

Glaucoma Pediatric Corneal Disease—Special Considerations

An Expert Interview with Gerald W Zaidman

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Keywords

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Glaucoma is a frequent occurrence in pediatric corneal disease, and its management requires special considerations. This expert interview with Gerald W Zaidman will consider the definition, incidence, diagnosis and treatment of pediatric glaucoma, with the exception of congenital glaucoma, which is not a disease of the cornea.

Q: How do we define pediatric glaucoma?

The pediatric age group is defined as children under the age of 16. However, older children can usually be examined without difficulty; therefore, for the sake of our discussion we will focus on children under the age of 6 years old. In the ophthalmic literature, glaucoma specialists have presented varying definitions of pediatric glaucoma. Dr Paul Sidotti, when he lectured us, said that "glaucoma in children is a disease of elevated intraocular pressure with resulting damage to the optic nerve." In their lectures, Drs Jeff Liebmann and Robert Ritch have observed that children tolerate a higher intraocular pressure than adults.

Other pediatric glaucoma specialists look for increasing axial length or increased corneal diameter. This phenomenon is not seen in adults. But in young children there can be pressure-induced expansion of the globe prior to damage of intraocular structures. Therefore, is glaucoma in children a disease of increased intraocular pressure, changes in the optic nerve, a disease of increasing axial length, or a disease of increasing corneal diameter? Recently, in a monograph published after the World Congress on Childhood Glaucoma,¹ the consensus was that children must have at least two or more of the following: chronically elevated intraocular pressure greater than 21 mmHg (and typically in the higher 20s in order to create some of the other ocular changes seen in glaucoma); an increased cup-to-disc ratio or progressive cupping; an increase in corneal diameter, and an increase in axial length or a myopic shift on refraction. If a child demonstrates two of these findings, then they have pediatric glaucoma.

Q: Which pediatric corneal diseases are likely to have glaucoma?

One can categorize pediatric corneal diseases into three groups—congenital diseases, acquired traumatic diseases and acquired non-traumatic diseases. Congenital diseases, such as Peters' anomaly, sclerocornea, congenital hereditary endothelial dystrophy, or congenital glaucoma make up 70% of all pediatric corneal diseases. Within the congenital disorders, 70% are due to anterior segment dysgenesis, and the rest are split between glaucoma and congenital hereditary endothelial

dystrophy. Pediatric corneal trauma, occurring at any age, makes up 10% of pediatric corneal diseases. The third group, accounting for about 20% of pediatric corneal disorders, is acquired non-traumatic disorders. In younger children, under 6 to 8 years, the two most common causes of acquired corneal disease are corneal scarring from herpes keratitis and corneal scarring from ocular rosacea or blepharokeratoconjunctivitis. In older children and teenagers, contact lens-related corneal ulcers and keratoconus are the most frequent causes of corneal disease.

Q: What is the incidence of pediatric glaucoma post-keratoplasty?

Recently, my chief resident, Dr Miriam Habel and I did an extensive retrospective chart review of all pediatric eyes that had had corneal transplants and that had been followed for more than 10 years. We identified 102 eyes in 84 children. We divided the eyes into the aforementioned groups. We found that 46% of children with congenital corneal opacities had glaucoma. Eighteen percent of children with acquired traumatic corneal opacities had glaucoma. This was more common in the younger children with trauma, under the age of 3 years. In the children with acquired non-traumatic corneal opacities, there was a zero incidence of glaucoma. Overall, we found that 37% of all post-keratoplasty children have glaucoma. This is much higher than in adults. In the literature, the incidence of post-keratoplasty glaucoma in adults is approximately 8.7%.

Q: How can we diagnose glaucoma in young children (and older children) who do not cooperate for an eye exam?

An exam under anesthesia is usually required. However, some of the anesthetic agents that are used during the examination under anesthesia (EUA) can affect the intraocular pressure. We use the Icare® tonometer to measure the intraocular pressure. The Icare can be used without topical anesthetics. This enables us to occasionally obtain Icare readings in the office on children, who are only moderately cooperative. We ask the parents to assist and distract the child with a toy or some similar object. Another option for the uncooperative child is office sedation. The other parameters that are required: axial length, corneal diameter, optic nerve cupping, refractive error, can usually be done in the office. If not, then they are done during the EUA.

Q: What is the recommended treatment of pediatric glaucoma post-pediatric keratoplasty

Medical therapy is the first choice, using topical and oral agents. The first line of treatment should be prostaglandin analogs or beta-blockers, such as timolol twice a day or latanoprost once a day. If that does not work,

then topical carbonic anhydrase inhibitors would be the second line of treatment. Alpha-2 agonists can only be used on children over the age of 4 years, though many glaucoma specialists feel that topical apraclonidine is safe to use in younger children. Miotics are rarely used. Combination drugs can also be used if necessary. If topical agents do not work, then oral carbonic anhydrase inhibitors would be indicated. It is important to inform the child's pediatrician that the child is using these drugs.

In general, approximately half of the children who develop glaucoma post-keratoplasty require surgical treatment. In our review of 102 pediatric post-keratoplasty patients, most eyes did not develop glaucoma. Thirty-eight eyes (37%) had glaucoma, and in these 38 eyes, 18 (47%) required surgical treatment (53% were controlled medically). Ten (56%) of the 18 required more than one surgical procedure. Initial surgical procedures were a mixture of glaucoma valves, trabeculectomies, and goniotomies. When those did not work, the same procedures were usually repeated, though glaucoma valves were more frequently used as a secondary procedure.

One other important finding was that if a child develops glaucoma and they require glaucoma surgery, it increases the chance of graft failure. If we looked at all failed grafts, glaucoma was present in 74% of the failed grafts. For example, in the infants and children with congenital corneal opacities (the largest group of patients), 22% of the grafts failed and 80% of those had glaucoma. From this data we can conclude that the presence of glaucoma puts pediatric grafts at greater risk of failure.

To summarize, children are special and require special ways of diagnosing and treating glaucoma following corneal transplant surgery. In these young patients, glaucoma is not simply a disease of elevated intraocular pressure. Increased intraocular pressure (IOP) has to be associated with evidence of optic nerve cupping or enlargement of the eye to meet the definition of glaucoma. The Icare tonometer is very helpful, but measuring the IOP often requires sedation or a EUA.

Finally, approximately 35–40% of children post-penetrating keratoplasty have glaucoma. Children with congenital corneal opacities have the highest incidence of glaucoma. Some children with trauma also develop glaucoma. Glaucoma is rarely seen in children with acquired non-traumatic diseases. When glaucoma develops, approximately half of the children can be successfully treated with topical medications. The other half requires surgery. Finally, children who require glaucoma surgery have a higher chance of graft failure. □

1. Weinreb RG, Papadopoulos M, Grigg, J. *Childhood glaucoma. World glaucoma association consensus series 9*, Amsterdam: Kugler Publications, 2013.