Medical Treatment in Pediatric Glaucoma

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Medical Treatment in Pediatric Glaucoma

- Pediatric glaucoma is a surgical disease
- Several options are available for surgery
- Yet, medical therapy still has a role
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• “When should we use medical therapy in pediatric glaucoma?”

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• “When should we NOT use medical therapy in pediatric glaucoma?”
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- “When should we use medical therapy in pediatric glaucoma?”
  - Preoperative
    - In preparation for surgery to clear the cornea to allow goniotomy if this is the procedure planned
    - To manage an accidental delay of surgery (e.g., patient’s bad general condition or acute illness, operating room or surgeon availability issues)
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“When should we use medical therapy in pediatric glaucoma?”

- Postoperative
  - In the *interim between two procedures* if the initial surgery fails & the patient is scheduled for another surgery
  - After glaucoma drainage device (GDD) surgery (i.e. in the *hypertensive phase of GDDs*)
  - *Permanently after failure* of all surgical procedures to adequately control the IOP

- Permanently if surgical intervention is *not applicable* in a seeing eye, due to
  - very high risk (e.g. Sturge-Weber glaucoma with choroidal hemangioma & a mild elevation of IOP)
  - very poor prognosis (e.g. aphakic/pseudophakic glaucoma with a scarred conjunctiva)
  - both (e.g. aphakic/pseudophakic glaucoma in a vitrectomised eye with advanced optic nerve damage & poor vision)
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• “When should we use medical therapy in pediatric glaucoma?”
  ◦ Permanently if surgical intervention is not applicable in a non-seeing eye (palliative) →
    therapy may include *cycloplegics & steroids*
    mainly, with IOP lowering medications
    secondarily, specially with time

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• “When should we NOT use medical therapy in pediatric glaucoma?”
  ◦ General → relative
    • *Before confirmation of the diagnosis* of elevated IOP, by an office examination or by examination
      under general anaesthesia (EUA), in order not to mask the diagnosis & to allow a proper differential diagnosis
    • *Before near term surgery* (few days up to 1 week),
      in order to facilitate lamellar dissection and/or other surgical procedures on a full –non hypotonous – globe
“When should we NOT use medical therapy in pediatric glaucoma?”

- General → relative
  - Very young patients (infants of few days old) due to the small body surface area & body mass with resultant mismatch between dose administered & patient tolerance
  - Poor general condition, e.g. preterm infants, infants with very low birth weight, infants with severe congenital cardiac, renal or otherwise metabolic anomalies

- Drug specific
  - ß blockers
  - α agonists
  - topical carbonic anhydrase inhibitors (CAIs)
  - systemic CAIs
  - prostaglandin analogues (PGAs)
  - Miotics
  - osmotic drugs
“What is the treatment plan in pediatric glaucoma?”

IOP lowering medications

1st line choice
- Topical CAIs (safest) / ß blockers (stood the test of time)

Measure IOP

No response (IOP not reduced)
- SUBSTITUTE (shift to 2nd line choice)
  - ß blockers (stood the test of time) / Topical CAIs (safest) / PGAs

Partial response (IOP reduced but not normalised)
- ADD (adjuvant therapy)
  - ß blockers (stood the test of time) / Topical CAIs (safest) / PGAs / Systemic CAIs

Full response (IOP normalised)
- MAINTAIN same treatment till target
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- Precautions & comments
  - evaluate the risks & benefits of the individual medications
  - use the minimum dosage of the medication to achieve a therapeutic benefit
  - monitor children for ocular & systemic side effects
  - in general, the percentage of responders to glaucoma medical therapy ranges from 19% to 29%, declining with time

“What are the drugs used for medical therapy of pediatric glaucoma?”
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“What are the drugs used for medical therapy of pediatric glaucoma?”

- β blockers
- α agonists
- topical carbonic anhydrase inhibitors (CAIs)
- systemic CAIs
- prostaglandin analogues (PGAs)
- Miotics
- osmotic drugs

β blockers
- prototype drug: timolol
- has an IOP lowering effect in almost 30% of treated eyes
- plasma timolol levels after topical timolol 0.25% in children (specially infants) exceed levels in adults after topical timolol 0.5% (due to volume distribution of the drug) → increased risk of systemic side effects, especially in infants
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- **β blockers**
  - reported *side effects*:
    - reduction in resting pulse rates
    - apnea (in smaller children)
    - provocation of asthma (?betaxolol)
  - *contraindications & precautions*:
    - bronchial asthma
    - cardiac disease
    - neonates (use with extreme caution)
  - *recommendation*:
    - once daily dosing, of timolol 0.25%, in gel form

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- **Topical carbonic anhydrase inhibitors (CAIs)**
  - prototype: *dorzolamide*
  - are currently the recommended medical treatment for pediatric glaucoma
  - *recommendation*:
    - twice daily
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- **Systemic CAIs**
  - prototype: oral acetazolamide
  - are safe & well tolerated by children
  - reported *side effects*:
    - same side effects as in adults
    - growth suppression
    - severe metabolic acidosis in infants
  - **recommendation**:
    - oral acetazolamide, in a dose of 5 – 15 mg/kg (average 10 mg/kg), given in 3 divided doses

- **Prostaglandin analogues (PGAs)**
  - prototype: latanoprost
  - more effective in older juvenile onset open angle glaucoma & Sturge-Weber syndrome glaucoma
  - reported *side effects*:
    - iris pigmentation change
    - eyelash growth
    - hyperemia
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- α-2 agonists
  - prototype: brimonidine
  - IOP lowering range of 7%
  - side effects:
    - **central nervous depression**
      (lipophilic [brimonidine] → cross the blood brain barrier) → extreme fatigue, episodes of coma
    - brimonidine should be used with caution in pediatric patients & only used in older children

- Miotics
  - prototype: pilocarpine
  - not effective due to goniodysgenesis & abnormal (anterior) insertion of the ciliary muscle into the trabecular meshwork
  - may be used in aphakic/pseudophakic pediatric glaucoma patients (?debatable)
  - long acting anticholinesterase drugs may induce systemic cholinergic crisis
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- Osmotic drugs
  - prototype: glycerin, mannitol
  - dose:
    - glycerin 0.75 – 1.5 g/kg body weight, orally, in 50 % solution
    - mannitol (20 % solution) 0.5 – 1.5 g/kg body weight, intravenously, at approximately 60 drops /minute
  - may be administered *preoperatively* if IOP remains high even with standard medical therapy

Thank you