Advancements in ICL Sizing: Leveraging AI and UBM with the ABSolu® Device

By: Dr. Roger Zaldivar

I'm thrilled to share the remarkable results we're achieving with the ABSolu® ultrasound device, utilizing its UBM capabilities and the STS Module from Lumibird Medical®, alongside the ICL GURU platform. These tools are transforming the landscape of ICL sizing, allowing us to move from a forgiving, less precise environment to a standardized, high-tech, AI-powered methodology that I believe is a true game-changer.

The Evolution of ICL Technology

Let me start by emphasizing my belief in ICL technology. For those familiar with its history, ICLs have evolved significantly since the 1990s. Initially considered a procedure of exclusion, the introduction of the EVO ICL with its central flow technology marked a pivotal shift. This innovation elevated the safety profile to new heights, reducing complications and making ICL a competitive option alongside other refractive modalities. Today, with AI-powered EVO and UBM-optimized algorithms, ICL is often our first choice for vision correction in many procedures.

EVO ICL™ (STAAR SURGICAL®)

The central flow technology is not just a surgical advantage—it's a clinical game-changer. It has resulted in five times fewer exchanges and three times fewer removals.[1] In our experience with over 10,000 patients, we've seen only one or two cases requiring intervention, virtually eliminating anterior subcapsular cataracts. The elimination of iridotomy, a painful and time-consuming step, further enhances patient comfort and surgical efficiency.

To illustrate the long-term benefits, consider the vault—the space between the ICL and the crystalline lens. Our data, supported by publications like Dr. Alfonso's and our own patient cohorts, shows an expected vault loss of just 84 microns over 20 years with EVO ICLs.[2] Compare this to older ICL models without central flow, which lost around 300 microns. This reduction—roughly a quarter of the previous loss—significantly lowers the risk of cataracts, provided there's no toxic viscoelastic or crystalline lens touch. Even with some circulation issues, the behavior of modern ICLs is far superior.

The Importance of Lens Selection

The collamer material used in ICLs is unique, with over 30 years of proven safety and biocompatibility. However, the Achilles' heel of this platform has always been lens selection. While suboptimal sizing doesn't always lead to complications, as surgeons, we strive for precision to limit outliers and narrow the bell curve of outcomes. Hypervault or hypovault scenarios, though not always problematic, can create uncomfortable situations for patients undergoing elective procedures. Our goal is to control variables and enhance predictability.

This is where AI steps in. AI empowers us to shift from a forgiving platform to one where we have precise control. Refractive surgery is about accuracy and anticipation, and AI is helping us achieve that by refining lens selection and sizing.

The Limitations of Traditional Measurements

One of the challenges with traditional ICL sizing is the reliance on external measurements, such as White-to-White (WTW). Studies show poor correlation between WTW and internal eye structures: 0.3 for Angle-to-Angle

(ATA), 0.28 for Sulcus-to-Sulcus (STS), and 0.3 for ciliary-to-ciliary.[3] This disconnect highlights the difficulty of achieving precision with external metrics alone. The ICL typically sits in the ciliary sulcus or valley, but our research shows variability—some lenses sit more posteriorly, others asymmetrically, with around 10% having one haptic in the sulcus and another in the ciliary process.[4] Posteriorly positioned lenses often exhibit slight overvaulting, emphasizing the need for precision.

The Role of UBM and the ABSolu® Device

This brings us to Ultrasound Biomicroscopy (UBM).

While Angle-to-Angle measurements offer some improvement over WTW, only UBM delivers the true anatomical detail needed for accurate sizing.

The ABSolu device, with its UBM capabilities, is a cornerstone of our approach. Its STS module ensures image standardization, addressing the historical pain points of UBM, which was often cumbersome and subjective. The STS module includes an internal automated caliper that aligns the anterior cornea, crystalline lens, and posterior structures to select the best-aligned images.

"I firmly believe UBM is a non-negotiable tool for precise ICL sizing. Unlike other imaging modalities, UBM allows us to visualize structures behind the iris, providing critical insights into the eye's internal configuration."

Image taken on the ABSolu®

"These high-quality images feed our AI algorithm, ensuring reliable data input. As the saying goes, "Garbage in, garbage out." With the ABSolu, we're feeding the algorithm the best possible data."

The ICL GURU Platform: A Surgical GPS

The ICL GURU platform is the culmination of our efforts to standardize and scale UBM-based sizing. It predicts lens location, estimates vault formation, and assesses angle impact, guiding surgical decision-making. The platform processes MP4 files from the ABSolu, running them through an automated recognition analysis algorithm (ADLL). Once uploaded to the REVAI® environment, surgeons input minimal additional data, such as anterior chamber depth from OCT (though this requirement will soon be eliminated). The result is a comprehensive sizing recommendation.

What sets ICL Guru apart is its GPS-like guidance system, using color-coded predictions to simplify decision-making:

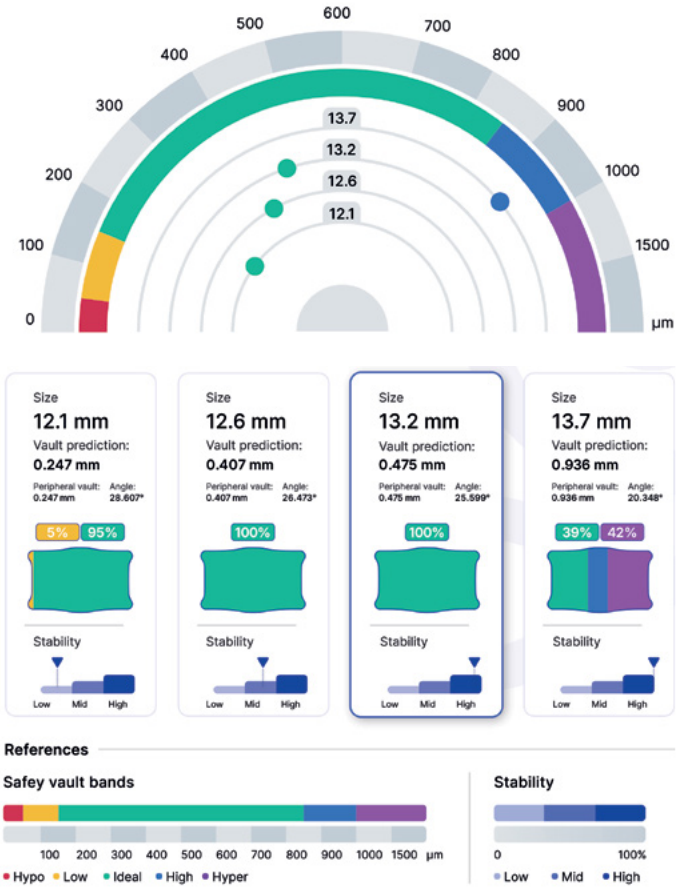
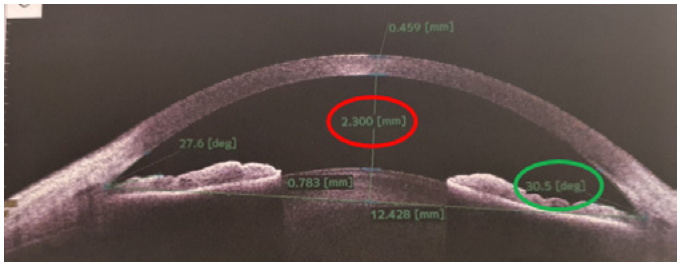


Image provided by Dr. Roger Zaldivar

- Red: Predicted vault <50 microns.
- Yellow: Vault between 50–150 microns
- Green: Ideal vault (150–850 microns) or residual angle >20°.
- Blue: Vault between 850–1000 microns or residual angle 15–20°
- Magenta: Vault >1000 microns or residual angle <15°

This system allows surgeons to visualize outcomes before surgery. For example, a patient with two available lens sizes (e.g., 12.6 mm and 13.2 mm) might achieve ideal vault with both, but ICL Guru highlights the optimal choice based on central and peripheral vault and residual angle. In challenging cases, such as a small eye with a 2.3mm anterior chamber, ICL Guru predicted a 200-micron vault with a 13.2mm lens, which we confirmed post-operatively at 200.3 microns. Another case, a large eye with a 13.3mm WTW, required a 13.2mm lens instead of the 13.7mm suggested by traditional formulas, achieving a 700-micron vault and excellent residual angles.



IOL overall diameter	Central vault	Peripheral vault	Angle
12.1 mm	0.000 mm	0.000 mm	23°
12.6 mm	0.000 mm	0.000 mm	23°
13.2 mm	0.196 mm	0.196 mm	20°
13.7 mm	0.895 mm	0.895 mm	11°

Real-World Results

Our multi-site study across four locations, including sites in the Philippines, demonstrates the power of this approach. Among our patients, 100% achieved vaults below 416 microns, 96% below 300 microns, and 86% below 200 microns.[5] The consistency across sites underscores the scalability of the ABSolu and ICL Guru platform. These results are improving with each iteration, giving us confidence in the methodology.

Surgical Technique

While I won't delve into the full surgical procedure, our approach emphasizes efficiency and safety. We perform ICL implantation through a 3mm main incision, using phenylephrine and viscoelastic (Kukod) in all cases. The lens is loaded through the edge, trapped, and inserted using a Pac-Man manipulator developed by my father. We use a thicker intraocular anesthetic to seal incisions, preventing iris prolapse, and irrigate with moxifloxacin, which has proven effective over 15 years with no complications in our experience.

The Future of ICL

I'm incredibly excited about the journey we're embarking on with the ABSolu and ICL GURU. With ABSolu devices deployed worldwide, we have an opportunity to collaborate with users globally, refining and expanding this technology. I firmly believe that, due to these advancements in sizing methodology, ICL will become the standard of care for vision correction within the next five years. The combination of AI, UBM, and standardized imaging is empowering surgeons to achieve unprecedented precision, making ICL a safer, more predictable, and more accessible option for patients.

Thank you for your interest in this transformative approach. I look forward to continuing this conversation and working together to elevate refractive surgery.

Disclaimer: This supplement is a transcription-based summary of a recorded webinar held in April 2025 and is intended for educational purposes only. This supplement reflects only Dr. Roger Zaldivar's clinical experience and opinions presented during this session. This content was created with AI assistance and reviewed by our editorial team to ensure accuracy and value for our readers. Always consult with patients and consider individual factors when applying diagnostic and treatment strategies. For more information on the ABSolu, contact Lumibird Medical®.

Lumibird Medical, is only ICL GURU compatible, and the goal is only to send images to REVAI platform for ICL calculation. The images sent to REVAI platform have to be checked and validated by the user before sending. Lumibird Medical, cannot decide of the correct images sent to REVAI platform for ICL calculation. Lumibird Medical, cannot be held responsible in case of ICL miscalculation.

Sources:

[1]EVO ICL page 1 still need legal disclaimer, Zaldivar didn't have this slide included in the versin he sent us.

[2]ALfonso-Fernández Vega (2021) vs Schmidinger - Skorpik (2010) and Alfonso (2012)

[3]Unpublished multicenter data from Instituto Zaldivar, Medipolis Eye Clinic, Asian Eye and Wellington Eye Clinic ready for publication

[4]Zaldivar R, Zaldivar R, Adamek P, Quintero G, Cerviño A. Descriptive Analysis of Footplate Position After Myopic Implantable Collamer Lens Implantation Using a Very High-Frequency Ultrasound Robotic Scanner. Clin Ophthalmol. 2022 Dec 5;16:3993-4001

[5]Unpublished multicenter data from Instituto Zaldivar, Medipolis Eye Clinic, Asian Eye and Wellington Eye Clinic ready for publication