

## Addressing Glaucoma During Routine Cataract Surgery: **The Experts' Opinions on the role of ELIOS™**

To understand the potential of the excimer laser-based ELIOS™ to improve the outcomes and quality of life of patients with glaucoma, Elios Vision Inc. held a round-table discussion with an international expert group of ophthalmologists during the 15<sup>th</sup> Conference of the European Glaucoma Society in Athens (June 4-8, 2022).

The expert panel convened to consider the unmet needs in treating glaucoma at the time of cataract surgery and define which patients will benefit the most from ELIOS, and to share their experiences with it.

### **EXPERT PANEL:**

- Prof. Keith Barton (Chair), Moorfields Eye Hospital, London, UK
- Prof. Ike Ahmed, University of Utah, USA and University of Toronto, Canada
- Prof. Philippe Denis, Croix-Rousse University Hospital, Lyon, France
- Prof. Julián García Feijóo, Clinico San Carlos, Madrid, Spain
- Dr. Antonio Moreno Valladares, University Hospital of Albacete & Quironsalud, Albacete, Spain
- Dr. Eva González, University Hospital of Albacete & Quironsalud, Albacete, Spain
- Prof. Swaantje Grisanti, Universitätsklinikum Schleswig-Holstein, Lübeck, Germany
- Dr. Karsten Klabe, Breyer, Kamak and Klabe, Dusseldorf, Germany

## Glaucoma: A Disease with Significant Unmet Needs

Glaucoma is a leading global cause of irreversible blindness, and its prevalence increases as people age. Currently, around 80 million people worldwide have glaucoma, but against a background of an aging population, this number is expected to reach over 111 million by 2040.<sup>1,2</sup> Glaucoma, like cataract, therefore represents a notable challenge to healthcare systems: its prevalence is rising, and with it, demand for its treatment. Efficient delivery of services will be key to meeting this global demand.

The main pathology in glaucoma is a progressive optic neuropathy caused by retinal ganglion cell death. There are several risk factors for this, but currently, the only modifiable one is intraocular pressure (IOP). As vision loss in glaucoma is irreversible, early and effective lowering of IOP is the mainstay for effective glaucoma treatment.<sup>3</sup>

## Combining Cataract and Glaucoma Surgery Makes Sense

Given the demographics of both cataract and glaucoma, where both are considerably more prevalent in older individuals, nearly all patients with glaucoma will develop cataracts in their lifetime. Prof. Philippe Denis observed that “one of the strongest rationales for combining a MIGS procedure with cataract surgery is that the patient is being exposed to one intraocular surgery, instead of two – which should reduce the risks

## Glaucoma is a Common Comorbidity with Routine Cataract Surgery

- It is estimated that 19% of eyes undergoing cataract surgery also have glaucoma<sup>7,8</sup>
- ~3 million cataract procedures are performed annually on patients with glaucoma worldwide<sup>9</sup>
- ‘...Cataract surgery alone is of limited benefit in lowering the IOP in open-angle glaucoma and is not recommended as an intervention to control glaucoma’, according to the latest EGS Guidelines<sup>10</sup>

accordingly,” before adding, “If a patient is going to need cataract surgery anyway, this represents a great opportunity to perform a safe and effective glaucoma intervention at the same time.” Cataract surgery is particularly convenient for this purpose, as it provides access to many of the structures implicated in glaucoma.

## Cataract Surgery Alone is of “Limited Benefit” in Lowering IOP

Although it is known that cataract surgery can result in modest postoperative IOP reductions<sup>11</sup> in some patients the precise impact can be unpredictable and transient and does not usually allow for the discontinuation of topical glaucoma medications.<sup>12</sup> The European Glaucoma Society noted in its most recent (2020) guidelines that “Cataract surgery alone is of limited benefit in lowering the IOP in OAG and is not

## Glaucoma poses a significant unmet need

>80M

people with glaucoma worldwide<sup>1</sup>

↓IOP

early and effective lowering of IOP remains the mainstay of treatment

>10M

annual U.S glaucoma-related physician visits

2<sup>nd</sup>

leading cause of blindness worldwide

~80%

of patients with glaucoma require daily drop therapy<sup>5</sup>

64%

of patients on drops experienced significant adverse side effects<sup>6</sup>

Preserving lifelong vision with minimal impact on quality of life in terms of inconvenience and side effects is the goal of all treatment guidelines<sup>4</sup>

recommended as an intervention to control glaucoma.”<sup>10</sup> However, it is hard to ignore that cataract surgery represents an excellent opportunity to alter the course of the disease and/or improve patient quality of life by reducing the subsequent burden of medication. With the advent of Phaco-MIGS Karsten Klabe explains the benefits he believes can be afforded to patients: “After 2–3 years, even if the IOP reductions are modest, there is a great benefit of reducing medications, and that improves patients’ quality of life.”

### **Big Picture Benefits**

From a demographic perspective, combining glaucoma and cataract surgery makes great sense. The prevalence of both disorders increases with age, and in 2022, an estimated 32 million people globally will undergo cataract removal and around 20% also have glaucoma or ocular hypertension.<sup>13</sup> It’s a combination that is proving increasingly popular as illustrated by the rapid increase in MIGS procedures performed each year. Ike Ahmed explained why: “We’ve seen studies, now at five years out, where combining a MIGS procedure with cataract surgery can halve [glaucoma] progression, that has reduced the need for patients to go on to aggressive surgical interventions like trabeculectomy within 5 years by a third – those are some important benchmarks to justify why we would combine MIGS procedures with cataract.”

### **What Would the Ideal MIGS Procedure in Cataract Surgery Look Like?**

Prof. Barton told the panel, “There are a lot of MIGS procedures in this space that can be combined with cataract surgery. They all do roughly the same thing – but they don’t all do it the same way. Some will be faster, more elegant, less intrusive, and less potentially damaging than others...” before asking the panel of experts, “but for combined surgery to become ‘routine’, what are the most important characteristics?”. The panel shared the following opinions:

#### ***A short learning curve***

To be adoptable by surgeons in all types of practice, and not just those routinely performing conventional glaucoma surgery. Prof. Ahmed noted that a “short learning curve would be essential” so that all surgeons can be empowered to adopt the technique.

#### ***Safe and predictable***

Prof. Ahmed went on to explain that he would ideally “want a relatively straightforward procedure, with minimal trauma” to maintain the safety profile of the phacoemulsification, and that such a procedure would ideally “have the finesse and predictability of cataract surgery, a fast visual recovery, a fast postoperative recovery, and minimal to no impact on the refractive status of the eye.” Prof. Denis underscored the importance of this, noting that “a favorable safety profile is essential for these types of surgeries, especially in centers where the follow-up is performed not by the surgeon, but by general ophthalmologists.”

Dr. Klabe said the procedure would need to be “safe and predictable, and not have much of an impact on the cataract procedure either intraoperatively or postoperatively, in terms of the amount of follow-up required,” explaining that high-volume cataract centers simply do not have the capacity to deal with patients who need non-standard or supplementary follow-up postoperatively.

#### ***Leaving nothing behind is better than leaving something behind***

Prof. Ahmed mentioned that “a procedure that is easily adoptable, is more predictable, and is less likely to cause implant issues, is something worth having.” Prof. Barton noted that “in terms of what is left behind by these implants, it varies by which device,” adding, “if it were a choice between a procedure that leaves an implant behind, and an implant-free procedure, that choice is self-evident: implant-free.”

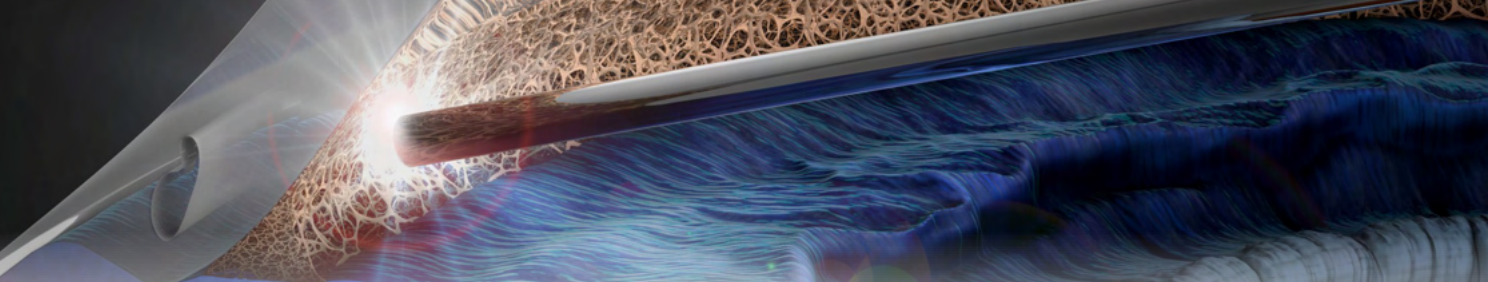
#### **Introducing ELIOS**

ELIOS is a proprietary excimer laser procedure for the treatment of glaucoma, marketed by Elios Vision. ELIOS uses an excimer laser to ablate tissue in the trabecular meshwork to create ten 210 µm “microchannels,” which reduce resistance to outflow and lower IOP. ELIOS utilizes the eye’s natural physiological outflow pathway and preserves the integrity, structure, and function of the trabecular meshwork. Importantly, ELIOS avoids thermal and mechanical trauma to the tissue and does not require introducing and leaving foreign objects in the canal.

Data from 14 clinical studies involving over 600 eyes,<sup>14</sup> some with 8 years of follow-up, have shown that ELIOS\* has robust and long-lasting IOP-lowering efficacy ranging

\*ELIOS is an equivalent medical device [Regulation (EU) 2017/745 Annex XIV Part A] to the ExTra and AIDA devices.





## Who is Elios Vision, Inc?

Elios Vision, Inc. is a private medical device company, headquartered in Los Angeles, California, focused on the commercialization of ELIOS, a proprietary excimer laser procedure for glaucoma. Clinical data describes ELIOS safety and efficacy for up to 8 years post-operatively.

- ‘Implant-free’
- No thermal or mechanical trauma
- Low intra- and postoperative complexity.



ELIOS is CE marked for use in adult patient with glaucoma. In the United States, ELIOS is investigational and undergoing an IDE pivotal trial.<sup>13</sup>

from 20–40% for the 8-year follow-up duration (**Figure 1**). The incidence of serious complications is extremely low, in part, thanks to the atraumatic mechanism of the excimer laser. Another study found that 82% of patients were medication-free at one year (**Figure 2**) – with a mean reduction in medications from 1.7 preoperatively, to 0.3 postoperatively.<sup>14, 15</sup>

### What is the Evidence Base for the Efficacy of ELIOS Performed During Cataract Surgery?

In 2022, Reisen et al. published 8-year follow-up results of the use of ELIOS during routine cataract surgery in 128 patients (161 eyes) with glaucoma or OHT and cataract.<sup>16</sup> Significant reductions in IOP, from 19.3 mmHg at baseline to 15.4 mmHg after eight years of follow-up ( $p = 0.0040$ ), and medication burden were achieved.<sup>15, 16</sup> Only 3.7% of patients required secondary invasive surgical glaucoma interventions during the follow-up period, and no serious intra- or postoperative events were observed. ELIOS technology can produce a sustained drop in IOP over the long term and these clinical findings suggest that the IOP reductions are longer than any other currently available MIGS procedure reported in the literature. Additionally, ELIOS’ standalone efficacy<sup>17</sup> supports its use in patients who are motivated to reduce drop burden, experiencing side effects, and those non-compliant with drops.

### Which Patients Could Benefit Most from ELIOS?

Prof. Barton asked the panel to identify the most appropriate patients for ELIOS.

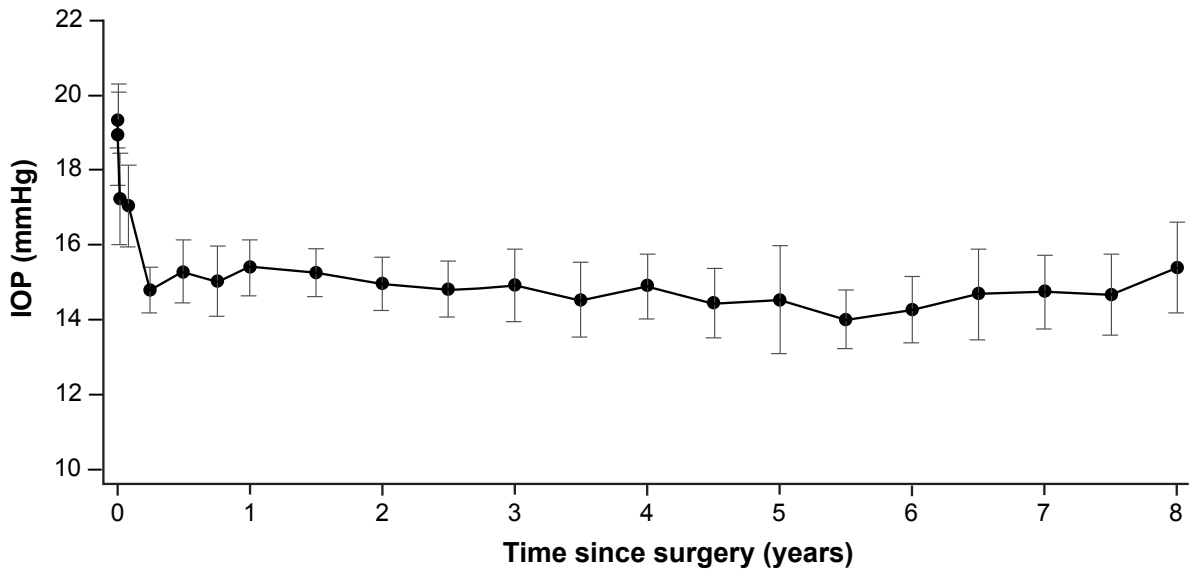
The consensus among the experts who have performed ELIOS was that: patients with early, mild-to-moderate glaucoma who will receive routine cataract surgery are ideal for ELIOS. Younger patients tend to have better outcomes with ELIOS and cataract surgery than older patients with more chronic disease.

### Why mild-to-moderate glaucoma?

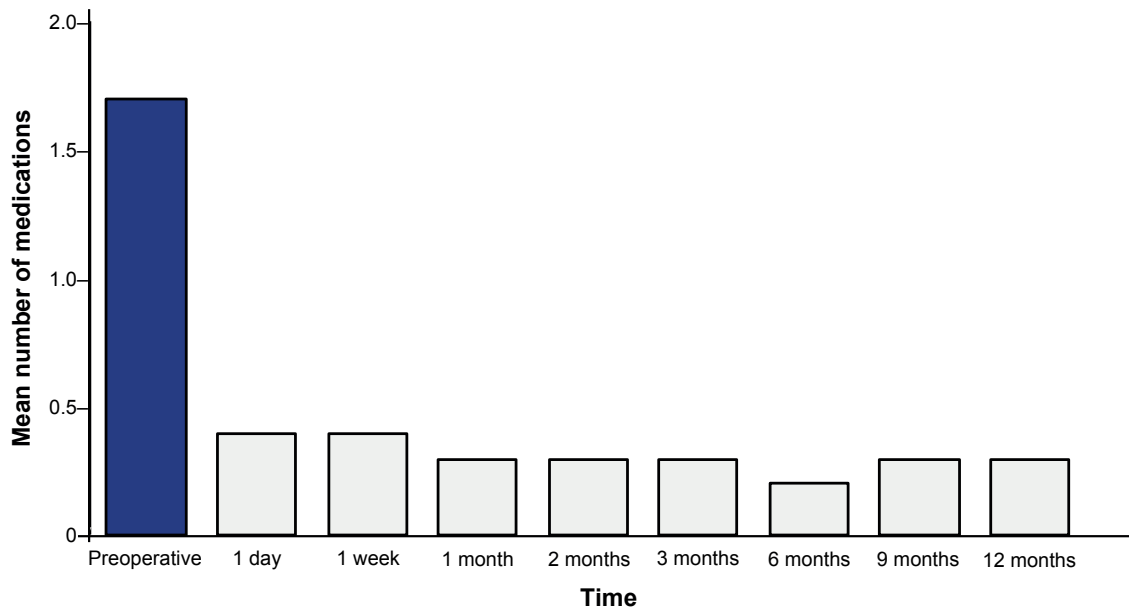
“Surgeons may be reluctant to open the eye and perform surgery when there are still other non-surgical options available,” noted Prof. Grisanti, and this typically excludes patients with early disease. According to Dr. Klabe, “the majority of [his] early diagnosed patients could control their IOP well using only one or two medications.” Prof. Denis explained that “Techniques [like ELIOS] that avoid having to create a bleb and all of its potential side effects – especially in patients with mild-to-moderate glaucoma – makes it easier to get IOP under control with topical pharmacotherapy. This is a large and significant patient population.” Prof. Grisanti described how she offers a MIGS procedure for most of her patients with mild-to-moderate glaucoma who undergo cataract surgery. “These patients read about these options and ask for them. When I do cataract surgery in my mild-to-moderate glaucoma patients, I combine it with canal-based MIGS in most of the cases.” Prof. Ahmed added, “I think ELIOS provides a standardized, implant-free, and adoptable procedure that can be done in that patient population.”

### ELIOS Users Describe Their Ideal Patient

Dr. Valladares, who has 3 years of experience performing ELIOS, explained that “the best cases for ELIOS are, one

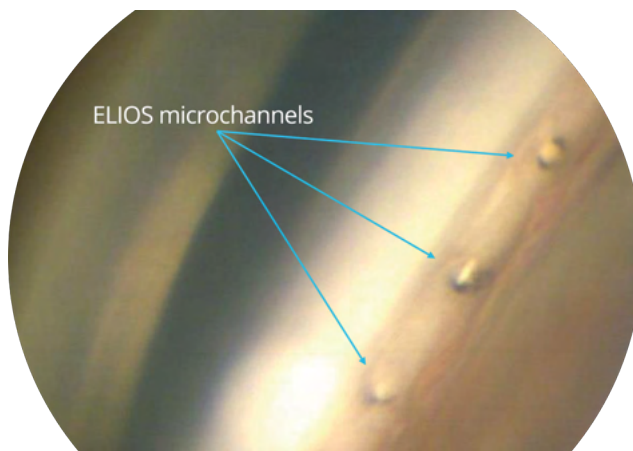


**FIGURE 1.** Riesen et al.<sup>16</sup> found that even at 8 years of follow-up after patients received the ELIOS procedure with cataract surgery, patients still displayed mean IOP reductions of >20% compared with pre-surgery levels.



**FIGURE 2.** Moreno Valladares et al.<sup>15</sup> found that 82% of the 29 patients who received the ELIOS procedure and cataract surgery were medication-free at 1 year postoperatively, and the mean number of medications required for IOP control had dropped from 1.7 to 0.3.

## The ELIOS procedure



- **Approach:** A custom XeCl excimer laser is used to create ten 210 µm microchannels in the trabecular meshwork.
- **Laser action:** Using a high precision, photoablative decomposition process, chemical bonds in the trabecular meshwork tissue are disrupted without causing any thermal damage to surrounding tissue.
- **Effect:** Aqueous flow through microchannels into Schlemm's canal, decreasing outflow resistance, lowering IOP, whilst preserving the trabecular meshwork integrity, structure, and function.

or two drops, mild glaucoma, or ocular hypertension without damage, needing cataract surgery," adding that "treating earlier-stage cases with ELIOS could significantly reduce the need for filtration surgery." Prof. Barton agreed, stating "if you're treating patients early, fewer will be progressing toward advanced disease."

Dr. Eva González had a similar outlook, "The ideal patient will have mild-to-moderate glaucoma, be on one or two drops, and undergoing cataract surgery. In that case, you might as well also perform an ELIOS during surgery." Dr. Klabe thought that patients with controlled glaucoma undergoing routine cataract surgery were ideal. However, he would also offer ELIOS to patients with slow disease progression where a target IOP can be achieved, as well as those with failed drop therapy. Prof. Grisanti added that in her experience, the patients that responded best to ELIOS were "those with primary open-angle glaucoma, no previous glaucoma surgeries, and 'younger' age, who need cataract surgery."

Dr. García Feijóo concurred but added that he would widen that population to include both progressive and non-progressive glaucoma, and even uncontrolled cases, explaining that these patients would be the "typical

patients I would offer a MIGS procedure to – patients that I wouldn't like to do a bleb procedure on right away."

Prof. Ahmed explained that "the synergy of cataract surgery and MIGS is ideal; ELIOS fits in very well," adding that "we've had pretty good success at patients with secondary open-angle glaucoma." He noted that "standalone treatment is indicated in patients with mild-to-moderate disease who are on medication but suffer from side effects, non-compliance or who wish to reduce medication." He then went on to say that "the ideal patient indicated for ELIOS is essentially the same as those indicated for MIGS in general," adding, "I think ELIOS just provides a standardized, implant-free and an easier-to-use procedure that can be done in that patient population."

The experts' consensus was clear: the patients who would benefit most from ELIOS are patients with mild-to-moderate glaucoma who will undergo routine cataract surgery.

### What Makes ELIOS an Attractive Procedure to adopt?

ELIOS is a clinically proven, reliable, safe, implant-free MIGS procedure with a short learning curve. ELIOS

## Published Clinical Data Demonstrates Safety & Efficacy

14

clinical studies

>600

ELIOS-treated eyes

29-43%

IOP reduction

47-61%

reductions in IOP-lowering medication

is an optimized solution for use during routine cataract surgery, and has also proven efficacious as a standalone treatment, with 8-year standalone data now published.<sup>18</sup> The medication lowering benefits of ELIOS may improve quality of life and reduce the burden of drop therapy in patients motivated to reduce the number of drops used on a daily basis, as well as those who have poor compliance or those experiencing undesirable side effects from drops.

ELIOS uses an excimer laser energy to enhance aqueous outflow avoiding thermal or mechanical trauma with the benefit of being implant-free.

Prof. Ahmed has performed almost 40 ELIOS procedures to date and mentioned that "The synergy of cataract surgery and MIGS is ideal, and this is where ELIOS fits in very well. It's very straightforward, you point and shoot," adding, "I

think this is a very reliable procedure."

Prof. Barton noted that when comparing ELIOS with MIGS procedures that physically remove trabecular meshwork "obviously ELIOS is attractive in that area because frankly, it's not cutting in the same way or stimulating the same degree of scarring." Prof. Ahmed agreed, "I think the safety profile is an enhanced one, and because we're using an excimer laser, rather than a blade, I think we'll see that the ostia remain patent, rather than becoming occluded through fibrosis and scarring."

### The ELIOS Learning Curve

Commenting on the learning curve with ELIOS Dr. Klabe stated that "In my opinion, there is no learning curve at all. If they [surgeons] have experience with trabecular bypass implants or ab-interno canaloplasty, you have the skills to perform ELIOS."

In the USA, Prof. Ahmed noted that a large number of MIGS procedures are performed by cataract surgeons who aren't necessarily fellowship-trained in glaucoma surgery. He stressed that the learning curve of the surgical technique would not be a barrier to adoption by these doctors, but instead, he would like to see a focus on ensuring appropriate pre-operative evaluation with imaging and perimetry, appropriate patient selection, and postoperative follow-up.

Prof. Barton believed that "a procedure that is more predictable and less likely to cause implant issues, may be more adoptable by surgeons with less glaucoma training and experience".

The consensus expert opinion was that ELIOS could be adopted by comprehensive surgeons as well as glaucoma subspecialists.

### Conclusion

ELIOS represents an implant-free, minimally invasive procedure with a favorable safety profile and a rapid learning curve for ophthalmic surgeons. Patients ideally suited to ELIOS are those with mild-to-moderate glaucoma, or those with ocular hypertension, undergoing routine cataract surgery, where both procedures can be easily combined into a single surgery. ELIOS is associated not only with low intra- and postoperative complication rates, but it also delivers robust and long-lasting IOP reductions of up to 8 years.<sup>16</sup>



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