Lessons on dilation

Jill Fishbaugh
University of Iowa
Lessons on dilation

Mydriatics cause pupil dilation by blocking the responses to the sphincter muscle of the iris from cholinergic stimulation. Cycloplegics paralyze the action of the ciliary muscles thereby prohibiting accommodation of the lens.

You’ve been told to dilate the patient in exam room #4. Whether the setting is an ophthalmic specialty clinic or in a general practice, there are several things a competent ophthalmic nurse should know to safely carry out this request. First, why are different mydriatics/cycloplegics used in different patients and for what reasons? Second, what is the patient’s ocular and systemic history? Beware—there are several types of patients who require caution with pupil dilatation. And third, what is the importance of chart review and accurate documentation in the patient record concerning diagnostic drop instillation? This column will address the issues necessary to safely and correctly dilate patients in your care.

Diagnostic dilation

There are several types of mydriatics and cycloplegics used to dilate the pupil for diagnostic purposes. Mydriatics cause pupil dilatation by blocking the responses to the sphincter muscle of the iris from cholinergic stimulation. Cycloplegics paralyze the action of the ciliary muscles thereby prohibiting accommodation of the lens. The different types of dilating drops, their action, use, onset, and duration are described in Table 1.

To help reduce anxiety, it is advantageous to let patients know what to expect prior to instilling the dilating drops. Inform the patient that the drops will sting and burn for about 30 seconds upon instillation. Using digital compression, occlude the lacrimal sac for approximately one minute after drop instillation. This prevents systemic absorption and facilitates a higher concentration of the medication dispersed locally. Following this, instruct the patient to sit with their eyes gently closed for about 1–2 minutes. The cycloplegic and mydriatic effect will occur more rapidly if the patient sits in a darkened room. Patients with darker colored irides often take longer to reach the full effect of dilation. For these patients, a stronger medication or an additional drop of medication after five minutes may be necessary to reach maximal dilation.

### Table 1

<table>
<thead>
<tr>
<th>GENERIC NAME</th>
<th>TRADE NAME</th>
<th>ONSET</th>
<th>DURATION</th>
<th>COMMON DIAGNOSTIC USES</th>
</tr>
</thead>
<tbody>
<tr>
<td>Atropine sulfate</td>
<td>Atropisol</td>
<td>45 - 120 min</td>
<td>1 - 2 weeks</td>
<td>for strong cycloplegic refractions in children with mydriasis</td>
</tr>
<tr>
<td></td>
<td>Atropine-Care</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Isopto Atropine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Cyclopentolate hydrochloride</td>
<td>AK-Pentolate</td>
<td>30 - 60 min</td>
<td>2 days</td>
<td>diagnostic screening - cycloplegic refractions with mydriasis</td>
</tr>
<tr>
<td></td>
<td>Cyclogyl</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Homatropine hydrobromide</td>
<td>Isopto Homeatropine</td>
<td>30 - 60 min</td>
<td>3 days</td>
<td>cycloplegic refractions with mydriasis</td>
</tr>
<tr>
<td>Hydroxyamphetamine hydrobromide</td>
<td>Paremyd</td>
<td>15 - 60 min</td>
<td>3 - 4 hours</td>
<td>routine diagnostic procedures - significant short term mydriasis with only partial cycloplegia</td>
</tr>
<tr>
<td>Phenylephrine hydrochloride</td>
<td>AK-Dilate</td>
<td>30 - 60 min</td>
<td>3 - 5 hours</td>
<td>diagnostic screening - significant mydriasis without cycloplegia</td>
</tr>
<tr>
<td></td>
<td>Mydfrin</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Scopolamine</td>
<td>Isopto Hyoscine</td>
<td>30 - 60 min</td>
<td>4 - 7 days</td>
<td>diagnostic screening - for both mydriasis and cycloplegia</td>
</tr>
<tr>
<td>Tropicamide</td>
<td>Mydriacyl</td>
<td>20 - 40 min</td>
<td>4 - 6 hours</td>
<td>diagnostic screening - for both mydriasis and cycloplegia</td>
</tr>
</tbody>
</table>
Pediatric dilation
Since children have a strong accommodating capability, a more potent cycloplegic may be required for refractions. Most commonly, Cyclomydril (0.2% cyclopentolate and 1% phenylephrine) is used for newborns. For infants 2–6 months in age, 0.5% cyclopentolate is used. Newborns and infants may experience reactions of irritability and exhibit a skin flush with these medications. They are, however, almost always benign. Depending on skin and eye color, 1% cyclopentolate is generally used after patients reach at least 6 months of age. Remember the importance of digital pressure on the lacrimal sac, especially in children, with the use of atropine, homatropine, cyclopentolate, scopolamine, and phenylephrine. All pediatric dilations require using this technique to prevent the possibly dangerous reactions from systemic absorption. Tropicamide is most often contraindicated for use in children because of the potential behavior disturbances and psychotic reactions it can cause. Vasomotor or cardiorespiratory collapse from anticholinergic drugs can also occur in infants, children, or the elderly, although this is very rare.

Narrow or closed angle dilation
Patients with a history of narrow or closed anterior chamber angles, or have eyes anatomically predisposed to such conditions, should be evaluated (such as by gonioscopy) and have their intraocular pressures checked prior to any type of dilating drop instillation. In this patient population, mydriatics and cycloplegics may precipitate an intraocular pressure spike or an angle-closure attack (Shields, 1992). In the case of an angle-closure attack, maximum medical treatment of timolol, apraclonidine, pilocarpine, osmotic, acetazolamide may be instituted as necessary to bring the intraocular pressure down until a laser peripheral iridotomy can be performed. If patients have already had a peripheral iridotomy or iridectomy in the past, which remains patent, they can be safely dilated without worry of complications from angle closure attacks.

Some physicians feel it is appropriate to dilate every glaucoma patient, regardless of their angle size. They believe that if an attack of angle closure is going to happen, it is best to have it occur in a controlled setting. However, the risk of angle closure is greatest about five hours after dilation, when the pupil is coming back down to normal size. The patient may already have left the office and is in visual danger if they don’t promptly return for treatment.

Postop IOL & keratoplasty dilation
Although it is uncommon, another group of patients who require caution with dilation are those with iris supported intraocular lenses (IOL). These lenses are fixed into position in front of the iris plane with clips or sutures. Patients with iris sutured or iris fixed lenses may be safely dilated, but not patients with iris supported lenses. Risk of IOL dislocation causing endothelial touch from dilation can be quite detrimental, causing problems of iritis and corneal decompensation (Stamper, Sugar, & Ripkin, 1993). Iris supported IOLs are no longer typically used in the United States. However, there are still some patients who had them placed when they were more popular fifteen to twenty years ago. Some of these older IOLs can cause patients to appear to have a square shaped pupil. Newer designs of iris sutured IOLs have recently been used safely in patients where a posterior lens is indicated over placing an anterior chamber IOL.

At one time, it was believed that pupil dilation with a strong cycloplegic such as atropine following penetrating keratoplasty for keratoconus could cause permanent mydriasis. This condition was first reported in 1963 by Urrets-Zavalia. However, possibly due to improved surgical technique, Geyer, Rothkoff, and Lazar (1991) report strong cycloplegics are no longer contraindicated in this patient group.

Precautions
A benefit of using phenylephrine with mydriatics and cycloplegic is to increase the effects of mydriasis. A 2.5% solution is commonly combined with atropine, homatropine, cyclopentolate, and tropicamide for dilation of the pupil when cycloplegic reaction is not required. However, patients using monoamine oxidase (MAO) inhibitors should avoid contact with anticholinergic drugs. For example, a patient on antidepressants such as Nordil or Parnate (MAO inhibitors) may experience a hypertensive crisis with topical phenylephrine. Phenylephrine is contraindicated in elderly patients with arteriosclerotic cardiovascular or cerebrovascular disease. Also, patients using beta adrenergic blocking agents such as propranolol are at risk for tachycardia with phenylephrine.

Continued on page 32
Lessons on dilation

As demonstrated in the examples above, the importance of taking a thorough history including that of ocular and systemic health on all patients being examined is well advised. Include a current listing of all medications the patient is using. Refer to this list prior to instilling any eye drops each time. Be sure to document in the patient record the name, strength, dose and time of dilating drop instilled. If any adverse reaction occurs, there is no mistaking which drop was responsible. This way, any similar such complications can be avoided in the future.

Inquire about drug allergies and record the adverse reaction that occurred with their use. Many patients believe a reaction of vomiting or nausea is an allergic reaction. True allergic reactions are only those in which anaphylaxis or itching with hives is involved. Other adverse signs and symptoms could be a drug sensitivity but should be documented as well.

Post dilation

Many patients request reversal of diagnostic mydriasis and cycloplegia after the examination process is completed. Dapiprazole hydrochloride (Rev-Eyes) can reverse pupil dilation. It partially restores accommodation and reverses mydriasis induced by phenylephrine and tropicamide. The miotic effect occurs by blocking alpha-adrenergic receptors on the dilator muscle of the iris. However, this reversal does not restore normal pupillary function, but instead generates a pharmacologically induced state of miosis.

Patients should be warned that their pupils may appear fixed and small with a reduced field of vision, and their dark adaptation abilities may be impaired until the effects of this second drug have time to wear off. Depending on eye color, strength, dosage, and which mydriatic or cycloplegic was used, the onset of action will begin in approximately thirty minutes. Generally, the pupil will be brought down to normal size in approximately two hours.

A strong burning sensation with a twenty minute episode of conjunctival injection is commonly reported following instillation of dapiprazole. Other more infrequent reactions can be ptosis, corneal and lid edema, itching, photophobia, chemosis, browache, and headache. Once constituted, Rev-Eyes can be stored at room temperature for three weeks. It is administered by instilling two drops five minutes apart into the inferior fornix. Patients should not receive this medication more frequently than one time per week.

Summary

Dilating patients can be done confidently and safely when three important variables are considered. Check for the age, ocular and systemic history, and allergies or previous adverse drug reactions of your patients. Always be accurate and concise by recording your actions in the patient chart. When the ophthalmic nurse is well informed, the patients will also be informed.

This new column will focus on different subspecialty practices but will have excellent review information for ophthalmic nurses in every practice setting. If you have topics you would like to see covered, contact the author by writing to: Jill Fishbaugh, R.N., CRNO, Cornea Center, University of Iowa Hospitals and Clinics, Iowa City, IA 52242.

Jill Fishbaugh is the Cornea Center Clinic Coordinator for the Department of Ophthalmology, University of Iowa Hospitals and Clinics in Iowa City IA. She is on the INSIGHT Editorial Board and has been a member of ASORN since 1986.

References


Bibliography


