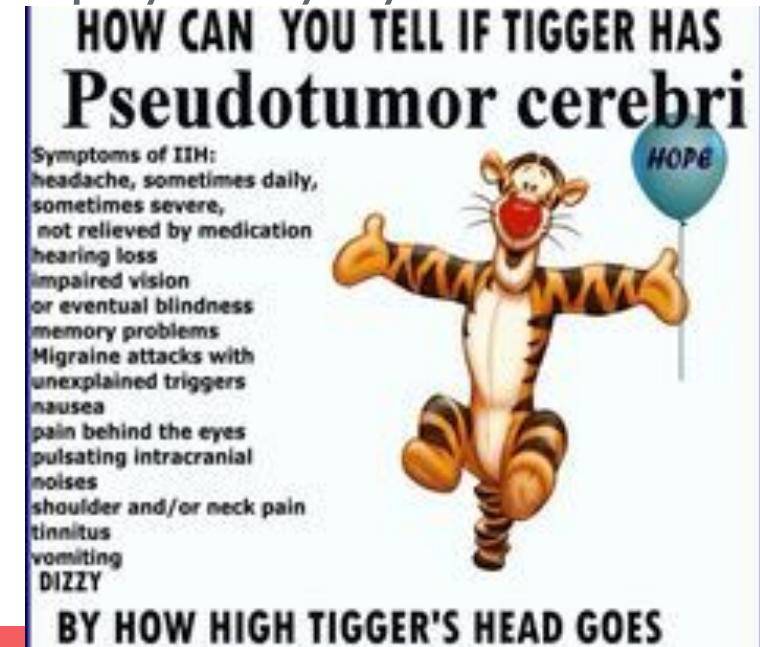
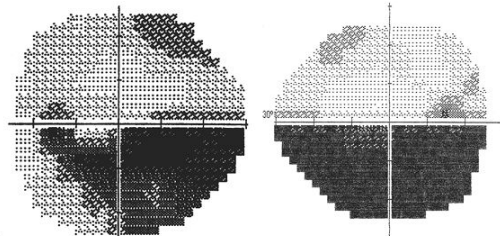
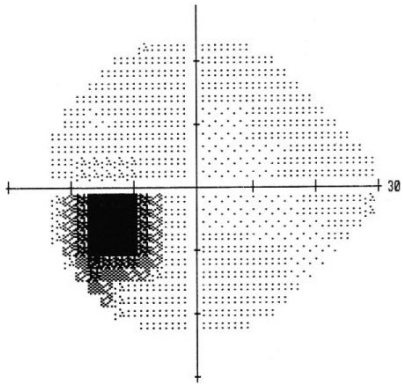
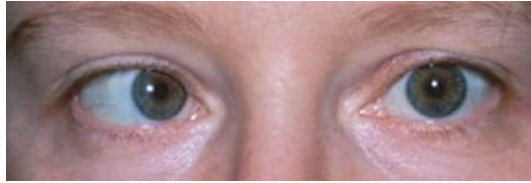
- Gram-positive and gram-negative bacteria
- Rosacea, Meibomianitis, Acne
- Lyme disease, Chlamydia
- Protozoa
 - Mechanism of action:
 - Bacteriocydial
 - Inhibits protein synthesis
 - Suppression of sebaceous gland activity



Antiinfectives – cyclines

Visual / Ocular ADR

- Hyperpigmentation of periorbital area and sclera
- Meibomian gland dysfunction and atrophy / Dry Eye
- Pseudotumor cerebri
- Photophobia



Anti-Infective Agents

Sulfonamides (sulfa drugs)

Brand Name: Septra, Bactrim

Generic Name: sulfonamide



Antiinfective Agents – sulfonamide

Prescribed for:

- Gram-positive and gram-negative infections
- Rosacea
- Dandruff

Mechanism of Action:

Inhibits folate synthesis →
disrupts bacterial cell division
Bacteriostatic

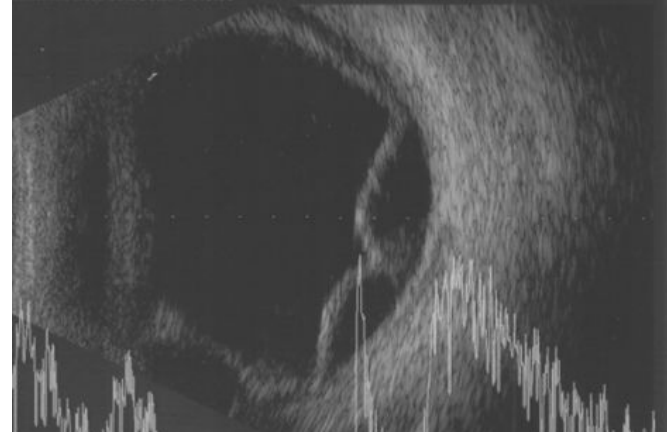


Antiinfective Agents - sulfonamide

Visual / Ocular ADR

- Conjunctivitis
- Choroidal effusion
 - Sudden onset myopia
 - Angle closure
- Stevens-Johnson syndrome
 - immune mediated hypersensitivity involving skin and mucous glands
 - Amniotic membrane

avoid Diamox in choroidal effusion



Anti-Infective Agents

Antimycobacterial



Brand Name: Myambutol, Hydra, Isovit

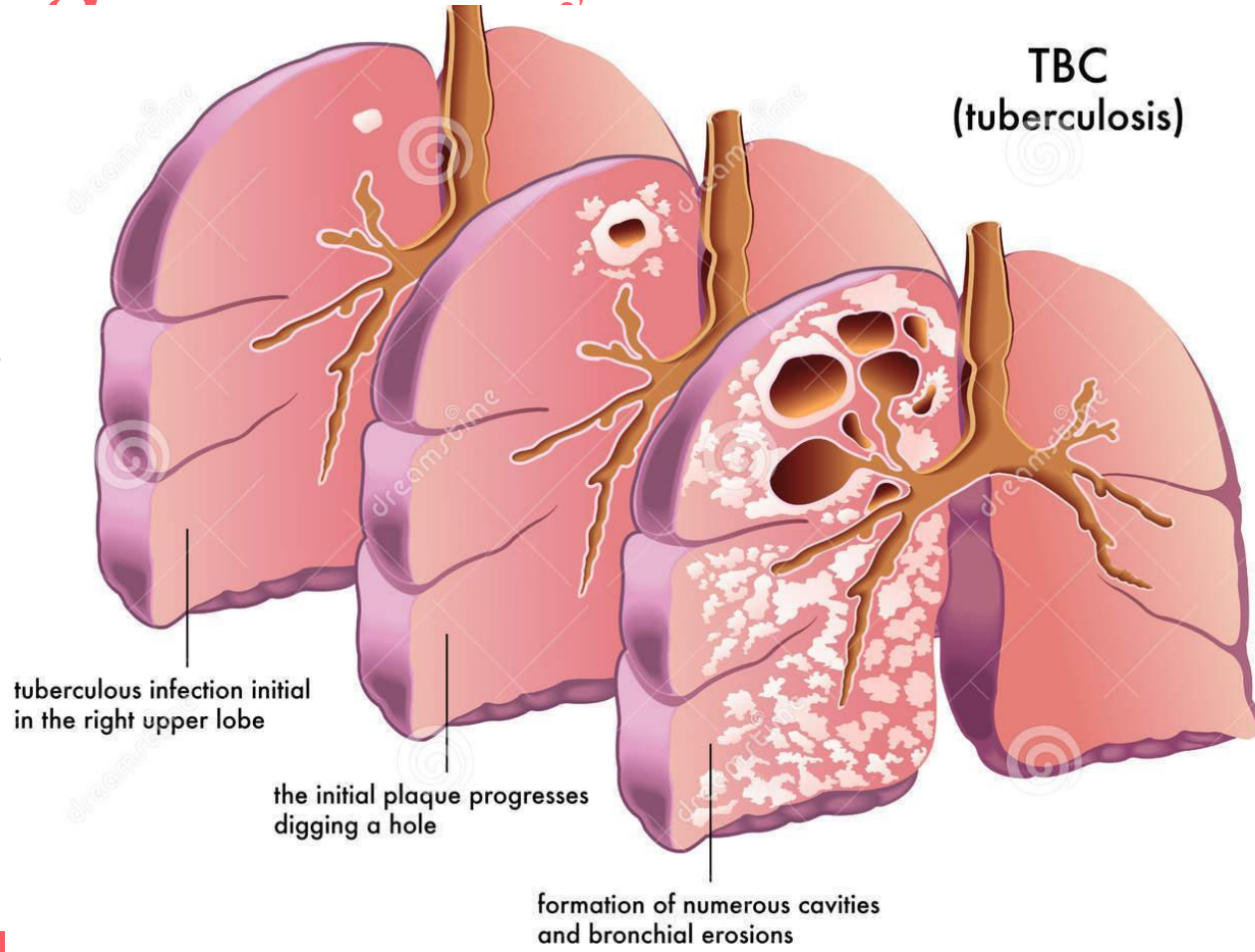
Generic Name: ethambutol, isoniazid

Antiinfective Agent – antimycobacterial

Prescribed for:

Treating
mycobacterial
disease, including
tuberculosis

Mechanism of action:
Prevents cell wall
synthesis
Bactericidal

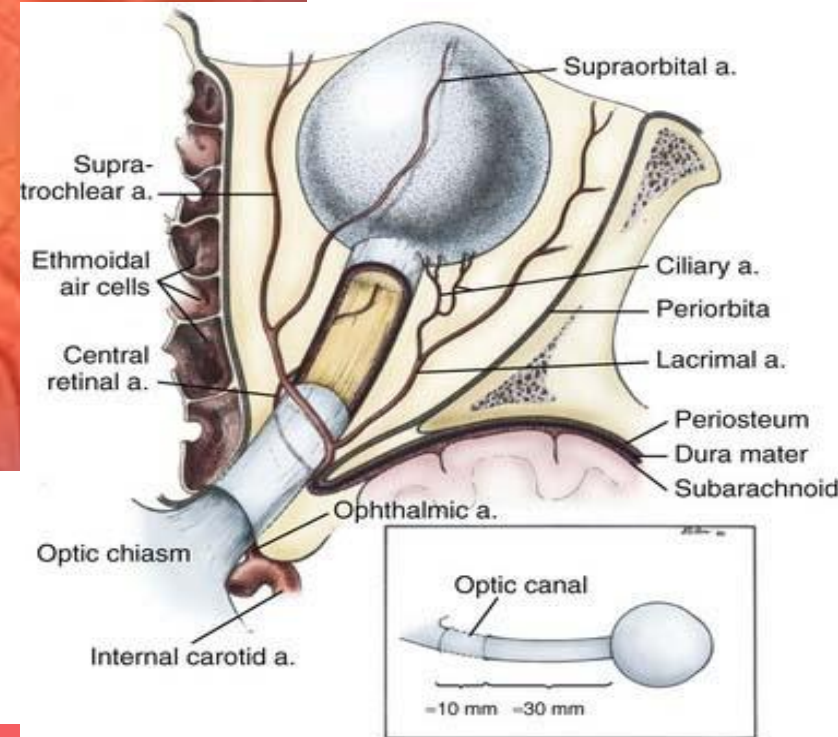
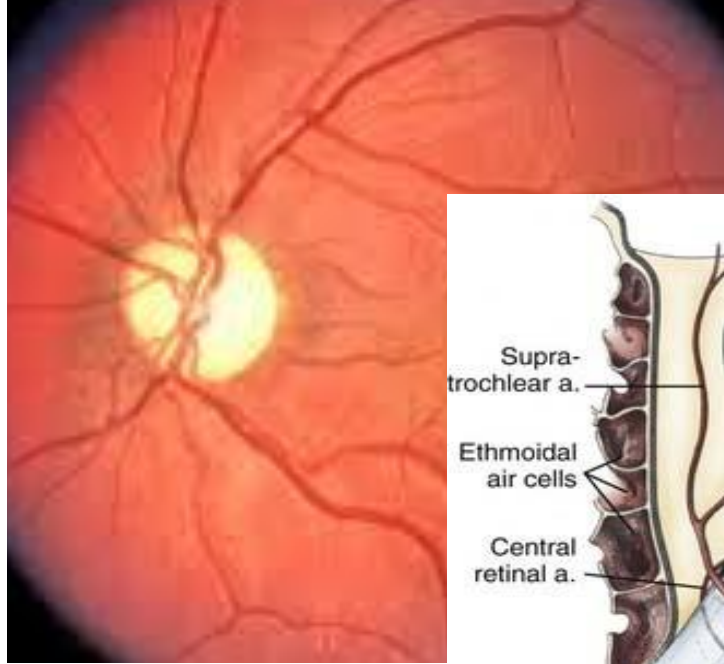


Antiinfective Agent – antimycobacterial

Visual / Ocular ADR

Optic nerve toxicity - irreversible

Slow and progressive vision loss due to retrobulbar optic neuritis (pain, blur, CV, VF)



Common ADR of Anti Infective Meds

Blurry Vision (4/4)

Visual Field Defects (4/4)

Pseudotumor Cerebri (2/4)



What are these medications used for?

CARDIOVASCULAR

HTN, HLD, AFib

PSYCHIATRIC

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Hep C

ANTI-INFLAMMATORY

Steroids, NSAIDs,

ANTI-INFECTIVE

Bacterial infections, Acne, TB

ANTI-ALLERGY

Seasonal allergy, Decongestants

VITAMINS / SUPPLEMENTS

Common ADR of Anti Allergy Meds

Blurry Vision (2/2)

Dry Eye (2/2)

Mydriasis (2/2)



Antiallergy Agents

Histamine Antagonists



Brand Name: Zyrtec, Claritin, Allegra, Singulair, Benadryl

Generic: cetirizine, loratadine, desloratadine, fexofenadine, diphenhydramine

Antiallergy Agent – antihistamine

Prescribed for: (OTC and Rx)

- Cold and Allergy
- Itching, sneezing, nasal congestion, watery eyes

Mechanism of action:

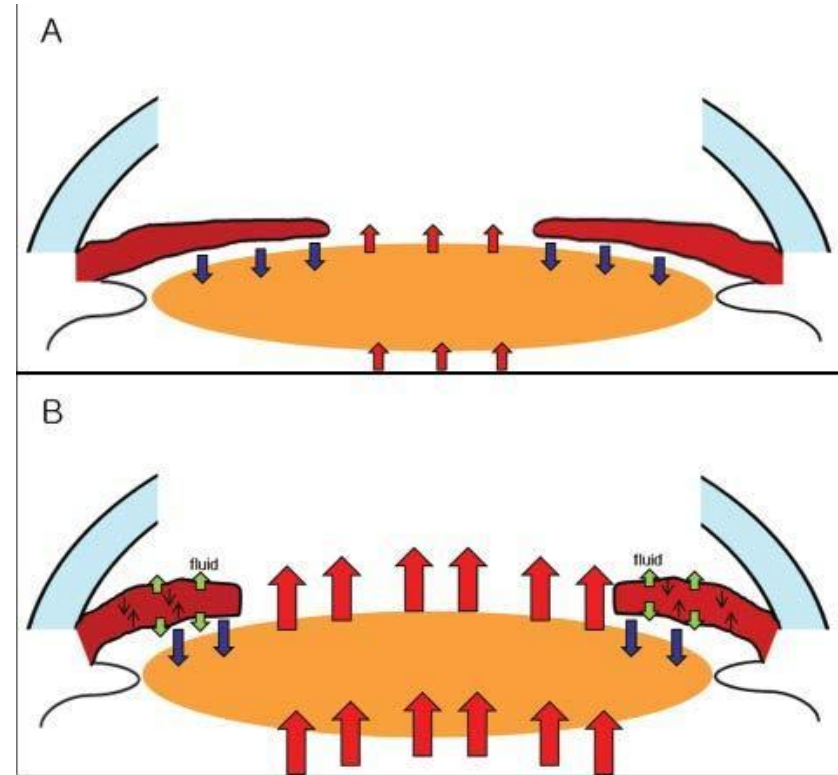
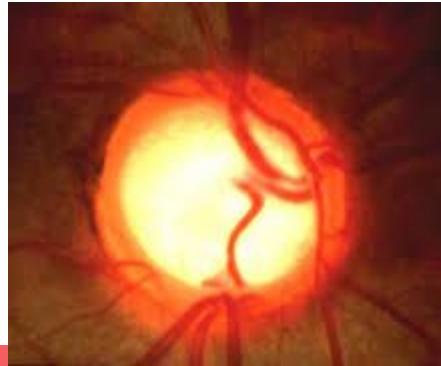
- Antihistamine and histamine H1 receptor antagonist
- Weak anticholinergic-like action
- Reduce mucus and tear secretion



Antiallergy Agent - antihistamine

Visual / Ocular ADR

- Cycloplegia / Blurry vision
- Decreased lacrimal secretion / Dry Eye
- Mydriasis
- IOP elevation
- Narrow angle or angle closure glaucoma



Antiallergy Agents Decongestants

Brand Name: Sudafed

Generic: pseudoephedrine



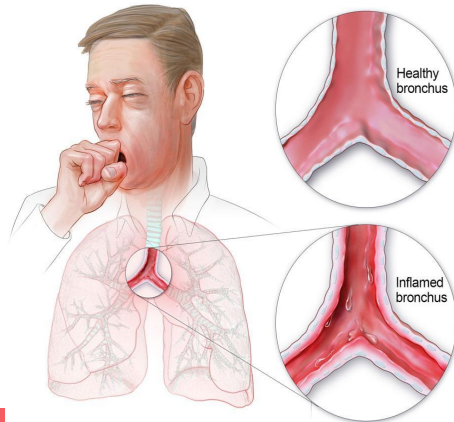
Antiallergy Agent – decongestant

Prescribed for: (OTC and Rx)

Mechanism of action:

- Nasal congestion
- Bronchitis
- Ear congestion

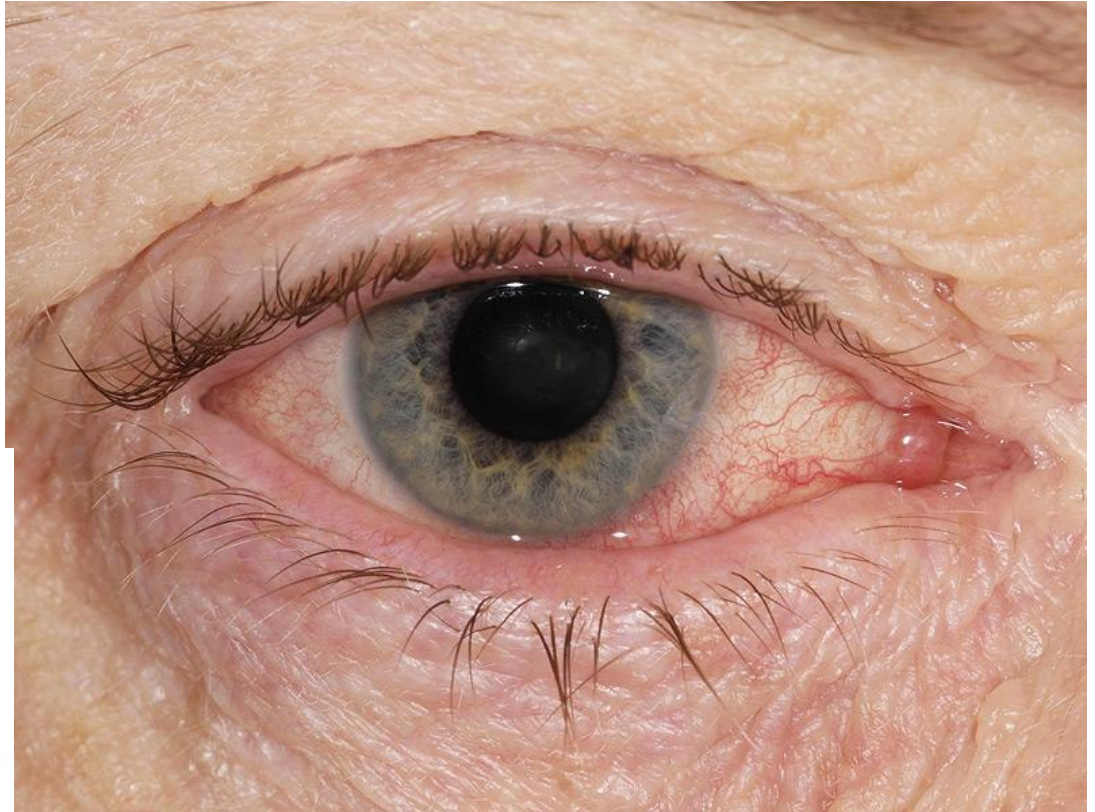
Adrenergic agonist
Vasoconstriction



Antiallergy Agent - decongestant

Visual / Ocular ADR

- Mydriasis
- Blurry vision
- Dry eye

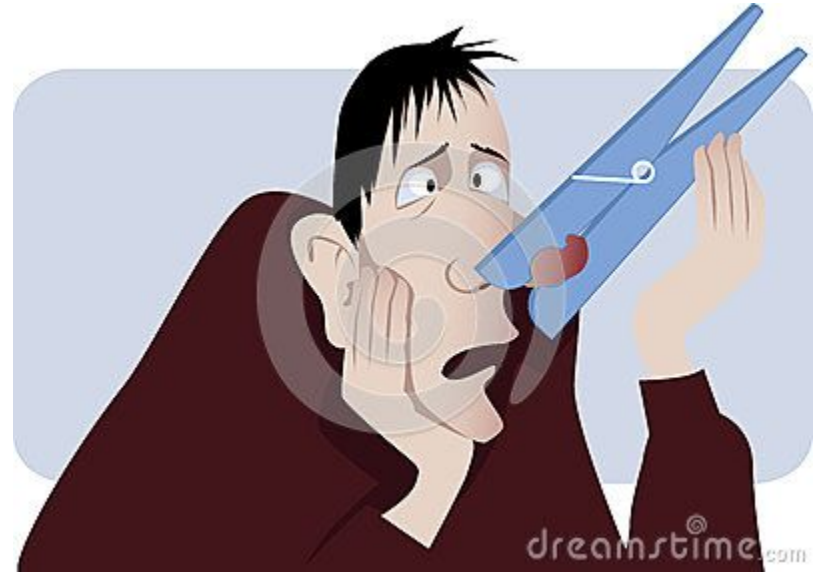


Common ADR of Anti Allergy Meds

Blurry Vision (2/2)

Dry Eye (2/2)

Mydriasis (2/2)



What are these medications used for?

CARDIOVASCULAR

HTN, HLD, AFib

PSYCHIATRIC

Depression, ADHD, Anxiety

GENITOURINARY

ED, BPH, GERD

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Steroids, NSAIDs,

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Seasonal allergy, Decongestants

VITAMINS / SUPPLEMENTS

Common ADR of Vitamins and Supplements (Hypervitaminosis)

Vitamins and Supplements

- Herbal medications are reportedly a \$60 billion industry worldwide and a \$20 billion industry in the United States
- Patients don't tell their doctors about it because they don't think it's pertinent

Vitamins and Supplements

Brand Name: Ginkgo

Generic Name: ginkgo biloba



Vitamin/Supplement – ginkgo biloba

Prescribed for: (OTC)

- Dementia
- Improved blood flow
- Antioxidant


Mechanism:

- Blood vessel dilation
- Inhibition of platelet activation



Ginkgo Biloba's basic action is to increase blood circulation thus eventually improves brain function, reduces age related loss, reduces sexual dysfunction etc. Some of its important benefits are:

Improves Blood Circulation

Ginkgo Biloba is known to improve blood circulation throughout the body by cleaning the blockage of blood vessels. It can supply blood and boost oxygen levels thus supporting the body better.




Ginkgo Biloba cleans the blockage of Blood Vessels




Improves Overall Health

Besides the benefits mentioned above, Ginkgo Biloba works on different organs like eye, ear, etc..., hence improving the overall health.



Prevents Heart Attack!

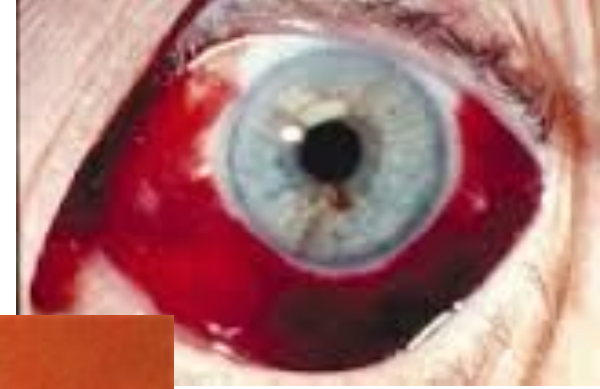
Ginkgo Biloba helps to prevent heart diseases. Taking Ginkgo Biloba regularly ensures normal functioning of heart.



Vitamin/Supplement – ginkgo biloba

Visual / Ocular ADR

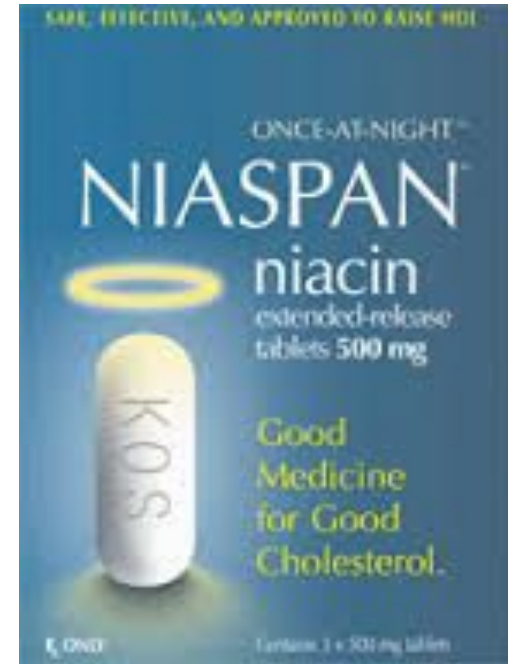
- Subconjunctival hemorrhage
- Retinal hemorrhage



Vitamins and Supplements

Brand Name: Niaspan

Generic Name: niacin, vitamin B3



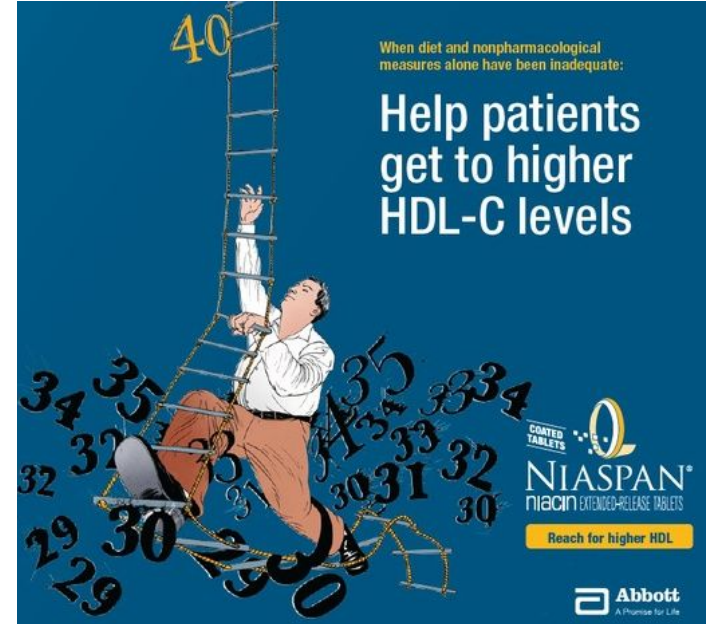
Vitamin/Supplement – niacin

Prescribed for: (OTC and Rx)

- HDL improvement
- Vitamin/Supplement

Mechanism:

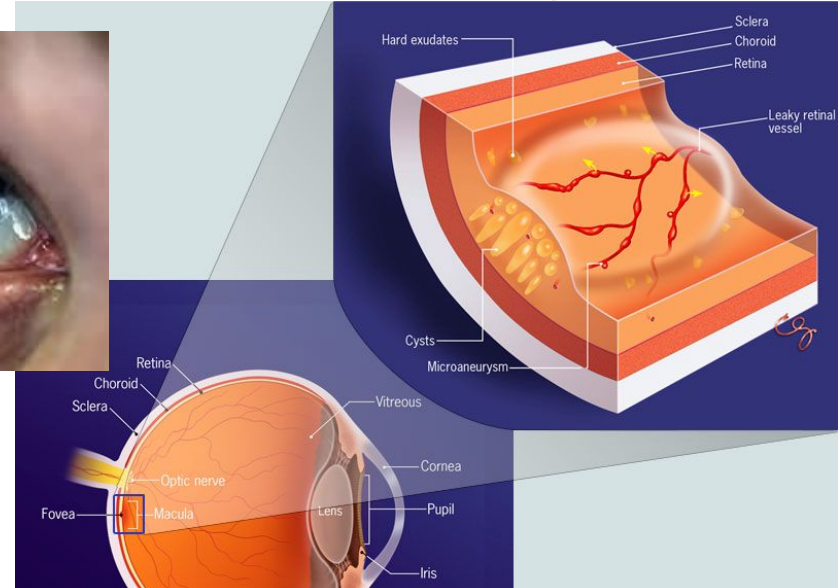
- Inhibits release of free fatty acids from adipose tissue
- Increased lipoprotein lipase activity
- Recommended daily allowance
13-18mg/day



Vitamin/Supplement – niacin / Vit B3

Visual / Ocular ADR

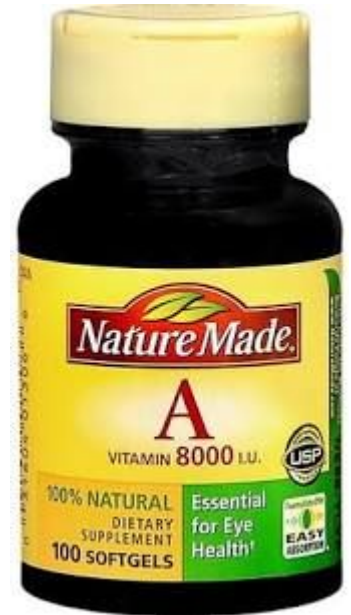
- Dry eye syndrome
- Macular edema
- Eyelid edema and ptosis
- Discoloration of eyelids



Vitamins and Supplements

Brand Name: Retinol

Generic Name: vitamin A



Vitamin/Supplement – retinol / vit A

Prescribed for: (Rx and OTC)

- Vitamin
- Skin health
- Growth and development

Mechanism:

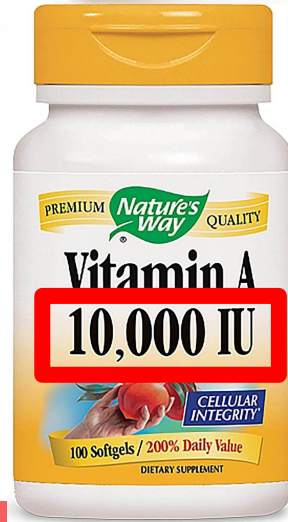
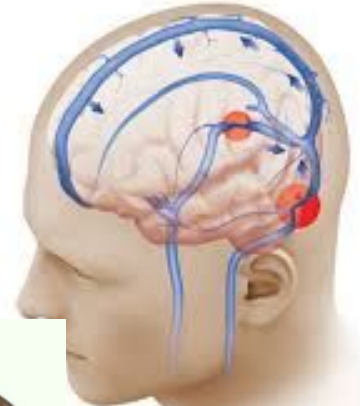
- Growth and differentiation of cells throughout the body
- Accumulates in the body



Vitamin/Supplement – retinol / vit A

Visual / Ocular ADR

- Pseudotumor cerebri
- Orange discoloration of skin
- Dry eye syndrome
- Recommended daily dose
 - 19+ years: 900mcg for males, 700mcg for females
 - Taking more than the recommended daily allowance for several months can cause hypervitaminosis



Vitamins and Supplements

Vitamin A analog / Retinoid

Brand Name: Accutane, Roaccutane

Generic Name: isotretinoin

Accutane (Isotretinoin)



40 mg

20 mg

10 mg

Vitamin/Supplement – retinoid

Prescribed for:

- Acne
- Keratinizing dermatoses
- Psoriasis



Mechanism of action:

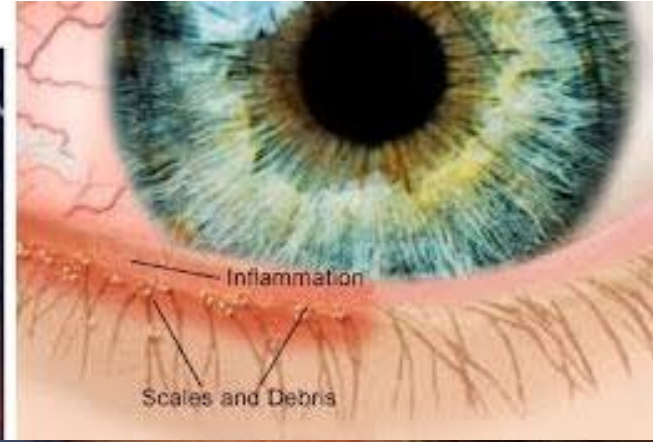
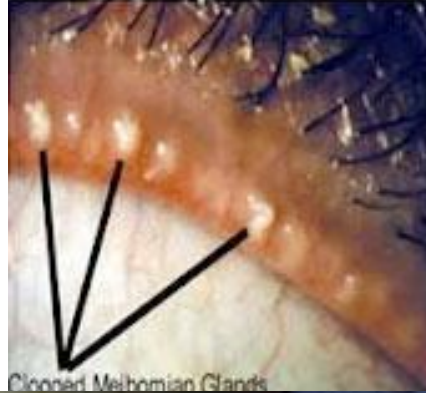
- Suppression of sebaceous gland activity
- Changes surface lipid composition of skin
- Inhibits keratinization



Vitamin/Supplement – retinoid

Visual / Ocular ADR (reversible)

- Meibomian gland dysfunction and atrophy / Dry Eye
- Blepharoconjunctivitis
- Vision blur
- Pseudotumor cerebri
- Retinotoxicity

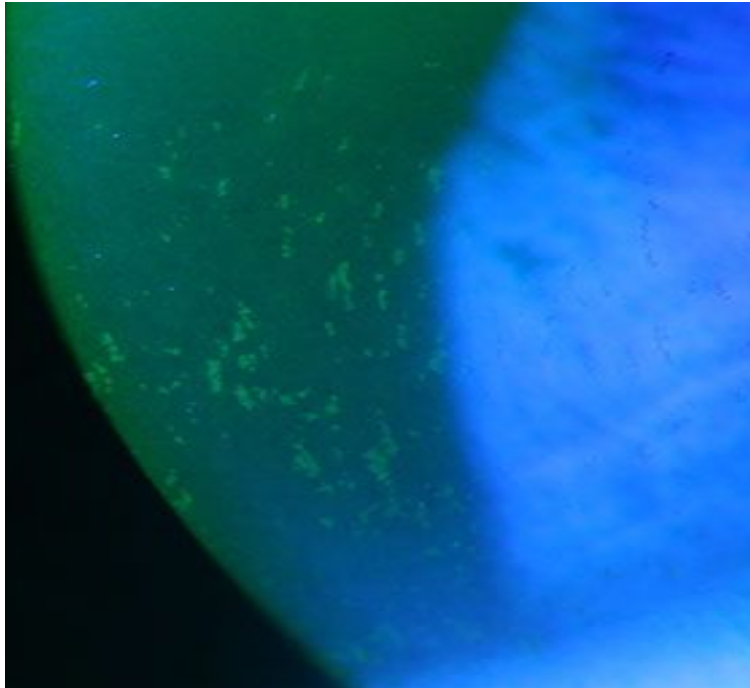


Case 5

- 35yo IF SCL f/u reporting CL intolerance and poor VA with lenses
 - First time SCL wearer, currently going through trial fitting with patient
 - All previous exam findings from last week with DFE unremarkable
 - Pt seems agitated and reports having HA recently relating to lack of sleep (sick kids)
- Medical Hx unremarkable except for birth control pills

Case 5

- BCVA
 - 20/80 OD/OS PH and refraction NI



Case 5

- Assessment:
 - a. PTC OU - pt on birth control
 - Pt later notes that has been taking high doses of Ibuprofen for her HAs
 - b. Dry eye disease OU causing CL intolerance

Case 5

- Assessment:
 - a. PTC OU - pt on birth control
 - Pt later notes that has been taking high doses of Ibuprofen for her HAs
 - b. Dry eye disease OU causing CL intolerance
- Plan:
 - a. Pt sent to ER
 - MRI / LP
 - Tx with acetazolamide (D/C meds with OK of OBGYN)
 - b. RTC 2-3 weeks for f/u evaluation with DES/CL assessment and DFE

Common Side Effects 40 Classes of Meds

Blurry Vision

Dry Eye

Visual Field Defects

Color Vision / Contrast Defects

Optic Neuropathy

Diplopia

Photophobia

Pseudotumor Cerebri

Cataract

Increased IOP

Mydriasis

Accommodative Disf.

Conjunctivitis

Macular Edema

Ptosis

Retinal Changes

Myopia

Whorl Keratopathy

Retinal Hemes

Nystagmus

Visual and Ocular ADR of Common Systemic Meds

| | | | Blur | DES | VF Defects | CV Defects | Optic Neuropathy | Diplopia | Photophobia | Pseudotumor (PTC) | Cataract | IOP | Mydriasis | Acc. Dysfunct. | Conjunctivitis | Macular Edema | Prosis | Retinal Changes | Myopia | Whorl Keratopathy | Retinal Heme | Nystagmus |
|-----------------------------|--|---|------|-----|------------|------------|------------------|----------|-------------|-------------------|----------|-----|-----------|----------------|----------------|---------------|--------|-----------------|--------|-------------------|--------------|-----------|
| CARDIOVASCULAR | | | | | | | | | | | | | | | | | | | | | | |
| statin | lovastatin, niacin, atorvastatin, simvastatin | Mevacor, Advicor, Niaspan, Lipotor, Zocor | x | x | | | | | | | x | | | | | x | x | | | | | |
| beta blocker | acebutolol, atenolol, betaxolol, meroprolol | Sectral, Tenormin, Kerlone, Lopressor | | x | | | | | | | | | | | | | | | | | | |
| glycoside | digoxin | Digox, Lanoxin, Cardoxin, Lenoxin | x | | x | x | x | | | | | | | | | | | | | | | |
| amiodarone | amiodarone | Cordarone, Pacerone | x | | | x | x | | x | | x | | | | | | | | | | x | |
| thiazide and diuretic | hydrochlorothiazide, furosemide | Microzide, HydroDIURIL, LASIX | x | x | | | | | | | | | | | | | | | x | | | |
| anticoagulant | warfarin, heparin, clopidogrel, aspirin | Coumadin, Hemochron, Plavix | x | | x | | | | | | | | | | | | | | | | | x |
| PSYCHIATRIC | | | | | | | | | | | | | | | | | | | | | | |
| phenothiazines | thioridazine, chlorpromazine | Mellaril, Thorazine | x | x | | x | | | x | | x | x | x | x | | | | | x | | | |
| benzodiazepine | alprazolam, diazepam | Xanax, Valium | x | x | | | | x | x | | | | x | x | x | | | | | | | |
| SSRI | fluoxetine HCL, sertraline, paroxetine, citalopram | Prozac, Zoloft, Paxil, Celexa, Effexor | x | x | | | | x | x | | | | x | x | x | | | x | | | | |
| CNS stimulant | methylphenidate, amphetamine | Ritalin, Adderall | x | x | | | | | x | | | | | x | | | | | | | | |
| GENITOURINARY | | | | | | | | | | | | | | | | | | | | | | |
| alpha 1 antagonist | tamsulosin, terazosin, alfuzosin | Flomax | | | | | | | | | | | floppy | | | | | | | | | |
| phosphodiesterase inhibitor | sildenafil citrate, vardenafil, tadalafil | Viagra, Levitra, Cialis | x | | x | x | x | | | | | | | | | | | | | | | |
| histamine 2 blocker | ranitidine | Zantac, Deprizine | x | | | x | | | x | | | | | x | | x | | | | | | |
| ENDOCRINE | | | | | | | | | | | | | | | | | | | | | | |
| hormone replacement | levothyroxine | Synthroid, Levoxyl, Levothyroid | x | | x | x | x | x | | x | | | | | | | | | x | | | |
| thiazolidinedione | rosiglitazone, pioglitazone hydrochloride | Avandia, Actos | x | | x | | | | | | | | | | | | x | | | | | |
| contraceptive | estrogen and pregestin | Ortho-Novum, Levora, Laziant, Ocella | x | x | x | x | x | x | | x | | | | | | | x | | | | | x |
| CHEMOTHERAPEUTIC | | | | | | | | | | | | | | | | | | | | | | |
| estrogen antagonist | tamoxifen | Nolvadex | x | | x | x | x | x | | x | x | | | | | | | | x | | x | |
| immunosuppressant | methotrexate | Trexall, Rasuvo | x | x | | | | x | | x | | | | | | x | | | | | | |
| anticholinergic | scopolamine | Scopace, Transderm-Scope | x | | | | | | x | | | x | x | x | | | | | | | | |
| NEUROLOGIC | | | | | | | | | | | | | | | | | | | | | | |
| anticonvulsant | topiramate | Topamax | x | | x | | | x | | | x | x | | | | | | | x | | | x |
| anticonvulsant | lamotrigine | Lamictal | x | | | | | x | | | | | | | | | | | | | | x |
| GABA analog | gabapentin | Neurontin | x | | x | | x | x | | | | | | | | | x | | | | | x |
| BONE DISEASE | | | | | | | | | | | | | | | | | | | | | | |
| bisphosphonate | alendronate, risedronate, tiludronate, pamidronate | Fosamax, Actonel, Skelid, Aredia, Boniva | x | x | | | | | | | | | | | | x | | | | | | |
| RHEUMATOLOGIC | | | | | | | | | | | | | | | | | | | | | | |
| quinoline | chloroquine, hydroxychloroquine | Aralen, Plaquenil | x | | x | x | | | | x | | | | x | | | | | x | | | x |
| IMMUNOMODULATING | | | | | | | | | | | | | | | | | | | | | | |
| signaling protein | interferon | Intron A, Avonex, Pegasys | x | x | x | x | x | | | x | | | | | x | | | | x | | | x |
| INFLAMMATORY | | | | | | | | | | | | | | | | | | | | | | |
| steroid | corticosteroids | Deltason, Kenalog, Dexasone, Pred-Pak | x | | x | x | x | x | | x | x | x | | | | | x | | | | | |
| NSAID | NSAIDs, Indomethacin | Ibuprofen, Indocin | x | x | x | x | x | x | | x | | | | | | | | | | | | x |
| ANTIINFECTIVE | | | | | | | | | | | | | | | | | | | | | | |
| cycline | tetracycline, doxycycline | Sumycin, Vibramycin | x | | x | | | x | x | x | | | | | | | | | | | | |
| minocycline | isotretinoin | Accutane, Roaccutane | x | x | x | x | x | x | | x | | | | | | x | | | x | x | | |
| sulfacetamide | sulfacetamide | Klaron, Ovale | x | x | | | | | | | | | x | | | x | | x | | x | | |
| antimycobacterial | ethambutol, isoniazid | Myambutol, Hydra, Isonit | x | | | x | x | | | | | | | | | | | | | | | |
| ANTIALLERGY | | | | | | | | | | | | | | | | | | | | | | |
| antihistamine | certirizine, loratadine, diphenhydramine | Zyrtec, Claritin, Benadryl | x | x | | | | | | | | | x | x | x | | | | | | | |
| decongestant | pseudoephedrine | Sudafed | x | x | | | | | | | | | | | x | | | | | | | |
| VITAMINS | | | | | | | | | | | | | | | | | | | | | | |
| vitamin A analog | vitamin A | Aquasol A | x | x | x | x | x | x | | x | | | | | | | | | | | | |
| niacin | vitamin B3 | Niacor, Niaspan | x | x | | | | | | | | | | | | | x | x | | | | |

www.webmd.com/interaction-checker

Drug Interaction Checker

Enter two or more drugs, OTC's, or herbal supplements to check for interactions

Medication 1

Medication 2

Add another



Check Interaction

Summary

- Many systemic medications have significant side effects that impact the ocular and visual health of the patient
 - The prescribing doctor may not be aware (co-manage)
- Eye is a complex organ in which minimal impairment may produce a substantial functional loss
- Get all Rx and OTC medications as both can have ocular and visual ADR
- Be familiar with the associated ADR which can be mild and transient or devastating and permanent



Summary

- A careful and detailed case history is critical, especially to reveal a patient's medication history
 - Does timing of findings/symptoms match drug use
- Should color vision (and visual field) testing be added into the exam flow for geriatric patients?
- Rx all meds to the same pharmacy so pharmacist can screen for potential drug-drug interaction (polypharmacy)

Summary

- Help co-manage patient in a team approach
 - Provide critical info to help prescribing doc make better choices on what class of medication to prescribe for their patient
- Help increase knowledge about you and improve collaboration opportunities with other healthcare providers

THANK YOU
typetrosyan@gmail.com



Being on
MEDICATION
has it perks.

*You can slap
insensitive people at*
RANDOM
and blame it on
the side effects.



Case 3

- 89yo HM returning for doctor directed evaluation of cataract OU
 - Pt feels vision has dramatically decreased with adverse effect on QOL and ADL
- LEE: 6 mos ago with you
 - Hx of Gr 2 ACC and Gr 3 NS OU
- LME: 1 year ago
 - HCL x 10 years well controlled with diet
 - HTN x 15 years poorly controlled with hydrochlorothiazide
 - BPH x 10 years well controlled with tamsulosin
- All other Hx unremarkable

Case 3

- Entrance testing unremarkable
- BCVA Distance
 - 20/50 OD -1.50 DS
 - 20/50 OS -1.50 DS
- BCVA Near
 - 20/60 OU with +2.50 ADD

Case 3

- IOP 26 OD/OS
- SLE and DFE:
 - Gr 4 ACC and Gr 3 NSC OU
 - Very poor views with poor ability to assess posterior pole / ONH



Case 3

- Assessment:
 - a. Visually significant cataract OU - affecting pt's QOL and ADL
 - b. Ocular hypertension OU - unable to properly evaluate posterior pole due to poor views from cataract

Case 3

- Assessment:
 - a. Visually significant cataract OU
 - b. Ocular hypertension OU - unable to properly evaluate posterior pole due to poor views from cataract
- Plan:
 - a/b. Refer for CE OU. Return s/p CE for re-eval of IOP/DFE

Case 3

- Assessment:
 - a. Visually significant cataract OU
 - b. Ocular hypertension OU - unable to properly evaluate posterior pole due to poor views from cataract
 - Plan:
 - a/b. Refer for CE OU. Return s/p CE for re-eval of IOP/DFE
- ***inform OPHTH of hx of Flomax use and risks of IFIS***

Summary

MedWatch - The FDA Safety Information and Adverse Event Reporting Program (including ophthalmic toxicities)

www.fda.gov/safety/medwatch