Editorial

Pregnancy and Glaucoma: Management Overview

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Introduction

Glaucoma primarily affects individuals over the age of 40; however, it can occasionally present in women of reproductive age. In many cases, these women have pre-existing glaucoma conditions from childhood, such as congenital glaucoma or anterior segment dysgenesis, or they may develop glaucoma secondary to conditions like uveitis or diabetes. Managing glaucoma during pregnancy presents a unique challenge, as it requires balancing the preservation of maternal vision with the potential risks to fetal and neonatal health.

This review focuses on the management of glaucoma before, during, and after pregnancy. Special emphasis will be placed on pre-conception planning, pregnancy, and the lactation period. Additionally, the risks associated with both medical and surgical interventions for glaucoma will be explored, alongside alternative treatment strategies and necessary modifications to standard care protocols.

Glaucoma prevalence

Glaucoma is the second most common cause of blindness worldwide, affecting over 6.7 million people, following cataracts, which impact approximately 19.3 million individuals.[1] Because glaucoma-related vision loss is irreversible through both medical and surgical means, it presents a significant challenge for global blindness prevention initiatives. Early detection is crucial, as delayed diagnosis can result in poor visual outcomes.[2] Even when identified, effective treatment remains complex due to individual patient needs and social factors.

Limited data exist on glaucoma prevalence in individuals under 40, particularly among women of reproductive age. A Japanese study identified the prevalence of open-angle glaucoma—characterized by visual field defects and optic nerve abnormalities—at 0.48%, 0.42%, and 0.73% in women aged 15-24, 25-34, and 35-44, respectively.[3] Moreover, women of childbearing age may develop glaucoma due to congenital conditions (e.g. congenital glaucoma, anterior segment dysgenesis) or secondary causes such as uveitis or diabetes, often following cataract development.

Intraocular pressure (IOP) changes and disease progression

During pregnancy, IOP generally decreases. A study examining pregnant women found that IOP was, on average, 2 mmHg higher in the first trimester compared to the third trimester.[4] Several mechanisms may contribute to this reduction, including hormonal fluctuations that enhance aqueous outflow, decreased episcleral venous pressure due to reduced upper limb venous pressure, and metabolic acidosis related to pregnancy.[5,6] Increased levels of progesterone and relaxin may also contribute to lower IOP and greater aqueous outflow efficiency.

However, the extent to which these changes affect women with pre-existing glaucoma remains uncertain. A small study of 15 women found no IOP or visual field progression in 57% of cases, 18% showed worsening visual field loss, and another 18% experienced elevated IOP without visual field progression. Among those with IOP increases, the mean rise was 10 mmHg (ranging from 1.3 mmHg to 22.5 mmHg). Some of these patients required additional medication to control IOP.[7] Due to these variations, pregnant glaucoma patients should undergo monitoring at least once per trimester.

Medical treatment

The FDA classifies medications used during pregnancy based on available human and animal research.

- Category A: Demonstrates safety in human studies.
- Category B: Mixed or inconclusive findings in human and animal studies.
- Category C: Adverse effects observed in animals, or insufficient data available.
- Category D: Evidence suggests a risk to the fetus in human studies.
- Category X: Strong evidence links the drug to birth defects

No glaucoma medications currently fall under Category A, meaning all available treatments pose some level of risk during pregnancy. Patients should be fully informed of potential medication risks, and treatment should be coordinated with an obstetrician and neonatologist. Additionally, newer medications such as netarsudil and latanoprostene bunod lack an assigned FDA category due to insufficient research.[8]

Treatment plan by pregnancy stage

In pre-conception period, Ideally, glaucoma management discussions should occur before pregnancy. This allows for modifications to medication regimens to minimize fetal risk, particularly in the first trimester when organogenesis occurs. Alternative treatments, including surgical options, should also be considered before conception. Women who are planning a pregnancy or suspect they may be pregnant should notify their physician promptly.
In first trimester, since critical organ development occurs within the first eight weeks, early consultation is essential to assess medication risks and determine the safest treatment strategy. This includes evaluating drug concentrations, systemic absorption reduction methods, and potential medication discontinuation. Brimonidine, classified as Category B, may be the safest option. Other drugs, such as beta-blockers, prostaglandins, and carbonic anhydrase inhibitors, should be avoided due to potential teratogenic effects or risks of miscarriage. If surgery is required, delaying it beyond the first trimester is advisable to reduce the likelihood of congenital abnormalities or pregnancy loss.

In second trimester, brimonidine remains a preferred treatment option. Beta-blockers may also be used, but regular fetal heart rate and growth monitoring are necessary. If prostaglandins are prescribed, patients should be educated on the signs of premature labor and instructed to discontinue the medication if symptoms appear. Carbonic anhydrase inhibitors, if used, require careful monitoring of fetal development.

Finally, in third trimester,caution should be exercised with brimonidine, beta-blockers, and topical carbonic anhydrase inhibitors. Avoiding prostaglandins can help prevent preterm labor, particularly early in the trimester. Brimonidine should be discontinued in the final weeks due to its potential to cause central nervous system depression in newborns. Beta-blockers require close monitoring for fetal growth and heart rate, while carbonic anhydrase inhibitors necessitate acidosis assessments.[9] Newer agents like netarsudil and latanoprostene bunod should be avoided near delivery due to theoretical risks of delayed labor.[9]

Surgical interventions may be performed cautiously in the second and third trimesters if

absolutely necessary. However, anesthesia, sedatives, and antimetabolites still pose fetal risks. Uterine displacement techniques should be used to prevent maternal hypotension, which could result in fetal asphyxia. Laser trabeculoplasty (ALT or SLT) offers a safer alternative across all trimesters, providing temporary IOP control until postpartum.

During labor and delivery, although there are concerns regarding labor-related Valsalva maneuvers increasing maternal IOP, normal vaginal delivery does not appear to significantly impact IOP in healthy women.8 Standard obstetric protocols should be followed, and cesarean delivery is not generally required for glaucoma patients unless they have recently undergone glaucoma tube surgery or trabeculectomy, in which case cesarean delivery may be considered.

In postpartum considerations, beta-blockers and carbonic anhydrase inhibitors are approved for use during breastfeeding, though the lowest effective doses should be utilized. Brimonidine, however, is contraindicated due to its potential to cause central nervous system depression in infants.

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