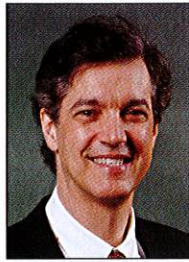


Red reflex stability improves illumination

David M. Lubeck, MD



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Red reflex stability is one quality of a microscope that is integral to precise visualization during ophthalmic surgery. The red reflex is the reddish-orange reflection from the retina that is observed through an ophthalmic surgical microscope as coaxial light passes into and then back out of the eye. Its stability is defined by how even and bright the red illumination is across the entire working diameter within the pupil, no matter where the eye moves or is directed during the procedure. In cataract surgery specifically, the majority of visualization is derived from indirect illumination. That is, visualization is created by shadows and contrast that are created by lens material altering and being highlighted by the red reflex. A brilliant red reflex is one that creates the highest degree of contrast, edge definition and detail shadowing within the cataract. The stability of the red reflex, to a great extent, determines how efficiently and safely the surgeon can manipulate the cataract and work within the capsular bag.

Causes and effects of a poor red reflex

Many factors within the eye can cause a poor red reflex, darkening areas of the intra-pupillary surgical field that need to be visualized for surgery. Achieving a stable red reflex is particularly challenging in patients with small pupils, because maintaining coaxial illumination is structurally more difficult. Significant eye movement during surgery can create havoc with the red reflex because when the eye shifts off center, coaxial illumination can again be difficult to maintain. The surgeon must then take time to re-adjust the microscope so the correct illumination is achieved. Dense lens opacities and corneal haze can interfere with the red reflex and surgeon's view, as well. External factors such as the position of the microscope can also cause a

diminished or unstable red reflex. Illumination optics are changed by tilting the microscope. Movement of the eye away from the point of perfect optical focus in the Z axis or of centration in the X/Y axes can further affect the quality of the red reflex by limiting coaxial light reaching the retina. Therefore, it is imperative that a microscope not only provides a bright red reflex, but also offers a stability that can best accommodate all of these situations.

When the red reflex decreases because of eye movement or change in the position of the microscope, certain phases of cataract surgery become more difficult and potentially dangerous. For example, creation of round and appropriately sized capsulorrhexis is more difficult with a diminished red reflex. It is more difficult for the surgeon to determine where within the cataract the phaco or irrigation and aspiration tip is being placed. Most importantly, without consistent illumination, it is more difficult to see and judge the position of the posterior capsule during different phases of the procedure. When surgeons do not have a consistent view of the posterior capsule, the risk for rupture increases. If posterior capsule rupture does occur in the absence of a good red reflex, then the surgeon will be less able to recognize and stabilize it early enough to prevent a larger, more complicated tear.

Benefits of a stable red reflex

To help prevent intraoperative complications like posterior capsule rupture, surgeons need a microscope that provides a stable and consistent red reflex. The red reflex created by the LuxOR Ophthalmic Microscope (Alcon Laboratories, Inc.), is not affected by pupil size, eye movement, lens tilt, microscope tilt or centration. Its red reflex is significantly more consistent and stable than any microscope I have previously used; this is largely because its unique illumination optics have a broad coaxial light source for both of the surgeon's eyes (Figure 1, Figure 2). This provides

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such consistent visualization that the surgeon is not required to re-adjust the microscope at any point during surgery to maintain the red reflex.

Consistent visualization of elements in the eye improves every step of cataract surgery, such as making corneal incisions, dividing nuclear material, removing the cortex, complete cleaning of the anterior and posterior leaves of the capsular bag, placing the IOL and removing the viscoelastic. Consistent visualization is especially essential when performing capsulorrhexis or other complex capsular maneuvers. Creation of the capsulorrhexis is best judged by the shadow its edge creates in the red reflex. As the red reflex becomes brighter and more even, the capsular edge becomes more distinct. This greatly adds to the surgical ease in performing centered and appropriately sized capsulorrhexis in all types of cataracts.

Conclusion

Cataract surgeons rely on the red reflex and depth of focus to provide visualization for the most critical steps of surgery. Therefore, these qualities in an operating microscope can affect the efficiency and success of each procedure. The advanced illumination and optical systems of the LuxOR provide superb visualization throughout each case and does so without requiring intraoperative re-adjustment of the microscope position. This exceptional improvement in red reflex stability and focus helps to ensure a satisfying experience for the surgeon and the best opportunity for successful outcomes.

Reference

1. Data on file, Alcon Laboratories, Inc.

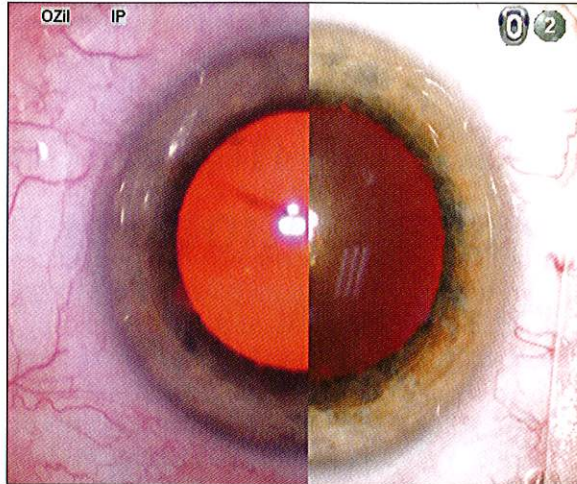


Figure 1: View with the LuxOR Ophthalmic Microscope (left) compared to a standard microscope (right).

Source: Lubeck DM.

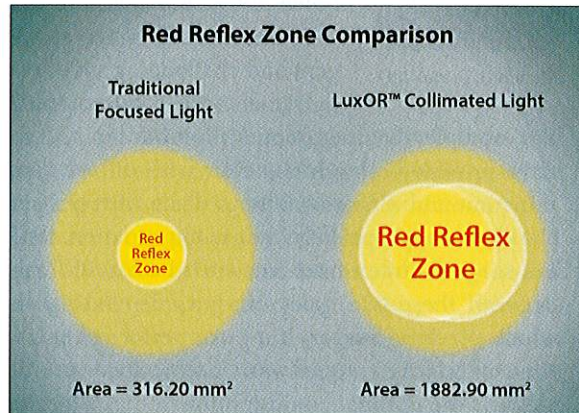


Figure 2: The red reflex zone of a traditional microscope compared to the red reflex zone of the LuxOR Ophthalmic Microscope.¹

Source: Alcon Laboratories, Inc.

PERSPECTIVES

John P. Berdahl, MD

The LuxOR has a highly stable and consistent red reflex that is not affected by eye movement. The amount of X/Y and focus surgeons can achieve with its LIBERO-XY Communication System while still maintaining a red reflex is remarkable. Surgeons can see a level of detail that they were never able to see using past models.

Michael P. Jones, MD

The red reflex is similar to depth of focus, but the red reflex is adjusted by moving the microscope left or right, or up or down to achieve a large, vibrant zone that illuminates the eye. The LuxOR microscope's three collimated beams of light create a red reflex zone that is six times larger than a standard microscope.¹ Surgeons do not have to worry about focusing up or down and do not need to move the microscope left or right if the patient's eye moves, because the red reflex zone is so large. Not having to re-adjust the microscope in any direction helps to improve the surgeon's efficiency in the operating room.

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