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LASER SURGERY IN GLAUCOMA

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What is SLT?

- Selective Laser Trabeculoplasty
- Non-thermal laser treatment
- Short pulses of low energy 532nm light
- Selective photothermolysis- confinement of thermally mediated radiation damage to a selected pigmented cell population within a tissue composed of multiple cell types of varying pigmentation
- Selectively targets and irradiates only the pigmented cells in the trabecular meshwork with no collateral damage to its underlying structure

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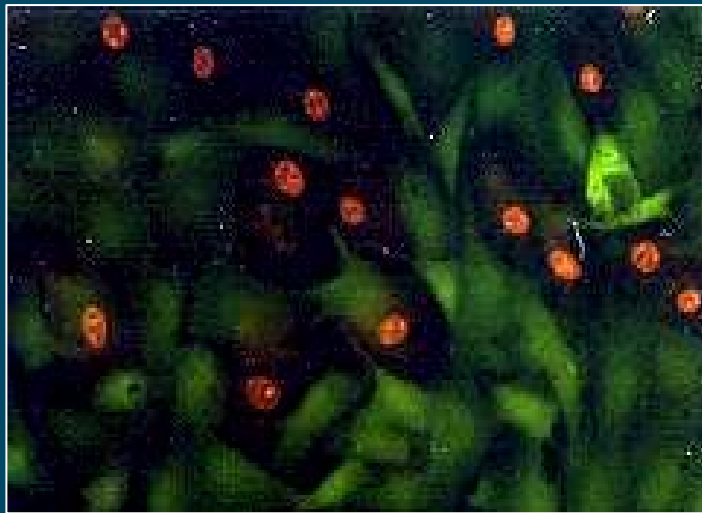
SLT Parameters

- 3 nanoseconds pulse width
- Q-switched, frequency doubled Nd:YAG laser (532nm)
- Power = 0.5 - 0.8 mJ (average)
- 400 micron spot size

Efficacy of SLT

Fluorescence photomicroscopy evidence of efficacy of SLT

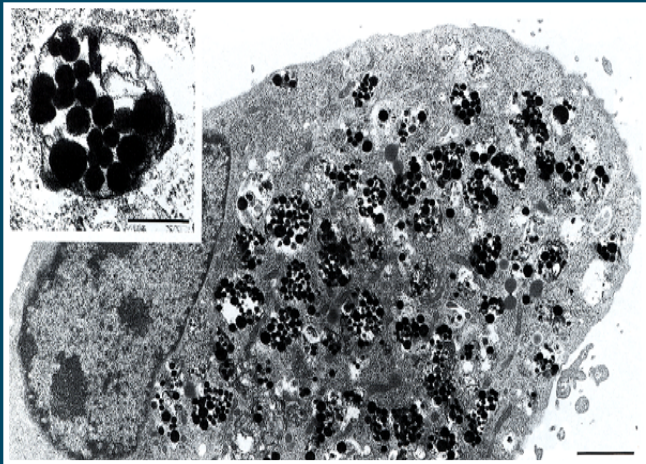
(Green = live cells : Orange = dead cells)



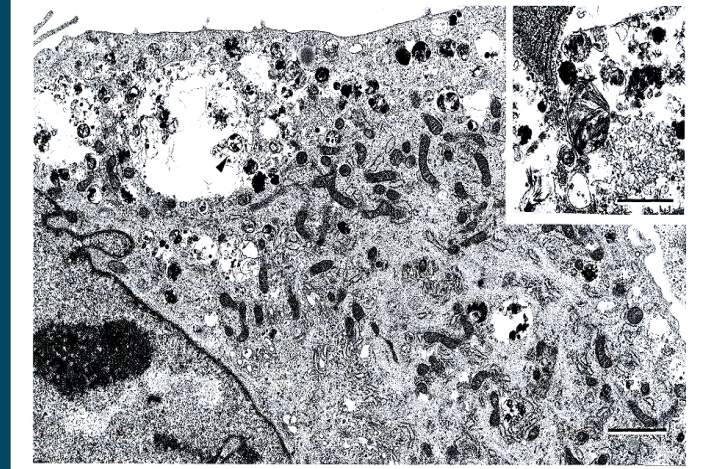
¹Latina MA, Tumbocon JA. Selective Laser Trabeculoplasty: The Evolution of Laser Treatment for Open Angle Glaucoma

A Cell with Melanin

Pre-SLT



Post-SLT





Mechanisms of SLT

- Melanin containing cells are damaged by SLT, without affecting the underlying structure
- Macrophage recruitment takes place to remove damaged cells
- Trabecular meshwork cells divide to replace the lost cells
- A healthier, more porous trabecular meshwork restores balanced aqueous outflow
- This process occurs differently from person to person but typically takes about a week



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Mechanisms of SLT

- Cell death causes macrophage recruitment to clean out the dead cells
- The cytokines :
 - Stimulate cell division and regeneration
 - Increase the porosity of the trabecular meshwork and Schlemm's canal



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Characteristics of **SLT**

- **Natural**

SLT stimulates a natural healing response in the body to rebuild the meshwork with increased porosity

- **Selective**

Selectively targets only the melanin-rich cells of the trabecular meshwork.

- **SLT is Non-thermal**

The short pulse duration of SLT is below the thermal relaxation time of the TM tissue, thereby eliminating the incidence of thermal damage.

- **SLT is Repeatable**

Treatment can be repeated without causing harm or further complications.

SLT Patient Selection

- Patients with the following conditions:
 - Primary Open-Angle Glaucoma
 - Ocular Hyper Tension
 - Pigmentary Glaucoma
 - Pseudo-exfoliative glaucoma
- Poorly compliant, intolerant or unresponsive to drug therapy
- Patients under drug therapy who wish to use SLT in conjunction with glaucoma medications
- Failed ALT
- Post-filtration surgery patients requiring additional treatment

Alternative & Adjunct to Medications

A recent study found that 25-40% of patients who turned in a glaucoma prescription at a pharmacy never picked up the medication, so.....

- SLT enables you to control your patients' glaucoma treatment through effectively lowering IOP without the compliance issues and side effects associated with drug therapy.
- SLT is particularly appropriate for individuals who cannot correctly administer, or are intolerant to, glaucoma medications, and can also be used effectively in conjunction with drug therapy.

SLT Standard Treatment Regime

Pre-treatment

- Alpha-agonist (Iopidine or Alphagan) and topical anesthetic (e.g. Amethocaine)

Treatment

- Latina SLT lens or Three-mirror Gonio lens (no magnification) with methylcellulose 1% (Goniosol or GenTeal gel)
- Focus slit lamp on the trabecular meshwork and place aiming spot on full height of the TM
- Set laser to 0.6 mJ (average) and then increase by 0.1 mJ steps until champagne bubbles appear, then decrease energy by 0.1mJ
- Approximately 50 shots are placed onto the TM over 180° from superior towards inferior

Post-treatment

- Alpha-adrenergic agonist (Iopidine)
- Topical NSAID 4x daily for 5 days
- Follow up after 1-2 weeks and onwards
- NB: different protocol for PG and PACG

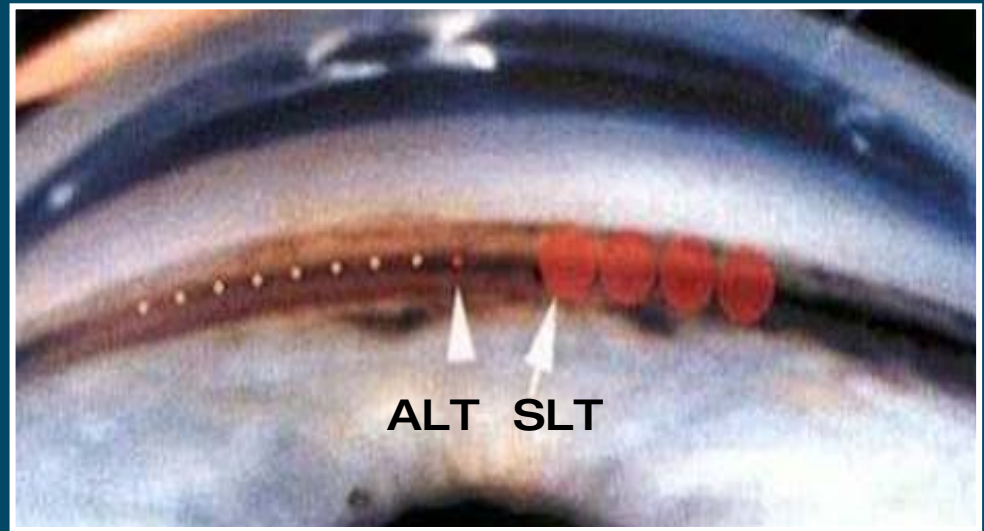
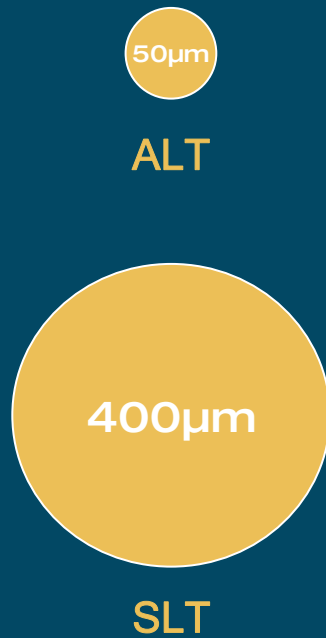
SLT v ALT

- Focussing not critical
- SLT works even on very lightly pigmented TMs
- Can be performed in presence of synechiae
- No structural change
- Immediate and sustained IOP reduction
- Reduced side effects (inflammation, pressure spikes)
- Less need of alpha-agonist and anti-inflammatory medication
- No membranes - no Peripheral Anterior Synechiae (PAS)
- Works in failed ALT cases
- Repeat treatments give repeat IOP reduction
- After 5 years, ALT effective in 22%, SLT in 31% (Juzych 2004)



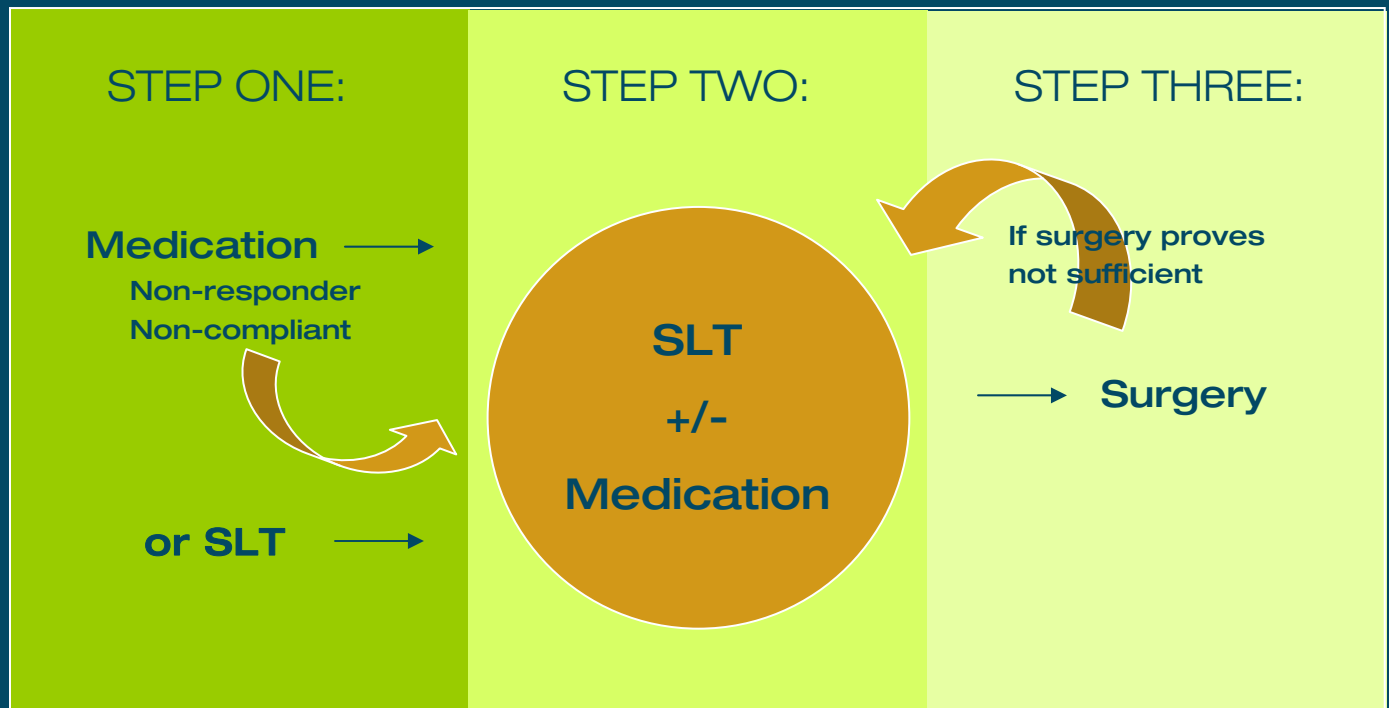
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SLT vs ALT: spot size



Latina MA, Tumbocon JA. Selective Laser Trabeculoplasty: The Evolution of Laser Treatment for Open Angle Glaucoma

SLT in the glaucoma armamentarium





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8-year Results with SLT as Primary Therapy

(Jindra et al, ESCRS 2010)

- Mean follow-up on 1393 eyes was 757 days
- Mean IOP decreased 31 % from a mean of 19 mmHg to 13 mmHg
- Results were significant with $p < 0.01$

Mean Follow-up	757 Days
Pre-SLT Mean IOP	19 mmHg
Post-SLT Mean IOP	13 mmHg
% IOP Drop	31 %

Results: Primary (POAG, MMG & XFG)

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POAG – 85 % eyes

Pre-SLT Mean IOP	19 mmHg +/- 6
Pre-SLT Mean IOP Range	14 – 52 mmHg
Post-SLT Mean IOP	13 mmHg +/- 4
Post-SLT Mean IOP Range	5 – 43 mmHg
% IOP Drop	31 %

MMG – 5 % eyes

Pre-SLT Mean IOP	18 mmHg +/- 4
Pre-SLT Mean IOP Range	12 – 26 mmHg
Post-SLT Mean IOP	12 mmHg +/- 2
Post-SLT Mean IOP Range	7 – 19 mmHg
% IOP Drop	34 %

XFG – 2 % eyes

Pre-SLT Mean IOP	20 mmHg +/- 4
Pre-SLT Mean IOP Range	14 – 26 mmHg
Post-SLT Mean IOP	13 mmHg +/- 4
Post-SLT Mean IOP Range	8 – 22 mmHg
% IOP Drop	34 %

Results: Primary (PIG,LTG & Other)

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PIG – 1 % eyes

Pre-SLT Mean IOP	19 mmHg +/- 5
Pre-SLT Mean IOP Range	12 – 28 mmHg
Post-SLT Mean IOP	14 mmHg +/- 4
Post-SLT Mean IOP Range	9 – 20 mmHg
% IOP Drop	26 %

LTG – 4 % eyes

Pre-SLT Mean IOP	14 mmHg +/- 3
Pre-SLT Mean IOP Range	9 – 14 mmHg
Post-SLT Mean IOP	11 mmHg +/- 2
Post-SLT Mean IOP Range	7 – 13 mmHg
% IOP Drop	30 %

Other – 3 % eyes

Pre-SLT Mean IOP	18 mmHg +/- 4
Pre-SLT Mean IOP Range	13 – 28 mmHg
Post-SLT Mean IOP	12 mmHg +/- 2
Post-SLT Mean IOP Range	8 – 18 mmHg
% IOP Drop	31 %

8-year Results with SLT as Secondary Therapy

(Jindra et al, ESCRS 2010)

- Mean follow-up on 1016 eyes was 520 days
- Mean IOP decreased by 22 % from a mean of 20 mmHg to 16 mmHg
- Mean meds decreased by 57 % from a mean of 2.3 meds to 1.0 meds
- Results were significant with $p < 0.01$

Mean Follow-up	520 Days
Pre-SLT Mean IOP	20 mmHg
Post-SLT Mean IOP	16 mmHg
% IOP Drop	22 %
Pre-SLT Mean Meds	2.3 meds
Post-SLT Mean Meds	1.0 meds
% Meds Drop	57 %

Results: Secondary POAG, MMG & XFG

POAG – 92 % eyes

Pre-SLT Mean IOP	20 mmHg +/- 6
Pre-SLT Mean IOP Range	7 – 52 mmHg
Post-SLT Mean IOP	15 mmHg +/- 4
Post-SLT Mean IOP Range	5 – 43 mmHg
% IOP Drop	23 %

MMG – 2 % eyes

Pre-SLT Mean IOP	17 mmHg +/- 4
Pre-SLT Mean IOP Range	12 – 26 mmHg
Post-SLT Mean IOP	15 mmHg +/- 4
Post-SLT Mean IOP Range	5 – 20 mmHg
% IOP Drop	23 %

XFG – 4 % eyes

Pre-SLT Mean IOP	21 mmHg +/- 5
Pre-SLT Mean IOP Range	14 – 32 mmHg
Post-SLT Mean IOP	17 mmHg +/- 4
Post-SLT Mean IOP Range	11 – 30 mmHg
% IOP Drop	22 %

Results: Secondary PIG,LTG & Other

PIG – <1 %

Pre-SLT Mean IOP	19 mmHg +/- 7
Pre-SLT Mean IOP Range	12 – 32 mmHg
Post-SLT Mean IOP	15 mmHg +/- 3
Post-SLT Mean IOP Range	11 – 19 mmHg
% IOP Drop	22 %

LTG – <1 % eyes

Pre-SLT Mean IOP	13 mmHg +/- 1
Pre-SLT Mean IOP Range	12 – 14 mmHg
Post-SLT Mean IOP	12 mmHg +/- 1
Post-SLT Mean IOP Range	12 – 12 mmHg
% IOP Drop	8 %

Other – 1 % eyes

Pre-SLT Mean IOP	23 mmHg +/- 9
Pre-SLT Mean IOP Range	13 – 38 mmHg
Post-SLT Mean IOP	12 mmHg +/- 5
Post-SLT Mean IOP Range	5 – 20 mmHg
% IOP Drop	47 %

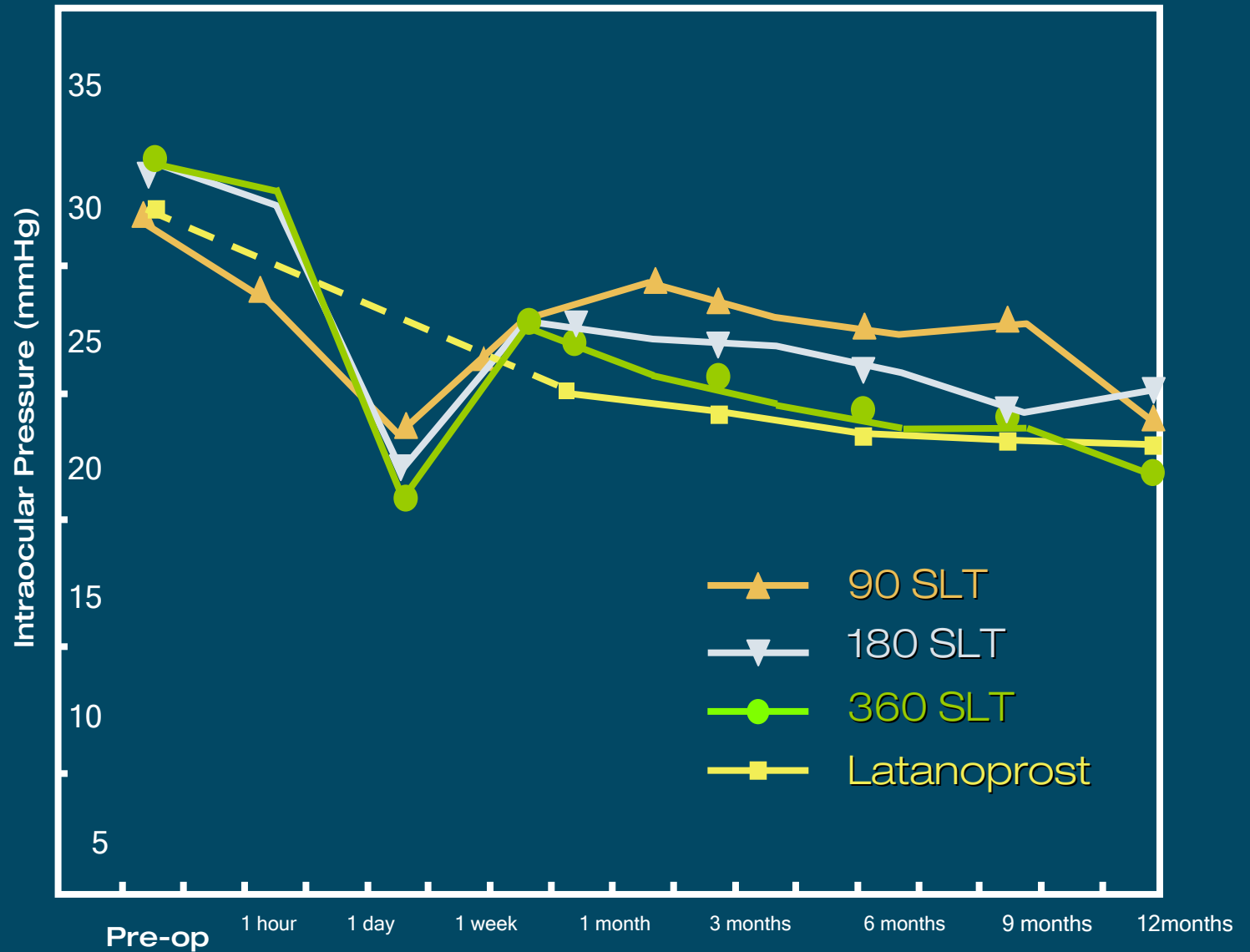
7-year Results with SLT as Repeat Therapy

(Jindra et al, ESCRS 2009)

- 588 eyes out of 2419 eyes initially treated with SLT required repeat treatment
- Patients referred for IOP control / reduction in side effects
- Data represent a repeat rate of
 - 11% of eyes treated over three years
 - 24% of eyes treated over five years
 - 24% of eyes treated over seven year
- Repeat rates after primary SLT at all time intervals examined, were significantly less than repeat rates after secondary SLT.
- Results were significant with $P < 0.01$

SLT vs Medications

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SLT vs Medications: long-term effects

- Lai et al 2004 (5yr prospective randomised study)
 - IOP 32% reduction with SLT and 33% with medication
 - Treatment failure 17% SLT, 28% medications
- McIlraith et al 2006 (5yr non-randomised)
 - IOP reduction comparable between the two groups

Local Data

- IOP reduction at 6 months in primary group 34% ($p < 0.005$)
- IOP reduction at 6 months in secondary group 24% ($p < 0.005$)
- Discomfort in 15%, resolved by day 4
- No repeat treatments at 6 months
- Medications reduced by 55% in secondary group
- Average age primary group 63.4yrs, secondary group 65 years ($p = 0.8$)

Economics

Projected cost comparison of selective laser trabeculoplasty versus glaucoma medication in the Ontario Health Insurance Plan- Lee, Hutnik
Can-J-Ophthalmol. Aug 2006; vol. 41, no. 4: 449-56

- Projected 6-year cost comparison of primary selective laser trabeculoplasty (SLT) versus primary medical therapy in the treatment of open-angle glaucoma for Ontario patients aged 65 years or more
- N=707
- Assuming SLT repeated 2 years later, the use of primary SLT over mono-, bi-, and tri-drug therapy produced a 6-year cumulative cost savings of \$206.54, \$1668.64, and \$2992.67 dollars per patient, respectively
- Assuming SLT repeated 3 years later, the use of primary SLT over mono-, bi-, and tri-drug therapy produced a 6-year cumulative cost savings of \$580.52, \$2042.82, and \$3366.65 per patient, respectively
- SLT as primary therapy, at a per-patient level, offers a modest potential cost saving over primary medical therapy in the management of open-angle glaucoma

Economics

Cantor LB, Katz LJ, Cheng JW, Chen E, Tong KB, Peabody JW.
Economic evaluation of medication, laser trabeculoplasty and
filtering surgeries in treating patients with glaucoma in the U.S.
Curr Med Res Opin. 2008;24(10):2905-18.

- Laser trabeculoplasty techniques, including SLT, offered a potential cost saving of about \$1,700 for patients who needed two to four medications over 5 years. The study calculated that the 5-year cumulative cost of laser trabeculoplasty was approximately \$4,838, compared to the \$6,571 of medications and \$6,363 of filtration surgery.



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Conclusions

- Safety
- Control
- Compliance
- Quality of life
- Cost-saving

