CHILDHOOD GLAUCOMA RESEARCH NETWORK

Alana Grajewski, MD
Director, CGRN
President,
GL Foundation for Children with Glaucoma

CGRN Annual Meeting & Breakfast at AAO 2023

Full Circle

AGENDA

CHILDHOOD GLAUCOMA RESEARCH NETWORK

- Introduction – Alana Grajewski
- Pediatric Preventable Blindess (PPB) Initiative, Update – Eleonore Savatovsky, MD
- Research and Publication Review – Sylvia Groth, MD
- From Fellow to Developing a Pediatric Glaucoma Progam – Daniel Vu
- Long-Term Outcomes in Patients Operated for Primary Congenital Glaucoma Between 1991 and 2000 – Dr. Anil Kumar Mandal
- Townhall Discussion – Ta Chen Peter Chang, MD
- North American Pediatric Glaucoma Society (NAPGS) CLOSED MEETING

CGRN

Important Look Back As We Move Forward

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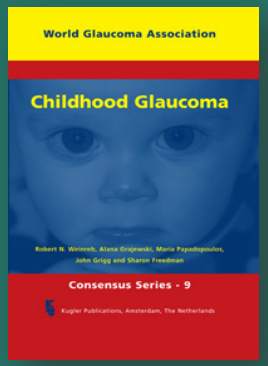
Bascom Palmer Eye Institute
UNIVERSITY OF MIAMI HEALTH SYSTEM

UNIVERSITY OF MINNESOTA

MINNESOTA LIONS VISION FOUNDATION

- ARVO 2011
- Founding Members
- Classification System 2012
- WGC Published 2013
- IPSOCG – 2015
- The Balkan Center at BPEI – 2017
- Multiple Studies & Education Programs
- Promote & Support Local Societies



CGRN 2022: Move To Diversify

Local Societies Dedicated to Pediatric Glaucoma

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The Impact of a Pediatric Glaucoma Clinic

Carolina Prado Larea, MD

Mexico

Introduction To The North American Pediatric Glaucoma Society

James Brandt, MD

California

Buidling a Center & Updates on Indian Pediatric Glaucoma Society

Dr. Sushmita Kaushik

India

The CGRN is an international organization of ophthalmologists who share a mutual interest in childhood glaucoma. CGRN membership currently includes 250+ ophthalmologists, clinicians, and scientists from 48+ countries in North and South America, Europe, Asia, Australia, Africa and the Middle East.

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Global Education & Investigation

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Priorities | New Collaboration | International Outreach

Global Education & Investigation

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Global Eye SITE™

- Observership for Skilled Surgeon from Area of Need
- Sponsored Travel & Stay
- Clinical & Surgical Training
- Surgical Equipment

CGRN AAO Courses

- CGRN sessions allow physicians from all over the world to meet and discuss future collaborative research
- Peds Glaucoma Surgery

SOAR Fellowship

- Sponsored training & research program for medical students and physicians early in their career & interested in Ophthalmology or Public Health

Estimate of Education Impact: Rubric

What exactly does a rubric do?

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Method to assess competency in a technical skill and assist in skill acquisition

Benefit of numerical score to track progress • Standardization mitigates bias amongst graders

Gradation of proficiency helps identify weak points (NOT a checklist!)

GRASIS Tool developed for ophthalmic surgery in 2005

Previous Published Rubrics

Ophthalmology Surgical Competency Assessment Rubrics (OSCARs)

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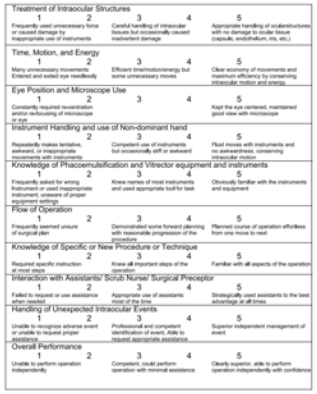
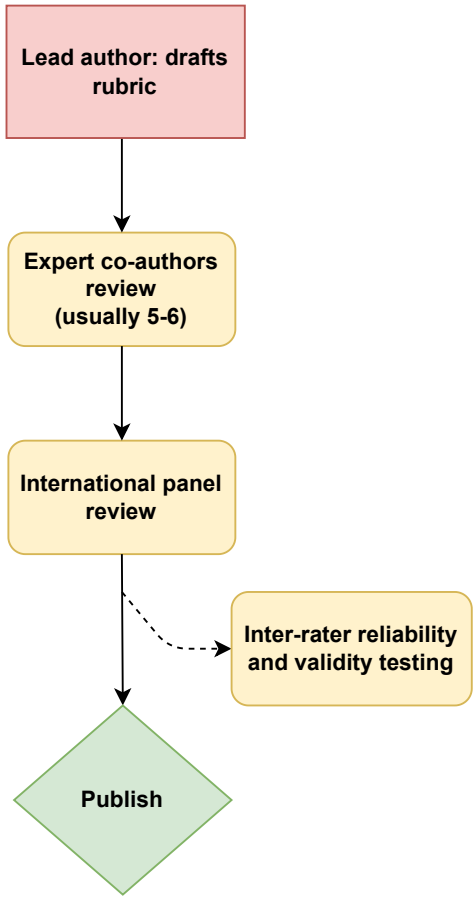
- Ophthalmology Foundation
- Previously ICO
  - Pediatric and adult cataract
  - SICS, Phaco
  - Vitrectomy, PRP
  - Pterygium
  - Strabismus
  - Trabulectomy
  - Lateral tarsal strip, open globe
  - Anterior approach ptosis



	Date: Resident: Evaluator:	Novice (score = 2)	Beginner (score = 3)	Advanced Beginner (score = 4)	Competent (score = 5)	Not applicable. Done by preceptor (score = 0)
1	Draping	Unable to start draping without help/Unsure of technique or location of drape placement/Inappropriate draping causing undue tension or distortion of the surgical field/Sterile field not adequately covered	Drapes only with direct instruction and guidance/Some inadvertent tension or distortion of the surgical field/Sterile field poorly or incompletely covered	Drapes with adequate consideration of the operative field and ensures both eyes are visible/Sterile field mostly covered but some non-sterile areas exposed	Drapes quickly and meticulously keeping the operative field clear/No undue tension or distortion of the surgical field/Sterile field adequately covered	
2	Lid crease marking	Not aware of the accurate landmarks for incision/Needs instructions for marking/Marks the skin crease incorrectly/Asymmetrical or inappropriate location/Fails to place mark before anesthesia	Marks with hesitation and with errors corrected only by instruction/Fails to properly consider the contour or height in comparison with contralateral eyelid/Smears skin crease marking	Marks without hesitation/Gets the contour and height broadly correct but with either a degree of asymmetry, loss of contour or height	Marks accurately with contour and height matching correctly in the first attempt without need for instruction	

Ophthalmology Foundation Roadmap



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NEXT STEPS & THE WAY FORWARD

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GOAL

Create CGRN standardized surgical & educational Rubrics for Pediatric Glaucoma via collaboration with Ophthalmology Foundation

OPPORTUNITY • BROADEN THE REACH OF CGRN

Assign content experts to each project as co-authors

Brainstorm additional projects of interest

Participate in validation process, if needed

PEDIATRIC PREVENTABLE BLINDNESS (PPB)
UPDATE

Eleonore Savatovsky, MD

Scientist, Dept of Ophthalmology
Bascom Palmer Eye Institute
University of Miami

Program Director
Samuel & Ethel Balkan International
Pediatric Glaucoma Center

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Pediatric Preventable Blindness Update

Eleonore Savatovsky, MD, PhD

Bascom Palmer Eye Institute
UNIVERSITY OF MIAMI HEALTH SYSTEM

SAMUEL & ETHEL BALKAN
INTERNATIONAL PEDIATRIC
GLAUCOMA CENTER

THE UNIVERSITY OF THE WEST INDIES
CAVE HILL CAMPUS, BARBADOS, WEST INDIES

DISCLOSURES

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- **No actual or potential conflict of interest in relation to this presentation**

Early Vision Screening

Model for the Caribbean

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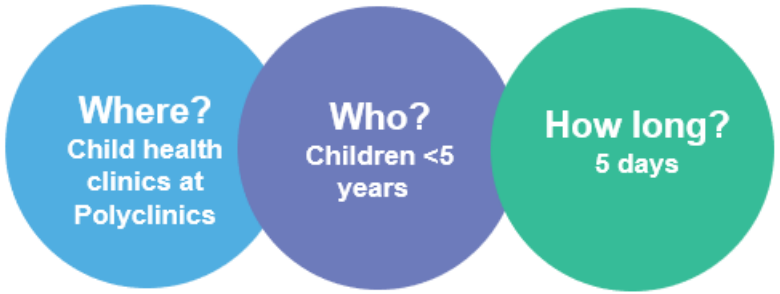
- Collaboration with vaccination clinics reaching children early in the disease process
- Screening children where they are
- Create a unique referral system for each country
- Centers of excellence can accommodate newly discovered patients
- Every child has access to screening, evaluation, and care



- 7 clinics
- 92% vaccination rate

- 6 points of contact before entering school

- Data collection
- Referral and follow-up at QEH

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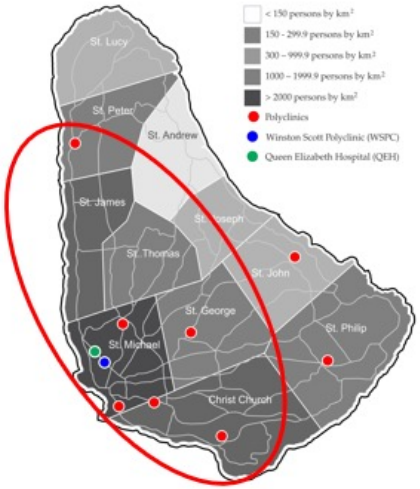
Recruitment (Video / Pamphlets / PC nurses)

Consenting and demographic assessment

Photoscreener / fundus reflex imaging

Referral to QEH, if indicated



PPB Barbados
March 2023

Total (n) = 120		
	Number (n)	**Percentage (%)**
Gender		
Male	65	54
Female	55	46
Age		
< 6 months	29	24
6 mo - < 5 yrs	91	76
Transportation		
Private Vehicle	61	49
Public Transportation	35	29
Walking	24	20
Travel Time		
<30 minutes	98	82
30-60 mins	21	18
History of Eye Assessment?		
Yes	10	9
No	109	91

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7.5% Referral Rate

- All > 6 months old
- None had received a previous eye exam
- 67% with FH of RE

Project Impact

Opportunity for screening in children

Awareness

Test a referral system that is feasible and efficient

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Next Steps

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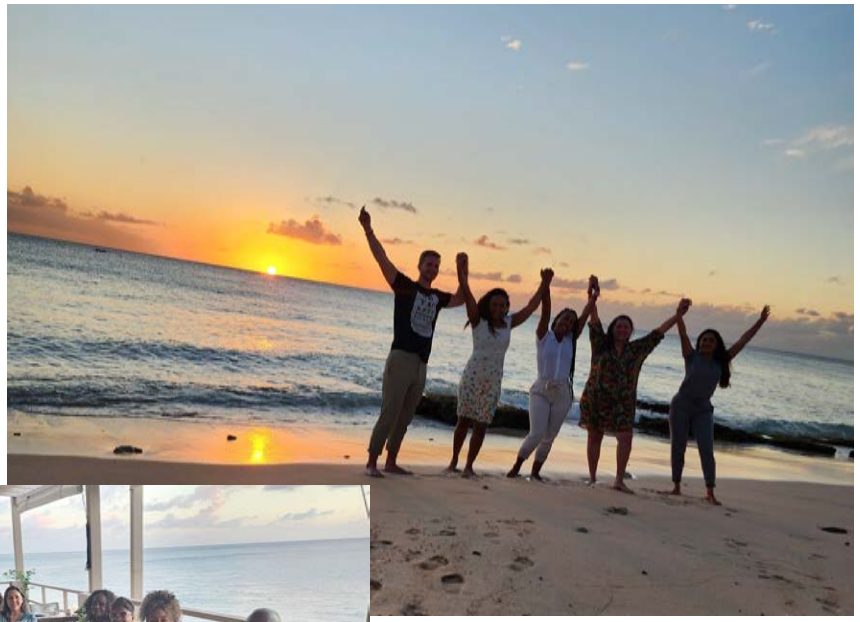
Short-term

- Report findings with the Barbados Ministry of Health and Wellness
- Collect data from follow-up visits
- Network with key stakeholders: Public Health Nurses

Long-term

- Work towards making it part of health policy
- Expand to other Caribbean countries



ACT
THE AMARONE CHARITABLE TRUST

RESEARCH
&
PUBLICATION REVIEW

Sylvia Groth, MD

Associate Professor, Dept of Ophthalmology

Associate Vice Chair for Clinical Affairs

Dept. Ophthalmology and Visual Sciences

Vanderbilt University

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Top Papers in Pediatric Glaucoma in 2023

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Sylvia L. Groth, MD
Associate Professor of Ophthalmology, Vanderbilt University
Associate Vice Chair of Clinical Affairs, Department of Ophthalmology
Vanderbilt University Medical Center

DISCLOSURES

CHILDHOOD GLAUCOMA RESEARCH NETWORK

- **No relevant disclosures**

Paper Review Outline

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1. Monitoring: Glaucoma suspects
2. Glaucoma after Cataract: Glaucoma 5 years after lensectomy
3. New Surgical Technique: Paul implant 1 year follow-up
4. Secondary glaucoma: Sturge Weber in contralateral eye
5. QOL: Pediatric glaucoma providers
6. Socioeconomic Analysis: Geospatial analysis of disease risk factors

Monitoring Glaucoma Suspects

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Conversion to Glaucoma in Pediatric Glaucoma Suspects

Nur Cardakli, MD, Rujuta A. Gore, MBBS, DNB,† and Courtney L. Kraus, MD**

Précis: In this retrospective review of pediatric glaucoma suspects, 11.5% of eyes progressed to glaucoma over an average of 6.5 years; eyes with ocular hypertension had an 18-fold increased risk of progression compared with eyes with suspicious disc appearance.

Purpose: The purpose of this study was to describe the rate of progression to glaucoma of a large cohort of pediatric glaucoma suspects at a quaternary academic center.

Design: Retrospective case series

Participants: One thousand three hundred seventy-five eyes (824 individuals) followed as pediatric glaucoma suspects at the Wilmer Eye Institute between 2005 and 2016.

Methods: Retrospective study of pediatric patients monitored as glaucoma suspects at the Wilmer Eye Institute between 2005 and 2016.

Main Outcome Measures: Progression to glaucoma, defined according to Childhood Glaucoma Research Network criteria or by surgical intervention; initiation of intraocular pressure-lowering therapy.

- 1375 glaucoma suspects monitored for an average of 6.5 years
- Main outcome was progression to glaucoma based on CGRN classification or surgical intervention or initiation of IOP-lowering medications

Monitoring Glaucoma Suspects

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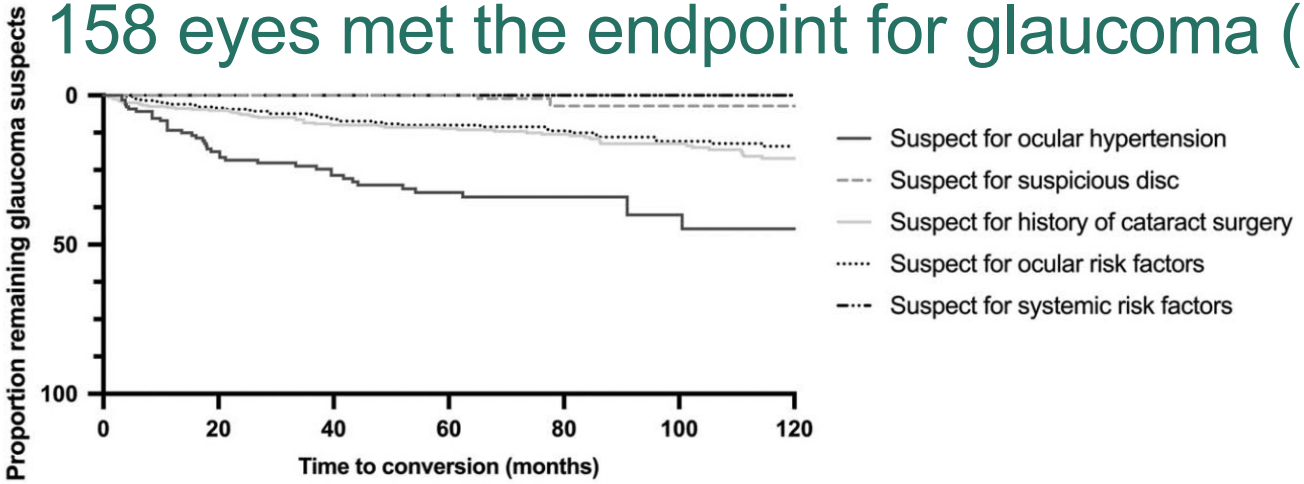
158 eyes met the endpoint for glaucoma (11.5%)



Reason for GS	Eyes in cohort (n)	% Progressed to Glaucoma
Ocular Hypertension	131	32%
Suspicious Optic Nerve	123	1.8%
Following lensectomy	325	20%
Ocular risk factors	216	13.3%
Systemic risk factors	354	0.3%

Monitoring Glaucoma Suspects

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TABLE 3. Hazard Ratios for Conversion to Glaucoma

Reason for being followed as a suspect	Hazard ratio (HR)	95% CI of HR
Suspicious disks (reference)	1 (reference)	—
Ocular hypertension	18.33	10.05–33.41
History of lensectomy	6.20	3.66–10.51
Other ocular risk factors	5.43	3.00–9.84
Systemic risk factors	0.07	0.01–0.59

Monitoring Glaucoma Suspects: Takeaways

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- Most common reason to progress to glaucoma is with ocular hypertension
- Similar rate seen across other studies

Conclusions: Eyes being followed as pediatric glaucoma suspects for ocular hypertension had higher rates of progression to glaucoma than eyes being monitored for prior lensectomy, other ocular risk factors, suspicious disc appearance, or systemic risk factors.

Glaucoma After Lensectomy

JAMA Ophthalmology | Original Investigation

Incidence of Glaucoma-Related Adverse Events in the First 5 Years After Pediatric Lensectomy

Erick D. Bothun, MD; Michael X. Repka, MD, MBA; Raymond T. Kraker, MSPH; Rui Wu, MS; David A. Leske, MS; Sarah R. Hatt, DBO; Zhuokai Li, PhD; Sharon F. Freedman, MD; William F. Astle, MD; Susan A. Cotter, OD, MS; Jonathan M. Holmes, BM, BCh; for the Pediatric Eye Disease Investigator Group

Pediatric Eye Disease Investigator Group 5-year cohort follow-up

OBJECTIVE To assess the cumulative incidence of glaucoma-related adverse events (defined as glaucoma or glaucoma suspect) and factors associated with risk of these adverse events in the first 5 years after lensectomy prior to 13 years of age.

DESIGN, SETTING, AND PARTICIPANTS This cohort study used longitudinal registry data collected at enrollment and annually for 5 years from 45 institutional and 16 community sites. Participants were children aged 12 years or younger with at least 1 office visit after lensectomy from June 2012 to July 2015. Data were analyzed from February through December 2022.

EXPOSURES Usual clinical care after lensectomy.

MAIN OUTCOMES AND MEASURES The main outcomes were cumulative incidence of glaucoma-related adverse events and baseline factors associated with risk of these adverse events.

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- 810 children (1049 eyes):
  - 443 eyes aphakic and 606 eyes pseudophakic
- Aphakic children younger than pseudophakic children

Glaucoma After Lensectomy

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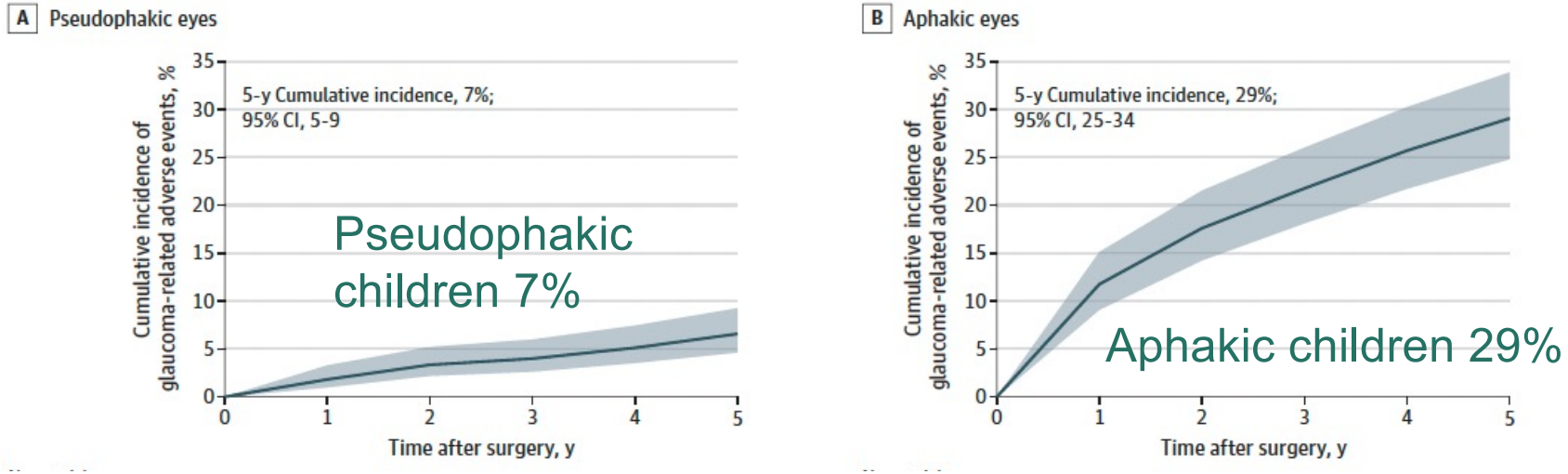
Figure 1. Cumulative Incidence of Glaucoma-Related Adverse Events in Aphakic vs Pseudophakic Eyes



- In Aphakia: higher risk in age <3 months
- Similar rate to other major trials (15-35%) including IATS, IoLunder2, PECARE and TAPS

Glaucoma After Lensectomy: Takeaways

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- Glaucoma a higher risk in children with earlier cataract surgery (therefore more likely left aphakic)
- Development of glaucoma in aphakic patients was associated with:
  - Age <3 months
  - Abnormal anterior segment
  - Intraoperative complication
  - Bilateral cataracts

Surgical Technique

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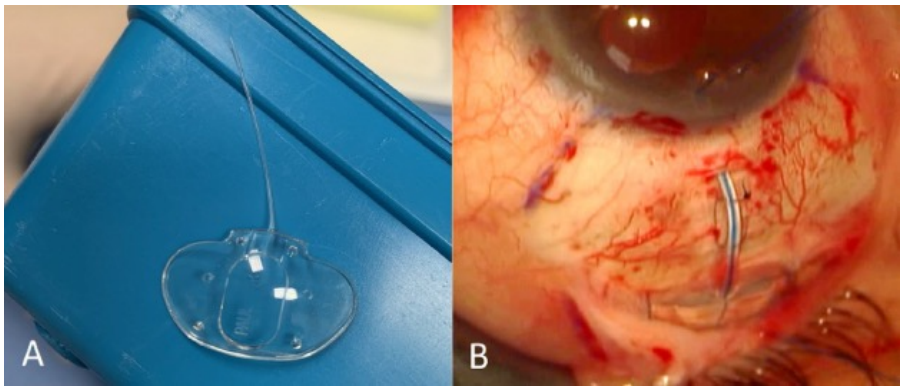
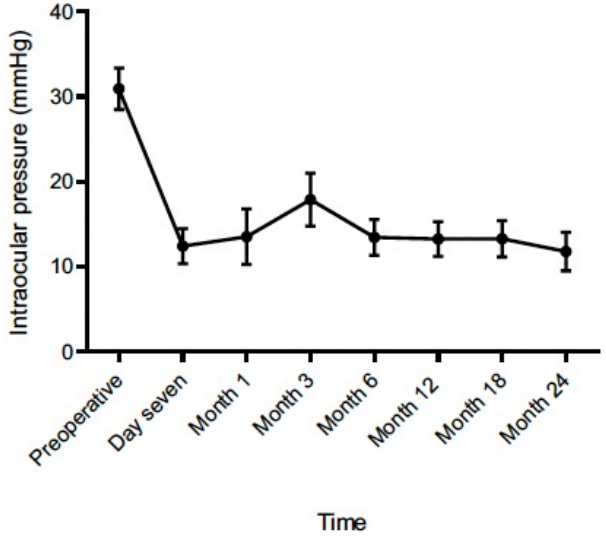
The PAUL® glaucoma implant: 1-year results of a novel glaucoma drainage device in a paediatric cohort

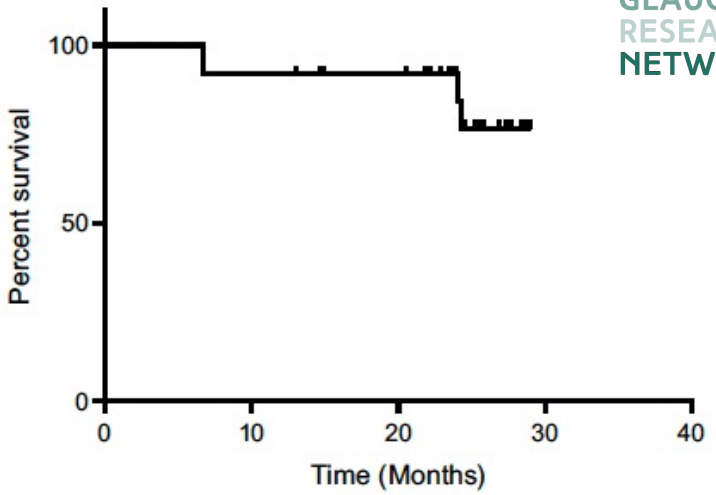
Neeru Amrita Vallabh[1,2] · Ravi Mohindra[3] · Elizabeth Drysdale[3] · Fiona Mason[3] · Cecilia H. Fenerty[3,4] · Kenneth Yau[3,4]

- Novel glaucoma drainage device: PAUL, smaller lumen (inner: 0.127 mm; outer: 0.467 mm) of tube compared to Ahmed and Baerveldt
- MMC used



Surgical Technique





- 11 of 25 children had complete success (not on medications)
- 21 of 25 had qualified success (in IOP range not on medications)
- 4 failures: 2 from hypotony, 2 needing additional glaucoma surgery

Surgical Technique: Takeaway

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- PAUL drainage tube may be have a use in children
- Still saw some hypotony with this implant
- Helpful to have options to consider and smaller tube in the eye may cause less long-term corneal complications

Glaucoma Associated with Systemic Condition

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J Glaucoma. 2023 Aug 15. doi: 10.1097/IJG.0000000000002295. Online ahead of print.

Incidence of and Risk Factors for Fellow-Eye Involvement in Sturge-Weber Syndrome Children with Unilateral Glaucoma

Young In Shin [1 2], Ahnul Ha [1 3 4], Yoon Jeong [1 2], Min Gu Huh [1 2], Jin Wook Jeoung [1 2], Ki Ho Park [1 2], Young Kook Kim [1 2 5]

- 47 children with unilateral port wine mark included
- All had glaucoma and diagnosed at an early age (<5 years)
- Rate of glaucoma in contralateral eye

Glaucoma Associated with Systemic Condition

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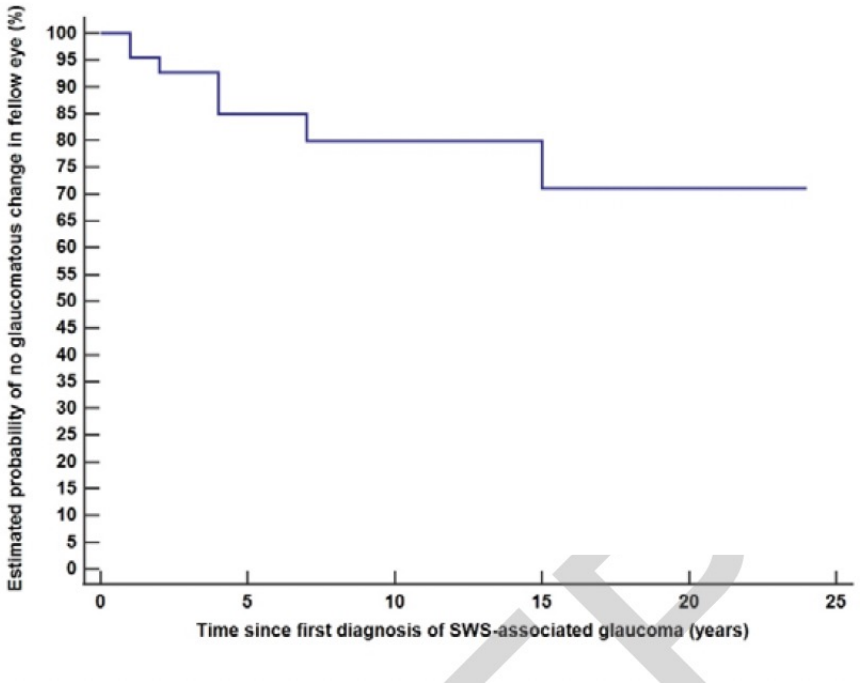
7 of 47 children (14.9%) developed glaucoma in contralateral eye

- Fellow eye involvement group showed significantly higher mean f/u IOP in fellow eye
- Older age at first-eye surgery
- Higher frequency of choroidal hemangioma in first-onset and in fellow eye.



Glaucoma Associated with Systemic Condition: Takeaways

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- Monitor the contralateral eye
- Watch for angle dysgenesis
- If choroidal hemangioma is present there is higher risk
- c/d ratio may be larger at baseline than healthy children
- Small sample so unable to draw definitive conclusions

Physician Quality of Life

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Original Article

Professional Quality of Life and Associated Factors Among Pediatric Glaucoma Providers

Annika J. Patel BS, Hounsh Munshi MSCTI, Elizabeth A. Vanner PhD, Elena Bitrian MD, Elizabeth A. Hodapp MD, Ta C. Chang MD, Alana L. Grajewski MD

- Goal was to evaluate the quality of life, compassion satisfaction and burnout and secondary traumatic stress for pediatric glaucoma providers
- Validated instrument sent to providers in: CGRN, AGS and Indian Pediatric Glaucoma Society

Physician Quality of Life

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- 76 pediatric providers responded
- Most had **low** burnout, **low** secondary traumatic stress and **high** compassion satisfaction
- Older age and more years in practice correlated **positively** with compassion satisfaction
- Age correlated **negatively** with secondary traumatic stress
- Married or unmarried couple had **lower** compassion satisfaction than single, divorced or separated respondents

Physician Quality of Life: Takeaways

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- All providers are at risk for burnout and stress but generally a low amount of burnout and secondary traumatic stress were seen in pediatric glaucoma providers
- Younger and less experienced clinicians are at risk of higher rates of burnout and fatigue.

Socioeconomic Analysis

Geographic Information System Mapping of Social Risk Factors and Patient Outcomes of Pediatric Glaucoma

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Kevin W. Chen,[1] Angela Jiang, MD,[2] Chandni Kapoor,[3] Jeffrey R. Fine,[4] James D. Brandt, MD,[2] Jenny Chen, MD[2]

Purpose: This study aimed to use Geographic Information System (GIS) mapping to present the geospatial distribution of visual outcomes and sociodemographic risk factors of a cohort of pediatric glaucoma patients.

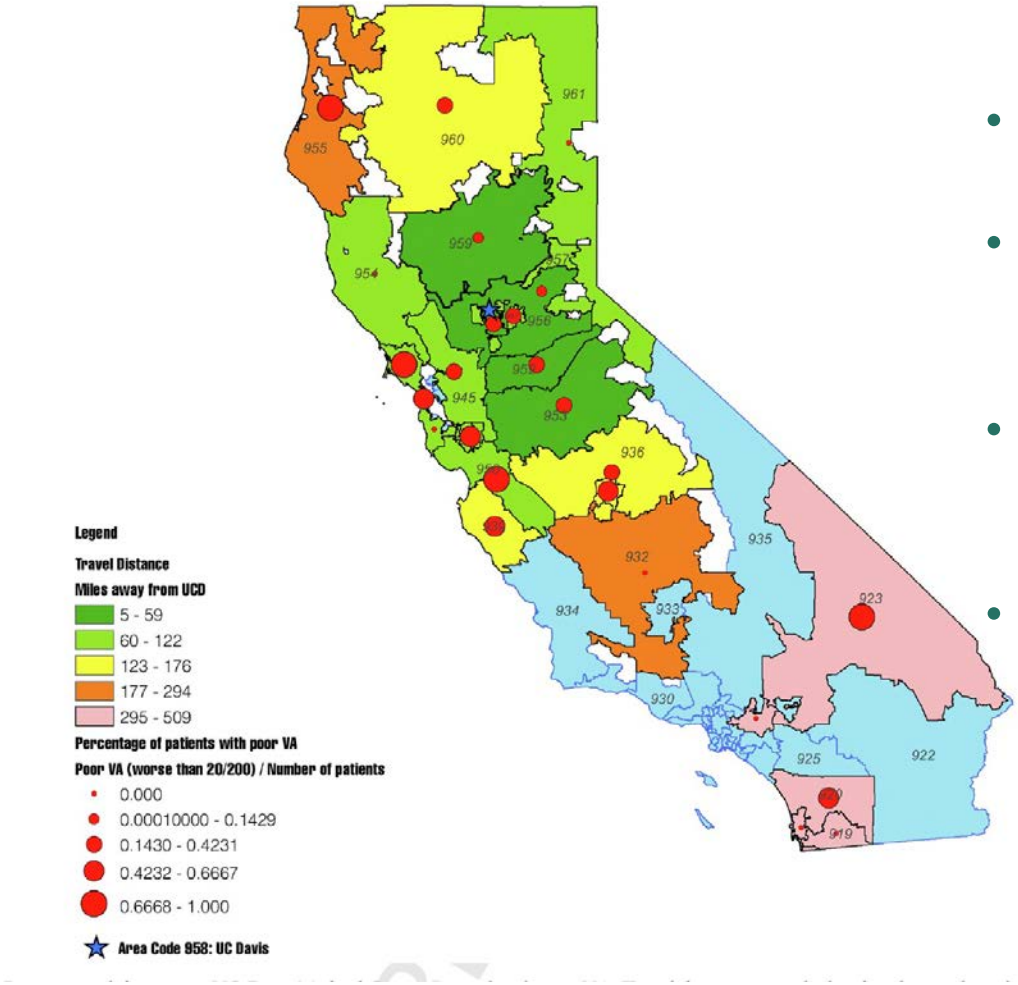
Design: Retrospective cohort study.

Subjects: 233 eyes of 177 pediatric glaucoma patients treated at UC Davis Medical Center.

Methods: We reviewed the medical records of pediatric patients (aged less than 18 years) with the diagnosis of pediatric glaucoma or any adult with a prior history of pediatric glaucoma at UC Davis Medical Center from 2001 to 2019. Patient sociodemographic information and ocular health data were recorded. Patients were mapped to their residential home 3-digit zip code prefix using ArcGIS software to generate geographic representations of the pediatric glaucoma database. Statistical analyses were performed to identify significant risk factors to poor visual outcome.

Main Outcome Measures: The primary outcome was the patient's final visual acuity (VA), defined as a binary variable based on the World Health Organization's criteria: good VA (better than 20/200) or poor VA (worse than 20/200). The secondary outcome was final intraocular pressure (IOP) at patients' final follow-up. Risk factors for poor vision and higher IOP were assessed.

Socioeconomic Analysis



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- 27.9% of patients had poor vision
- Travel distance was not associated with poorer visual outcomes
- Private insurance had lower final IOP than Medicaid patients
- Despite travel distance appearing to be associated with poorer visual outcomes by GIS mapping, it was not statistically significant.

Socioeconomic Analysis: Takeaways

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- Geographic information system mapping of patient outcomes is an innovative way to visualize patient demographics and risk factors
- Private insurance patients had lower IOP than Medicaid patients
- More investigation is needed for evaluating potential health disparities

Summary

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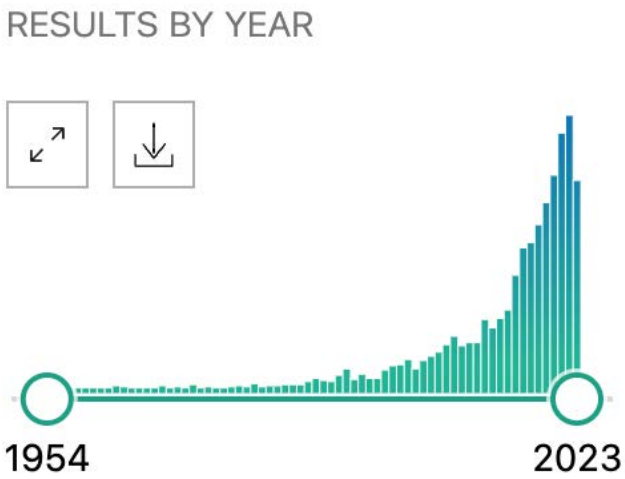
Major increase of Pediatric glaucoma studies!

Other papers of note?



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Thank You!

sylvia.groth@vumc.org

FROM FELLOW TO FELLOW DEVELOPING A PEDIATRIC GLAUCOMA PROGRAM

Daniel Vu, MD

Professor of Ophthalmology, Bascom
Palmer Eye Institute, University of Miami

Director Elect, Samuel & Ethel Balkan
International Pediatric Glaucoma Center

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Long-term Outcomes in Patients Operated for Primary Congenital Glaucoma Between 1991 and 2000

Dr. Anil Kumar Mandal, MD

Senior Ophthalmologist

LV Persad Eye Institute, Hyderabad

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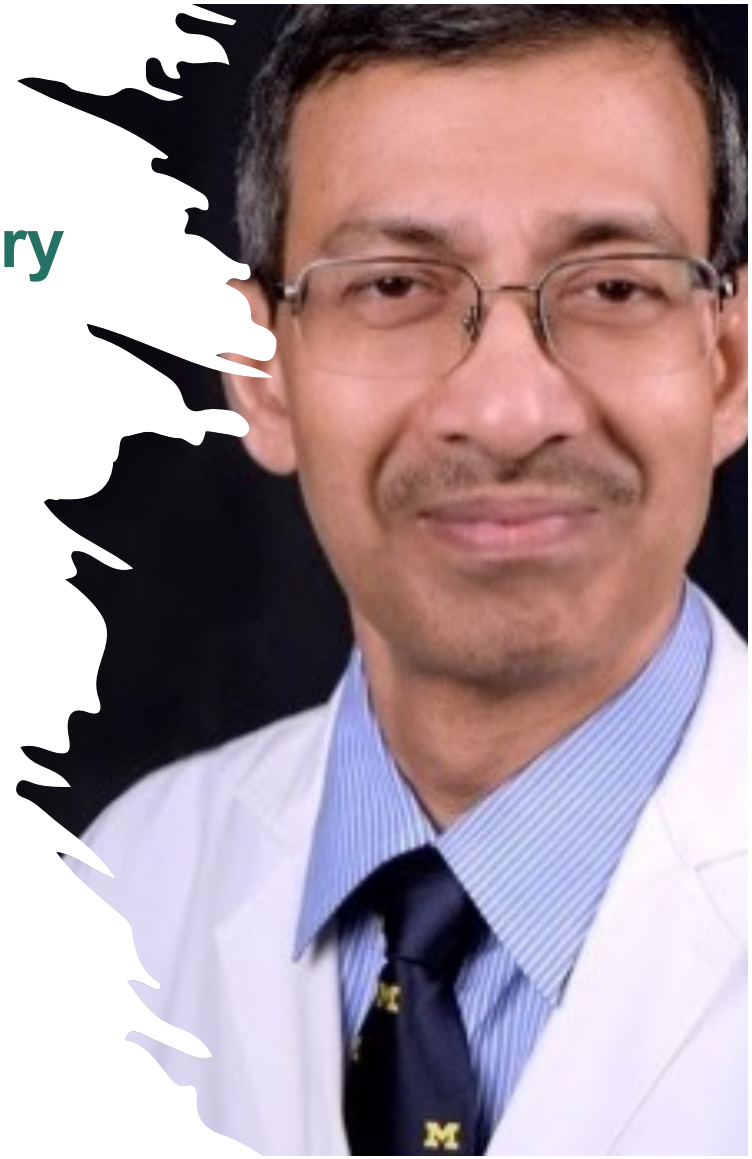

AMERICAN ACADEMY OF OPHTHALMOLOGY®

AAO 2023 CELEBRATE

PO233 Long-term Outcomes in Patients Operated for Primary Congenital Glaucoma between 1991 and 2000

- **Anil K Mandal**,[1] Vijaya K Gothwal[2]
- [1]VST Centre for Glaucoma care, [2]Patient-Reported Outcomes Unit-Brien Holden Eye Research Centre
- L V Prasad Eye Institute, Hyderabad, India

AAO 2023 CELEBRATE

Financial Disclosure

Presenter: Anil K Mandal

None

Co-author: Vijaya K Gothwal

None

Objective

- To estimate the long-term surgical and vis
  outcomes in patients with primary congenita
  glaucoma (PCG) who completed at least
  20 years of follow-up

Newborn Glaucoma

Methods and Materials

- Design – Retrospective study
- Participants
  - 220 eyes (121 patients)
  - Underwent primary combined trabeculotomy-trabeculectomy without MMC
  - Operated by a single surgeon between January 1991 and December 2000
  - Returned for a follow-up visit between January 2021 through January 2022
- Success criteria
  - Complete - IOP ≥6 mmHg and ≤21 mmHg without glaucoma medication
  - Qualified - upto 2 glaucoma medications were required
  - Failure - Uncontrolled IOP with >2 glaucoma meds, need for reoperation, chronic hypotony

Methods and Materials

- Statistical analysis
  - Stata software ver. 14.2 (StataCorp)
  - Mixed-effects model using maximum likelihood estimation
  - Kaplan-Meier survival analysis
  - Risk factors for failure - Cox proportional hazards regression using sandwich clustered estimation
  - $P<0.05$ – Statistically significant
- Main outcome measures
  - Primary
    - Proportion of patients with complete success over 20-year follow-up
  - Secondary
    - Rate of surgical failure, need for reoperation, risk factors for poor outcome and complications

Results

- 121 patients (220 eyes) with PCG
- Median age at surgery = 6 months
- Majority of patients had infantile-onset PCG (58%)
- Most eyes had severe form of PCG (70.5%)
- Follow-up
  - Mean = 21.3 years
  - Median = 21 years
- Intraocular pressure (mean ± SD)
  - Preop. = 26.9 ± 7.7 mmHg (range, 16-59)
  - Last visit = 17.6 ± 6.5 mmHg (range, 5-58)
    - P<0.0001 (Fig.1)
- At presentation,120 eyes (54.5%) had corneal oedema (Fig. 2)
- At last visit, 86 eyes (44%) required glaucoma meds.

Table 1. Baseline Characteristics of Patients with Primary Congenital Glaucoma

Characteristic	Results
No. of patients	121
No. of eyes	220
Age	
Mean ± SD	25.7 ± 46.7 mos
Range	1 day to 267.7 mos
Median	6 mos
Sex	
Male	55 (45)
Female	66 (55)
Laterality	
Unilateral	22 (18)
Bilateral	99 (82)
Type of glaucoma	
Neonatal	27 (22)
Infantile	70 (58)
Late onset	24 (20)
Corneal diameter at presentation, mm	
Mean ± SD	13.25 ± 1.19
Range	10.5–18
Corneal edema at presentation*	120 (54.5)
Corneal scar at presentation*	43 (19.5)
Clear cornea at presentation*	57 (25.9)
Preoperative IOP, mmHg	
Mean ± SD	26.9 ±7.7
Range	16–59
Use of glaucoma medications at presentation*	
Mean ± SD	1 ± 0.8
Range	0–4

IOP = intraocular pressure; SD = standard deviation.
Data are presented as no. (%) or no., unless otherwise indicated.
*Number of eyes.

Results

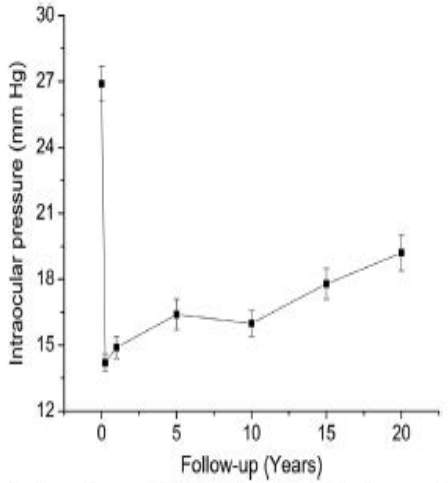

Figure 1. Line graph showing postoperative intraocular pressure distribution at 5-year intervals in primary congenital glaucoma. Results represent mean ± standard error of the mean.

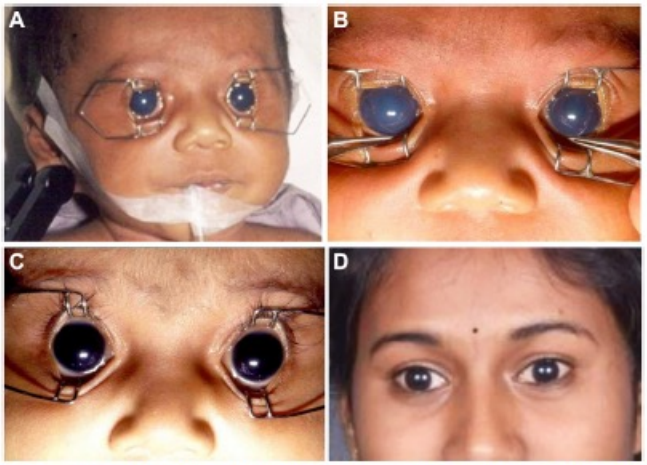

Figure 2. Photographs showing appearance of a patient with bilateral congenital glaucoma (A, B) before surgery and (C) 6 months after surgery who underwent surgery at 2 weeks of age and (D) the long-term postoperative (27 years) appearance of the cornea showing normal corneal transparency. Informed consent was obtained from all patients to include these images.

Results

Visual outcomes

- Good (20/40 or better) = 73 eyes (33.2%)
- Fair (20/50 - 20/200) = 36 eyes (16.4%)
- Poor (worse than 20/200) = 111 eyes (50.4%)

Refractive error (mean ± SD) (n=103 eyes)

- Last visit spherical equivalent = - 3.93 ± 4.38 D
- 36 eyes (34.9%) had high myopia
  - Spherical equivalent ≥ 6 D

Results

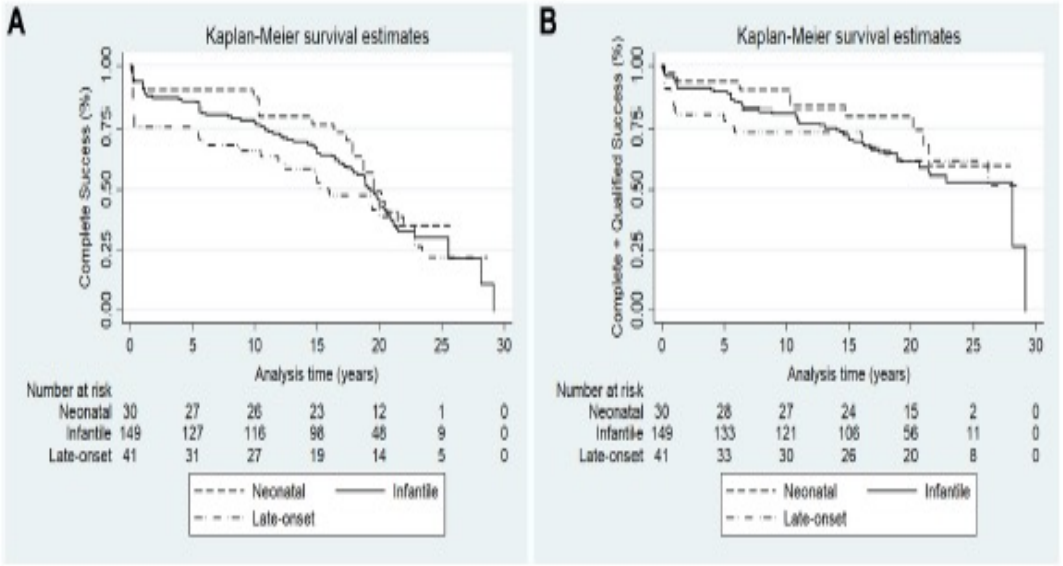

Figure 3. A, Kaplan–Meier survival analysis of the entire cohort showing probability of complete success for 3 subtypes (neonatal, infantile, and late onset) of primary congenital glaucoma (n = 220 eyes). Note no statistically significant difference was found in the success rates across the subtypes ($P = 0.63$). B, Kaplan–Meier survival analysis of the entire cohort showing probability of complete plus qualified success for 3 subtypes (neonatal, infantile, and late onset) of primary congenital glaucoma (n = 220 eyes). Note no statistically significant difference was found in the success rates across the subtypes ($P = 0.51$).

Table 2. Surgical Success Rates of Patients with Primary Congenital Glaucoma at 5-Year Intervals

Visit Duration (yrs)	Entire Cohort	
	Success Rate % (95% CI)	
	Complete	Complete + Qualified
0.25	92.7 (88.4, 95.5)	95.0 (91.2, 97.2)
1	89.1 (84.2, 92.6)	91.8 (87.3, 94.8)
5	83.6 (78.1, 87.9)	87.7 (82.6, 91.4)
10	76.8 (70.2, 81.4)	80.9 (75.1, 85.5)
15	65.3 (58.6, 71.2)	72.6 (66.2, 78.0)
20	43.1 (36.1, 49.8)	64.0 (57.1, 70.1)

Visit Duration (yrs)	Primary Combined Trabeculotomy-Trabeculectomy	
	Success Rate % (95% CI)	
	Complete	Complete + Qualified
0.25	92.8 (88.1, 95.7)	95.4 (91.3, 97.6)
1	90.7 (85.7, 94.1)	93.3 (88.7, 96.1)
5	85.6 (79.8, 89.8)	89.7 (84.5, 93.2)
10	78.9 (72.4, 84.0)	83.0 (76.9, 87.6)
15	67.9 (60.8, 74.0)	74.1 (67.3, 79.7)
20	44.5 (37.0, 51.7)	66.6 (59.3, 72.9)

CI = confidence interval

Results

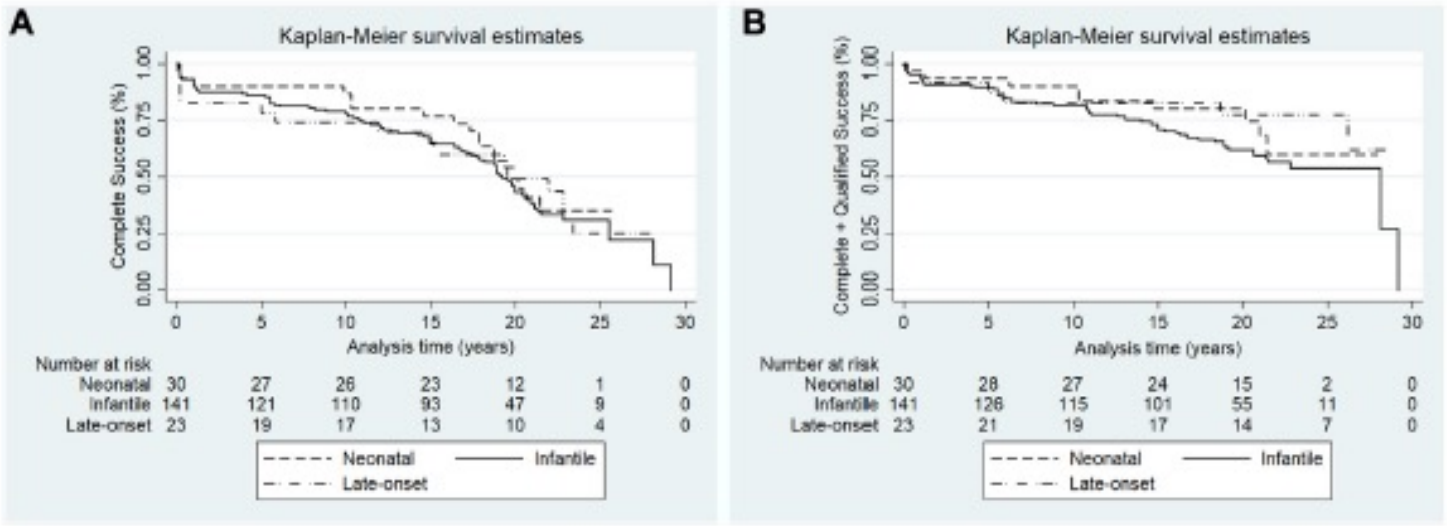

Figure 4. A, Kaplan–Meier survival analysis showing probability of complete success for 3 subtypes (neonatal, infantile, and late onset) of primary congenital glaucoma who underwent primary combined trabeculotomy–trabeculectomy (n = 194 eyes). Note that no statistically significant difference was found in the success rates across the subtypes ($P = 0.82$). B, Kaplan–Meier survival analysis showing the probability of complete plus qualified success for 3 subtypes (neonatal, infantile, and late onset) of primary congenital glaucoma who underwent primary combined trabeculotomy–trabeculectomy (n = 194 eyes). Note that no statistically significant difference was found in the success rates across the subtypes ($P = 0.17$).

Results

Table 3. Results of Cox Proportional Hazards Analysis for Assessing Risk Factors on the Survival Estimates of Complete Success

Variable	Bivariate Analysis	
	P Value	Hazard Ratio ± Robust Standard Error (95% Confidence Interval)
Age at surgery (mos)	0.70	0.999 ± 0.003 (0.994–1.004)
Age at surgery (neonatal, infantile, late-onset PCG)	0.44	1.16 ± 0.22 (0.80–1.67)
Sex (male)	0.13	0.73 ± 0.15 (0.49–1.09)
Laterality	0.29	1.36 ± 0.39 (0.77–2.38)
Preoperative IOP*	0.17	1.01 ± 0.01 (0.99–1.04)
Preoperative IOP > 35 mmHg	0.56	1.18 ± 0.32 (0.69–2.01)
PCG severity	0.22	1.23 ± 0.21 (0.88–1.73)
Preoperative horizontal corneal diameter	0.61	1.05 ± 0.09 (0.88–1.24)
Preoperative corneal edema	0.34	0.80 ± 0.19 (0.50–1.27)
Any additional surgery	**< 0.0001**	2.92 ± 0.76 (1.76–4.85)

IOP = intraocular pressure; PCG = primary congenital glaucoma.
Boldface values indicate statistical significance.
*Continuous variable.

Results

Table 4. Results of Cox Proportional Hazards Analysis for Assessing Risk Factors for Poor Visual Outcome*

Variable	Bivariate Analysis		Multivariable Analysis	
	P Value	HR ± Robust SE (95% CI)	P Value	HR ± robust SE (95% CI)
Age at surgery (mos)	0.65	1.001 ± 0.002 (0.997–1.006)		NI
Type of glaucoma (neonatal/infantile/late onset)	0.11	1.41 ± 0.30 (0.92–2.15)		NI
Male sex	**0.02**	0.65 ± 0.12 (0.45–0.94)	**0.006**	0.60 ± 0.11 (0.41–0.86)
Laterality	**0.03**	0.63 ± 0.13 (0.41–0.96)	**0.01**	0.52 ± 0.14 (0.31–0.87)
Preoperative IOP	**< 0.0001**	1.05 ± 0.01 (1.02–1.07)	**< 0.001**	1.04 ± 0.01 (1.02–1.06)
Disease severity	0.07	1.45 ± 0.29 (0.97–2.16)		NI
Preoperative horizontal corneal diameter	**0.005**	1.24 ± 0.10 (1.07–1.44)	0.15	Step 1 elimination
Preoperative corneal edema	**0.007**	0.54 ± 0.12 (0.35–0.85)	**< 0.001**	0.45 ± 0.11 (0.27–0.72)
Any additional surgery	**0.007**	1.91 ± 0.46 (1.20–3.06)	**< 0.001**	2.41 ± 0.58 (1.51–3.85)

CI = confidence interval; HR = hazard ratio; IOP = intraocular pressure; NI = not included; SE = standard error.
Boldface values indicate statistical significance.
*Visual acuity worse than 1.00 logarithm of the minimum angle of resolution.

Results

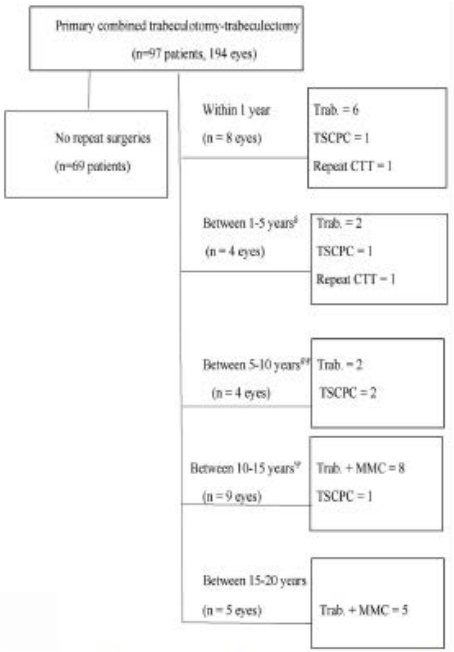

Figure 5. Flowchart showing distribution of additional glaucoma surgeries (n = 28 patients) over the entire follow-up period in the study for only those who underwent primary combined trabeculotomy–trabeculectomy (n = 97 patients [194 eyes]). Two patients underwent repeated surgeries: [§]one at the 5-year and 10-year follow-up and the other at the [¶]10-year and 15-year follow-up. The timeline is shown in years in chronological order. CTT = combined trabeculotomy–trabeculectomy; MMC = mitomycin C; TSCPC = transscleral cyclophotocoagulation; Trab = trabeculectomy.

Figure 6: A: Clinical appearance of a 3-month-old child with infantile-onset PCG showing acute corneal hydrops in the left eye. B: 6-months postoperative appearance of the same child showing normal corneal transparency of the left eye. C: 10-year postoperative appearance of the same child showing clear cornea and using spectacles for compound myopic astigmatism and having a visual acuity of 20/20 in both eyes.

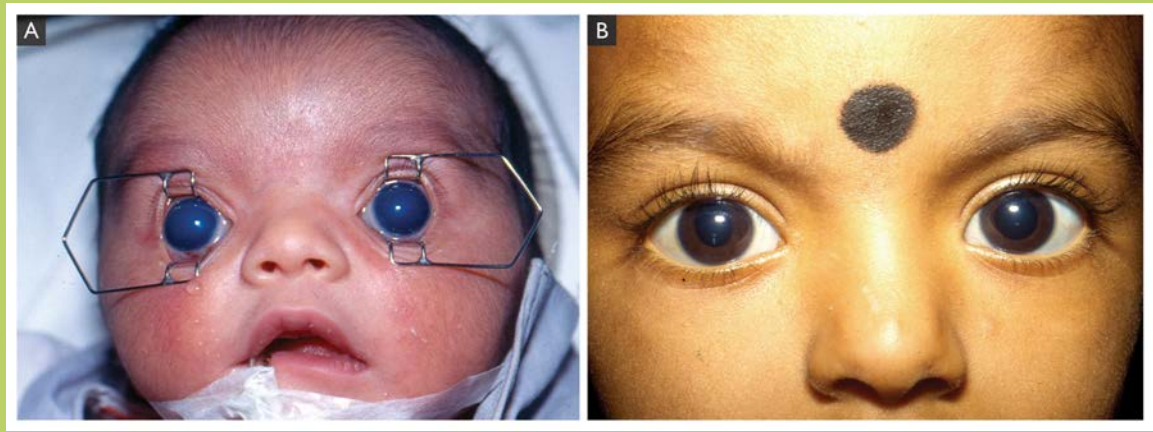

Figure 7: A: Preoperative appearance of the cornea in a child with neonatal-onset PCG operated at third day of birth B: 6-months postoperative appearance of the same child showing clear corneas in both eyes.

Conclusion

- Primary CTT is a useful procedure and provides good IOP control with moderate visual recovery that remained over a 20-year follow-up after surgery in patients with PCG.
- Although not frequent, the need for repeat surgery in the long-term should be borne in mind by both the glaucomatologist and the parents of children with PCG.
- Finally, the relatively uniform population of patients with PCG from a phenotypic and genetic basis in our study should be borne in mind, such that these results may not be applicable widely to patients with PCG in other parts of the world.

TOWNHALL DISCUSSION

Ta Chen Peter Chang, MD

Professor of Ophthalmology

Bascom Palmer Eye Institute

University of Miami

Director Elect

Samuel & Ethel Balkan International Pediatric Glaucoma Center

CHILDHOOD GLAUCOMA RESEARCH NETWORK

GRAJEWSKI LYRA FOUNDATION
For Children with Glaucoma

CHILDHOOD GLAUCOMA RESEARCH NETWORK

Thank You

Bascom Palmer Eye Institute
UNIVERSITY OF MIAMI HEALTH SYSTEM

SAMUEL & ETHEL BALKAN INTERNATIONAL PEDIATRIC GLAUCOMA CENTER

CHILDHOOD GLAUCOMA RESEARCH NETWORK

CLOSED MEETING

napgs NORTH AMERICAN PEDIATRIC GLAUCOMA SOCIETY