



المؤتمر السنوي الدولي للجمعية المصرية
INTERNATIONAL CONGRESS OF THE
EGYPTIAN OPHTHALMOLOGICAL SOCIETY

EOS 2023

**Pediatric Glaucoma:
From the Clinic to the OR**

**1- In the Clinic:
From Doubt to Certainty**

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Scope

- Basics
- General ophthalmologist
- Starting interest in pediatric glaucoma

Aim

To diagnose glaucoma

- IOP
- CDR
- Cornea
- AXL
- ? Refraction
- ? Field

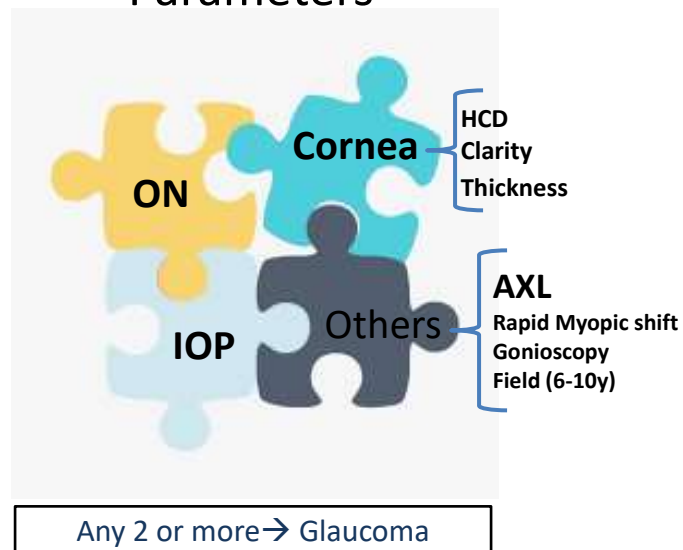
Any 2 or more → Glaucoma

Diagnose its cause/type

- PCG?
- Other?



Pediatric Glaucoma Parameters



Devices we Need

- ++ IOP
- **Optic nerve cupping**
 - ++ CDR
 - Asymmetry ≥ 0.2
 - Focal thinning
- **Cornea:**
 - Diameter
 - Haab's striae/edema/Clarity/scar/thickness
- ++ AXL/Myopic shift



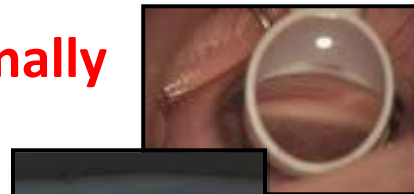
Additionally

- Gonioscopy (HH-AS-OCT)
- UBM
- Field defects (>6y/10y)

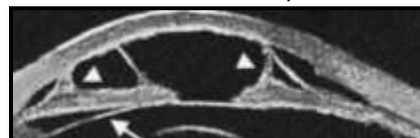
- **Be alert if :**

- History:

- Family/ Siblings
- ?? Unilateral (PCG vs. others)
- Consanguinity



Abdeen et al., 2021



Pediatric Glaucoma Parameters



IOP in Children

Bresson-Dumont, 2009:

< 8 mmHg (<3 months)
< **12 mmHg** (6-9 months.)
Approach adult levels by 12 years of age

El Sayed et al., 2019 :

- Retrospective review: 452 glaucomatous eyes
- Mean IOP : 22 mmHg
- Range: **10** -42 mmHg

CGRN: IOP > 21 mm Hg is diagnostic of glaucoma

In a child $\leq 2y$, IOP > **15 mmHg** is highly suspicious

How to examine the IOP

- In office
 - Awake/spontaneous sleep (≤ 2 months)
 - Under sedation (chloralhydrate 0.5-1cc/Kg BW)
- In theatre under GA (limitations)
- Device

IOP Under GA

- Why? → Uncooperative
Too young for in office sedation
Some CNS problems
- What?
- Where? → OR
- Who? → YOU
- How?
- When?



Types (What and How)

Inhalation anesthesia

- Induction with **Sevoflurane**

Surgical procedure

- Maintain with Isoflurane

Dissociative anesthesia

- Ketamine (IM 5mg/kg)
(IV 2mg/kg)

Minor procedure

Where, When n' Who?

ASAP



YOU

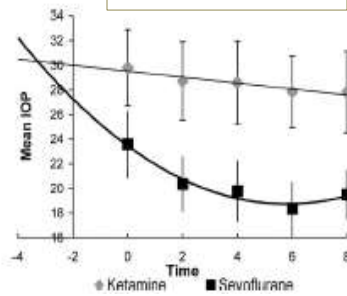
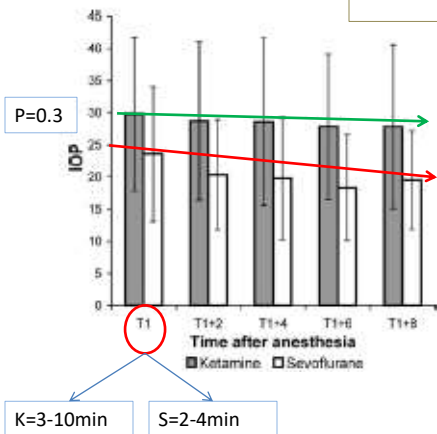
All anesthetics except ketamine lower the IOP over time

Why?:
 ?? related to vascular changes
 -- EOM tone
 ?? Change in ocular compliance

Sevoflurane vs. Ketamine

Ketamine resembles awake conditions

One eye
 Glaucoma (suspect)
 Before any surgery
 Topical anesthetic
 Tonopen



Blumberg et al, 2007

Ketamine side effects

- **Airway obstruction**
- Prolonged Sedation
- Emergence symptoms and agitation

What?

Device (calibrated)



Standardize for each patient

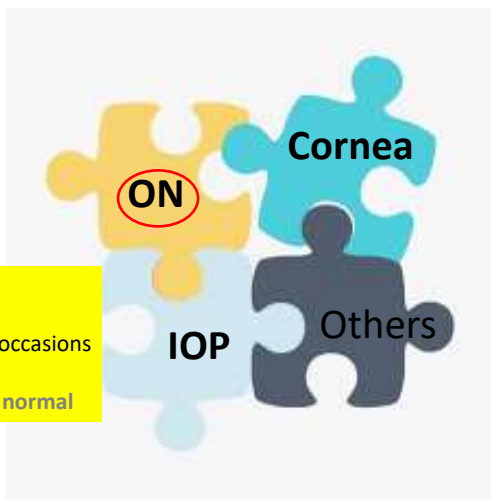


**Devices are not interchangeable
stick to one device**

العلاقات غير طردية وليس لها معامل تصحيح

Less agreement between PAT and RBT IOP > 15 mmHg *Esmael et al., 2018*

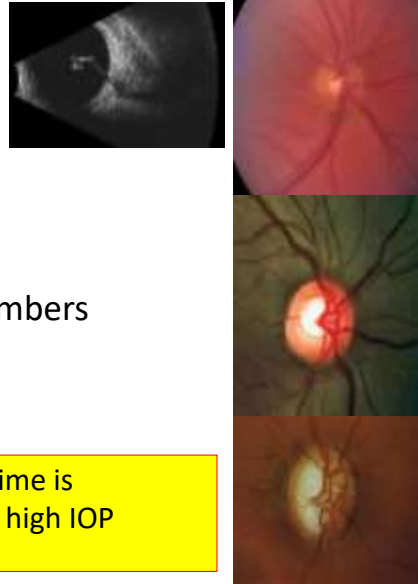
Pediatric Glaucoma Parameters



Always Same device
In office/ sevoflurane
IOP ≥ 21 on 2 separate occasions
10 mmHg may not be normal

The Optic Nerve

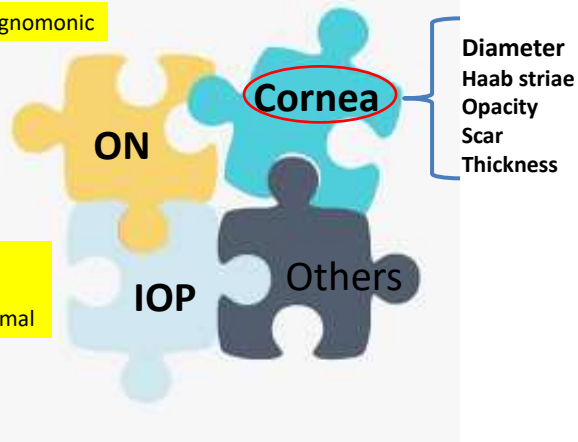
- Optic nerve cupping:
 - No cupping in newborn
 - Large cup ≥ 0.3
 - Asymmetry ≥ 0.2
 - Focal thinning
- Cupping without ++IOP:
 - Examine other family members
 - Myopia
 - Close follow-up



Progression of cupping over a short time is diagnostic of glaucoma in absence of high IOP

Pediatric Glaucoma Parameters

Ongoing cupping is pathognomonic



Always Same device
In office/ sevoflurane
10 mmHg may not be normal

The Cornea and Limbus

Horizontal Corneal Diameter

Newborn: 9.5 - 10.5 mm

At 1 year: 10.0 - 11.5 mm

> 11mm in Newborn

>12 mm in children < 1 year

> 13 mm in children > 1 year



In PCG the HCD is large/ enlarging

Corneal Clarity



++ IOP and size

PCG



DD



ASD



CHED



PPMD

CCT

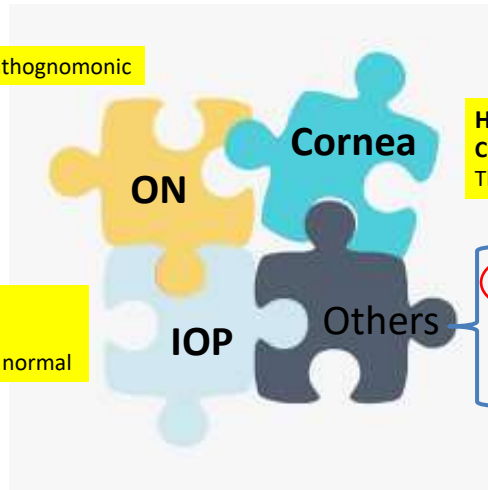


Thin, thick or average

Pediatric Glaucoma Parameters

Ongoing cupping is pathognomonic

Always Same device
In office/ sevoflurane
10 mmHg may not be normal



Horizontal Diameter
Clarity
Thickness

AXL
Rapid Myopic shift
Gonioscopy
?Field

Axial Length Measurement

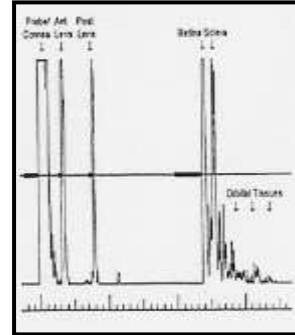
Normal development:

- <1 year : 17 mm
- 1-2 years : 17-21 mm
- 2-10 years : +1-2 mm

Red Flags:

Large/asymmetrical AXL

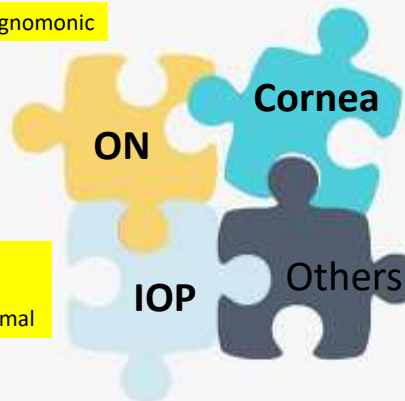
Rapid increase in AXL out of bound to age-related change



Pediatric Glaucoma Parameters

Ongoing cupping is pathognomonic

Always Same device
In office/ sevoflurane
10 mmHg may not be normal



Horizontal Diameter
Clarity
Thickness

AXL

Large for age
Progressive

Rapid Myopic shift
Gonioscopy
Field (6-10y)

Refraction

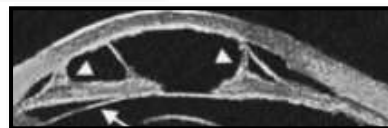
- Refraction:
 - <3months → 2 D of hyperopia (SD± 2 D).
 - 3-12months → fast **emmetropisation** (applies to myopes)
 - slow change till **2 years** in hyperopes.
 - Little change between 3-6 years
 - **Monitor these levels of refractive errors for a rapid MYOPIC SHIFT**



Gonioscopy



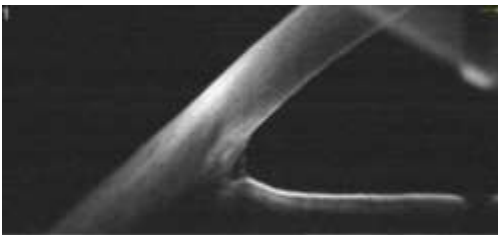
Contact methods
Require sedation/
anaesthesia



HH-AS- OCT

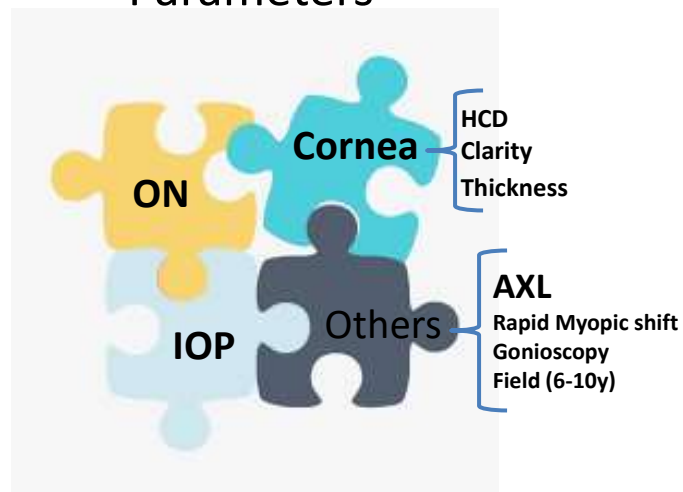
In office

Non contact

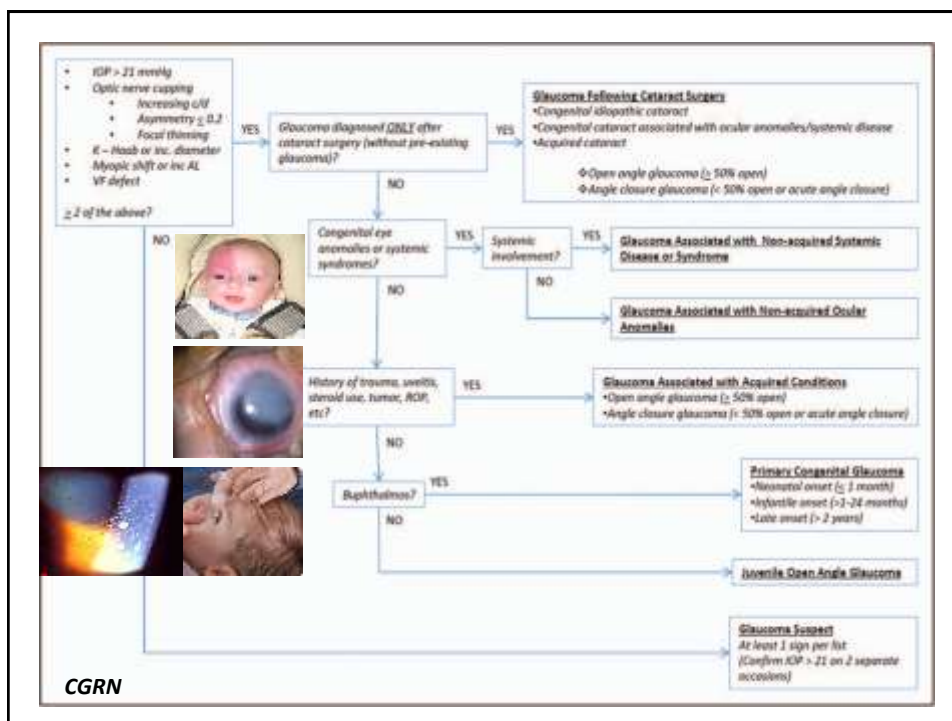


Abdeen et al., 2021

Pediatric Glaucoma Parameters



Any 2 or more → Glaucoma



Remember

When in doubt, wait and observe closely.

Glaucoma stigma is NOT easily erased.

References

- Sator-Katzenschlager, S, Deusch, E, Dolezal, S. Sevoflurane and propofol decrease intraocular pressure equally during non-ophthalmic surgery and recovery. *Br J Anaesth* 2002; 89(5): 764–766
- Dahlmann-Noor, AH, Puertas, R, Tabasa-Lim, S. Comparison of handheld rebound tonometry with Goldmann applanation tonometry in children with glaucoma: a cohort study. *BMJ Open* 2013; 3(4)
- Rodrigues, IA, Chan, WH. A comparison of the Icare Pro rebound tonometer with applanation tonometry in healthy infants. *Adv Ophthalmol Vis Syst* 2014; 1(3): 1–5.

References

Nagdeve et al., The effect of different doses of ketamine on IOP in anesthetized children. J Pediatr Ophthalmol Strabismus 2006; 43:219-23

Blumberg et al., The effects of sevoflurane and ketamine on IOP in children during EUA. Am J Ophthalmol 2007; 143: 494-99

Jones et al., IOPs after ketamine and sevoflurane in children with glaucoma undergoing EUA. Br J Ophthalmol 2010; 94: 33-35



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Thank you for your Kind Attention

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