Pediatric Glaucoma: Diagnosis and Medical Management

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OUTLINE: Dx and Tx

- **KNOWLEDGE:** The attendee will have a greater appreciation of the relative efficacy and side effect profile of commonly used glaucoma medications in pediatric patients.

- **SKILLS:** Strategies to facilitate in-office assessment of intraocular pressure in pediatric glaucoma will be discussed.

- **ATTITUDE:** Awareness regarding CLIA (Clinical Laboratory Improvement Amendments) certified labs that can assist in achieving a molecular diagnosis in pediatric glaucomas.
Pediatric glaucoma

Developmental:
Sturge Weber syndrome

Secondary acquired:
Stevens Johnson syndrome

The DDx for both forms of pediatric glaucoma is broad.
Congenital glaucoma aka isolated goniodysgenesis

- Symptoms
  - Blepharospasm
  - Epiphora
  - Photophobia
- 2/3 boys
- 2/3 bilateral
+FH of congenital glaucoma; Does this child have congenital glaucoma?
A normal eye!
Hazy cornea: Is this congenital glaucoma?
Same patient dilated
Is this primary congenital glaucoma?
Congenital (infantile) glaucoma

• Corneal clouding DDx
  – Congenital glaucoma and STUMPED
    • Sclerocornea
    • Trauma
    • Ulceration
    • Mucopolysaccharidosis
    • Peters anomaly**
    • Endothelial dystrophy*
    • Dermoid
Congenital (infantile) glaucoma

- Corneal enlargement

**DDx**
- Congenital glaucoma
- Megalocornea*
- High myopia
- Exophthalmos
Corneal iridogoniodygenesis: Axenfeld Reiger

Can be confused with ICE syndrome – check the other eye
Peters Anomaly: central corneal goniodysgenesis

- Congenital central corneal opacities
  - 80% bilateral
- Lens adherent to the cornea
- Absent Kendo and Descemet’s
- Usually sporadic
  - Can be AD or AR
In office exam

• Facilitated by a hungry sleepy child in the newborn period
• IOP measurements in the clinic facilitated by rebound tonometry
• Confirmatory EUA often needed
Rebound tonometry

Probe is 0.9 mm in diameter and 26 mg of force is applied. Anesthetic is not used.
EUA

- IOP with Perkins or tonopen immediately after induction*
- Corneal diameter
- Portable SLE
- Gonioscopy
- Retinoscopy
- Ophthalmoscopy
EUA findings: 2 month old with possible buophthalmos OD

<table>
<thead>
<tr>
<th></th>
<th>OD</th>
<th>OS</th>
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</thead>
<tbody>
<tr>
<td>IOP (mm Hg)</td>
<td>19</td>
<td>13</td>
</tr>
<tr>
<td>Corneal diameter (mm)</td>
<td>12</td>
<td>10</td>
</tr>
<tr>
<td>SLE</td>
<td>normal</td>
<td>normal</td>
</tr>
<tr>
<td>Gonioscopy</td>
<td>Gr III open</td>
<td>Gr III open</td>
</tr>
<tr>
<td>CDR</td>
<td>0.5</td>
<td>0.2</td>
</tr>
<tr>
<td>Refraction</td>
<td>-2.00 sph</td>
<td>+2.00 sph</td>
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Does this patient have primary congenital glaucoma?
Molecular diagnosis

• Congenital glaucoma: r/o CYP1B1 in proband and sibs; 1st degree relatives should be tested in consanguineous families.

• AD juvenile glaucoma: screen for MYOC mutations. A list of known myocilin mutations can be found on www.myocilin.com

NB: Treatment is coming for exon 3 mutations like Tyr437His that produce Endoplasmic Reticulum stress (4-phenylbutyrate)
How do I get a molecular diagnosis for my patient?

- Local CLIA (Clinical Lab Improvement Amendments) certified ophthalmic genetics lab
- eyeGENE Network
Pediatric glaucoma: medical therapy

Plays an important supportive role in glaucoma management, especially when surgical response is poor like aphakic glaucoma
Bexatolol 0.25% bid vs Timolol GFS 0.25% qd vs Timolol GFS 0.5% qd: An RCT

- Generally well tolerated
- Same contraindications as adults
- Response rate (>15% reduction in IOP) is ~45%
- Mean IOP reduction ~3.5 mm Hg

Plager DA et al. J AAPOS, 2009
Brinzolamide 1% bid vs. Betaxolol 0.5% bid: An RCT in children under age 6

• Both drugs well tolerated
• Both drugs were effective in lowering IOP
• Patients with primary congenital glaucoma seemed to be non-responders to brinzolamide

Whitson JT et al. J AAPOS 2008
Oral acetazolamide is additive to topical dorzolamide in children under age 6

- **INTERVENTION:** 13-30 mg/kg/d in divided doses
- **BASELINE IOP:** 32 mm Hg
- **F/U IOP:** 21.8 mm Hg
  (6-30 days after treatment)

NB: This a more pronounced response than seen in adult glaucoma. Many of the patients in this had aphakic glaucoma or aniridia—conditions known to have thick CCT.

Sabri and Levin J AAPOS 2006
Brimonidine

• Majority of children have side effects—sleepiness and lethargy

• Efficacy: limited as IOP lowering agent but effective at minimizing bleeding perioperatively after angle surgery

• Sporadic reports of *de novo* bradycardia and hypotension reported

• Some feel SE profile for apraclonidine is more favorable

3. Wright and Freedman J Glaucoma 2009
Both drugs well tolerated

Latanoprost is either more effective or of similar efficacy to timolol 0.25% bid or timolol 0.5% bid in children under age 18

Responder rate (>15% reduction in IOP): 62% for latanoprost 52% for timolol

PAP has not been reported in children using PGA but is theoretically possible
Prostaglandin associated periorbitopathy

- Deepening of the upper lid sulcus
- Upper lid ptosis
- Loss of inferior orbital fat
- Enophthalmos
Conclusions

• **KNOWLEDGE:** Brimonidine has the worst SE profile. The other gtts can be effective in pediatric glaucoma.

• **SKILLS:** Rebound tonometry can be useful to assess IOP in clinic.

• **ATTITUDE:** EyeGene Network can assist in achieving a molecular diagnosis in pediatric glaucomas will be enhanced.
Pediatric glaucoma diagnosis
Aniridia a form of iridogoniiodysgenesis

- misnomer

Mutations in PAX6 produce haploinsufficiency – that is only 1 functional copy of the gene is produced.
This patient with familial nystagmus also has a PAX mutation that also produces haploinsufficiency but does not have glaucoma.