Cassini Guidance System (CGS) - Clinical FAQ Guide

This guide provides a comprehensive, surgeon-facing clinical FAQ for the Cassini Guidance System. It is written for refractive cataract surgeons and is intended to support clinical decision-making, astigmatism management, toric IOL planning, arcuate incision planning, workflow integration, and outcome optimization. All responses are written in professional clinical language suitable for peer-to-peer reference.

The discussion is informed by published literature and clinical consensus. A selected list of references supporting these concepts is provided at the end of this document.

1. What is the Cassini Guidance System (CGS)?

The Cassini Guidance System is a digital surgical guidance platform that uses preoperative iris imaging from the Cassini Ambient (topographer) to provide real-time intraoperative alignment for toric IOLs and corneal incisions. This image-based system allows the planned astigmatic correction to be delivered at the true anatomic axis of the eye, compensating for cyclotorsion, head tilt, and pupil shift between diagnostic imaging and surgery.

2. Why is image registration clinically important?

Between preoperative biometry (upright, dilated) and surgery (supine, anesthetized), the eye can rotate by 3–15° (cyclotorsion)[1]. Because each degree of toric misalignment reduces effective astigmatic correction by ~3.3%[2], even modest rotation can cause significant residual refractive astigmatism, reduced uncorrected visual acuity, and increased need for post-op enhancement. Cassini Guidance System ensures that the planned astigmatic axis is reproduced accurately inside the operating room, rather than relying on ink marks or estimated alignment.

3. How does the Cassini Guidance System differ from manual ink marking?

Cassini Guidance System differs from ink marks by using digital, iris-based image registration rather than static manual markings. Ink marks are placed while the patient is upright and do not compensate for the 2-6° of mean cyclotorsion that commonly occurs when the patient lies supine in surgery[3], leading to axis misalignment and loss of astigmatic correction. Cassini Guidance System instead re-identifies the eye in the operating room using iris

imaging, automatically correcting for cyclotorsion, head tilt, and eye movement, and displays the true astigmatism axis and toric IOL alignment as a real-time surgical overlay—without smearing, fading, or human marking error.

4. What imaging does Cassini Guidance System use?

CGS uses high-resolution multi-spot corneal topography (from the Cassini Ambient) combined with iris pattern recognition to create a unique biometric map of each eye. These anatomical features are captured during the preoperative Cassini Ambient exam and then matched to the intraoperative eye using advanced pattern-matching algorithms, allowing the system to detect eye rotation, eye translation, and image-scale changes with high spatial precision for accurate surgical alignment.

5. How does the Cassini Guidance System compare to the Verion™ system from Alcon?

Cassini Guidance System and Alcon VERION™ both use image-based registration to replace static ink marks, but they differ in how static versus dynamic images are used and in platform flexibility. VERION™ relies on a static preoperative reference image of limbal, pupil, and scleral features that are matched intraoperatively through select compatible microscopes to guide alignment[4]. Cassini Guidance System captures a detailed preoperative biometric map using high-resolution corneal topography plus iris patterns and then performs dynamic image comparisons in the OR with advanced pattern-matching algorithms. This allows Cassini to continuously detect and compensate for eye rotation, translation, and scale changes with high spatial precision, providing a real-time alignment overlay rather than a single static reference.

6. How does the Cassini Guidance System compare to the CALLISTO eye® system from Zeiss?

Cassini Guidance System and ZEISS CALLISTO eye® are both digital, image-guided systems designed to replace ink marks and compensate for cyclotorsion, but they differ in flexibility and image-tracking approach. CALLISTO eye® relies on a static preoperative reference image that is overlaid through a ZEISS microscope only[5], whereas Cassini Guidance System uses dynamic image matching based on high-resolution corneal topography plus iris patterns. This allows Cassini to track eye rotation, translation, and scale

changes in real time and to connect to any microscope brand, providing a live surgical overlay that is not restricted to a single manufacturer.

7. What happens if registration fails during surgery?

If Cassini Guidance System is unable to successfully complete image registration, the system simply does not display the alignment overlay, so the surgeon is never shown low-confidence or incorrect guidance. Registration can occasionally fail if anatomical features are difficult to recognize, such as in eyes with dense arcus, corneal pannus, or an overly dilated pupil that obscures normal iris detail. In these cases, the user can press the “Refit” button to re-attempt registration after returning to the initial focus plane, adjusting focus, illumination, or docking. For these challenging cases, it is recommended that they be identified preoperatively and that backup ink marking be performed before surgery, so a reliable alignment method is available if image registration cannot be achieved. If registration still cannot be achieved, the case proceeds using the surgeon’s standard backup method (e.g., ink marks or intraoperative aberrometry), ensuring a safe, uninterrupted surgical workflow.

8. How does the Cassini Guidance System improve toric outcomes?

The Cassini Guidance System improves toric outcomes by ensuring that the true astigmatism measured preoperatively is delivered accurately in the operating room. It uses the Cassini Ambient corneal topographer to capture total corneal astigmatism—including both anterior and posterior corneal surfaces—and combines this with iris pattern registration to digitally identify the eye. During surgery, Cassini automatically compensates for cyclotorsion, head tilt, and eye translation, allowing the toric IOL to be aligned to the true total-corneal astigmatism axis rather than to ink marks or estimated landmarks. By eliminating rotational and measurement errors, Cassini reduces residual astigmatism and delivers more predictable toric refractive outcomes.

9. Is Cassini Guidance System safe?

Yes. Cassini Guidance is a non-contact, image-based system that uses only optical imaging to provide digital alignment overlays and does not touch the eye or alter the surgical procedure. It is fail-safe by design—if high-confidence registration cannot be achieved, no overlay is shown, and the surgeon

proceeds using standard methods. Because it is purely observational and advisory, CGS improves precision without adding risk to the patient or the surgery.

10. Does Cassini Guidance System incorporate preoperative surgical planning?

Yes. Cassini Guidance System incorporates preoperative surgical planning using measurements from the Cassini Ambient corneal topographer, including total corneal astigmatism, to define the intended toric IOL axis, arcuate incision location, and treatment parameters. This plan is managed and transferred through Cassini Connect OR, which digitally delivers the surgical plan into the operating room. Cassini Guidance then uses image registration to align the live eye to the planned treatment and display the correct axis and alignment cues as a real-time surgical overlay.

11. What is Cassini Connect OR?

Cassini Connect OR is Cassini's digital operating-room integration platform that links preoperative diagnostics, surgical planning, and intraoperative guidance into a single, seamless workflow. It receives measurement data from the Cassini Ambient corneal topographer, allows the surgeon to create and store a toric IOL or arcuate incision plan, and then securely delivers that plan into the operating room. During surgery, Cassini Connect OR synchronizes the plan with the live surgical video and enables Cassini Guidance System to display real-time alignment overlays that compensate for cyclotorsion and eye movement, ensuring the preoperative plan is accurately executed. This digital workflow reduces manual transcription errors, procedure time and costs.

12. Is the Cassini Guidance System regulatory approved globally?

The Cassini Guidance System is FDA-cleared and approved by Health Canada for digital guidance. It is being evaluated for regulatory approval under the EU MDR.

13. What are best practice pearls for achieving reliable image registration in the OR using the Cassini Guidance System?

Achieving reliable image registration with the Cassini Guidance System begins with high-quality preoperative imaging, ensuring well-centered, well-

focused images with full limbal exposure and avoiding excessive pupil dilation that can wash out iris features. Eyes with arcus, pannus, limbal scarring, very dark or homogeneous irides, or prior iris manipulation should be identified in advance and marked as higher risk, with a backup ink reference planned. In the OR, success depends on clean globe exposure and stable docking, with careful control of eyelids and lashes, avoidance of pressure-induced iris distortion or pupil ovalization, and minimizing OVD overfill prior to registration. If registration is unsuccessful, re-centering the eye and repeating image capture often resolves the issue, as most failures are related to exposure or image quality rather than the registration algorithm itself.

14. Is the Cassini Guidance System compatible with different operating room microscopes?

Yes. The Cassini Guidance System is designed to be microscope-agnostic and can be used with a wide range of operating room microscopes. It delivers its real-time alignment guidance as a digital surgical overlay that is displayed through compatible OR visualization pathways, allowing surgeons to view axis guidance without altering their standard microscope workflow. Because the guidance is image-based rather than dependent on a specific microscope model, the system can be integrated into modern cataract surgery environments, including both conventional phaco cases and femtosecond laser–assisted cataract surgery workflows. This flexibility allows practices to adopt Cassini Guidance System without requiring changes to their existing microscope platform.

15. What if the axis alignment overlay disappears during surgery following successful registration?

If the overlay does not appear, adjust the microscope magnification to match the zoom level used during the original registration. You can also make small incremental zoom-in or zoom-out adjustments to help the system re-establish the registration point. Ensure that no instruments are present in the field of view during this process.

References

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The references listed support general clinical principles discussed in this document and are not intended to represent device-specific performance claims.