## Geriatric Fast Fact #029

### Systemic Effects of Ocular Medications I. Glaucoma and Pupillary Dilation

<table>
<thead>
<tr>
<th>Ophthalmologic Condition: Glaucoma</th>
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<td><strong>Drug Class/Mode of administration</strong></td>
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</table>
| **α-2 adrenergic agonists**  
Administration - Topical |  
• Apraclonidine (more α1 activity)  
• Brimonidine (lipophilic, higher CNS penetration) | Cardiovascular: Bradycardia, hypotension, vasovagal symptoms  
GI: Dry mouth and nose (common), abnormal taste  
CNS (lipophilic agent only)  
CNS depression, somnolence, HA, fatigue | Do not use in patients taking a MAO inhibitor or with drugs that block re-uptake of epinephrine/ norepinephrine<sup>2,4,5</sup> |
| **β- Adrenergic Antagonists**  
(beta-blockers)  
Administration - Topical |  
• Non-selective(β1/2): Levobunolol, Metipranolol, Timolol  
• Non-selective with intrinsic sympathomimetic activity: Carteolol  
• Selective β-1: Betaxolol | Side effects rare but more common in elderly or fragile patients  
-CNS : anxiety, confusion, fatigue, hallucinations, dysarthria  
-Cardiovascular : Bradycardia, heart block, arrhythmia, syncope, hypotension, dizziness, reduced exercise capacity  
-Respiratory : Bronchospasm, dyspnea, pulmonary failure  
-GI: Diarrhea, nausea, cramping  
-Endocrine: Reduces HDL, raise triglycerides, sexual dysfunction | Decompensated Heart failure  
Heart Block (any type)  
- safe with functioning pacemaker  
History of unexplained syncope, dizziness or pre-syncope  
Symptomatic bradycardia  
Asthma  
β1-selective agent can be used with well controlled mild-moderate disease  
COPD  
β1-selective likely safe based on systemic use of β1-selective oral agents in COPD patients<sup>3,7,8</sup> |
| **Carbonic Anhydrase Inhibitors**  
• Oral & Topical | Oral: Acetazolamide  
Topical: Brinzolamide, Dorzolamide | Oral Administration:  
• Renal: Metabolic acidosis, sodium and potassium wasting (all transient), urolithiasis, renal failure  
• GI: Metallic taste (common), nausea, vomiting, diarrhea, constipation, anorexia, GI bleed  
-Nervous system: Parasthesias of fingers/toes (very common), confusion, lethargy, somnolence, fatigue  
-Hematologic: Aplastic anemia(not dose or time dependent)  
Topical Administration: Rarely serious  
-More common: Bitter taste, dry mouth  
-Rare: headache, nausea, fatigue, skin rash, urolithiasis<sup>2,3,5,9</sup> | Oral Administration:  
Sulfonamide allergy  
Reduced kidney function (Dosage needs to be adjusted as acetazolamide plasma concentrations highly dependent on renal excretion)  
- Concomitant use of loop or thiazide diuretics increases electrolyte imbalance and risk of nephro lithiasis  
-COPD/CO2 retainer (high risk for severe acidosis with metabolic acidosis combined with pre-existing respiratory acidosis)  
Topical Administration:  
Sulfonamide allergy<sup>3,4,5,9</sup> |
### Miotics (now rarely used for chronic glaucoma treatment)

**Administration:** Topical

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<th>Direct cholinergic agonist:</th>
<th>Common: periorbital pain/HA (Pilocarpine)</th>
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<td>• Acetylcholine, Pilocarpine,</td>
<td>Other systemic effects rare at recommended doses: diaphoresis, nausea, hypersalivation, bradycardia, hypotension, seizures, Hallucinations, coma&lt;sup&gt;2,5,6&lt;/sup&gt;</td>
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<td>• Indirect cholinergic agonist: Carbachol</td>
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<td>• Cholinesterase Inhibitor: Echothiophate iodide</td>
<td>Avoid depolarizing agents like succinylcholine with use of cholinesterase inhibitors&lt;sup&gt;3&lt;/sup&gt;</td>
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- **Prostaglandin Analogues** (Prostaglandin F2α Receptor Agonist)
  - **Administration:** Topical
  - **Bimatoprost** Latanoprost, Tafluprost, Travoprost, Unoprostone isopropyl
  - **Minimal to no specific Side Effects**
  - **Most often reported but non-specific:** flu-like/upper respiratory symptoms
  - **Theoretical stimulation of smooth muscle constriction (tracheobronchial, vascular, uterine)**<sup>2,3</sup>

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### Ophthalmologic Condition: Pupillary Dilation

(Secondary to Mydriatic and Cycloplegic Agents; Used for dilation during routine eye exam as well as for ocular inflammatory conditions)

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<th>α-agonist -Topical</th>
<th>Hypertension, cardiac arrhythmias, angina, secondary CHF, pulmonary edema, subarachnoid hemorrhage</th>
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<td>Phenylephrine</td>
<td>Rare but serious, occur more frequently in patients with underlying poorly controlled cardiovascular disease&lt;sup&gt;3&lt;/sup&gt;</td>
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<td>10% formulation should never be used in patients with ischemic heart disease or hypertension</td>
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<td>2.5% formulation generally safe in all but neonates&lt;sup&gt;3&lt;/sup&gt;</td>
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- **Cycloplegics (anti-muscarinic agents)** -Topical
  - **Atropine Cyclopentolate** Scopolamine Tropicamide
  - **Acute urinary retention in elderly males with prostate enlargement (rare)**
  - **Anti-cholinergic effects (dryness of mouth and skin, flushing, fever, irritability, tachycardia, confusion)** Rare, occurs with over-dosing<sup>3,5</sup>

- **Pregnancy**
  - **Active ocular inflammation**<sup>3</sup>