

LASER THERAPY & ADVANCED PROCEDURES IN OPTOMETRY

Nate Lighthizer, O.D., F.A.A.O.

1

Overview

- ▣ Why we use lasers
- ▣ YAG capsulotomy
- ▣ Laser Peripheral Iridotomy (LPI or PI)
- ▣ Argon Laser Peripheral Iridoplasty (ALPI)
- ▣ Argon Laser Trabeculoplasty (ALT)
- ▣ Selective Laser Trabeculoplasty (SLT)
- ▣ Other Laser Trabeculoplasty

2

Why do we use lasers?

- ▣ Vision is decreased from PCO following cataract surgery
- ▣ Narrow angles/angle closure
- ▣ Glaucoma is progressing in a pt on max meds
 - Something else needs to be done
 - Surgery not wanted yet
- ▣ Compliance issues
- ▣ Cost issues
- ▣ Convenience issues
- ▣ Doctor preference

3

Posterior Capsular Opacification (PCO)

- ▣ Lens capsular bag has an anterior and posterior surface
 - Anterior surface usually removed w/ capsulorhexis
- ▣ PCO is the formation of a cloudy membrane on the posterior surface of the capsular bag following ECCE
 - AKA: Secondary cataract

4

PCO

- ▣ Incidence:
 - Most common complication of post ECCE
 - 10-80% of eyes following cataract surgery
 - Can form anywhere from a few days to years post surgery
 - Younger patients higher risk of PCO
 - IOL's
 - Silicone > acrylic
- ▣ Prevention:
 - Capsulotomy during surgery
 - Posterior capsular polishing

5

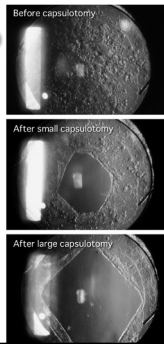
YAG Laser

- ▣ Nd: YAG laser
 - Neodymium: Yttrium aluminum garnet laser
- ▣ Tissue interaction: Photodisruptive laser
 - High light energy levels cause the tissues to be reduced to plasma, disintegrating the tissue
 - A large amount of energy is delivered into very small focal spots in a very brief duration of time
 - 4 nsec
 - No thermal reaction/No coagulation when bv's are hit
 - Pigment independent*

6

YAG Cap Pre-op

- ▣ Visual acuity, glare testing, PAM/Heine lambda
 - Vision 20/30 or worse
- ▣ Slit Lamp Exam
- ▣ IOP's
- ▣ Dilate - will be able to visualize the PCO much better
- ▣ Posterior segment exam
 - Macula
 - Periphery
- ▣ Educate Pt
- ▣ Informed Consent Signed



7

YAG Cap Risks, Complications, Contraindications

CONTRAINDICATIONS

1. Corneal problems
2. Intraocular inflammation
3. Macular problems
4. Patient unable to hold steady or fixate

RISKS/COMPLICATIONS

1. IOP spike/elevation
 - Most often transient
2. Inflammation
 - Pred Forte QID X 1 week
 - Use appropriate laser energy
3. Floaters
4. IOL Pitting
 - Silicone IOL most common
5. Retinal detachment
6. Permanent vision loss

8

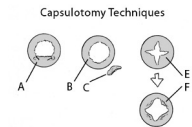
YAG Cap Procedure

- ▣ Patient Pre-op Drops
 - dilating drops
 - 1 drop Alphagan or Iopidine 5 minutes prior to laser
- ▣ Laser Settings
 - Energy 1.3 - 2.5 mJ
 - Spot Size fixed
 - Duration fixed
 - Pulses 1
 - Offset 250 microns

9

YAG Cap Procedure

- ▣ Focus HeNe beams on the PCO
- ▣ Perform the procedure
 - No pain for patients
 - May feel popping/snap/clap in ears
- ▣ Usually done in a cruciate pattern
- ▣ Other patterns:
 - Horseshoe
 - Circular



10

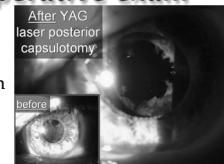
YAG Cap Procedure

- ▣ Post-op Care
 - Remove laser lens
 - Rinse Eye/Clean eye
 - 1 drop of Alphagan or Iopidine post-laser
 - IOP measurement 15-30 minutes post-laser
- ▣ Post-op drops
 - Pred Forte QID to surgical eye X 1 week
 - Pt ed - S/S of RD
- ▣ RTC 1 week for f/u

11

1 week post-operative exam

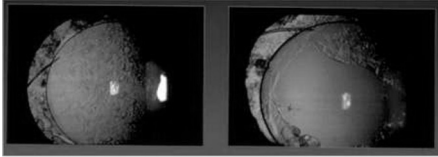
- ▣ VA's
- ▣ Anterior segment exam
 - Check for cell/flare
- ▣ Check IOP
- ▣ Dilate
 - Check for holes/tears/RD's
- ▣ D/C Pred Forte
- ▣ Release back to referring doc



12

YAG Cap

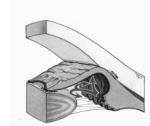
- ▣ Reimbursement codes
 - 66821
- ▣ 90 day global period



13

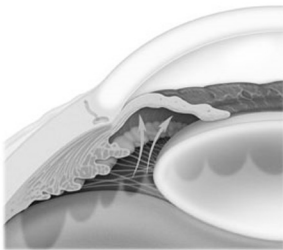
Anatomically Narrow Angles / Angle Closure

- ▣ Anatomic disorder characterized by peripheral iris & TM apposition
- ▣ 4 basic forms:
 - Pupillary block
 - Plateau iris
 - Phacomorphic glaucoma
 - Malignant glaucoma



14

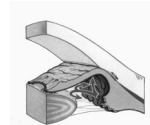
Pupillary Block Glaucoma Mechanism



15

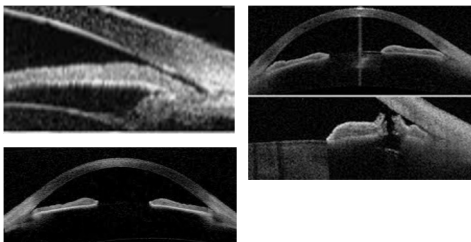
Anatomically Narrow Angles / Angle Closure

- ▣ Anatomic disorder characterized by peripheral iris & TM apposition
- ▣ 4 basic forms:
 - Pupillary block
 - Plateau iris
 - Phacomorphic glaucoma
 - Malignant glaucoma



16

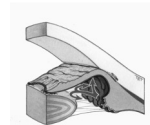
Plateau Iris Syndrome



17

Anatomically Narrow Angles / Angle Closure

- ▣ Anatomic disorder characterized by peripheral iris & TM apposition
- ▣ 4 basic forms:
 - Pupillary block
 - Plateau iris
 - Phacomorphic glaucoma
 - Malignant glaucoma



18

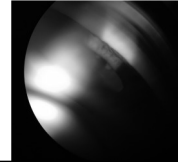
PI Indications

- ▣ Primary angle closure
- ▣ Plateau iris syndrome/configuration
- ▣ Secondary pupillary block
 - Phacomorphic, malignant glaucomas
- ▣ Pigmentary glaucoma
- ▣ Prophylaxis*
 - Narrow angles on gonioscopy
 - Most often reason why PI is done

19

Laser peripheral iridotomy (LPI)

- ▣ How likely is this patient to develop glaucoma?
- ▣ How do we predict whether she will progress?
- ▣ How effective is LPI?
- ▣ What do we do if LPI fails?



20

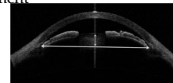
A Simplified Classification Scheme

1. Anatomically narrow (PACS)
 - Indentation gonioscopy opens angle
 - Normal IOP
 - Heightened suspicion
 2. Anterior synechiae and/or elevated IOP (PAC)
 - Minimal natural history data
 3. Closed angles and glaucomatous damage (PACG)
- (Fourth category: Acute symptomatic angle closure)

21

How narrow is too narrow?

- ▣ Gonioscopy: iridotrabecular contact in at least 180 degrees
 - Iridotrabecular contact = failure to see posterior meshwork
- ▣ AS-OCT: angle opening is less than 5-10 degrees
 - Visante: use lens vault measurement



22

A Simplified Classification Scheme

1. Anatomically narrow (PACS)
 - Indentation gonioscopy opens angle
 - Normal IOP
 - Heightened suspicion
 2. Anterior synechiae and/or elevated IOP (PAC)
 - Minimal natural history data
 3. Closed angles and glaucomatous damage (PACG)
- (Fourth category: Acute symptomatic angle closure)

23

PI Alternatives

- ▣ Surgical Iridectomy
 - Equal results to laser PI
 - Much more invasive
 - More trauma to iris
 - Infection
- If concurrent surgery not occurring, laser PI is the way to go

24

PI Pre-op Exam

- ▣ Visual acuity
- ▣ Slit Lamp Exam OU
 - Note lid position
 - Note AC depth
- ▣ Gonio OU
 - Pigment in the TM?
 - Neovascularization?
 - Peripheral anterior synechiae?
- ▣ IOP's OU
- ▣ Educate Pt
- ▣ Informed Consent Signed

25

PI Risks, Complications, Contraindications

CONTRAINDICATIONS

1. Corneal problems
2. Intraocular inflammation
3. Iris in contact with endo
4. Angle closure from NVG or inflammatory glaucoma
5. Patient unable to hold steady or fixate
6. Macular problems?

RISKS/COMPLICATIONS

1. Non-perforation
2. IOP spike/elevation
 - Most often transient
3. Inflammation
 - Pred Forte QID X 1 week
 - Use appropriate laser energy
- ▣ Others: hyphema, synechiae, peaked pupil, floaters, blur, monocular diplopia, RD, permanent vision loss

26

PI Procedure

- ▣ Patient Pre-op Drops
 - 1 drop Pilocarpine 1% or 2% OU
 - 1 drop Alphagan or Iopidine OU
- ▣ Laser Settings
 - Depends on which laser you use

27

PI Laser Options

ARGON LASER

- ▣ Less commonly used
- ▣ Advantages:
 - Less bleeding
 - Less debris
- ▣ Disadvantages:
 - Less successful compared to YAG laser in penetration
 - Requires more shots
- ▣ Settings:
 - Spot size = 50 microns
 - Duration = 0.1 sec
 - Power = 300-1200 mW

YAG LASER

- ▣ More commonly used
- ▣ Advantages:
 - Very good penetration rate
- ▣ Disadvantages:
 - More likely to bleed
 - Much more debris
- ▣ Settings:
 - Spot size = fixed
 - Duration = fixed
 - Energy = 2.0 - 5.0 mJ
 - Offset = 0 - 250 microns

28

PI Procedure

- ▣ Sit patient comfortably
- ▣ Adjust laser for your comfort
 - Armrest, oculars, controls
- ▣ Instill proparacaine in both eyes
- ▣ Select PI location
 - Usually superiorly under lid
 - Crypt
 - 11:00 or 1:00
- ▣ Place Abraham Iridotomy laser lens on eye with goniosol or cellulisc
 - Orientation of lens matters
 - Button @ 11 or 1 o'clock (for a superior PI)

29

PI Procedure

- ▣ Focus HeNe beams on the iris
- ▣ Perform the procedure OU
 - Argon first for pre-treatment
 - YAG to finish PI
 - No pain for patients - usually
 - May feel popping/snap/clap in ears
- Takes longer than a YAG Cap
 - Occasional bleeding
 - Debris/pigment
 - "pigment plume"

30

PI Procedure

- ▣ It may take 1-2 visits depending on the thickness of the iris to get through (usually only 1 visit)
 - 150-250 mJ maximum energy for me on 1 visit
- ▣ Goals:
 - patent PI \approx 1mm in size
 - Deepening of the AC
 - IOP control

31

PI Procedure

- ▣ Post-op Care
 - Remove laser lens
 - Rinse Eye/Clean eye
 - 1 drop of Alphagan or Iopidine post-laser
 - IOP measurement 30 minutes post-laser
- ▣ Post-op drops
 - Pred Forte QID to surgical eye X 1 week
- ▣ Pt ed
- ▣ RTC 1 week for f/u

32

1 week post-operative exam

- ▣ VA's
- ▣ Anterior segment exam
 - Check for cell/flare
 - Note AC depth
 - Is the PI patent?
- ▣ Gonio - did angle deepen?
- ▣ Check IOP
- ▣ D/C Pred Forte
- ▣ Release back to referring doc

33

Peripheral Iridotomy (PI)

- ▣ Reimbursement codes
 - 66761
- ▣ 10 day global period

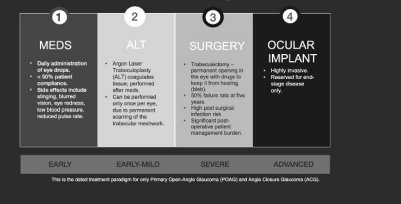
34

Why do we need lasers?

- ▣ Glaucoma is progressing in a pt on max meds
 - Something else needs to be done
 - Surgery not wanted yet
- ▣ Compliance issues
- ▣ Cost issues
- ▣ Convenience/quality of life issues
- ▣ Systemic side effect issues of drops
- ▣ Doctor preference

35

Glaucoma: Traditional Paradigm



36

Why do we need lasers?

- ▣ Glaucoma is progressing in a pt on max meds
 - Something else needs to be done
 - Surgery not wanted yet
- ▣ Compliance issues
- ▣ Cost issues
- ▣ Convenience/quality of life issues
- ▣ Systemic side effect issues of drops
- ▣ Doctor preference

37

Laser Trabeculoplasty (LTP)

- ▣ Use of laser light to burn areas of the TM to increase aqueous outflow
- ▣ Two types
 - Argon laser trabeculoplasty (ALT)
 - Selective laser trabeculoplasty (SLT)
- ▣ Both increase aqueous outflow

38

Laser Trabeculoplasty (LTP)

- ▣ Most common laser procedure for OAG
 - ALT in the 90's and early 2000's
 - SLT has largely taken over
- ▣ Usually a Secondary Line of Treatment
 - After meds fail to control IOP
- ▣ Some use as Primary Treatment
- ▣ Universally Accepted

39

Laser Trabeculoplasty (LTP)

- ▣ Glaucoma Laser Trial (1990)
 - Compared ALT to topical meds in the control of IOP and VF and ONH status
 - Results:
 - Pts who underwent ALT as first-line therapy achieved better control of IOP and better VF and ONH status than those treated initially with topical meds
 - 44% proper IOP control in the ALT group
 - 30% proper IOP control in the meds group
 - Fewer eyes that underwent ALT as first-line therapy ultimately required 2 or more meds postoperatively to control IOP

40

LTP Indications

- ▣ POAG
- ▣ Normo-tensive glaucoma
- ▣ Pigmentary dispersion glaucoma
- ▣ Pseudoexfoliative glaucoma

41

LTP Contraindications

- ▣ Advanced POAG
- ▣ Narrow Angle Glaucoma
- ▣ Angle Closure (Emergency IOP decrease)
- ▣ Inflammatory Glaucoma
- ▣ Angle Recession Glaucoma
- ▣ Neovascular Glaucoma
- ▣ Congenital Glaucoma
- ▣ Prior LTP that failed
- ▣ Under 40 years of age
- ▣ Hazy media

42

Argon Laser Trabeculoplasty (ALT)

- ▣ Traditional form of laser therapy for patients with glaucoma
- ▣ Presented as an alternative to filtering surgery for patients whose open angle glaucoma was not controlled by meds
- ▣ Exact mechanism of effect is unknown but:
 - Mechanical effects from laser burns scarring tissue and causing contracting of tissue and opening of adjacent areas of the TM
 - Biologic effects with increased inflammatory cells with "clean up" the TM

43

Argon Laser Trabeculoplasty (ALT)

- ▣ ALT complications/risks
 1. IOP spike/elevation
 - ▣ Most often transient
 - ▣ High risk pt - may consider Diamox
 2. Inflammation
 - ▣ Pred Forte QID X 1 week
 - ▣ Use appropriate laser energy
 3. Peripheral Anterior Synechie (PAS)
 - ▣ As the scar tissue forms from the laser PAS can form
 - ▣ May increase IOP long-term

44

ALT Procedure

- ▣ Patient Pre-op Drops
 - 1 drop Alphagan or Iopidine 15-30 minutes prior to
 - 1 drop pilocarpine 1% (optional)
- ▣ Laser Settings
 - Energy 600 mW
 - Spot Size 50 microns
 - Duration 0.1 sec
 - Pulses 1 (shoots once every time you push the foot pedal)

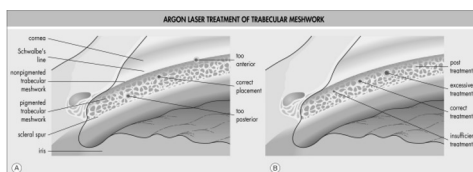
45

ALT Procedure

- ▣ Focus on the anterior aspect of the pigmented TM*****
 - Aim is much more critical with ALT than SLT
- ▣ Adjust Energy as needed
 - Pigment blanching
 - Small bubble formation
- ▣ Treat inferior 180 degrees first
- ▣ Space burns approximately 2 spot sizes apart
 - 45-60 burns per 180 degrees

46

Placement of Laser Burns



47

ALT Post-operative Period

- ▣ Post-op Care
 - 1 drop of Alphagan or Iopidine
 - Check IOP 15-30 minutes after the procedure
 - Continue all glaucoma meds
 - Pred Forte QID X 1 week
 - RTC 1-2 weeks for f/u

48

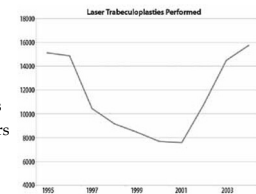
ALT Post-operative Period

- ▣ 1-2 week post-op exam:
 - Check IOP
 - Check for A/C reaction
 - Should be minimal to no C&F
- ▣ 6 week post-op exam:
 - Check IOP
 - Start to consider reducing glaucoma meds if pressure is reduced
 - May consider treating superior 180 degrees

49

Argon Laser Trabeculoplasty (ALT)

- ▣ Long term outcome
 - 80% effective at 1 year
 - 50% effective at 5 years
 - 30% effective at 10 years
- ▣ Retreatments
 - Success rate is much lower
 - More likely to get complications
 - 50% of retreatments require filtering procedure within 6 months to lower IOP



50

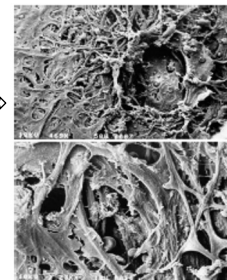
Selective Laser Trabeculoplasty (SLT)

- ▣ Newer form of laser therapy for patients with glaucoma
- ▣ Presented as an alternative to filtering surgery for patients whose open angle glaucoma was not controlled by meds
- ▣ Exact mechanism of effect is unknown but:
 - Biologic effects with increased inflammatory cells with "clean up" the TM
 - Laser energy causes chemical mediators to attract macrophages and phagocytes to come and clean up the debris in the TM

51

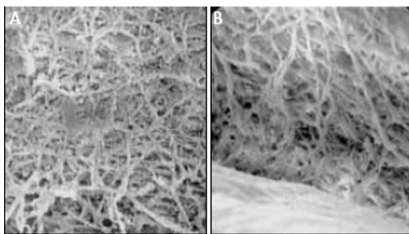
ALT Procedure/SLT Procedure

Scanning electron microscopy comparison of TM after ALT above and SLT below



52

Selective Laser Trabeculoplasty (SLT)



53

Selective Laser Trabeculoplasty (SLT)

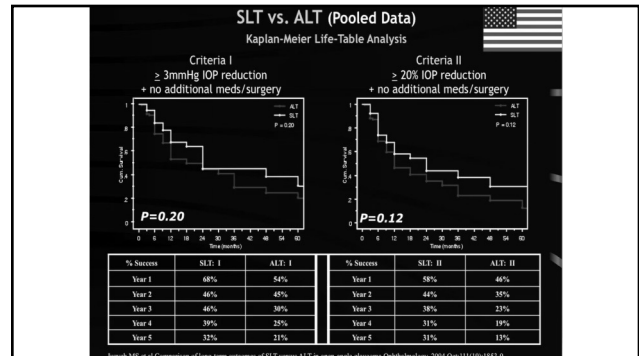
- ▣ Optimal laser is a Q-switched frequency doubled 532 nm Nd:YAG Laser (Lumenis, formerly Coherent, Selecta II Glaucoma Laser System)
- ▣ Permits selective targeting of pigmented TM cells w/o causing structurally or coagulative damage to the TM

54

Thermal Relaxation Time

- SLT works on the principle of Thermalysis which involves the Thermal Relaxation Time
 - The time required by melanin granules to convert electromagnetic energy into thermal energy
 - Melanin has a TRT = 1 microsecond
 - SLT has a pulse duration = 3 nanoseconds
- Since pulse duration is so quick, melanin cannot convert the laser electromagnetic energy into thermal energy
 - No thermal damage ("cold laser")

55



56

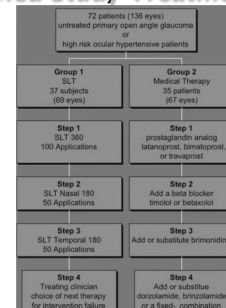
Selective Laser Trabeculoplasty Versus Medical Therapy as Initial Treatment of Glaucoma: A Prospective, Randomized Trial

L. Jay Katz, MD,* William C. Steinmann, MD,† Azad Kabir, MD,‡ Jeanne Molinoux, COA,*
Sheryl S. Wizen, COA,* and George Marcellino, PhD§ the SLT/Med Study Group
J Glaucoma • Volume 21, Number 7, September 2012

- SLT Med Study (2012)
 - Dr. Katz @ Wills Eye in Philadelphia
 - J Glaucoma 2012;21:460-468
 - SLT (100 applications over 360 degrees of TM) vs. prostaglandin analog
 - Primary outcome -> IOP
 - Secondary outcome -> # of treatment steps

57

SLT Med Study Treatment Arms



58

SLT vs. Prostaglandins

- SLT Med Study (2012)

Results:

 1. 29 SLT patients -> IOP reduced from 24.5 to 18.2 (6.3 mmHg reduction)
 - 25 prostaglandin patients -> IOP reduced from 24.7 to 17.7 (7.0 mmHg reduction)
 2. SLT group -> 11% of eyes required additional SLT
 - Prostaglandin group -> 27% of eyes required additional medication

59

SLT Med Study

Conclusions: IOP reduction was similar in both arms after 9 to 12-months follow-up. More treatment steps were necessary to maintain target IOP in the medication group, although there was not a statistically significant difference between groups. These results support the option of SLT as a safe and effective initial therapy in open-angle glaucoma or ocular hypertension.

60

SLT as Primary Therapy

- IOP decreased by 30% (7.7 mmHg), from 25.5 to 17.9 mmHg over the f/u period
- Forty eyes (89%) had a decrease of 5 mmHg or more



"Selective laser trabeculoplasty is effective and safe as a primary treatment for patients with ocular hypertension and open-angle glaucoma."

Arch Ophthalmol. 2003;121: 957-960

61

Selective laser trabeculoplasty versus eye drops for first-line treatment of ocular hypertension and glaucoma (LIGHT): a multicentre randomised controlled trial

Guo G, et al. *Lancet*. 2019;393(10181):10181-10191. doi:10.1016/S0140-6736(19)30000-0

Summary

Background Primary open angle glaucoma and ocular hypertension are habitually treated with eye drops that lower intraocular pressure. Selective laser trabeculoplasty is a safe alternative but is rarely used as first-line treatment. We compared the two.

Methods In this sham-masked, randomised controlled trial treatment-naïve patients with open angle glaucoma or ocular hypertension and no ocular comorbidities were recruited between 2012 and 2014 at six UK hospitals. They were randomly allocated (web-based randomisation) to initial selective laser trabeculoplasty or to eye drops. An objective target intraocular pressure was set according to glaucoma severity. The primary outcome was health-related quality of life (HRQL) at 3 years (assessed by EQ-5D). Secondary outcomes were cost and cost-effectiveness, disease-specific HRQL, clinical effectiveness, and safety. Analysis was by intention to treat. This study is registered at controlled-trials.com (ISRCTN308323).

Findings Of 718 patients enrolled, 356 were randomised to the selective laser trabeculoplasty and 362 to the eye drops group. 652 (91%) returned the primary outcome questionnaire at 36 months. Average EQ-5D score was 0.89 (SD 0.10) in the selective laser trabeculoplasty group versus 0.96 (SD 0.10) in the eye drops group, with no significant difference (difference 0.01, 95% CI -0.01 to 0.03, p=0.23). At 36 months, 74.2% (95% CI 69.3-79.6) of patients in the selective laser trabeculoplasty group required no drops to maintain intraocular pressure at target. Five of patients in the selective laser trabeculoplasty group were within target intraocular pressure at more visits (93.0%) than in the eye drops group (93.3%), with glaucoma surgery to lower intraocular pressure required in more versus 13 patients. Over 36 months, from an ophthalmology cost perspective, there was a 97% probability of selective laser trabeculoplasty as first treatment being more cost-effective than eye drops first at a willingness to pay of £2000 per quality-adjusted life-year gained.

Interpretation Selective laser trabeculoplasty should be offered as a first-line treatment for open angle glaucoma and ocular hypertension, supporting a change in clinical practice.

Funding National Institute for Health Research, Health and Technology Assessment Programme.

Copyright © 2019 The Author(s). Published by Elsevier Ltd. This is an Open Access article under the CC BY 4.0 license.

62

Recent Ground Breaking 3-Year LIGHT Clinical Trial SLT vs Eye Drops

CLINICAL CONCLUSION

"Selective Laser Trabeculoplasty (SLT) should be offered as first-line treatment for open angle glaucoma and ocular hypertension, supporting a change in clinical practice."



QUALITY OF LIFE

The trial supports a longer drop-free period for patients when treated with SLT, which may confer significant benefits to your patient's quality of life.

63

Selective Laser Trabeculoplasty (SLT)

- SLT complications/risks
 - IOP spike/elevation
 - 3-5% risk
 - Most often transient
 - Inflammation
 - Anti-inflammatory
 - Use appropriate laser energy
 - Stromal haze/edema
 - Rare - usually responds to a topical steroid
 - Peripheral Anterior Synechie (PAS)
 - Less likely due to less/no scar tissue formation
 - May increase IOP long-term

64

SLT Procedure

- Patient Pre-op Drops
 - 1 drop Alphagan or Iopidine 15-30 minutes prior to
 - 1 drop pilocarpine 1% (optional)
- Laser Settings
 - Energy 0.6 - 1.2 mJ (0.8 - 1.0 mJ most often used)
 - Spot Size 400 microns
 - Duration 3 nsec
 - Pulses 1 (shoots once every time you push the foot pedal)

65

SLT Procedure

- Sit patient comfortably
- Adjust laser for your comfort
 - Armrest, oculars, controls, safety glasses
- Instill proparacaine in both eyes
- Place laser lens on eye with goniosol or celluvisc
- Gonio mirror usually at 3:00 or 9:00
 - Treat 360 degrees in both eyes unless significant pigment in the TM

66

Latina SLT Gonio Lens



The Latina SLT Gonio Laser Lens was designed specifically for Selective Laser Trabeculoplasty. 1.0x magnification maintains laser spot size and 1 to 1 laser energy delivery. Tilted anterior lens surface corrects astigmatism to maintain circular laser beam profile and give sharp images for examination. Suitable for standard laser trabeculoplasty.

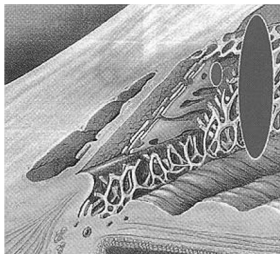
67

Rapid SLT Gonio Lens



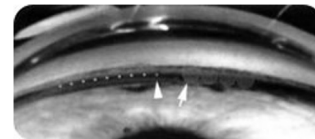
68

Spot Size Comparison



69

Spot Size Comparison



ALT on the left

SLT on the right

70

SLT Procedure

- ▣ Large spot size – cover the entire TM
 - Aim is less critical with SLT compared to ALT
 - Easier to do**
- ▣ Adjust Energy as needed (start around 0.8 mJ)
 - Usually don't want to see pigment blanching w/ SLT
 - Small bubble formation
- ▣ Treat 360 degrees in both eyes unless significant pigment in the TM
- ▣ Space burns right next to each other
 - 45-60 burns per 180 degrees

71

SLT Post-operative Period

- ▣ Post-op Care
 - 1 drop of Alphagan or Iopidine
 - Check IOP 15-30 minutes after the procedure
 - Continue all glaucoma meds
 - Give pt post-op med(s)
 - RTC 1-2 weeks for f/u

72

SLT Post-operative Period

American Glaucoma Society Meeting

NSAIDs, steroids boost short-term results of laser trabeculoplasty

March 5, 2019

NEW YORK — Data from the Steroids After Laser Trabeculoplasty trial showed both NSAIDs and steroids resulted in statistically significant short-term IOP lowering compared with a placebo, according to a speaker here.

"Both NSAIDs and steroids resulted in an approximate twofold improvement of IOP compared to placebo in a short-term result. So, practically, short-term postop use of NSAIDs or steroid drops may improve pressure after SLT in the short term," Bylyvia Groth, MD, said at the American Glaucoma Society annual meeting.

SEE ALSO

Middle-age men presents with bilateral progressive...
SLT may be effective in severe primary open-angle...
Near reduction after PPV, LADK require aggressive...

The double-masked, randomized, placebo-controlled, dual-center, multi-surgeon trial included 96 eyes, all pretreated with one drop of apraclonidine immediately before laser treatment. Twenty-eight eyes received NSAIDs, 37 received steroids, and 31 received saline tears after surgery. At baseline, patients in all groups were similar with regard to demographics and IOP.

At 12 weeks, IOP decreased a mean 6.4 mm Hg ($P = .002$) in the NSAID group and a mean 5.2 mm Hg in the steroid group ($P = .02$), both statistically significant decreases compared with the saline placebo group, which decreased a mean 3 mm Hg.

"A future direction for this study could be to determine if applying both drops could have a synergistic effect," Groth said. — *By Robert Lindehan*

73

SLT Post-operative Period

- ▣ 1-2 week post-op exam:
 - Check IOP
 - Check for A/C reaction
 - Should be minimal to no C&F
- ▣ 6 week post-op exam:
 - Check IOP
 - Start to consider reducing glaucoma meds if pressure is reduced
 - May consider treating superior 180 degrees???

74

Selective Laser Trabeculoplasty (SLT)

- ▣ Long term outcome
 - 80-90% effective at 1 year
 - 40-50% effective at 5 years
 - 10-30% effective at 10 years
- ▣ Tends to be very effective for 12-48 months
 - Effect perhaps wanes after that

75

Selective Laser Trabeculoplasty (SLT)

- ▣ Retreatments
 - Since no mechanical damage -> can we repeat SLT???

76

SLT Enhancement & Repeatability



- ▣ SLT Enhancement: Treating previously untreated area (27 eyes)
- ▣ Repeatability: Re-treating previously treated area (15 eyes)
- ▣ Retrospective analysis of case notes
- ▣ Average SLT Life
 - After enhancement: 18.26 months
 - After repeat treatment: 17.47 months
- ▣ SLT enhancement success rate
 - One year: 70.37%
 - Two years: 55.55%
 - Three years: 25.93%
- ▣ SLT repeat treatment success rate
 - One year: 70.37%
 - Two years: 53.33%

Nagar M, Shah N, Vadav R: AAO Poster, Las Vegas 2006

77

Repeatability of 360° SLT in OAG



- ▣ 52 Eyes with successful IOP reduction for at least one year
 - Pretreatment IOP: 21.1 mmHg
 - Post-treatment IOP at one year: 17.0 mm Hg
 - IOP reduction of 4.1 mmHg
- ▣ Retreated with 360° SLT
 - IOP reduction of re-treated eyes: 3.6 mm Hg

Bournias TE, Lai J: AAO Paper, Las Vegas 2006

78

Selective Laser Trabeculoplasty (SLT)

- ▣ Retreatments
 - Since no mechanical damage -> can repeat SLT
- How many times do we repeat it?
 - Usually twice

79

ALT & SLT Summary

- ▣ Positives
 - Work about 80-95% of the time
 - On average, takes the place of 1 medication
 - ALT & SLT average IOP reduction of 20-35%
 - ALT 20-25% reduction
 - SLT 28-35% reduction as primary therapy
 - SLT 21-25% reduction as secondary therapy
 - Doesn't interfere with other treatments or meds
- ▣ Negatives
 - Effect tends to diminish over time
 - ALT has more side effects and fails more often as time goes by than SLT

80

ALT & SLT Summary

- ▣ Code for ALT & SLT is the same
 - 65855
- ▣ Global Period is the same as well
 - 10 global period
 - Contrast that to YAG cap & laser PI
 - 90 days

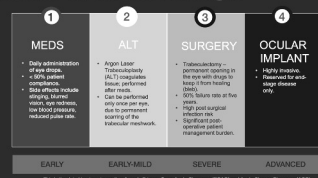
81

ALT & SLT Summary

- ▣ Positives
 - Work about 80-95% of the time
 - On average, takes the place of 1 medication
 - ALT & SLT average IOP reduction of 20-35%
 - ALT 20-25% reduction
 - SLT 28-35% reduction as primary therapy
 - SLT 21-25% reduction as secondary therapy
 - Doesn't interfere with other treatments or meds
 - Cost benefit?
- ▣ Negatives
 - Effect tends to diminish over time
 - ALT has more side effects and fails more often as time goes by than SLT

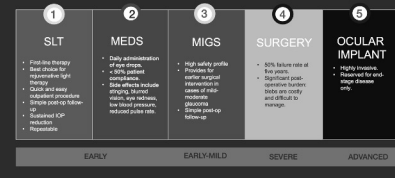
82

Glaucoma: Traditional Paradigm



83

Glaucoma: New Paradigm



84

Overview

- ▣ Eyelid anatomy review
- ▣ Eyelid lesions
 - Review
 - Benign vs. Precursors vs. Cancer
 - How it relates to the anatomy
- ▣ Eyelid surgery clinical tips
- ▣ Lesion removal techniques/terms
- ▣ Radiofrequency surgery (Ellman Unit)
 - Indications
 - Contraindications
 - Techniques for removal of lesions
 - Videos
- ▣ Chalazion management

85

Keep in mind...

- ▣ Most eyelid lesions are benign
- ▣ Benign lesions originate in the skin (epidermis) and grow outward
- ▣ The skin of the eyelid is ideally suited for office surgery

86

Unique Features of the Eyelid Skin

- ▣ Very thin (4 – 5 cell layers thick)
- ▣ Uniform depth
- ▣ Fastest turnover (5 – 7 days)
- ▣ *No dermal papilla present (absent rete ridges & rete pegs)*
- ▣ *Potential space between epidermis & dermis accommodates local anesthetic well*

87

Eyelid Surgery: Clinical Tips...

- ▣ Lid Margin: Stay 2 mm from margin is possible
- ▣ Eyelid proper: Skin is only 4 – 5 cell layers thick
- ▣ Inner canthus: Beware lacrimal apparatus, angular vein, etc...
- ▣ Outer Canthus: Beware moving outer canthus up or down as this significantly changes individuals appearance
- ▣ Lid Crease: Can be altered
- ▣ Brow: Stay 2 mm below the brow if possible.

88

Common eyelid lesions

- ▣ Benign
 - Hyperkeratoses: eg, squamous papilloma
 - Pseudoepitheliomas: eg, seborrheic keratosis
 - Cysts: eg, chalazion
 - Nevi: eg, Clark nevus
- ▣ The Gray Zone (pre-malignant): eg, actinic keratosis
- ▣ Malignant: eg, squamous cell carcinoma

89

Lid Lesion Overview

- | | |
|--|--|
| <ul style="list-style-type: none"> ▣ Benign Lid Lesions <ul style="list-style-type: none"> ▪ Chalazion ▪ Skin tag/papilloma ▪ Verrucae ▪ Seborrheic Keratosis ▪ Cyst of Moll & Zeiss ▪ Sebaceous Cyst ▪ Freckle/nevus | <ul style="list-style-type: none"> ▣ Precursors To Cancer <ul style="list-style-type: none"> ▪ Actinic Keratosis ▪ Keratoacanthoma ▣ Cancer <ul style="list-style-type: none"> ▪ Basal Cell Carcinoma ▪ Squamous Cell Carcinoma ▪ Malignant Melanoma ▪ Sebaceous Gland Carcinoma |
|--|--|

90

Ask yourself: Is it Benign???

- ✓ **H**: loss of hair bearing structures?
- **A**: asymmetrical?
- **A**: abnormal blood vessels (telangectasia's)?
- **B**: borders irregular?
- ✓ **B**: bleeding reported?
- **C**: multicolored?
- ✓ **C**: change in the size or color of the lesion?
- ✓ **D**: overall diameter > 5 mm?

91

Lid Lesions

- Lesion work-up
 - How long has that been there?
 - Is it changing/enlarging?
 - Is it bothersome?
 - Is it bleeding?
 - Personal history of cancer?
- Is it ulcerated?
- Is there hair loss?
- Is there destruction of tissue?

92

Benign Lid Lesions – Squamous Cell Papilloma

- AKA papilloma or Skin Tag
- Squamous papillomas are the most common benign neoplasms of the eyelid and conj**
- Usually not bothersome to patient other than cosmetic concerns
- Often been there for many years
- More likely seen in overweight people

93

Benign Lid Lesions – Squamous Cell Papilloma

- Signs:
 - Flesh-colored, avascular pedunculated lesion
 - Often seen at areas of skin rubbing
 - May be one or several
- DDx:
 - Verruca vulgaris
 - Seborrheic keratosis
 - Intradermal nevus
- Tx:
 - Simple excision at the base of the lesion

94

Benign Lid Lesions – Verucca Vulgaris

- AKA Viral Warts or Common Warts
- Caused by epidermal infection with the HPV
 - Spread by direct contact and fomites
 - Contagious***
- More common in children and young adults
- May occur anywhere on the skin
 - Occasionally on the eyelids

95

Benign Lid Lesions – Verucca Vulgaris

- Signs:
 - Single or multiple elevated flesh-colored lesions with an irregular, hyperkeratotic papillomatous surface
 - If on lid margin can shed viral particles into the tear film -> mild viral conjunctivitis
- DDx:
 - Skin tags
- Treatment:
 - Observation
 - Simple excision

96

Benign Lid Lesions – Seborrheic Keratosis

- ▣ AKA Basal cell papilloma
- ▣ Common, slow growing benign epithelial neoplasm most often found on the face, trunk, and extremities of older individuals
- ▣ Signs:
 - Single or multiple discrete, greasy brown plaque with a “stuck on” appearance

97

Benign Lid Lesions – Seborrheic Keratosis

- ▣ DDx:
 - Pigmented basal cell carcinoma
 - Skin nevus
 - Malignant melanoma
 - Verruca vulgaris
 - Skin tag
- ▣ Tx:
 - Shave excision of flat lesions
 - Excision of pedunculated lesions

[Elman unit Seborrheic keratosis removal](#)

98

Benign Lid Lesions – Cyst of Zeis

- ▣ Small, non-translucent cyst on the anterior lid margin arising from obstructed sebaceous glands associated with the eyelash follicle
- ▣ Only problem may be a cosmetic concern for pt
- ▣ Basically is a type of sebaceous cyst
- ▣ Tx:
 - Surgical excision/drainage
 - Pt ed they may recur
 -

99

Benign Lid Lesions – Cyst of Moll

- ▣ Cyst of Moll (AKA apocrine hydrocystoma) = small retention cyst of the lid margin apocrine glands.
- ▣ Appears as a round, non-tender, translucent fluid-filled lesion on the anterior lid margin.
- ▣ Only problem may be a cosmetic concern for pt
- ▣ Tx:
 - Surgical excision/drainage
 - Pt ed they may recur

100

Benign Lid Lesions – Sebaceous Cyst

- ▣ Benign cyst filled with cheesy sebum from a sebaceous gland in the skin
- ▣ Caused by a blocked sebaceous gland/follicle
- ▣ May be found on the eyelid or ocular adnexa
- ▣ Only problem may be a cosmetic concern for pt
- ▣ Tx:
 - Surgical excision/drainage
 - Pt ed they can recur

101

Epidermal Inclusion Cyst

- 2nd most common benign lesion after the epithelial hyperplasias
- develop from epidermal cells trapped within the hair follicle, allowing keratin to accumulate beneath the cutaneous surface

102

Benign Lid Lesions - Freckle & Nevus

- ▣ Freckle = brown macule due to increased melanin in the epidermal basal layer, usually in sunlight exposed areas
- ▣ Nevus = sharply demarcated lesion of the skin
 - AKA birthmarks or moles
 - Benign by definition
 - Correct term is melanocytic nevus for most lesions
 - 4 main types:
 - Junctional nevus
 - Compound nevus
 - Intradermal nevus
 - Dysplastic nevus

103

Benign Lid Lesions - Freckle & Nevus

- ▣ Junctional nevus - occurs more often in young individuals. Usually brown macule. Nevus cells are located at the junction of the epidermis and dermis and have low potential for malignant transformation (although higher than the next 2).
- ▣ Compound nevus - occurs more often in middle aged individuals. Usually light tan-dark brown slightly raised papular lesion. Nevus cells extend from the epidermis into the dermis. It has low malignant potential.
- ▣ Intradermal nevus - most common nevus. Typically occurs in old age. Usually papillomatous lesion and flesh-colored (not pigmented). Nevus cells are confined to the dermis. No malignancy potential.
- ▣ Dysplastic nevus - usually a compound nevus with cellular and architectural dysplasia. Can be flat or raised. Typically larger than normal nevi and tend to have irregular borders and coloration. More likely to transform into melanoma.

104

Benign Lid Lesions - Freckle & Nevus

- ▣ Signs:
 - Usually pigmented, flat or slightly elevated skin lesion
 - Located anywhere on the body
 - Frequently at the lid margin
- ▣ DDx:
 - Melanoma
- ▣ Diagnosis:
 - A
 - B
 - C
 - D
 - E

105

Benign Lid Lesions - Nevus

- ▣ Tx:
 - Photodocument q3-6 months for any changes
 - Biopsy if suspicious***
 - If you cut on a melanoma in OK = malpractice***
 - Be darn sure that is not a melanoma***

106

Benign Lid Lesions - Capillary Hemangioma

- ▣ AKA strawberry hemangioma or nevus
- ▣ One of the most common tumors of infancy
 - Usually present shortly after birth
- ▣ Female: male ratio is 3:1
- ▣ May present as a small isolated lesion of minimal clinical significance or as a large disfiguring mass that can cause visual impairment and systemic complications

107

Benign Lid Lesions - Capillary Hemangioma

- ▣ Signs:
 - Unilateral, raised bright red lesion which blanches with pressure
 - May appear dark blue or purple if below the skin
 - Large lesion may cause a mechanical ptosis
 - Large orbital tumors may give rise to proptosis
 - Biggest ocular concern????

108

Benign Lid Lesions – Capillary Hemangioma

- ▣ Tx:
 - Usually just leave it alone and it will go away
 - 30% of lesions resolve by 3 years of age
 - 70% of lesions resolve by 7 years of age
 - Steroid injections – primary treatment
 - Surgical excision/resection
 - Refer to a PCP for any treatment

109

Benign Lid Lesions – Pyogenic Granuloma

- ▣ Most common acquired vascular lesion to involve the eyelids/conj
- ▣ Usually occurs after surgery or trauma to area
- ▣ Symptoms:
 - Asymptomatic
 - Cosmetic concerns
- ▣ Signs:
 - Fast growing, fleshy, pinkish red mass
- ▣ Treatment:
 - Steroid QID X 1-2 weeks
 - Surgical excision

110

Precursors to Cancer – Actinic Keratosis

- ▣ AKA Solar Keratosis
- ▣ Most common pre-cancerous lesion**
 - 60% of predisposed people over the age of 40 will have one of these in their lifetime
- ▣ Elderly, fair-skinned individuals with excessive sunlight exposure
- ▣ Most often seen on the forehead, face, and backs of the hands
- ▣ Low potential for conversion to SCC***
 - 1 in 1000

111

Precursors to Cancer – Actinic Keratosis

- ▣ Signs:
 - Hyperkeratotic plaque with distinct borders and a scaly surface
 - Dry, rough area when running your fingers over it
 - Usually minimally elevated
- ▣ DDx:
 - SCC
 - Seborrheic keratosis

112

Precursors to Cancer – Actinic Keratosis

- ▣ Tx:
 - Precancerous so referral to dermatologist
 - Biopsy & excision
 - Cryotherapy – liquid N2 to freeze the AK
 - 5-FU – chemotherapy agent which causes the area to become red and inflamed and the lesion will then fall off
 - PDT – injecting dye into the bloodstream which makes AK more sensitive to light therapy

113

Precursors to Cancer – Keratoacanthoma

- ▣ Rare tumor usually occurring in fair skinned individuals
- ▣ Often a history of chronic sun exposure
- ▣ More likely seen on the face, neck, hands/forearms
- ▣ Histopathologically, it is regarded as part of the spectrum of SCC
- ▣ Symptoms:
 - Lesion that comes about fairly rapidly (within weeks to months)

114

Precursors to Cancer - Keratoacanthoma

- ▣ Signs: (in order)
 - Pink, rapidly growing hyperkeratotic lesion, often on the lower lid
 - May double or triple in size in weeks
 - Growth ceases for 2-3 months, after which spontaneous involution occurs
 - During the period of regression, a keratin-filled crater may develop
 - Resolution may take up to a year and often leaves a nasty scar

115

Precursors to Cancer - Keratoacanthoma

- ▣ DDx:
 - SCC**
- ▣ Tx:
 - Derm consult
 - Complete surgical excision/biopsy
 - Removal with RFP
 - Cryotherapy
 - Topical or intralesional 5-FU

116

Lid Lesion Overview

- | | |
|--|--|
| <ul style="list-style-type: none"> ▣ Benign Lid Lesions <ul style="list-style-type: none"> ▪ Chalazion ▪ Skin tag/papilloma ▪ Verrucae ▪ Seborrheic Keratosis ▪ Cyst of Moll & Zeiss ▪ Sebaceous Cyst ▪ Freckle/nevus | <ul style="list-style-type: none"> ▣ Precursors To Cancer <ul style="list-style-type: none"> ▪ Actinic Keratosis ▪ Keratoacanthoma ▣ Cancer <ul style="list-style-type: none"> ▪ Basal Cell Carcinoma ▪ Squamous Cell Carcinoma ▪ Malignant Melanoma ▪ Sebaceous Gland Carcinoma |
|--|--|

117

Lesion Work-up

- ▣ Lesion work-up
 - How long has that been there?
 - Is it changing/enlarging?
 - Is it bothersome?
 - Is it bleeding?
 - Personal history of cancer?

 - Is it ulcerated?
 - Is there hair loss?
 - Is there destruction of tissue?

118

Cancer - Basal Cell Carcinoma

- ▣ Slow-growing, locally invasive, non-metastatic tumor
- ▣ Most common malignant lid tumor***
 - 90% of cases
- ▣ 90% of cases occur on the head and neck
 - 10% of these are on the eyelid
- ▣ Risk factors:
 - Fair skin
 - Chronic exposure to UV sunlight
 - Age

119

Cancer - Basal Cell Carcinoma

- ▣ Signs:
 - Most common location is the lower eyelid
 - Medial canthus > upper eyelid > lateral canthus
 - Pearly, raised, rolled edges of a raised or ulcerated firm lesion
 - Rolled, raised, pearly border/margins***
 - Usually not pigmented
 - Often small dilated feeder bv's on its surface

120

Cancer – Basal Cell Carcinoma

- ▣ Signs:
 - Nodular BCC – most common – grows slowly and it may take 1-2 years to reach 0.5 cm in size
 - Noduloulcerative BCC (rodent ulcer) – central ulceration, pearly raised rolled edges and dilated irregular bv's over its lateral margins
 - Sclerosing BCC – less common and harder to diagnose since it infiltrates laterally beneath the epidermis as an indurated plaque

121

Cancer – Basal Cell Carcinoma

- ▣ DDx:
 - SCC
 - Melanoma
- ▣ Tx:
 - Derm/oculoplastics consult
 - Biopsy/excision
 - Chemotherapy cream (5-FU)
 - PDT

122

Cancer – Squamous Cell Carcinoma

- ▣ Much less common, but more aggressive tumor than BCC
 - Metastasis to regional lymph nodes in ≈ 20% of cases
- ▣ 5-10% of eyelid malignancies
- ▣ May arise de novo or from pre-existing actinic keratosis, keratoacanthoma, or carcinoma in situ
- ▣ Risk factors:
 - Fair skin
 - Chronic sun exposure
 - Age

123

Cancer – Squamous Cell Carcinoma

- ▣ Signs:
 - No pathognomonic characteristics
 - Has a predilection for the lower lid, lid margin, and medial canthus
 - May be indistinguishable from BCC
 - Surface vascularization is usually absent
 - Growth tends to be more rapid
 - Hyperkeratosis is more often present

124

Cancer – Squamous Cell Carcinoma

- ▣ Signs:
 - Nodular SCC – hyperkeratotic nodule which may develop crusting erosions
 - Ulcerating SCC – reddish, sharply defined raised or ulcerated scaly plaque
 - Scaler, reddish, dryer look to it***
 - Cutaneous horn – rarest form and has underlying SCC beneath it

125

Cancer – Squamous Cell Carcinoma

- ▣ DDx:
 - BCC
 - Actinic keratosis
 - Keratoacanthoma
- ▣ Tx:
 - Derm/oculoplastics consult
 - Biopsy/excision
 - Chemotherapy cream (5-FU)
 - PDT
 - Much more rare than BCC.... but neglected cases are more likely to metastasize

126

Cancer – Malignant Melanoma

- ▣ Malignant tumor of melanocytes
- ▣ Much less common than other skin cancers
 - But causes 75% of deaths related to skin cancer
- ▣ More often develops in sun-damaged skin
 - Face, head, neck, hands/forearms in older pts
 - But can develop anywhere
 - Iris, choroid, retina, inside of mouth
 - Rarely on the eyelids, but is potentially lethal
- ▣ Pigmentation is a hallmark of malignant melanomas...but
 - ½ of lid melanomas are non-pigmented

127

Cancer – Malignant Melanoma

- ▣ Features suggestive of melanoma:
 - Recent onset of pigmented lesion
 - Change in an existing pigmented lesion
 - Irregular margins
 - Asymmetric shape
 - Color change or presence of multiple colors
 - Diameter greater than 6 mm

128

Cancer – Malignant Melanoma

- ▣ DDx:
 - Nevus
 - Lentigo maligna
 - Seborrheic keratosis
- ▣ Tx:
 - Refer for biopsy/wide excision***
 - May include local lymph node removal
 - If you cut on a melanoma that is malpractice***

129

Lid Lesion Overview

- | | |
|--|--|
| <ul style="list-style-type: none"> ▣ Benign Lid Lesions <ul style="list-style-type: none"> ▪ Chalazion ▪ Skin tag/papilloma ▪ Verrucae ▪ Seborrheic Keratosis ▪ Cyst of Moll & Zeiss ▪ Sebaceous Cyst ▪ Freckle/nevus | <ul style="list-style-type: none"> ▣ Precursors To Cancer <ul style="list-style-type: none"> ▪ Actinic Keratosis ▪ Keratoacanthoma ▣ Cancer <ul style="list-style-type: none"> ▪ Basal Cell Carcinoma ▪ Squamous Cell Carcinoma ▪ Malignant Melanoma ▪ Sebaceous Gland Carcinoma |
|--|--|

130

#1 Recommendation

- ▣ A Radiofrequency Surgical Device
 - RF surface ablation
 - Incisions
 - Excisions
 - Hemostasis/cautery
 - RF Epilation
 - RF punctal occlusion
 - Telangiectasias



131

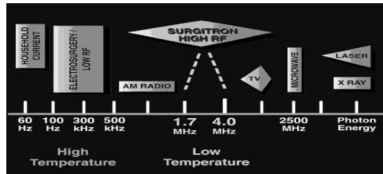
Radiofrequency Surgery - Overview

- ▣ History of Electrosurgery
- ▣ What is Radiofrequency (RF) Surgery
- ▣ Advantages of RF surgery
- ▣ Indications
- ▣ Contraindications
- ▣ Equipment
- ▣ Surgical Technique
 - Specific approaches for various lesions
- ▣ Risks/Complications
- ▣ Post-procedure patient care
- ▣ CPT/Billing Codes

132

What is Radio Surgery?

- Electro surgery at radiofrequency
- Why radio surgery?



- Radio Surgery vs. Electrocautery vs. Hyfrecation

133

HISTORY OF ELECTROSURGERY

- Origins in electrocautery
- Albucasis (980BC) used hot iron to stop bleeding
- Of course, this also caused third degree burns and poor cosmesis
- In 1893, Arsenne d' Arsonval was experimenting with passing high frequency electrical current through tissues and discovered that electric currents >100KHz do not cause muscle spasm.....this is known as the FARADIC EFFECT

134

HISTORY OF ELECTROSURGERY

- In 1975, Dr Irving Ellman designed, patented, and produced a relatively small, lightweight, solid state radiosurgery instrument which produced a 3.9 MHz frequency signal
- In 1978, Manness published a study showing that fully filtered 3.8 MHz waves were optimal for cutting soft tissue

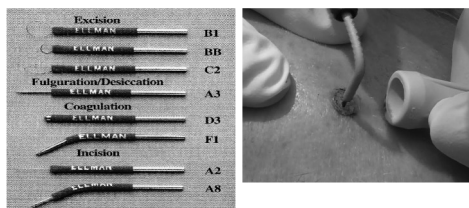
135

What is Radiofrequency (RF) Surgery?

- Radiosurgery is the passage of high frequency radiowaves through soft tissue to cut, coagulate, and/or remove the target tissue
- Resistance of the tissue to the radiowaves causes water in the cells to heat and the cell vaporizes
- Radio-surgical unit consists of
 - Active electrode
 - Antennae (passive electrode)
 - Transformer
- Ideal frequency = 3.8 - 4.0 MHz

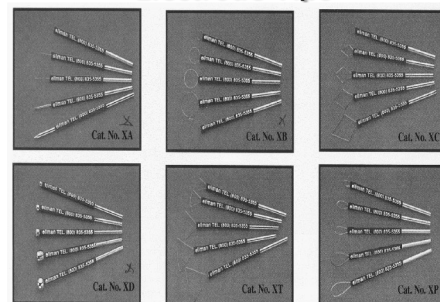
136

Electrode Tips



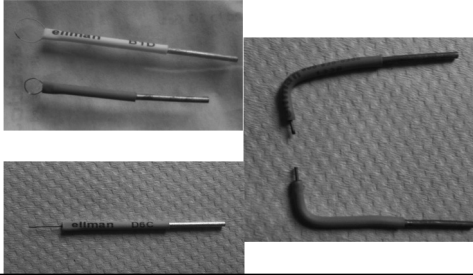
137

Electrode Tips



138

Electrode Tips

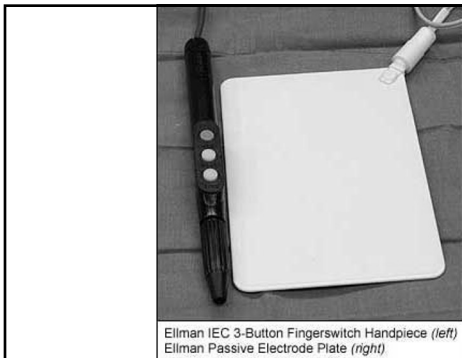


139

What is Radiofrequency (RF) Surgery?

- ▣ Radiosurgery is the passage of high frequency radiowaves through soft tissue to cut, coagulate, and/or remove the target tissue
- ▣ Resistance of the tissue to the radiowaves causes water in the cells to heat and the cell vaporizes
- ▣ Radio-surgical unit consists of
 - Active electrode
 - Antennae (passive electrode)
 - Transformer
- ▣ Ideal frequency = 3.8 - 4.0 MHz

140



141

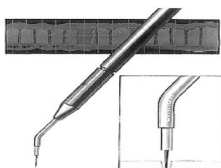
Advantages of Radiosurgery

- ▣ Cuts and coagulates at the same time
- ▣ Nearly bloodless field
- ▣ Minimal biopsy artifact damage*
- ▣ Quick and easy (to do and to learn)
 - Pressureless & bacteria-free incisions
- ▣ Minimal lateral heat
- ▣ Minimal Post-op pain
- ▣ Rapid healing
- ▣ Fine control with variety of tips
- ▣ No muscle contractions or nerve stimulation from radiowaves (Faradic effects)

142

Setting 1 Filtered Fully Rectified Wave Form - Pure Cutting Action

Power \approx 3.0 (old unit) or 20 (newer unit)



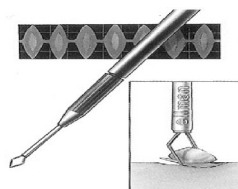
Fully filtered and fully rectified

- ▣ 90% Cutting
- ▣ 10% Coagulation
- ▣ Cutting current: high frequency sine wave that is not dampened.
- ▣ Produces very focused heat buildup that ruptures tissue through either molecular activity or through production of steam microbubbles
- ▣ Minimal lateral heat
- ▣ Use for biopsy, incisions, chalazion

143

Setting 2 Rectified Waveform (blended) Cut and Coag

Power \approx 3.0 (old unit) or 20 (newer unit)



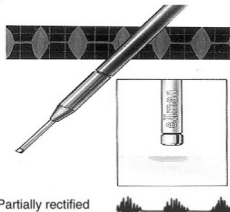
Fully rectified

- ▣ 50% Cutting
- ▣ 50% Coagulation
- ▣ When don't need biopsy
- ▣ Helps greatly with bleeding during procedure
- ▣ Very useful in vascular regions
- ▣ Great for excising
 - Skin tags, verruca
- ▣ Waveform we use the most

144

Setting 3
Partially Rectified Waveform
Coagulation/Hemostasis

Power \approx 2.5 (old unit) or 20 (newer unit)



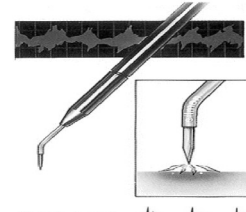
Partially rectified

- ▣ 90% Coagulation
- ▣ 10% Cutting
- ▣ Coagulating current: high frequency but dampened (rectified) sine wave.
- ▣ Produces oscillation of molecules leading to generation of intracellular heat that ultimately causes tissue dehydration/coagulation (hemostasis)
- ▣ Epilation, punctal occlusion

145

Setting 4
Fulguration – Coagulation and Destruction

Power \approx 8 (old unit) or 80 (newer unit)



Markedly damped

- ▣ Spark gap fulguration current (hyfrecation) for superficial cautery
- ▣ Doesn't penetrate deeply – superficial treatment
- ▣ Electrodesiccation (papilloma bed)
- ▣ Destruction of cyst remnants
- ▣ Intentional destruction of diseased tissue
 - BCC
 - SCC

146

Advantages of Radiosurgery

- ▣ Cuts and coagulates at the same time
- ▣ Nearly bloodless field
- ▣ Minimal biopsy artifact damage*
- ▣ Quick and easy (to do and to learn)
 - Pressureless & bacteria-free incisions
- ▣ Minimal lateral heat
- ▣ Minimal Post-op pain
- ▣ Rapid healing
- ▣ Fine control with variety of tips
- ▣ No muscle contractions or nerve stimulation from radiowaves (Faradic effects)

147

Lateral Heat

Lateral heat = $\frac{\text{time} \times \text{waveform} \times \text{power} \times \text{electrode size}}{\text{frequency}}$

Factors Affecting Lateral Heat

- ▣ Electrode contact time: slow passage = increased heat
- ▣ Excessive power can lead to sparking (too little power leads to tissue drag)
- ▣ Larger electrode head sizes lead to greater power/heat generation
- ▣ Different waveforms are associated with different levels of heat:
 - Fulguration > COAG > CUT/COAG > CUT
- ▣ Higher frequency associated with less lateral heat

148

Advantages of Radiosurgery

- ▣ Cuts and coagulates at the same time
- ▣ Nearly bloodless field
- ▣ Minimal biopsy artifact damage*
- ▣ Quick and easy (to do and to learn)
 - Pressureless & bacteria-free incisions
- ▣ Minimal lateral heat
- ▣ Minimal Post-op pain
- ▣ Rapid healing
- ▣ Fine control with variety of tips
- ▣ No muscle contractions or nerve stimulation from radiowaves (Faradic effects)

149

Hazards/Contraindications

- ▣ Excess lateral tissue damage
- ▣ Smoke hazard/unpleasant smells in office
- ▣ Don't use in presence of flammable fumes/liquids
- ▣ Pacemaker
 - "Do not work near the heart and place the antenna (or grounding) plate well away from the heart. Use the least power possible. Activate the handpiece intermittently rather than continuously. The cutting mode is the most risky, so avoid it if possible. Use another form of treatment if it is an option. The pacers are purportedly "shielded" and the current in the ESUs should not affect them, but all things are not perfect! Therefore caution is needed. Asystole and tachycardia are potential adverse outcomes."
- ▣ Pfenninger and Fowler's Procedures for Primary Care, 3rd Edition. John L. Pfenninger, MD, FAAP and Grant C. Fowler, MD

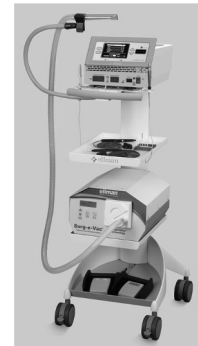
150

Radiofrequency Units

- ▣ ELLMAN
 - <http://www.ellman.com/radiosurgery/medical>
- ▣ COOPER SURGICAL LEEP
 - <http://www.coopersurgical.com>
- ▣ Valley Lab Force II
 - <http://www.valleylab.com/main.html>
- ▣ Wallach Surgical Devices
 - <http://www.wallachsurgical.com>
- ▣ Circon (Cryomedics)
 - <http://www.circoncorp.com>

151

Pelleve S5



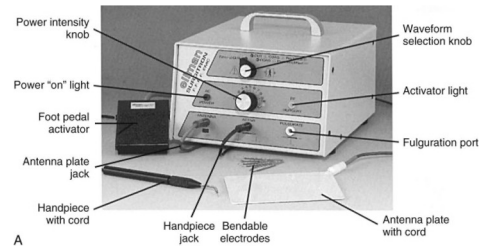
152

Dual 120



153

Ellman Unit



154

Elmann Unit - older model

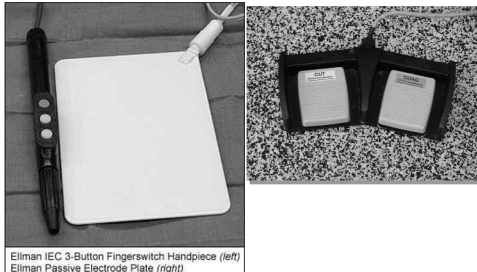


155

Ellman Unit Vacuum



156



Ellman IEC 3-Button Fingerswitch Handpiece (left)
Ellman Passive Electrode Plate (right)

157

Radiofrequency (RF) Surgery Indications

- ☐ Skin papillomas/skin tags
- ☐ Seborrheic keratoses
- ☐ Verruca
- ☐ Sebaceous cysts
- ☐ Benign Nevi
- ☐ Pyogenic Granulomas
- ☐ Incision into chalazion
- ☐ Trichiasis

- ☐ Xanthelasma
- ☐ Blepharoplasty incisions
- ☐ Biopsies of suspicious lesions (BCC, SCC, melanoma)

158

Hazards/Contraindications

- ☐ Do NOT perform shave excision on pigmented lesion unless certain is not melanoma!!!
- ☐ Don't use in presence of flammable fumes/liquids
- ☐ Pacemaker
 - "Do not work near the heart and place the antenna (or grounding) plate well away from the heart. Use the least power possible. Activate the handpiece intermittently rather than continuously. The cutting mode is the most risky, so avoid it if possible. Use another form of treatment if it is an option. The pacers are purportedly "shielded" and the current in the ESUs should not affect them, but all things are not perfect! Therefore caution is needed. Asystole and tachycardia are potential adverse outcomes."
- Pfenninger and Fowler's Procedures for Primary Care, 3rd Edition. John L. Pfenninger, MD, FAAFP and Grant C. Fowler, MD

159

Procedure Technique

- ☐ Pre-op (photos, consent, BP and Pulse, VA)
- ☐ Pacemaker? Allergies?
- ☐ Clean area, drape if needed
 - Betadine needs 3 mins on skin!
- ☐ Anesthetize (infiltrative usually)
- ☐ Turn on Ellman unit: warm up for at least 30 seconds
- ☐ Choose appropriate waveform
- ☐ Choose initial power setting (will often need to adjust depending on tissue response to energy level chosen)

160

Procedure Technique

- ☐ Have assistant turn on/position vacuum unit - USE vacuum and masks!
 - Have isolated HPV and HIV in smoke
- ☐ Place yourself in comfortable/stable position to do procedure
- ☐ Brace your handpiece wrist on patient for stability

161

Procedure Technique

- ☐ Electrode tip should be applied perpendicularly to allow even distribution of energy
- ☐ Press footplate activator when ready to begin procedure
- ☐ Move in expeditious but controlled fashion: always keep electrode moving when contacting tissue

162

Procedure Technique

- ▣ Keep the tissue around the lesion taut
- ▣ Keep surgical site moist (saline gauze) to avoid tissue drag
 - Removes debris on surgical field
- ▣ Also wipe energized tip to remove tissue stuck to it
- ▣ When feathering down a lesion with a loop, keep perpendicular---remove until healthy tissue seen
- ▣ Can use forceps closed tips to touch end of area of bleeding, touch electrode to forceps to transfer energy to area to stop bleeding

163

Post-procedure Technique

- ▣ Clean area of betadine
- ▣ Apply antibiotic ung
 - Pt ed about moist healing
- ▣ Don't let patient jump and run as you sit them up!
- ▣ Blood pressure and pulse post-op
- ▣ Write op report in chart along with patient instructions on wound care and follow-up schedule

164

Radiofrequency (RF) Surgery Indications

- ▣ Skin papillomas/skin tags
- ▣ Seborrheic keratoses
- ▣ Verruca
- ▣ Sebaceous cysts
- ▣ Benign Nevi
- ▣ Pyogenic Granulomas
- ▣ Incision into chalazion
- ▣ Trichiasis
- ▣ Xanthelasma
- ▣ Blepharoplasty incisions

165

Trichiasis Procedure Technique

- ▣ Cut offending lashes
 - ▣ Anesthetize???
 - ▣ Grab lash with forcep
 - ▣ Use microinsulated needle
 - ▣ Put needle beside lash shaft into follicle until cannot go further
 - ▣ Lowest power setting, Coag
 - ▣ Touch and let off immediately of footplate
 - ▣ Gently tug lash - if comes out smooth are done
 - ▣ If not treat quickly again
- Power \approx 0.1-0.2 (old unit) or 1-2 (newer unit)

166

LASER THERAPY & ADVANCED PROCEDURES IN OPTOMETRY

Nate Lighthizer, O.D., F.A.A.O.

167