elios Intra-and Postoperative Pearls

BACKGROUND

ELIOS is an excimer laser technology for microinvasive glaucoma surgery (MIGS) that creates up to 10 210-µm 'microchannels' through the trabecular meshwork using a 'non-thermal' laser, which establishes new outflow potential while maintaining tissue architecture. Excimer lasers are renowned for their extraordinary precision and non-lethality to adjacent tissues, and they have a proven track record in ophthalmic surgery. Applying excimer technology to glaucoma provides a novel way to lower IOP without the need for implants and with minimal trauma. ELIOS has been used in Europe for over a decade, and there are now over 14 clinical publications documenting ELIOS outcomes for up to 8 years. The following clinical pearls were shared during an ELIOS expert users' meeting organized by Elios Vision.

ATTENDEES

Iqbal Ike K. Ahmed, MD, FRCSC
Anselm Juenemann, MD, FEBO
Karsten Klabe, MD
Thomas Neuhann, MD
Herbert Reitsamer, MD
Antonio Moreno Valladares, MD, PhD

TIPS FOR VISUALIZATION

ELIOS is performed using 'standard' angle visualization techniques. Obtaining and maintaining good visualization of the trabecular meshwork (TM) is key to achieving accurate placement of the laser probe.

- A variety of goniolenses can be used.
- Most commonly, angle procedures are performed using a gonioprism which provides direct visualization of the TM, but alternatives may be considered if adjusting the microscope and the patient's head is undesirable during surgery.

	PROS	CONS
Gonioprism (Swan Jacob)	– Wide field of view and direct visualization of the TM – Self-retaining options may be available and help to avoid excessive downward pressure on the cornea	– Tilting of the microscope and patient's head is required to deliver en face probe placement
DVX, Goniolens	– No need to alter microscope or patient position	– High acquisition cost – Hand position on the probe requires adjustment
Single mirror goniolens	– No need to alter microscope or patient position – Disposable options available	– Image is inverted and laterally reversed – May be more technically challenging

Visualization pearls

- Avoid applying too much downward force on the cornea with the goniolens, and keep the eye pressurized with a cohesive OVD to avoid induced corneal folds.
- Avoid blood from the main incisions from getting beneath the goniolens.
- Staining the TM with Vision blue/Trypan blue and/or allowing Schlemm's canal to fill with blood may be helpful to properly identify the TM in eyes with very lightly pigmented TM.
- In combined phaco-ELIOS procedures, performing ELIOS prior to or after cataract removal is possible.
- Beware of OVD escaping through the main incision during laser application. Refill as needed to maintain good visualization and minimize blood reflux and corneal folds.

APPLYING THE LASER ENERGY

> "ELIOS is more 'failure forgiving' than other trabecular bypass implant-based MIGS, so if you don't open the channel fully with 1 or 2 laser microchannels, you still have plenty of others that are likely to be open."
>
> **— KARSTEN KLABE, MD**

- Ensure correct orientation of the probe bevel (the diamond shape on the blue handpiece should face upward) throughout all applications.
- Only a light apposition force on the TM is required at the moment of laser application.
- Surgeons should anticipate not having tactile feedback from the probe when it is in contact with the TM. Validation of contact with the TM should be done visually (hence good visualization is key).
- Too much pressure (resulting in 'dimpling') should be avoided and may make the probe slide posteriorly toward the scleral spur and/or bend the probe.
- Microchannels should be spread across a wide area (90-110°) including both the infero-nasal and supero-nasal quadrants (Figure).
- Start the laser applications at one extreme (far left or far right) of the gonio view. Commencing the laser application in the mid-point of the view may lead to a greater need to adjust the gonio view intraoperatively (adding technical complexity).
- Moving from one quadrant to the other often requires a small change in hand grip to maintain apposition between the probe tip and the TM.
- Once the probe tip is visible at the TM, increasing the microscope magnification and adjusting fine focus may aid visual confirmation of probe tip apposition with the TM.
- Adjusting the gonio view during the laser applications may be required, so it is valuable to practice adjusting the goniolens and maintaining a clear view.

FINISHING THE PROCEDURE

- Thorough removal of viscoelastic is essential, including behind the IOL, to avoid day 1 IOP elevation and ensure good irrigation of the microchannels with BSS.
- Extra care may be taken in myopic eyes where viscoelastic may be more prone to retention.
- Before finishing, the eye should be left firm (~25 mm Hg) to the touch and incisions watertight to help avoid reflux bleeding in the early postoperative days. Some eyes will drop their IOP in those early postoperative days (hyposecretion, wound leak), and thus it is preferred to leave the eye with a higher IOP.
- If reflux bleeding is significant, extra care should be taken to irrigate the chamber until controlled.

POSTOPERATIVE PEARLS

- Anti-inflammatory and antibiotic drop regimens should be the same as standard protocol for phaco.
- Patients exhibiting a steroid response should be switched to a less potent steroid or NSAID.
- Total cessation of IOP-lowering drops may be considered immediately after surgery if:
  1) the objective of treatment involves eliminating glaucoma medications,
  2) the preoperative medication load is not high (e.g., 2 or less), and
  3) patients are monitored closely.
- Maintain some IOP-lowering drops for 1 month after surgery and then taper medications thereafter if:
  1) the objective of treatment is reducing preoperative IOP,
  2) patients cannot be closely monitored, or
  3) patients are on more than 2 drops preoperative.
- Day 1 IOP is typically 12-21 mm Hg and is not generally indicative of long-term outcomes.
- Elevated IOP on day 1 may be attributable to retained viscoelastic, so thorough removal is strongly recommended.
- Elevated IOP in early postoperative days can be due to the presence of blood, even microhyphema. It is important to take steps to avoid intraoperative blood reflux at the end of each case. If microhyphema presents on postoperative day 1, consider maintaining IOP-lowering medications to prevent IOP elevation. IOP elevation from microhyphema invariably resolves, but it can take 4-6 weeks after which IOP-lowering medications can then be reduced.

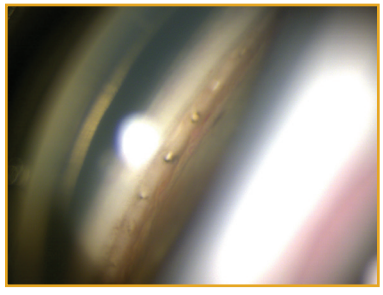

Figure. Microchannels imaged at 31 months postoperative.

PATIENT SELECTION

> Some patients say ***'I have no problems with eyedrops,'*** but they will have problems with eyedrops for sure, so we have to be proactive."
>
> **— ANSELM JUENEMANN, MD, FEBO**

> It's really a question of opportunity. And, if you are in the eye doing cataract surgery, it's hard to justify not doing something for a patient using drops."
>
> **— IQBAL IKE K. AHMED, MD, FRCSC**

- Early intervention with ELIOS maximizes the likelihood of having functional distal outflow.
- Combining ELIOS with routine cataract surgery offers a number of benefits:
  - Standard cataract follow-up is adequate
  - No bleb or implants at the time of cataract surgery
  - Stable refractive outcomes and prompt VA recovery
  - No impact on future glaucoma surgeries
  - Reducing postoperative medication burden may improve quality of life and the ocular surface.
- Patients with a target pressure >14 mm Hg and/or medication reduction goals should be considered for treatment with ELIOS.
- Patients poorly served by glaucoma drops (e.g., non-tolerance with/without prior failure of SLT) could also benefit from ELIOS.

SUMMARY

Overall, ELIOS is a highly adoptable procedure, both for glaucoma specialists and comprehensive doctors, especially those with previous experience performing angle-based surgery using a goniolens. The postoperative experience of ELIOS is analogous to routine cataract surgery in terms of postoperative steroid and antibiotic regimens, visual recovery, and refractive stability. ELIOS may be considered for patients with glaucoma undergoing routine cataract surgery and is capable of achieving meaningful lowering of IOP and medication burden. Early intervention with ELIOS improves the likelihood of enhancing outflow into a functional distal outflow system.

ELIOS Vision GmbH is the EU distributor of ELIOS manufactured by MLase AG, located at 82110 Germering, Industriestr. 17 and the FIDO laser applicator manufactured by WEINERT Fiber Optics GmbH, Mittlere-Motsch-Strasse 26, 96515 Sonneberg, Germany. ELIOS is CE marked and licensed for use in the EU in adult patients with glaucoma and is currently under investigational use in the US as part of an ongoing IDE study (FDA). Product feedback should be sent to productsurveillance@eliosvision.com.

ELIOS is an equivalent medical device [Regulation (EU) 2017/745 Annex XIV Part A] to the ExTra II, ExTra and AIDA devices. The points discussed above are based on the experiences of the named meeting participants.