LASER TRABECULOPLASTY

SLT OR ALT?

WHICH ONE IS MORE EFFECTIVE?
GLAUCOMA TREATMENT

TODAY WE KNOW THAT THE ONLY WAY:

TO REDUCE THE RATE OF PROGRESSION OF GLAUCOMA,

AND

TO PREVENT BLINDNESS DUE TO GLAUCOMA:

IS TO REDUCE THE IOP

NEUROPROTECTORS ??
GENE THERAPY ??
AND NARCOTICS ??
BACKGROUND HISTORY

GLAUCOMA HAS BEEN RECOGNIZED SINCE MANY CENTURIES AGO AND ATTEMPTS HAVE BEEN MADE TO TREAT OR EVEN TO CURE THIS BLINDING DISEASE
UNTIL 20-25 YEARS AGO,

MEDICAL TREATMENT OF GLAUCOMA WAS:

1-PILOCARPINE
   (PARASYMPATHOMIMETICS)
2-EPINEPHRINE
   (SYMPATHOMIMETICS)
3-DIAMOX
TRENDS IN GLAUCOMA MANAGEMENT

IN EARLY 1980’s:

1- THE FIRST TOPICAL SHORT ACTING BET-ABLOCKER (TIMOLOL)

2- AND THE FIRST NEW ADRENERGIC AGENT (PROPINE or DIPIVEFRINE) WERE DISCOVERED
TRENDS IN GLAUCOMA MANAGEMENT....

IN 1990s

- THE NEW TOPICAL MEDICATIONS BECAME AVAILABLE:

  1-CAIs, DROPS
  2-LONG ACTING BETA-BLOCKERS (XE),
  3-ALPHA AGONISTS (ALPHAGAN) AND
    FINALLY
  4-PROSTAGLANDIN ANALOGUES (XALATAN)
    (HYPOTENSIVE LIPIDS)
GLAUCOMA MEDICINES ARE:

1- Beta blockers
2- Adrenergic agents
3- Prostaglandin Derivatives
4- Carbonic anhydrase inhibitors
5- (Cholinergics or miotics)
PITFALLS IN TREATING GLAUCOMA WITH MEDICINE

- Studies of patients who require long term drug treatment (e.g., Diabetes, Hypertension, or Glaucoma) shows that they are not always as compliant as physicians imagine.

There are multiple reasons:

- Social factors: traveling
- Cost of the drugs
- Dosing regimen
- Problems with memory and physical ability
- Lack of education of patients by the physician
- Side effects of the drugs
- .......
SO WHAT IS THE ALTERNATIVE TO MEDICAL TREATMENT???.
LASER TRABECULOPLASTY
LASER
LASER TRABECULOPLASTY
1- ARGON LASER (ALT)

2- YAG LASER (SLT)
ALT

ALT: INTRODUCED IN 1979 FOR TREATMENT OF UNCONTROLLED COAG

IN 1983 NEI SET UP

GLAUCOMA LASER TRIAL
(MULTICENTER, RANDOMIZED CLINICAL TRIAL)

TO COMPARE ALT WITH MEDICAL TREATMENT
GLAUCOMA LASER TRIAL (GLT)

• 271 PATIENTS NEWLY DIAGNOSED WITH COAG;

  ALT IN ONE EYE and
  TIMOLOL 0.5% IN OTHER EYE

FOLLOW UP: 2 YEARS.
If IOP was not controlled, stepped regimen was applied

RESULT: ALT eyes had lower mean IOP and
  fewer of these eyes needed 2 or more drops to control
IN ADDITION:

After this 2 years study
44% were controlled by ALT only.
This increased to 70% when added Timolol

30% were controlled by Timolol only.
This increased to 66% with 2 or more Meds

No major difference in VA or VF
LONGER Follow-up

• After 9 years of follow-up

The eyes treated initially with ALT had lower IOP and better VF and optic disc status than their fellow eyes with topical medication first
Glaucoma laser trial
final result:

Using ALT as first line treatment for COAG is more effective than using medicine first.
SO WHY ALT DID NOT GAIN A WIDESPREAD ACCEPTANCE??
ACCORDING TO MY EXPERIANCE

There were several reasons

1- Temporary efficacy (in some patients)

2- AVERAGE PRESSURE DROP WAS NOT VERY IMPRESSIVE, AND THE

3- Advent of newer and more effective drugs
Other reasons why LTP did not become very popular

4- Limited efficacy IN ALT re-treatment
5- High incidence of Post-laser IOP rise and PAS formation and finally:
6- Coagulative damage to trabecular meshwork
Human TM (ALT 50 mic spot)
Because of these reasons:

- SCIENTISTS LOOKED FOR ANOTHER TYPE OF LASER WHICH IS AS EFFECTIVE AS ALT BUT NOT AS DESTRUCTIVE

- YAG LASER (Selective Laser Trabeculoplasty): (SLT)
The big advantage of SLT over ALT is that there is no tissue damage and treatment can be repeated several times.
## Differences between SLT Laser and ALT Laser

<table>
<thead>
<tr>
<th></th>
<th>SLT</th>
<th>ALT</th>
<th>Ratio</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of spots</td>
<td>50-100</td>
<td>50-100?</td>
<td></td>
</tr>
<tr>
<td>Energy</td>
<td>0.8-1 mJ</td>
<td>400-600 mW</td>
<td>1:100</td>
</tr>
<tr>
<td>Fluence (mJ/mm²)</td>
<td>6</td>
<td>40,000</td>
<td>1:6000</td>
</tr>
<tr>
<td>Exposure Time</td>
<td>3 nsec</td>
<td>100,000,000 nsec</td>
<td></td>
</tr>
</tbody>
</table>
Spot size difference between ALT SLT
YAG LASER TRABECULOPLASTY (SLT)

Q-SWITCHED, 3 NONOSECOND PULSE, FREQUENCY DOUBLED, (Nd:YAG LASER WITH 532 nm)
SLT

(YAG LASER TRABECULOPLASTY)

• FIRST DESCRIBED IN 2000
THE EFFICACY AND SAFETY OF THIS LASER WAS INVESTIGATED IN A MULTI-CENTER LASER TRIAL. THE RESULT of this trial was:

A SIGNIFICANT DECREASE OF IOP IN

1-PATIENTS WITH UNTREATED COAG,
2-PATIENTS WHO WERE ON GLAUCOMA DROPS
3-AND EVEN IN PATIENTS WITH PREVIOUS ALT
SLECTIVE LASER TRABECULOPLASTY (SLT)
Contact lens

- Latina SLT
- Goldmann 3 mirror
- Ritch
SLT
IN SLT

- pigmented cells are selectively targeted with no damage to adjacent non-pigmented cells
Differences in Cellular Response

• **ALT**
  - High thermal absorption with damage to the adjacent tissue

• **SLT**
  - Only pigmented cells are affected
HOW DOES SLT WORK?

The mechanism is still unknown

???
The theory is that:

When the pigmented cells absorb the laser light, the laser causes just cellular cavitation.
Then

Cellular cavitation triggers cytokine response

- Cytokines recruit macrophages
- Macrophages help clear cellular debris

RESULT: THIS IMPROVES OUTFLOW FACILITY
SLT MAY EFFECT ON THE OTHER EYE TOO

In monkey eyes there is a 300% to 400% increase in the number of macrophages. There are similar results in human too.

These macrophages localize within the TM, but may move to the Spleen then gradually release to repair the TM even in the second eye. This is a long term phase that can last from months up to years.
CONTRAINDICATIONS FOR SLT

THE FOLLOWING PATIENTS ARE NOT GOOD CANDIDATES FOR SLT:

1-ACG
2-NVG
3-EYES WITH PAS FORMATION
4-UVEITIS
5-TRAUMATIC GLAUCOMA?
SLT: Clinical Studies

USA
England
Canadian
Norwegian
In USA Study
SLT was performed on:

• 120 patients in this study
• AGE - 18 years or older
• IOP $\geq$ 22 mm Hg

Group 1: Uncontrolled OAG on max. tolerated medical Therapy
(Max Rx Group : 45%)

Group 2: Uncontrolled OAG with prior failed ALT
(PFLT Group 55%)
Diagnosis - 120 patients

Patients Treated:

- POAG 99
- PXF 7
- Pigmentary 7
- Mixed Mec. 4
- Pseudophakia 2
- Juvenile 1

Latina, et al - US
Selective Laser Trabeculoplasty
U.S. Clinical Trial Results

SLT-Treated Eyes Mean IOP Reductions at 26 weeks Responders (> 3mmHg IOP reduction) - 71/101 patients

Latina, et al - US
SLT
Result of US trial

• A safe and effective treatment to lower IOP in patients with COAG.

• IOP reduction could be maintained for up to 26 weeks in this U.S. clinical trial

Latina, et al - US
PERSONAL EXPERIENCE

- WE HAVE FOLLOWED 118 PATIENTS WITH GLAUCOMA FOR 18 MONTHS:
  - SIMPLE POAG,
  - PIGMENTARY GL,
  - PXF GLAUCOMA AND
  - JUVENILE GLAUCOMA

- 62 PATIENTS RECEIVED ALT
- 56 PATIENTS RECEIVED SLT
IOP Measurement Following ALT and SLT

ALT

SLT

Time

Pre-op 1W 1M 3M 6M 16M 18M

ALT: 62
SLT: 56

ALT: 62
30
SLT: 56
27
IN A SEPARATE STUDY OF 124 PATIENTS WHO HAD SLT:

RESULT SHOWED THAT:
82% (102 Pts) ACHIVED THEIR TARGET PRESSURE AT 9 MONTHS

27% (28 Pts) REQUIRED FEWER MEDICATIONS
67% (68 Pts) REMAINED ON THE SAME MEDICATIONS
ONLY 6% (6 Pts) REQUIRED AN INCREASE IN MEDICATIONS
COPLICATIONS OF SLT ARE THE SAME AS IN ALT

1-IOP RISE IN SOME PATIENTS (immediately after laser) IS NOT AS COMMON AS ALT

2-INFLAMMATION AND

3-FAILURE/SHORT TERM EFFECT (in some patients)

Definition of FAILURE is:
IOP decreases less than 3mm Hg or less that 20% of the baseline in two successive measurement 6 weeks after the procedure.
If we don’t achieve no IOP drop after 6 weeks, we would say the procedure is a failure.

If it does not work for the first time, it will probably fail the second time.

If the patient responds to SLT for the first time, it will respond for the second or third time too.
SLT OR ALT?

WHICH ONE IS BETTER AND MORE EFFECTIVE
SLT IS BETTER BECAUSE OF TWO IMPORTANT REASONS:

1-NO TISSUE DESTRUCTION AND
2-REPEATABILITY OF SLT
OTHER ADVANTAGES OF SLT

• 1-EFFICACY: AS EFFECTIVE AS MEDICINE
• 2-SFETY: VERY SAFE PROCEDURE
• 3-LESS EXPENSIVE THAN MEDICATION IN LONG RUN
• 4-IT MAY PREVENT NOCTURAL ELEVATION OF IOP?
• 5-CAN BE REPEATED SEVERAL TIMES
FACT:
I AM NOT RECOMMENDING TO DO SLT AS PRIMARY TREATMENT IN EVERY SINGLE PATIENTS.
SLT

NOW WE OFFER THIS PROCEDURE

- AS INITIAL TREATMENT OF GLAUCOMA
- WHEN A PATIENT REQUIRES MORE THAN ONE THERAPEUTIC AGENT TO CONTROL HIS/HER GLAUCOMA
- ANY ONE WHO HAS SIDE EFFECTS OF THE GLAUCOMA DROPS

AND FINALLY

- ANY ONE COMPLAINING ABOUT THE COST OF MEDICATIONS
THANK YOU

• THANK YOU
• THANK YOU
• THANK YOU
• THANK YOU
• THANK YOU
• ...........
THE END