Background:

Glauc... is characterized by elevated intraocular pressure (IOP), optic nerve atrophy, and gradual visual field loss. Open-angle glaucoma is the most common form, accounting for 90% of primary glaucoma cases, in which increased resistance in the trabecular network decreases aqueous fluid outflow. Angle-closure glaucoma accounts for 5% or less of primary cases, in which the iris bows forward, decreasing aqueous fluid outflow, either from forming tight contact with the lens or by causing closure of the trabecular network.

Numerous medications are thought to have the potential to worsen glaucoma or precipitate an acute ocular crisis by increasing IOP or by causing mydriasis. In particular, many medications used to treat allergic rhinitis and allergic conjunctivitis are recommended to use with caution in glaucoma patients. When allergy avoidance is not possible or is not enough to relieve allergy symptoms, the risks and benefits of the wide variety of pharmacologic treatment options must always be weighed when selecting appropriate therapy for glaucoma patients. Based on the National Guideline Clearinghouse rhinitis guidelines, oral and topical decongestants and ipratropium bromide should be used with caution in patients with glaucoma, and first-generation antihistamines have an increased risk of provocation of angle-closure glaucoma.

The associated risk of steroid use with glaucoma is not mentioned, and the guidelines provide minimal, if any, support for these recommendations.

Literature Search:

A literature search was conducted using Medline via PubMed. An initial search was performed as follows: “drug-induced [title] AND glaucoma* [title],” limited to English language. This search yielded 8 results, and 1 review article was selected. A second search was performed as follows: “corticosteroid [title] AND glaucoma [title],” limited to English language. This search yielded 46 results, and 2 articles were selected based on relevance and article access. A third search was performed as follows: “mydriasis AND glaucoma,” limited to English language and MESH terms. This search yielded 9 articles, 1 was selected, and a second article was discovered as a reference.

Data:

Steroids and Open-Angle Glaucoma

Glucocorticoid administration topically in or around the eye, intravenously, orally, or via inhalation all can cause increased IOP, potentially causing or worsening open-angle glaucoma. For example, after 4 weeks of using topical dexamethasone 0.1%, more than 90% of patients with primary open-angle glaucoma showed a rise in IOP greater than 6 mmHg. The exact mechanism of increased IOP after steroid use is unknown, but steroids are thought to induce structural and functional changes within the trabecular meshwork, and patients with open-angle glaucoma are particularly susceptible to this steroid-induced increase in IOP.

The elevation in IOP depends on the steroid anti-inflammatory potency, dose, route, frequency of administration, and duration of treatment, with greater risk and more rapid development with increasing exposure to high-potency steroids (such as dexamethasone and prednisolone). Topical administration is associated with the greatest risk of elevating IOP, followed by intravenous, parenteral,
and intranasal steroids. A rise in IOP can develop within hours of topical administration but typically develops over a period of weeks. In addition, patients with greater optic nerve damage at baseline are at greater risk for visual disability as a result of steroid-induced IOP elevation, opposed to patients with early open-angle glaucoma and minimal optic nerve damage.

If steroid treatment is necessary in patients with open-angle glaucoma, baseline IOP and disk evaluation should be obtained. IOP should be monitored at least after 2 weeks, or after 1, 4, and 8 weeks in patients at greater risk with prior optic nerve damage. If IOP rises, treatment should be discontinued, the optic disk should be monitored, and patients should be treated vigorously to achieve target IOP. If left untreated, elevations in IOP can cause neuronal damage and lead to visual loss or disability.

Mydriatics and Angle-Closure Glaucoma

Based on their mechanism of action as alpha agonists, decongestants (such as phenylephrine, pseudoephedrine, naphazoline, and oxymetazoline) have the potential to induce pupillary dilation and precipitate an acute angle-closure attack. Similarly, anticholinergics (such as ipratropium bromide) and antihistamines with anticholinergic effects (first generation antihistamines such as brompheniramine, chlorpheniramine, and diphenhydramine) can also induce pupillary dilation, potentially leading to an acute angle-closure glaucoma attack. Based on results of a systematic review of research from 1933-1999, the risk of inducing acute angle-closure glaucoma with mydriatics is between 1 in 3,380 and 1 in 20,000, with open-angle glaucoma providing no additional risk. For example, in the Rotterdam Study, 2.2% of patients developed narrower angles after mydriasis, but only 2 of the 6,760 patients studied developed acute angle-closure glaucoma.

Other Allergy Medications:

Second generation antihistamines (such as loratadine, cetirizine, and fexofenadine) are more selective for H1 receptors with minimal to no anticholinergic effects at recommended doses compared to first generation antihistamines. As a result, second generation antihistamines carry no precautions for use in patients with glaucoma. Saline nasal sprays, lubricant eye drops, intranasal or ophthalmic mast cell stabilizers (such as cromolyn or nedocromil), and montelukast are also all safe to use in patients with glaucoma, with no known precautions or effects on IOP.

Recommendations:

- Saline nasal sprays or lubricant eye drops can be used for symptomatic relief of mild allergic conditions without any known effect on glaucoma.
- Intranasal or ophthalmic mast cell stabilizers (such as cromolyn or nedocromil) can be used as prophylaxis for most allergic symptoms except nasal congestion and are a safe alternative with no known effects on glaucoma.
- Montelukast can be considered for seasonal or perennial allergic rhinitis, especially in patients with concurrent asthma, with no known effects on glaucoma.
- Second-generation antihistamines (such as loratadine, cetirizine, and fexofenadine) can be used safely at recommended doses in glaucoma patients, including those with angle-closure glaucoma, since they are selective for the H1 receptor, without anticholinergic effects.
- All formulations of anticholinergics (such as ipratropium bromide), first generation antihistamines (such as brompheniramine, chlorpheniramine, and diphenhydramine), and decongestants (such as phenylephrine, pseudoephedrine, naphazoline, and oxymetazoline) can be considered as options for patients with open-angle glaucoma. Although the risk of acute angle-closure glaucoma attacks is extremely small and primarily a hypothetical concern, these medications should be saved for use after failure with previously discussed alternatives with no
known risks in patients with angle-closure glaucoma. If these medications are used in patients with angle-closure glaucoma, patients should be monitored closely for elevations in IOP and the development of narrowing angles. If IOP elevations or narrowing angles occur, these medications should be discontinued, and the patient should be treated for acute angle-closure glaucoma if needed.

- All formulations of corticosteroids should be saved as a last resort for patients with open-angle glaucoma, as these patients are particularly susceptible to the steroid-induced increase in IOP. If steroids are needed, lower potency steroids (such as ophthalmic loteprednol) or intranasal steroids should be used for the shortest time necessary, and the patient should be monitored closely for elevations in IOP at least after 2 weeks of use. Patients with angle-closure glaucoma are at minimal risk from steroid use and therefore should be able to use steroids safely with IOP monitoring. If IOP elevations occur, patients should be tapered off of the steroid as soon as possible and treated accordingly.

Thank you for this opportunity. Please contact me if you have any further questions regarding this topic.

Student Name
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References: