What You Need to Know About Using a Pupil Expansion Device During Laser Cataract Surgery

Inserting the Malyugin Ring during surgery with the Femto LDV Z8 can help to ensure safe surgery in small pupils.

BY BORIS MALYUGIN, MD, PHD

Cataract surgery in eyes with small pupils presents a challenge to even the most seasoned surgeons. Not only does the small pupil limit our access to the surgical field, but it is also associated with several intra- and postoperative complications including anterior capsular tears, increased inflammation, posterior capsular rupture, and retained lens material. Therefore, in pupils that either do not achieve adequate preoperative mydriasis or in which intraoperative miosis occurs, I like to use a pupil expansion device like the Malyugin Ring (MicroSurgical Technology).

If the pupil is constricted or not sufficiently dilated before the procedure, laser cataract surgery can still be performed. A pupil expansion device can safely and effectively be incorporated into a laser cataract surgery procedure with the Femto LDV Z8 (Ziemer). This combination helps to ensure safe surgery and excellent visual outcomes in eyes with small pupils. I prefer the Femto LDV Z8 to other femtosecond laser platforms because of its versatility and its small footprint, eliminating the need to move the patient from the laser to the operating table. I find this is quite comfortable for the patient and the surgeon alike.

TWO SCENARIOS, ONE BASIC TECHNIQUE

As mentioned at the outset of this article, the Malyugin Ring can be used in two different scenarios, and these are in pupils that do not achieve adequate preoperative mydriasis and in pupils in which intraoperative miosis occurs.

I advise using the second-generation device, the Malyugin Ring 2.0, which is thinner and friendlier to the iris tissue. The device comes in two sizes (6.25 and 7.0 mm). I prefer the larger one, which allows me to widen the pupil more substantially. The exception is in rare cases when the pupil is very fibrotic, when the stiffer first-generation ring is more appropriate.

The insertion technique is basically the same in both scenarios; however, slight variations in the surgical procedure must be noted.

Using the Malyugin Ring in eyes with inadequate preoperative mydriasis. The second-generation Malyugin Ring is inserted through a 2-mm clear corneal incision. Obviously a smaller incision seals better and is more resistant to external pressure, such as that applied during docking of the laser system. An additional paracentheses does not need to be created before docking and applying laser energy. Subsequently, this avoids the presence of additional points of leakage from the anterior chamber.

After filling the anterior chamber with a dispersive OVD (Viscoat, Alcon), the ring's injector is inserted through the clear corneal incision, and the tip is positioned at the center of the anterior chamber. The ring is released from the injector tip and the distal scroll is engaged with the distal iris.

As both lateral scrolls emerge from the tube of the inserter, they catch the iris margins. Then the proximal scroll is expelled, and the injector is moved proximally until the inserter hook is no longer holding the ring. In this position, the proximal scroll is lying on top of the

STEP-BY-STEP

- **Insert the Malyugin Ring:**
  - Create a 2-mm clear corneal incision
  - Fill anterior chamber with a dispersive OVD
  - Insert the Malyugin Ring (position tip at center of the anterior chamber)
  - Release the ring and engage the distal scroll with the distal iris
  - Expel the proximal scroll and move the inserter proximally until the inserter hook no longer holds the ring; the proximal hook is now lying on top of the iris
  - Remove injector and use an iris hook to push the proximal scroll into the pupillary space; the proximal region of the iris marking is now engaged
  - Refill the anterior chamber with OVD and remove any air bubbles
  - Close the incision with a 10-0 nylon suture
  - Block possible bleeding with hydroxypropyl cellulose
- **Femtosecond Laser Treatment:**
  - Increase the capsulotomy laser energy by 20% to 25%
  - Proceed with Femto LDV Z8 laser treatment Remove the temporary suture and proceed with cataract surgery

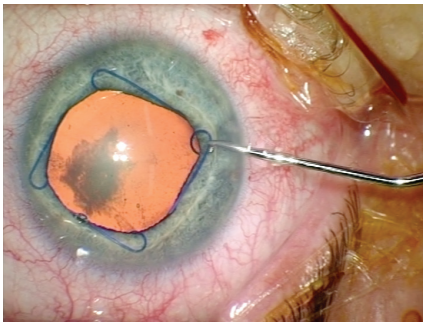

Figure 1. The Malyugin Ring is positioned in the eye.

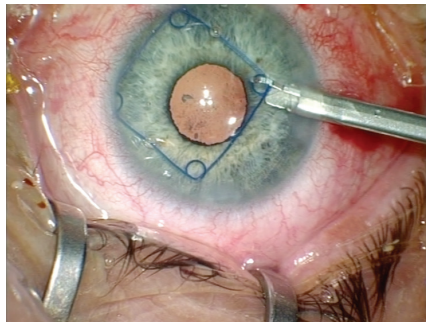

Figure 2. The Malyugin Ring is removed from the eye.

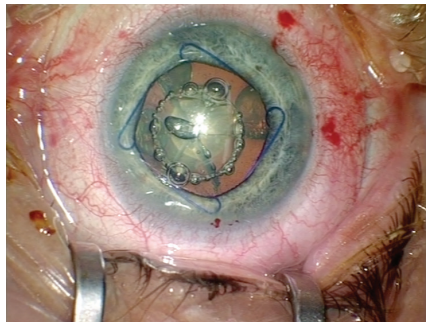

Figure 3. The Malyugin Ring in place, with laser prefragmentation segments visible.

iris. After the injector is removed from the eye, an iris hook is used to push the proximal scroll into the pupillary space. The proximal region of the iris margin is engaged, and then cataract surgery is performed.

Once the ring is in place (Figure 1), using the steps previously outlined, the anterior chamber is again refilled with OVD. If any air bubbles are present in the anterior chamber, they must be removed. Otherwise, the air bubbles will later block the laser during subsequent steps of the procedure.

Placement of one 10-0 nylon suture to close the 2-mm clear corneal incision is advisable. This additional safety measure can help to avoid the OVD from leaking from the wound and shallowing the anterior chamber. It will also ensure that laser application can be perfectly placed and an incomplete capsulotomy is avoided.

Another important point is to avoid bleeding from the limbal vessels when the entry point of the clear corneal tunnel is too peripheral. If bleeding does occur despite precautions, hydroxypropyl cellulose can be applied to the cornea. Due to its viscous properties, hydroxypropyl cellulose prevents blood from accumulating between the cornea and the laser interface by blocking the bleeding and directing it away from the center of the cornea.

APPLYING THE LASER

The next step is the laser capsulotomy. First, the laser energy parameters are increased by 20% to 25%, so that the laser can fire effectively through the OVD. Then, the capsulotomy is checked for integrity of the anterior capsule ridge, and the temporary incision is removed.

Gentle hydrodissection and bimanual irrigation and aspiration of the cortex material are then performed. In some cases, it might be necessary to create two additional paracentesis incisions, which were not required in the first steps of the procedure. At the end of the procedure, the Malyugin Ring is removed from the eye in the reverse order (Figure 2). The last steps are to remove the OVD, inject antibiotic, and check the integrity of the incision.

OTHER CONSIDERATIONS

When inserting the Malyugin Ring in an eye with an open anterior capsule, close attention must be paid that the scrolls do not get caught on the edge of the laser-assisted capsulotomy. If they are caught, the ring can be slightly displaced. Later during the course of the procedure, stress on the capsular edge can cause a radial tear that might extend to the equator.

To avoid catching the edge of the capsule with the ring scroll, first, OVD is injected behind the iris in order to separate the iris from the anterior capsule. The ring is then inserted and attached to the iris as previously described.

As soon as the Malyugin Ring is in place, something I call the *picture frame maneuver* is performed, wherein the Malyugin Ring is moved to the left and right and up and down. If it moves easily, then the device is well-positioned and it is not catching the edge of anterior capsule. But if movements are restricted in one or two directions, the scrolls must then be reengaged to the distal iris.

Use of the femtosecond laser for certain steps of the cataract surgery procedure is especially beneficial in eyes with zonular weakness. The latter is very common in patients with poor mydriasis due to the underlying conditions such as pseudoexfoliation syndrome, glaucoma, and diabetes. Femtosecond laser capsulotomy and lens nucleus prefragmentation (Figure 3) limits the pressure on the lens and zonules and decreases the amount of ultrasound energy that is delivered to the eye.

CONCLUSION

In the presence of a small pupil, I find it useful to place a pupil expansion device like the Malyugin Ring in conjunction with laser cataract surgery with the Femto LDV Z8. Using the steps outlined here and summarized below in *Step-by-Step*, this combination can help to ensure safe surgery and excellent visual outcomes. ■

BORIS MALYUGIN, MD, PHD

- Professor of Ophthalmology and Deputy Director General, S. Fyodorov Eye Microsurgery State Institution, Russia
- boris.malyugin@gmail.com
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