Non-Penetrating Schlemm's Canaloplasty versus Trabeculectomy

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Background

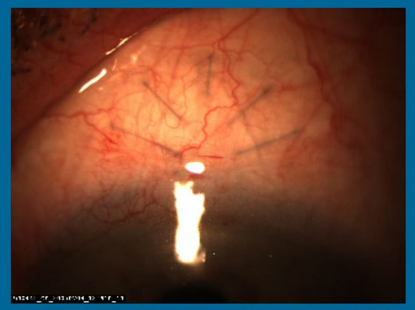
•A trabeculectomy is a fistulizing procedure that allows aqueous humor to pass from the anterior chamber into the subconjunctival space. It is the currently accepted gold standard glaucoma surgery due to its efficacy in lowering intraocular pressure (IOP).

• Canaloplasty is a non-penetrating surgical technique used for the treatment of open angle glaucomas which may be an alternative to conventional fistulizing trabeculectomy.

• The mechanism of IOP lowering in canaloplasty is thought to be via augmentation of physiologic Schlemm's canal outflow, as well as through the intrascleral lake and into the episcleral/scleral venous plexi and suprachoroidal space. This obviates the need for a subconjunctival bleb, its inherent short and long term risks, and in theory lowers the risk of hypotony and its associated potentially visually devastating complications.

• No study to date has reported a direct comparison of canaloplasty to trabeculectomy. Primary outcomes for the current study include IOP, number of glaucoma medications and BCVA at 6 and 12 months. Postoperative complications were examine as a secondary outcome.

Figure 1



Post-operative photograph of canaloplasty patient. Note the absence of a bleb

Objective

To compare and evaluate outcomes and complications after non-penetrating canaloplasty versus with conventional trabeculectomy as surgical treatment for patients with open angle glaucoma.

Methods

This study was a retrospective comparative chart review of 101 eyes of 93 patients. Fifty eyes underwent canaloplasty and 51 underwent trabeculectomy. Data indicating glaucoma severity (visual field indices and cup-to-disc ratio), IOP, number of glaucoma medications used, and best corrected visual acuity (BCVA) was collected. Time points were defined as preoperatively and after 1, 3, 6 and 12 months postoperatively. Complications and adjunctive procedures were recorded for each group. For a Kaplan-Meier survival analysis, complete success at 12 months was defined as a postoperative IOP of >6 mm Hg and <18 mm Hg without an increase in the number of glaucoma medications used postoperatively with no bleb needlings or further incisional procedures. Surgical or qualified success at 12 months was defined as an IOP of >6 and <18 mm Hg regardless of the number of medications used with no bleb needlings or further surgery. The use of postoperative laser suture lysis, laser goniopuncture, or transient hypotony was not considered a failure.

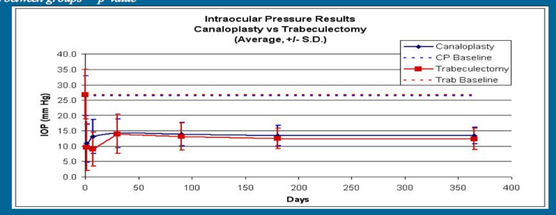
Results

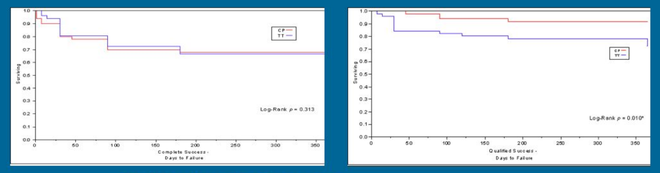
IOP CONTROL

IOP Control (mmHg)

	Preop IOP	6 mo IOP	p-value*	Preop IOP	1 yr IOP	p-value*
Canaloplasty	26.4 ± 6.5	13.4 ± 3.3	**<0.001**	26.4 ± 6.5	13.4 ± 2.7	**<0.001**
Trabeculectomy	26.8 ± 8.1	12.5 ± 3.3	**<0.001**	26.8 ± 8.1	12.3 ± 3.5	**<0.001**
p-value**	0.803	0.172		0.803	0.1 03	

**IOP control within groups p-value*
***IOP control between groups p-value*





CP=Canaloplasty, TT=Trabeculectomy
**Complete success between groups p=0.313 (Log-Rank)*
**Qualified success between groups p=0.010 (Log-Rank)*

BCVA

BCVA (LogMAR)

	Preop VA	6 mo VA	p-value*	Preop VA	1 yr VA	p-value*
Canaloplasty	0.35 ± 0.58	0.25 ± 0.33	0.340	0.35 ± 0.58	0.29 ± 0.37	0.447
Trabeculectomy	0.50 ± 0.63	0.60 ± 0.82	0.301	0.50 ± 0.63	0.63 ± 0.88	0.192
p-value**	0.217	**0.013**		0.803	0.103	**0.022**

**BCVA within groups p -value*
***BCVA between groups p-value*

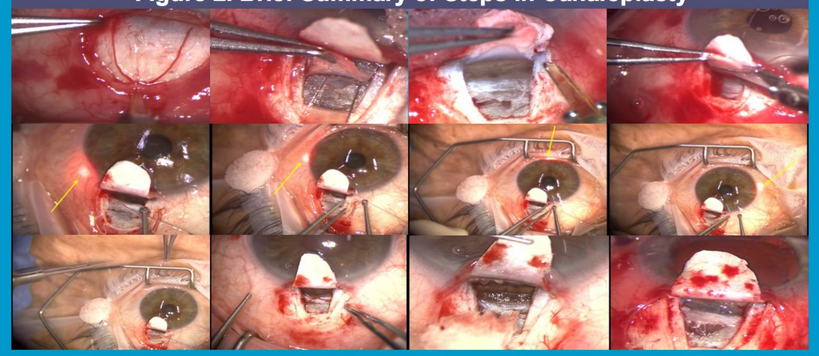
GLAUCOMA MEDICATIONS REQUIRED

#GTTS

	Preop gtts	6 mo gtts	p-value*	Preop gtts	1 yr gtts	p-value*
Canaloplasty	3.6 ± 0.9	0.7 ±1.3	**<0.001**	3.6 ± 0.9	0.6 ±1.1	**<0.001**
Trabeculectomy	3.6 ±1.1	0.4 ±0.9	**<0.001**	3.6 ±1.1	0.7 ±1.3	**<0.001**
p-value**	0.971	0.222		0.971	0.839	

**Average #GTTS within groups p-value*
*** Average #GTTS between groups p-value*

Figure 2. Brief Summary of Steps in Canaloplasty



Results

Postoperative Complications

Complication	Canaloplasty N,(%)	Trabeculectomy N,(%)	p-value*
Choroidal effusion	1 (2)	14 (28)	**<0.001**
Transient hypotony (IOP ≤ 6 mmHg for at least 2 visits + resolved)	1 (2)	13 (26)	**<0.001**
Hyphema/m icrohyphema	9 (18)	9 (18)	0.482
Shallow/flat anterior chamber	0	8 (16)	0.002
Inadvertent bleb f ormation	11 (22)	N/A	–
Loss of >2 lines Snellen VA	1 (2)	8 (16)	0.008
Bleb fibrosis	0	6 (12)	0.006
IOP spike (increase in IOP ≥ 10 mmHg from one visit to next)	5 (10)	2 (4)	0.118
Wound leak	0	5 (10)	0.012
Bleb encapsulation	0	4 (8)	0.022
Cataract	3 (6)	3 (6)	0.490
Iris incarceration	3 (6)	2 (4)	0.317
Persistent hypotony (IOP ≤ 6 mmHg for at least 2 visits + resolve d)	1 (2)	2 (4)	0.286
Localized D escemet's detachment	2 (4)	0	0.080
Iris bomb é	1 (2)	0	0.161
Malignant glaucoma	0	1 (2)	0.161
Bleb dy sesthesia	0	1 (2)	0.161
Blebitis	0	1 (2)	0.161
Corneal decompensation	0	1 (2)	0.161
Cystic bleb	0	1 (2)	0.161
Epiretinal membrane	0	1 (2)	0.161
Persistent anterior chamber inflammation	1 (2)	0	0.161
Chronic cystoid mac ular edema	1 (2)	1 (2)	0.494
Retinal detachment	0	1 (2)	0.161
Late bleb leak	0	0	–
Endophthalmitis	0	0	–

**Between groups p-value*

FIGURE 3. Postoperative Gonio-photograph of the Trabeculo-Descemet window created during canaloplasty with two 10-0 prolene suture knots visible.

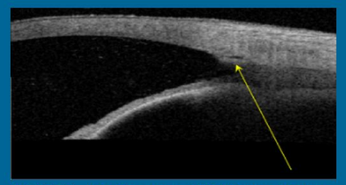


FIGURE 4. Anterior segment OCT image showing centripetal indentation of the Schlemm's canal as a result of the intracanalicular tensioned suture.

Conclusion

•Non-penetrating Schlemm's canaloplasty and MMC trabeculectomy were found to have equal efficacy with regards to IOP lowering and decrease in glaucoma medication usage at up to 1 year postoperatively.

•Eyes undergoing canaloplasty recovered BCVA faster postoperatively than eyes undergoing trabeculectomy.

•Eyes undergoing canaloplasty sustained fewer complications than those undergoing trabeculectomy.

References

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