Efficacy of Selective Laser Trabeculoplasty After Canaloplasty

Ilya Sluch[1], MD, Steven Sarkisian[2], MD, and Mahmoud Khaimi[3], MD

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Authors 3 is a Consultant for Ellex. Author 3 has research grants from Bausch and Lomb and InnFocus

2 – corresponding author
Dean McGee Eye Institute
608 Stanton L. Young Blvd
Oklahoma City, OK 73104

Purpose

- To investigate the efficacy of lowering the intraocular pressure of selective laser trabeculoplasty (SLT) in glaucoma patients who had previously undergone a canaloplasty.

Introduction

- Canalopalsty
  - Canaloplasty is a modern surgical technique in the treatment of glaucoma which aims to restore the natural trabeculocanalicular flow of the aqueous humor via catherization and dilation of Schlemm's canal.
  - Canaloplasty does not penetrate the anterior chamber, unlike trabeculectomy, which reduces the risk of post-operative bleeding, hypotony, choroidal detachment, and bleb-associated endophthalmitis.
- Selective laser trabeculoplasty (SLT)
  - SLT is a non-operative technique used to lower the IOP by improving the outflow through the trabecular meshwork.
  - A 532 nm, short-pulse laser is aimed at the pigmented cells of the trabecular meshwork and is absorbed by the melanin granules. The low energy beam causes release of inflammatory cytokines but does not cause any thermal injury to the surrounding structures. The result of the inflammatory cascade is improved outflow of the aqueous humor through the trabecular meshwork leading to a decrease in IOP.
- No studies have looked at the utilization of SLT in patients who have had a canaloplasty. Due to the dilation of Schlemm's canal, the distal aqueous outflow from the trabecular meshwork would be more patent as compared to the pre-canaloplasty Schlemm's canal, potentially leading to better SLT outcomes.

Methods

- A retrospective chart review of patients who underwent SLT after canaloplasty was performed at the Dean McGee Eye Institute from January 2010 to August 2014.
- 54 patients were identified of which 37 were excluded due to SLT being performed on a different eye, prior to canaloplasty, or a major glaucoma surgery was done prior to SLT. Major surgery was defined as trabeculectomy, i-stent, Ahmed valve, or trab-express.
- A total of 17 patients and 19 eyes were found to fit the criteria. Age, ethnicity, sex, medical diagnosis, ocular medical history, ocular surgical history, laterality of eye involved, surgeon, pre-operative intraocular pressure (IOP), pre-operative visual acuity, pre-operative IOP medications, post-operative pressure, post-operative visual acuity, and post-operative IOP medications at (2-4 weeks, 4 months, 6 months, 8 months, 1 year, 1.5 years, and 2 years) between the responders and non-responders.
- Success of treatment with SLT was defined as greater than 20% reduction in IOP or less than 20% decrease in IOP with decrease in number of IOP medications.
- Failure of therapy was defined as a less than 20% reduction in IOP with no decrease in IOP medications after 2-4 weeks, increase in IOP medications, or need for future IOP-lowering surgery.

Demographics

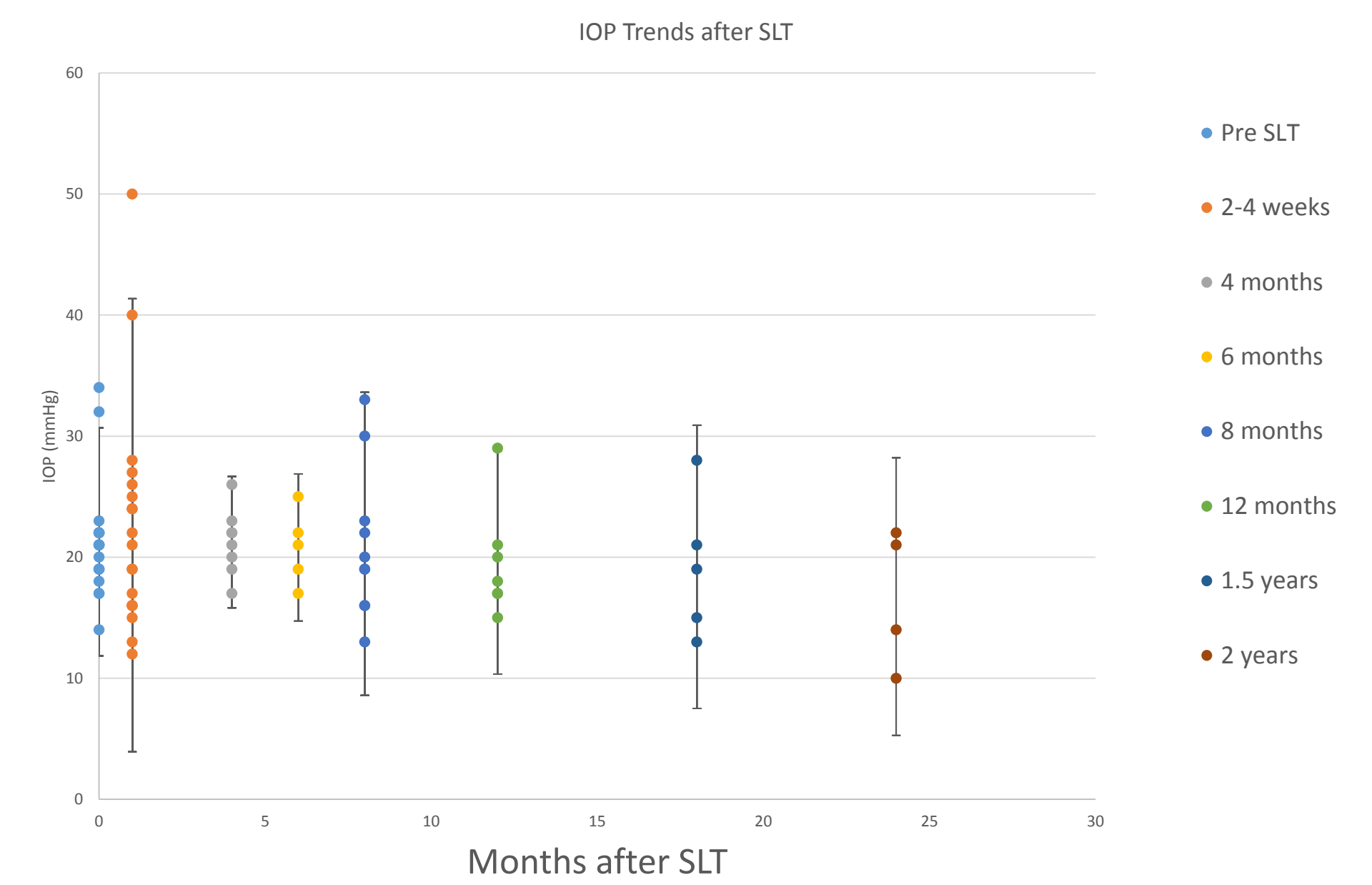
	All Patients	Non-Responders	Responders
Age at SLT (years)	66 +/- 12 (48-85)	65+/- 12	72 +/- 12
Sex	5 male (26%) 12 female (74%)	3 male 11 female	2 male 1 female
Ethnicity	17 Caucasian (89%) 2 African American (11%)	14 Caucasian 2 African Americans	3 Caucasian
Diagnosis	17 Primary open angle Glaucoma (89%) 1 Pseudoexfoliation Glaucoma (5%) 1 Pigmentary Glaucoma (5%)	15 Primary Open Angle Glaucoma 1 Pseudoexfoliation Glaucoma	2 Primary Open Angle Glaucoma 1 Pigmentary Glaucoma
Eye laterality	7 OD (37%) 12 OS (63%)	5 OD 1 OS	2 OD 1 OS

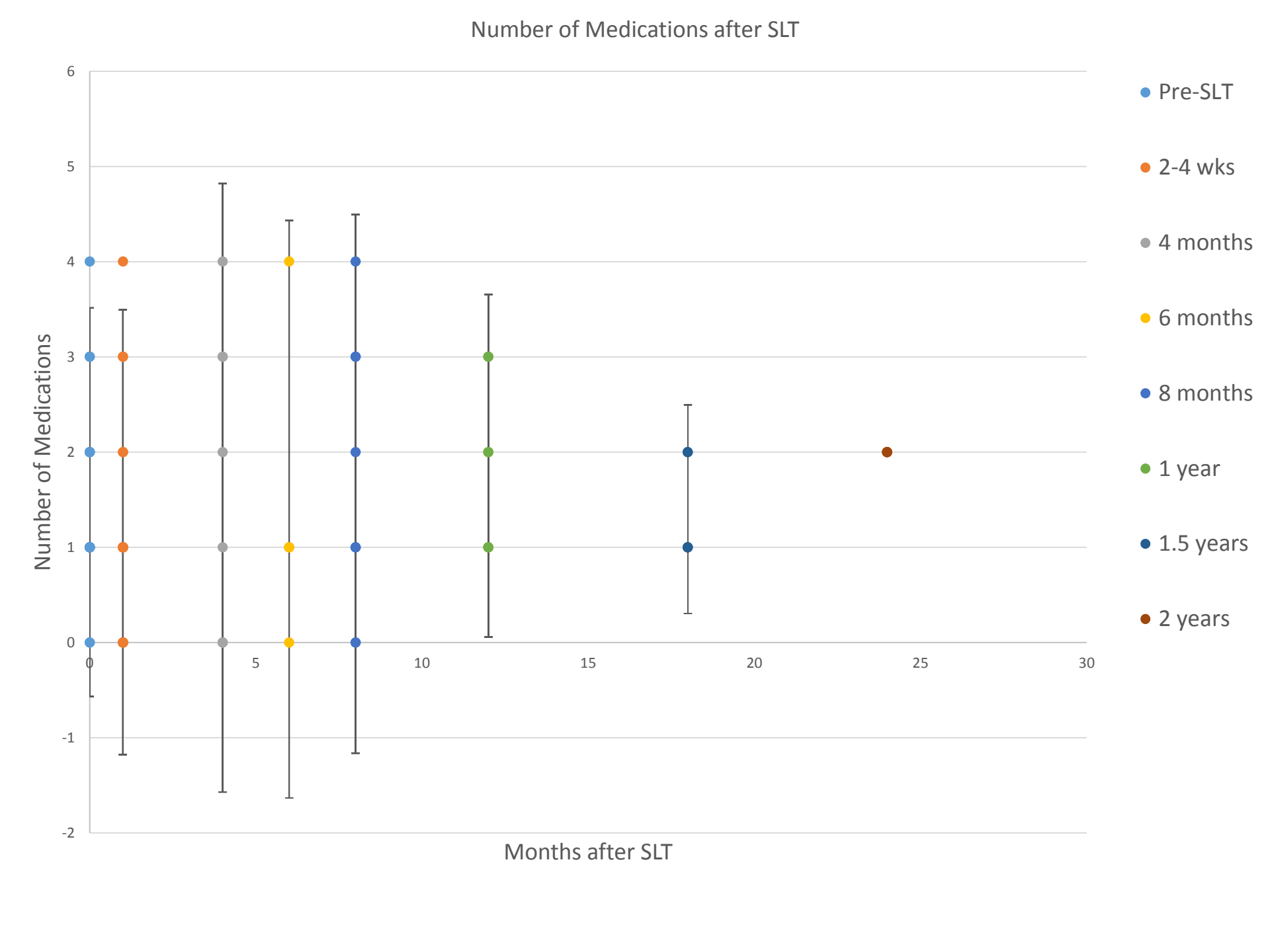
Results

- 17 of 19 eyes were diagnosed with primary open angle glaucoma. 1 eye had pseudoexfoliation glaucoma, and 1 eye had pigmentary glaucoma
- 16 of 19 eyes had a surgery/procedure performed in the past. Surgery procedure was defined as cataract extraction, YAG goniopuncture, YAG capsulotomy, vitrectomy, Argon laser trabeculoplasty, selective laser trabeculoplasty, or Descemet-stripping endothelial keratoplasty.
- Of the 19 eyes, 5 had SLT done prior to canaloplasty. All 3 eyes of the "Responders" had no history of prior SLT, but 2 had prior YAG goniopuncture.
- Pre-operative IOP was defined as IOP on the day when the decision was made to proceed with SLT
- IOP was decreased to 21 or less in 10 patients (53%), 18 or below in 7 patients (37%), 15 or below in 3 patients (16%) at 2-4 week follow up.
- IOP was lowered by at least 20% in 3 patients (16%) and was sustained over 2 year follow up.
- Of the remainder 16 eyes, 8 required further surgical intervention (repeat SLT, Trab-Express, YAG Goniopuncture, tube shunt with graft), 2 required increase in medications, and 6 were continued to be monitored.

Results

	All Patients	Non-Responders	Responders
Prior SLT	5/19	5/16	0/3
Prior Eye Surgery/Procedure	16/19	13/16	3/3
Time between Canaloplasty and SLT (months)	17 +/- 7	17 +/- 7	19 +/- 9
Completeness of Canaloplasty	12/19 Complete 3/19 <360 degree 4/19 unspecified	10/16 Complete 3/16 <360 degree 3/16 unspecified	2/3 Complete 1/3 unspecified
Surgeon	9/19 Surgeon 1 10/19 Surgeon 2	7/16 Surgeon 1 9/16 Surgeon 2	2/3 Surgeon 1 1/3 Surgeon 2
Pre-Operative IOP	21 +/- 5 (n=19)	21 +/- 4 (n=16)	25 +/- 8 (n=3)
2-4 week IOP	23 +/- 9 (n=19)	24 +/- 10 (n=16)	18 +/- 6 (n=3)
4-6 months IOP	21 +/- 3 (n=10)	21 +/- 3 (n=8)	21 +/- 6 (n=2)
8-12 months IOP	21 +/- 5 (n=13)	21 +/- 5 (n=12)	17 (n=1)
18-24 months IOP	18 +/- 6 (n=5)	18 +/- 6 (n=4)	18 +/- 5 (n=1)
Pre-Operative Medications	1.5 +/- 1.0 (n=19)	1.4 +/-0.8 (n=16)	1.7 +/- 2.1 (n=3)
2-4 week Medications	1.2 +/- 1.2 (n=19)	1.1 +/- 1.0 (n=16)	1.7 +/- 2.1 (n=3)
4-6 months Medications	1.5 +/- 1.5 (n=10)	1.1 +/- 1.2 (n=8)	2.5 +/- 2.1 (n=2)
8-12 months Medications	1.8 +/- 1.2 (n=13)	1.8 +/- 1.3 (n=12)	1.0 (n=1)
18-24 months Medications	1.7 +/- 0.5 (n=5)	1.6 +/- 0.5 (n=4)	1.5 +/- 0.5 (n=1)


IOP Trends after SLT
IOP (mmHg)
60
50
40
30
20
10
0
0
5
10
15
20
25
30
Months after SLT
Pre SLT
2-4 weeks
4 months
6 months
8 months
12 months
1.5 years
2 years


Number of Medications after SLT
Number of Medications
Months after SLT
6
5
4
3
2
1
0
-1
-2
0
5
10
15
20
25
30
Pre-SLT
2-4 wks
4 months
6 months
8 months
1 year
1.5 years
2 years

Conclusion

- A greater than 20% reduction of IOP 2-4 weeks after SLT in canaloplasty appears to create a sustainable and beneficial effect on IOP. Therefore, SLT should be considering as a viable treatment option in post-canaloplasty patients.
- In our patient population, greatest success was obtained in patients with no prior history of SLT. Unfortunately, due to our small patient population, statistically significant conclusions were challenging to obtain.
- Future studies with a larger, less refractory treatment group would be beneficial to further address this question.

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