MANAGEMENT OF PAEDIATRIC GLAUCOMA

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Peaditric glaucoma encompasses complex, diverse patho- physiological entities, with a pressure sensitive neurodegeneration of the optic nerve, and retinal ganglion cell death and loss. It is seen in 1 in 10,000 live births, and may be inherited in 10-27% cases. Although blindness due to childhood glaucoma is preventable, it still accounts for 5% of childhood blindness in United States, with a higher incidence in undeveloped countries.

This tragic situation stems from a gauntlet of challenges. They begin with the difficulty of early recognition by parents and pediatricians, continue with the difficulty of determining the type of glaucoma present in young patients and extend to the specialized skills and supplies needed for pediatric glaucoma surgery.

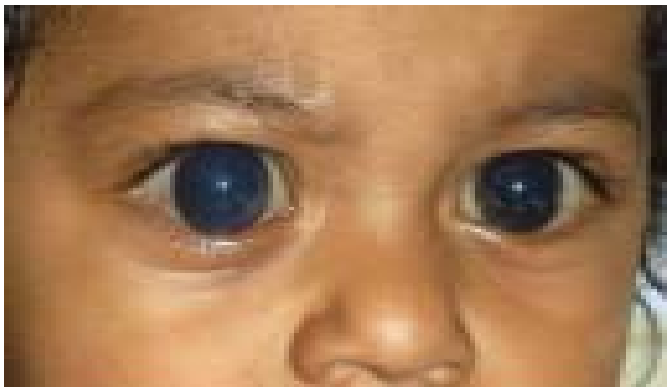
This article discusses the management of childhood glaucoma in brief. It does not go into details of different types of glaucoma seen in children; rather it is a review of the treatment options available and a brief discussion on each type.

Examination Protocol

Working as a team, the pediatrician, anesthetist, pediatric ophthalmologist, and glaucoma specialist have all the skills necessary to care for the child with glaucoma. Classically, childhood glaucoma has been considered a surgical matter, and medical management plays a stop-gap or adjunctive role. The most crucial point in the management of childhood glaucoma is a correct clinical diagnosis and a careful assessment of child's eye mainly under anesthesia (EUA). In-office gonioscopy can provide helpful information, but gonioscopy done with anesthesia provides a more informative examination than is possible with an active child (Figure: 1). While providing diagnostic information, it also confirms the choice of surgery and guides the resulting surgical strategy.

The examination protocol include:-

- Age-appropriate vision assessment
- Measurement of corneal diameter
- IOP measurement by Tonopen
- Detailed anterior segment examination under microscope or handheld slit-lamp laying stress on the corneal clarity and iris pattern.
- Gonioscopy
- Funduscopy - optic disc appearance and amount of cupping.
- Axial length measurement
- Measuring CCT (optional)
- Refraction



Age in Years	Corneal Diameter (mm)
Newborn	9.5-10.5
Upto 1 year	11.0
2-3 year	12.0

*13mm of corneal diameter is suggestive of glaucoma at any age.

Central Corneal Thickness (CCT)

The CCT in children (0.554+/- 0.22 mm) is comparable to that of adults (0.559+/-0.39mm). The CCT may be increased in acute episodes of IOP rise and in casas after cataract surgery. A higher CCT falsely elevate IOP measurement, and may lead to over diagnosing glaucoma in aphakic & pseudophakic children.

Therapeutic Options

1. Medical Management

Primary pediatric glaucoma nearly always requires surgical correction. Medical regimen is only a temporary measure. Glaucoma medications must be cautiously used and monitored for systemic toxicity. Punctal occlusion is a simple way of reducing systemic absorption but challenging in this group

Beta-blockers are the proven first choice therapy. Timolol maleate (0.25%and 0.5%) should be the initial choice. But with the increasing number of asthmatic children, respiratory and cardiovascular side-effects of the drug are to be considered. Betaxolol, a beta-1 specific agent is a safer, but less efficacious option.

Topical carbonic anhydrase inhibitors are effective in reducing IOP with less systemic side-effects. Dorzolamide (2%) twice a day is quite effective in lowering IOP. They have a synergistic action with beta-blockers, and fixed drug combination with Timolol (Misopt) are now available. Acetazolamide in oral dose of 10 to 15 mg /kg of body weight every 6 hours is safe and well tolerated by infants. Renal & hepatic disorders are contraindicated to CAI use. Fetal idiosyncratic reactions are reported in patients of blood dyscrasias.

Brimonidine should not be used in children under 12 years due to drowsiness and apnoea that can lead to coma.

Pilocarpine 2% or 4% is not favoured in children because of induced miosis and myopic shift, in phakic cases and tedious frequent dosing requirement.

Prostaglandin analogue, often first line medication in adult, is unsafe to use in children.

2. Surgical Management

Anaesthesia and IOP

Anesthetic agents affect IOP to varying extent and do so at different times after administration. Ketamine has been the gold standard anesthetic, yet carries its own side effects. So most children needing general anesthesia, will have an inhalational agent. Newer choices such as Sevoflurane result in rapid fall in IOP (with in a minute). Older agents such as Halothane cause IOP to fall in 1 to 3 minutes. When using these agents IOP should be measured as soon as the child loses consciousness. A Perkins tonometer is the device of choice, but one can use a Tono-pen also.

Surgical Options

In primary congenital glaucoma, the trabecular meshwork has not fully differentiated. Treatment involves incising the condensed trabecular meshwork to allow communication with Schlemm's canal. Angle surgery is the preferred initial intervention in these cases.

Goniotomy in which the trabecular meshwork is incised under direct gonioscopic visualization, is often performed where cornea is clear. Earlier, this was the preferred technique and is still used in some European clinics but repeated sittings and a high failure rate limits its use.

Trabeculotomy ab externo is preferred in case of cloudy cornea. It enables the surgeon to identify, cannulate and then connect Schlemm's canal, allowing communication with the anterior chamber.

Trabeculectomy is another option where a large

linear block needs to be excised, straddling iris root and ciliary body. In children, there is a better prognosis & less fibrosis induced filtration failure, if antimetabolites are used. Mitomycin-C (MMC)- 0.1-0.5 mg/ml for 1-5 minutes exposure is the preferred agent. It has a success rate of 50%-95%. Patients younger than 1 year and those who are aphakic often do not fare well. The long term risk of bleb leaks and endophthalmitis seems to be high.

Combining trabeculectomy with an ab externo trabeculotomy the so called "trab with trab" approach is currently the preferred approach in pediatric glaucoma. A limbus- based conjunctival flap is raised (7mm from limbus). Hemostasis is maintained. Aone-half thickness scleral incision is made in a V shape manner keeping in mind that the sclera is very thin. A partial thickness triangular flap allows adequate exposure of the schlemn's canal. A 2x2 mm trabeculectomy flap is outlined without penentrating the anterior chamber. A central radial incision is made across the scleral spur and carried through the external wall of Schlemm's canal, at which point there is a gush of aqueous. The internal arm of trabeculotome is introduced into the canal using the external parallel arm as a guide. It is swept into the chamber taking care not to cause an iridodialysis.It is then withdrawn, inserted and swept on the other side, completing a 180 degree trabeculotomy. The trabeculectomy is done by either the standard block excision, or with a kelly's punch. A peripheral iridectomy is done and scleral flap is closed with 10-0nylonsuture. Conjunctiva and tenon's capsule is closed with absorbable suture (6-0 Vicryl).

Implant surgery; The reported success rate of glaucoma implant surgery with the Moltero, Baerveldt and Ahmed implants has varied between 54% and approximately 80%-85%.

If artificial glaucoma drainage implants fail to control IOP, the visual prognosis is very poor. A cyclodestructive procedure should be considered preferably cyclocryotherapy, subtherapeutic ultrasound or Nd: YAG laser and diodelaser. 6

After surgery, the patient must be monitored closely for IOP within 1-2 weeks. The optic disc evaluation, cornea changes, axial length and refractive errors must be assessed regularly for visual outcome.

Conclusion :

The responsibility of the surgeon dose not stops with surgery or control of IOP. Visual rehabilitation involves correction of refractive error, media opacities, and amblyopia therapy in order to give these children the best possible vision and at the earliest. An attempt is made to counsel and familiarize the parents on the prognosis, repeated surgeries and long-term follow-up of the disease. Hence a team approach is necessary for managing childhood glaucoma.

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