



*Controversies in Primary Congenital Glaucoma
(PCG) surgical intervention*

By,

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*1. Classification of Primary Congenital Glaucoma
El Hamzi et al 2005*

Table 1 Classification used for primary congenital glaucoma

Severity	IOP (mm Hg)	Corneal diameter (mm)	Corneal clarity
Mild	<25	<13	Good
Moderate	25-35	13-14.5	Fair
Severe	>35	>14.5	Poor

El Hamzi et al 2005

Table 4 Outcome of three surgical procedures for primary congenital glaucoma in 820 eyes

Severity	Goniotomy			Trabeculotomy			CTM*		
	No	Success (%)	Failure (%)	No	Success (%)	Failure (%)	No	Success (%)	Failure (%)
Mild	145	117 (81) ←	28 (19)	102	93 (90) ←	10 (10)	2	2 (100) ←	0 (0)
Moderate	109	14 (13) ←	95 (87)	163	65 (40) ←	98 (60)	70	56 (80) ←	14 (20)
Severe	0	0	0	153	15 (10) ←	138 (85)	76	53 (70) ←	23 (30)
Total	254	131 (52)	123 (48)	418	173 (41)	246 (59)	148	111 (75)	37 (25)

*CTM=combined trabeculotomy-trabeculectomy with mitomycin C.

El Hamzi et al 2005

- *Classification of PCG in mild, moderate, or severe forms, based on IOP, corneal diameter, and corneal integrity can be helpful for surgical decision making.*
- *The mild form of congenital glaucoma generally responds successfully to surgery, no matter which procedure is chosen. Combined trabeculotomy-trabeculectomy with adjunctive mitomycin C results in better IOP control in the moderate and severe forms.*

- *Classification of PCG into mild, moderate, or severe forms, based on IOP, corneal diameter, and corneal integrity, to which extent can be applied before surgical intervention ?*



2. Study characteristics and clinical outcomes for studies comparing goniotomy versus trabeculotomy

Study ID	Anderson 1982		Al-Hazmi 2005*		Asseman 1972		Mendicino 2000	
Study design	Randomized trial	controlled	Retrospective study		Retrospective study		Retrospective study	
Interventions	Goniotomy	Trabeculotomy	Goniotomy	Trabeculotomy	Goniotomy	Trabeculotomy	Goniotomy (single or multiple)	360 Trabeculotomy
Number of eyes analyzed	9	9	254	418	34	19	40	24
Participants age	< 1 year	< 1 year	mean: 4.8 months	mean: 4.2 months	< 2 years	< 2 years	mean: 3.4 months	mean: 4.5 months
Follow-up (range)	3 to 34 months	3 to 34 months	0.4 to 12 months	0.3 to 12 months	3 to 24 months	3 to 18 months	2.6 to 14.2 years	2.7 to 5.9 years
Outcomes								
Surgical success** at 1 year	NA	NA	62.0%	61.5%	61.8%	100%	80.0%	92.0%
Surgical success at last follow-up	66.7%	66.7%	NA	NA	NA	NA	NA	NA
Examined at 1 year	100%		100%		47%	57.8%	unclear*	

Goniotomy versus trabeculotomy

- in children with clear corneas and early PCG, Most glaucoma specialists believe that goniotomy and trabeculotomy yield similar results (Allingham 2005a; Anderson 1982; Beck 2003; Brandt 2011; Hylton 2013; Morales 2013).*
- Anderson 1982 compared goniotomy in one eye with trabeculotomy in the other eye of the same children, observed that the success of goniotomy correlated with the success of trabeculotomy in the other eye which led the trial investigators to conclude that in children with clear corneas and early PCG, it is the patient rather than the type of surgery which determines the success or failure of the surgery.*

*Goniotomy versus
trabeculotomy in mild
congenital glaucoma.
Which is better ?*



3. Rigid-probe Versus 360 degree trabeculotomy

- *Over the past two decades, improvements in trabeculotomy include circumferential suture technique and a flexible illuminated microcatheter*
- *Rigid-probe trabeculotomy has an overall success of approximately 60%–87% after a mean follow up of 1–3 years, with a subset of the patients requiring additional angle surgery.*
- *A 360° filament trabeculotomy, on the other hand, achieved surgical success in 87%–92% of patients after 1–4 years of follow up.*

Rigid-probe Versus 360 degree trabeculotomy

- *The illuminated microcatheter improves the safety of filament trabeculotomy by allowing continuous visualization of filament tip and allows rapid detection of misdirection.*
- *Given the available outcome data and the improved safety profile of illuminated microcatheter, it was recommend over rigid-probe trabeculotomy as an initial procedure in PGC.*
- *TA C. Chang and Kara M. Kavuto .Surgical Management in Primary Congenital Glaucoma: Four Debates. J Ophthalmol. 2013*

Rigid-probe Versus 360 degree trabeculotomy

- *Conclusion:*
circumferential trabeculotomy afforded better long-term success and visual outcomes than conventional angle surgery for children with PGC. (Am J Ophthalmol 2017;183:17–24.)

Circumferential Trabeculotomy Versus
Conventional Angle Surgery: Comparing
Long-term Surgical Success and Clinical
Outcomes in Children With Primary Congenital
Glaucoma



REBECCA F. NEUSTEIN AND ALLEN D. BECK

Rigid-probe Versus 360 degree trabeculotomy

- *Conclusion:*
- *At 2 years postoperatively, microcatheter-assisted trabeculotomy still yielded*
- *superior results in terms of IOP control and success rates in children with primary congenital glaucoma.*
- *The need for reoperation for glaucoma was significantly lower in the microcatheter group.*

Acta Ophthalmologica

— ACTA OPHTHALMOLOGICA 2017 —

Two-year results of microcatheter-assisted trabeculotomy in paediatric glaucoma: a randomized controlled study

Yasmine El Sayed and Ghada Gawdat

Cairo University Faculty of Medicine, Cairo, Egypt

Rigid-probe Versus 360 degree trabeculotomy



4. 360 degree trabeculotomy, Microcatheter-assisted Trabeculotomy Vs 2-site Trabeculotomy With the Rigid Probe

• *CONCLUSION:*

- *Circumferential trabeculotomy using either the illuminated microcatheter or rigid probe trabeculotome yielded comparable results; however, the added cost of the microcatheter should be considered.*
- *Microcatheter-assisted Trabeculotomy Versus 2-site Trabeculotomy With the Rigid Probe Trabeculotome in Primary Congenital Glaucoma.*
- *El Sayed YM¹, Gawdat GI.*
- *J Glaucoma. 2018 Apr;27(4):371-376*

360 degree trabeculotomy, Microcatheter-assisted Trabeculotomy Vs 2-site Trabeculotomy With the Rigid Probe



5. Study characteristics and clinical outcomes for studies comparing trabeculectomy versus trabeculotomy

Study ID	Atrata 2003		Debnath 1989		Zhang 2009	
Study design	Retrospective study		Retrospective study		Retrospective study	
Interventions	Trabeculectomy	Trabeculotomy	Trabeculectomy	Trabeculotomy	Trabeculectomy with MMC	Trabeculotomy
Number of eyes analyzed	45	38	30	31	33	23
Participants age (mean)	5.1 months	3.8 months	At birth or immediately after	At birth or immediately after	2.08 years	2.08 years
Baseline IOP (mm Hg, mean \pm SD)	NA	NA	NA	NA	32.08 \pm 10.82	29.94 \pm 6.75
Follow-up (mean)	8.2 years	4.3 years	11.2 months; range: 3 to 30 months		5.8 years	
Outcomes						
Surgical success* at 1 year	NA	NA	NA	NA	93.9%	91.3%
Surgical success at 2 years	47.0%	76.0%	NA	NA	NA	NA
Surgical success at 3 years	NA	NA	NA	NA	66.7%	87.0%
Good VA (> 6/18) at final follow-up	51.2%	74.0%	NA	NA	NA	NA
Surgical success at last follow-up	NA	NA	54.0%	67.0%	53.9% (9 years)	37.7% (9 years)

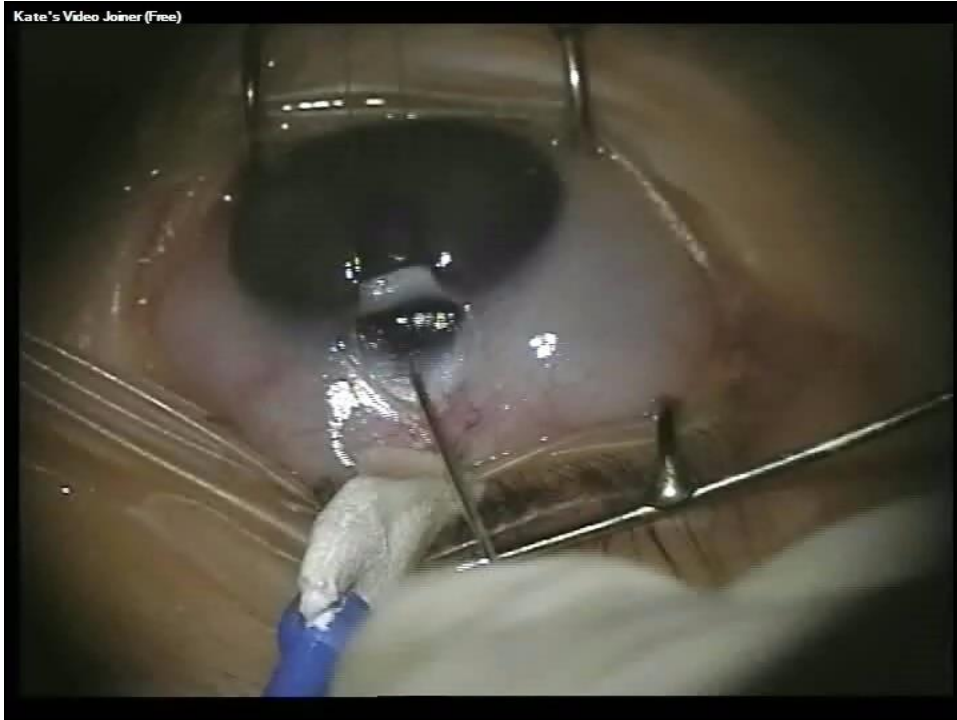
- *As a primary surgery, trabeculectomy with or without MMC appears to have a lower success rate and higher complications rate than trabeculotomy.*

*Trabeculotomy versus
trabeculectomy as a primary
surgery of PCG*



6. Combined trabeculectomy-trabeculotomy (CTT)

- 1. It does not require corneal clarity;*
- 2. It allows the trabeculectomy to be placed correctly, as Schlemm's canal has to be located, and provides additional filtering surgery.*
- 3. Failure to identify the canal does not lead to total failure of the surgery as there is another drainage pathway.*
- 4. CTT is favored in the Middle East (El Hamzi 2005), and India (Mandal 1999) for patients that present late, with severe disease .*



A. Study characteristics and clinical outcomes for studies comparing CTT versus trabeculotomy

Study ID	Biedner 1998		Al-Hazmi 2005*		Zhang 2009	
Study design	Quasi-randomized trial		Retrospective study		Retrospective study	
Interventions	Combined trabeculectomy-trabeculotomy	Trabeculotomy	Combined trabeculectomy-trabeculotomy with MMC	Trabeculotomy	Combined trabeculectomy-trabeculotomy with MMC	Trabeculotomy
Number of eyes enrolled	7	7	148	418	25	23
Participants age (mean)	3.4 months	4.9 months	3.5 months	4.2 months	2.1 years	
Baseline IOP (mm Hg, mean \pm SD)	NA	NA	NA	NA	32.74 \pm 8.71	29.94 \pm 6.75
Follow-up (mean)	range: 6 to 80 months		16 months	14 months	5.8 years	
Outcomes						
Surgical success** at 1 year	NA	NA	87.4%	61.5%	92.0%	91.3%
Surgical success at 2 years	NA	NA	75.0%	41.0%	NA	NA
Surgical success at 3 years	NA	NA	NA	NA	78.0%	87.0%
Surgical success at last follow-up	85.7%	57.1%	NA	NA	62.4% (9 years)	37.7% (9 years)

CTT versus trabeculotomy

- *The previous studies show that CTT has better results than a trabeculotomy.*
- *Dalia HK and Mohamed A in a recent study (Acta Ophthalmologica 2016) found that both primary trabeculotomy and CTT with MMC had similar outcome over 3 years follow up.*
- *Chang TA . and Kavuoto KM.(J Ophthalmol. 2013) concluded that The addition of trabeculectomy with MMC to the rigid-probe trabeculotomy seems to offer no additional advantage and presumably would increase the risk of bleb-associated complications..*

- *CTT versus trabeculotomy*



B. Study characteristics and clinical outcomes for studies comparing CTT versus trabeculectomy

Study ID	Elder 1994	Zhang 2009		
Study design	Retrospective study	Retrospective study		
Interventions	Trabeculectomy-trabeculotomy	Trabeculectomy	Trabeculectomy-trabeculotomy with MMC	Trabeculectomy with MMC
Number of eyes analyzed	16	44	25	33
Participants age (mean)	5.6 months	4.3 months	2.08 years	
Baseline IOP (mm Hg, mean \pm SD)	32.6 \pm 6.9	28.4 \pm 7.4	32.74 \pm 8.71	32.08 \pm 10.82
Follow-up (mean)	21.6 months	48.4 months	5.8 years	
Outcomes				
Surgical success* at 1 year	93.5%	72.0%	92.0%	93.9%
Surgical success at 2 years	93.5%	70.0%	NA	NA
Surgical success at 3 years	NA	NA	78.0%	66.7%
Surgical success at last follow-up	NA	NA	62.4% (9 years)	53.9% (9 years)

CTT versus trabeculectomy

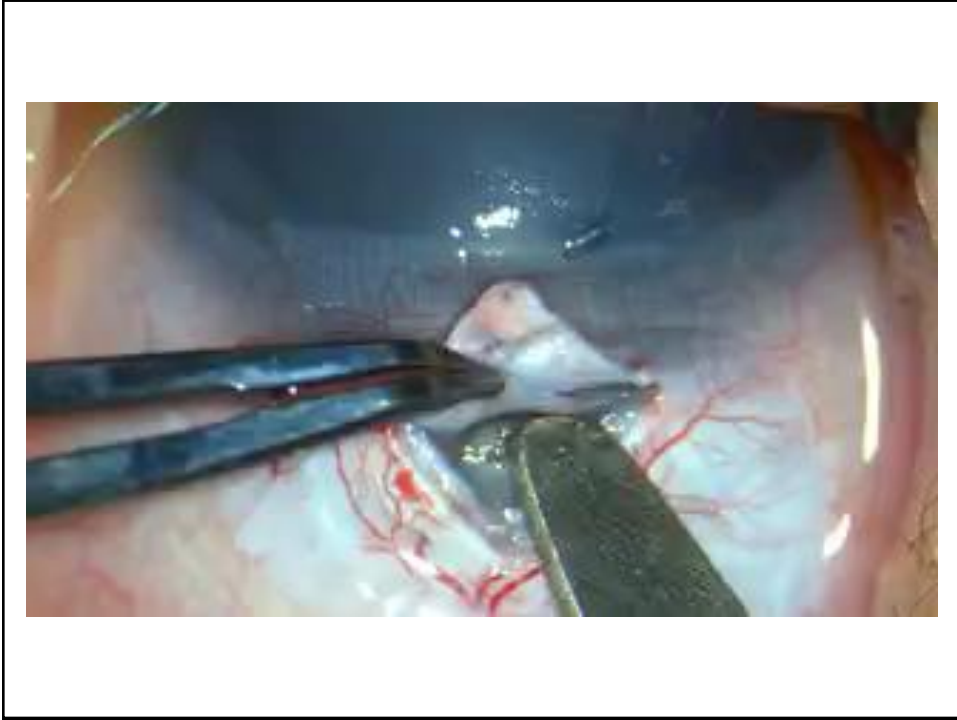
- *The previous studies show that CTT has better results than a trabeculectomy,*

- *CTT* versus trabeculectomy



C. CTT versus CTT with deep sclerectomy

- one RCT that compared these two procedures (*Bayoumi 2012*). The authors used MMC in both the arms of the study and had a 100% surgical success rate with both procedures at one year.
- *Bayoumi NH. Deep sclerectomy in pediatric glaucoma filtering surgery. Eye 2012;26(12):1548–53.*



- *CTT versus CTT with deep sclerectomy*



7. After failing of 360 degrees angle surgery, what is next ?

- *After failing treatment of 360 degrees of angle (whether one-time filament trabeculotomy or multiple-session with goniotomy/rigid-probe trabeculotomy) and maximizing medical treatment, the next procedure of choice is, a glaucoma drainage device (GDD), or a filtering procedure, usually a trabeculectomy (with or without augmentation with antifibrotic agents). The two choices have different risk/benefit profiles.*

7. After failing of 360 degrees angle surgery, what is next ?

- *With comparable efficacy and a lower complication rate, tube shunt surgery seems to be the favored procedure in children with PCG who have failed angle surgery.*
- *(Ghate et al 2105, Surgical interventions for primary congenital Glaucoma, (review).*

7. *After failing of 360 degrees angle surgery, what is next ?*

- **CONCLUSIONS:**
- *Both the MP-CPC and CW-CPC are effective in lowering the IOP in children with refractory glaucoma. However, the rate of complications, pain, and inflammation seem to be lower with the micropulse mode, making it a safer alternative for cyclophotocoagulation, especially since retreatments are often needed.*
- *Micropulse Versus Continuous Wave Transscleral Cyclophotocoagulation in Refractory Pediatric Glaucoma. J Glaucoma. 2018 Oct;27(10):900-905*
- *Abdelrahman AM¹, El Sayed YM.*
- *Author information*
- *Cairo University Faculty of Medicine, Cairo, Egypt.*

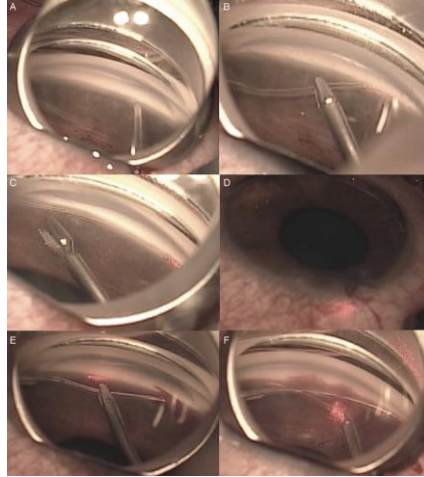
After failing treatment of 360 degrees of angle (whether one-or multiple-session) what is the next procedure of choice ?

- *Maximum medical treatment*
- *Trabeculectomy with or without MMC*
- *Glaucoma drainage device (GDD)*
- *TSCPC*



8. *Alternatives in Pediatric Congenital Glaucoma Surgery.*
Gonioscopy assisted transluminal trabeculotomy (GATT)

- Gonioscopy assisted transluminal trabeculotomy: an ab interno circumferential trabeculotomy (*GATT*) for the treatment of primary congenital glaucoma and juvenile open angle glaucoma
Grover DS, et al. Br J Ophthalmol. 2015



- *On the Horizon: Looking at the Alternatives in Pediatric Congenital Glaucoma Surgery.*



