

Stretching the Pupil in Cataract Surgery

Tips for expanding the pupils of glaucoma patients.

BY I. HOWARD FINE, MD; RICHARD S. HOFFMAN, MD; AND MARK PACKER, MD, FACS

Cataract surgery in patients with glaucoma can be complicated by a pupil that dilates poorly. Several pharmacologic and mechanical techniques for expanding the pupil are available to address this problem.

PHARMACOLOGIC TECHNIQUES

Using a pharmacologic agent is the first choice for dilating the pupil. Prior to cataract surgery, ophthalmologists typically use 1% tropicamide and 2.5% phenylephrine. If these agents do not produce sufficient dilation, good results can often be achieved by increasing the strength of the pharmacologic agents (eg, 10% Neo-Synephrine [Bayer Corporation, West Haven, CT] and 2% Cyclogyl [Alcon Laboratories, Inc., Fort Worth, TX]). In some cases, patients can take the agents home and begin dilation before they come to the surgery center.

If the pupil still does not dilate adequately, a viscoelastic agent may be helpful. Viscosurgical devices with high

“Using a pharmacologic agent is the first choice for dilating the pupil. Prior to cataract surgery, ophthalmologists typically use 1% tropicamide and 2.5% phenylephrine.”

molecular weights such as Healon5 (Advanced Medical Optics, Inc., Santa Ana, CA) work well. If posterior synechiae are present, then the surgeon should perform lysis prior to pupil dilation with a dispersive agent like Viscoat (Alcon Laboratories, Inc.). Healon5 may be used thereafter to dilate the pupil. Particularly in glaucoma patients, it is imperative that all of the viscoelastic be removed from the eye after surgery, because residual Healon5 can cause pressure increases.

(All figures are courtesy of Richard S. Hoffman, MD.)

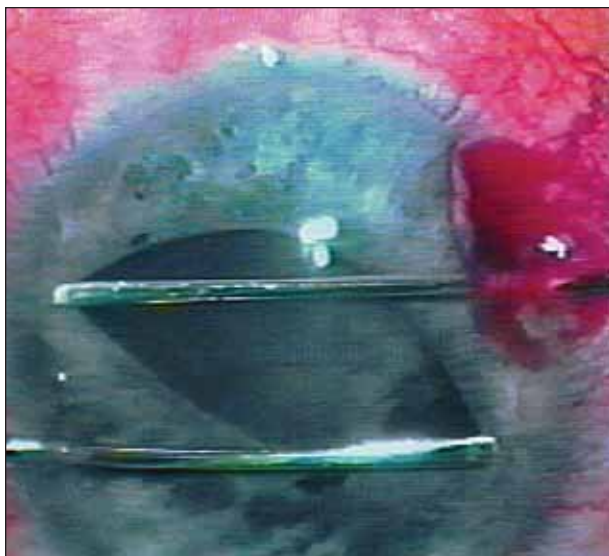


Figure 1. The surgeon uses two Lester hooks to stretch the pupil.

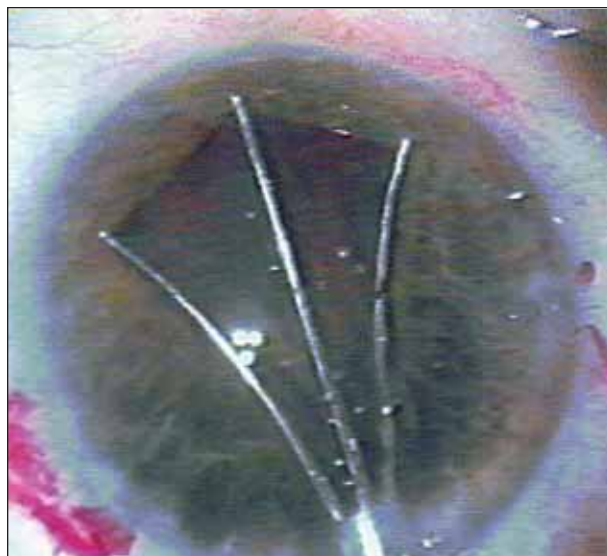


Figure 2. A three-pronged Beehler pupil dilator expands the pupil.

MECHANICAL PUPILLARY STRETCHING

Lester Hooks

If pharmacologic and viscoelastic agents are unable to dilate the pupil, two Lester hooks (Katena Products Inc., Denville, NJ) are an option. One hook is inserted through the main incision, and the second hook is inserted through the paracentesis. The hooks engage the pupillary margin at opposite points. They are then pulled apart, moved 90°, and pulled again to manually dilate the pupil (Figure 1).

The Beehler Pupil Dilator

Instead of hooks, our favorite technique in these cases is to use the Beehler pupil dilator (Moria, Antony, France), which comes in two- and three-pronged versions. The two-pronged version is inserted through a 2.5-mm incision, and the three-pronged version is inserted through a 3.0-mm incision. In both designs, one hook wraps around the subincisional pupillary margin. The surgeon then pushes a plunger, and either two or three prongs emerge from the tip (Figure 2). The prongs feature small hooks that engage the distal pupillary margin. In one motion, the whole pupil is dilated.

Because the Beehler pupil dilator creates more even dilation by distributing tension on all sides of the pupil, eyes will frequently have a better cosmetic appearance at the end of the case than after the use of two Lester hooks.

When employing the Beehler pupil dilator for the first time, surgeons should make sure to introduce and remove the proximal hook, which goes under the subincisional pupillary margin, in a sideways fashion so it does not accidentally tear the incision in the cornea. While dilating the pupil, surgeons must be careful not to put downward pressure on the lens, especially in eyes with pseudoexfoliation glaucoma, because these patients have weak zonules.

Iris Retractors

Iris retractors are another option for small pupils. The surgeon makes four small paracenteses, through each of which he inserts the retractors. The devices create a square pupil, and the paracenteses allow fluid to egress out of the eye, which can affect the fluidics. Iris retractors are therefore not ideal.

Pupil Ring

If the pupil is stretched but will not remain dilated, a pupil ring may be helpful. One available option is the type 5S Morcher pupil dilator (Morcher GmbH, Stuttgart, Germany). This solid PMMA ring is placed at the pupillary margin, and it expands the pupil through 300°

with even tension all the way around (Figure 3). The ring also protects the pupillary margin by preventing floppy irides from entering the phaco tip. The ring is inserted through the 2.5-mm incision, and it is easily placed using hooks. The surgeon manipulates the central segment of the ring into position, in apposition to the distal pupillary margin, and then places the ends of the ring with the aid of its eyelets. After implanting the IOL, the surgeon removes the ring by freeing its ends

DISCUSSION

By Iqbal Ike K. Ahmed, MD, FRCSC

Drs. Fine, Hoffman, and Packer provide a useful template for managing the small pupil. As described in the past,¹ and combined with stretching,² the creation of mini-sphincterotomies at the pupillary margin (Figure 1) is an effective method. Newer concepts such as using microscissors and viscodilation without stretching yield a well-controlled method, because they employ cutting rather than tearing or stretching techniques. I believe mini-sphincterotomies may result less often in flaccid iris, hemorrhage and exudation, and postoperative atonic pupils than other surgical techniques.

Iqbal Ike K. Ahmed, MD, FRCSC, is Assistant Professor at the University of Toronto and Clinical Assistant Professor at the University of Utah in Salt Lake City. Dr. Ahmed may be reached at (905) 820-3937; ike.ahmed@utoronto.ca.

1. Cole MD, Brown R, Ridgway AE. Role of sphincterotomy in extracapsular cataract surgery. *Br J Ophthalmol*. 1986;70:692-695.

2. Fine IH. Pupilloplasty for small pupil phacoemulsification. *J Cataract Refract Surg*. 1994;20:192-196.



Figure 1. Dr. Ahmed enlarges the pupil by means of mini-sphincterotomies.

from their point of apposition with the pupil by means of a small hook, again placed in each eyelet. The ring then may be withdrawn from the anterior chamber with a forceps. An injector for the ring is available from Geuder AG (Heidelberg, Germany).

Another available pupil ring is the Perfect Pupil (Milvella Pty Ltd, Epping, Australia). This polyurethane device functions similarly to the Morcher ring, but it has a safety arm that sticks out of the incision and prevents it from becoming lost in the eye. An injector is available from the company.

Although pupil rings work well, inserting them in the eye can be intimidating. Additionally, they remain in the eye during the cataract procedure.

SURGICAL TECHNIQUES

Although most surgical techniques for expanding the pupil have fallen into disuse because of the development of the aforementioned instruments, pupillary membrane dissection is sometimes still necessary.¹ Certain small pupils have a fibrotic membrane around the pupillary margin that can prevent them from dilating. Surgeons can peel the membrane off with a Fine forceps (American Surgical Instruments Corporation, Westmont, IL).

POSTOPERATIVE CONCERNS

Postoperatively, the pupil may not constrict. It is important to address this problem soon after surgery, because a

BIMANUAL MICROINCISIONAL PHACOEMULSIFICATION

Pharmacologic and viscoelastic agents may be used during bimanual microincisional phacoemulsification. If they do not provide adequate pupil dilation, the surgeon may employ two Lester hooks (Katena Products Inc., Denville, NJ). An alternative involves making eight micro-sphincterotomies through the pupillary margin, but not through the full pupillary sphincter, and stretching through those sites. Additionally, a Beehler pupil dilator (Moria, Antony, France) is available that will fit through bimanual incisions.

In cases where these options do not work, the surgeon must expand the incisions for a pupil dilator ring.

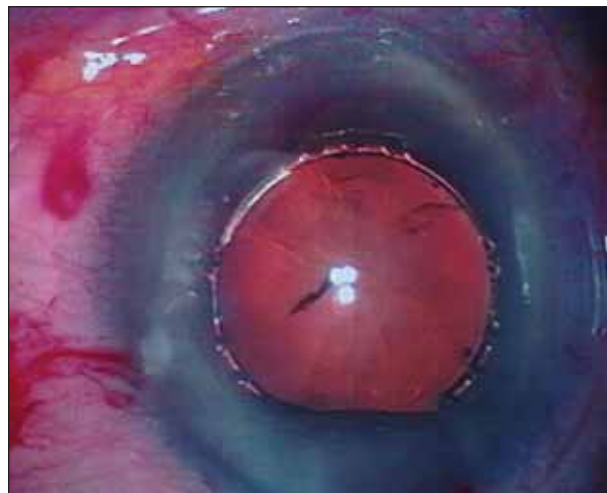


Figure 3. A pupil ring is placed.

pupil dilated to 6 or 7 mm is not cosmetically pleasing and can cause glare. Instilling Miochol-E (Novartis Ophthalmics, Inc., Duluth, GA) can help. Additionally, surgeons can stroke the pupil into place with a hook or spatula. Pilocarpine instilled postoperatively can also constrict the pupil and improve cosmesis. □

I. Howard Fine, MD, is Clinical Professor at Casey Eye Institute, Department of Ophthalmology, Oregon Health & Science University, and he is in private practice at Drs. Fine, Hoffman, & Packer in Eugene, Oregon. He is a paid consultant for Advanced Medical Optics, Inc., and he receives research and travel support from Alcon Laboratories, Inc. Dr. Fine may be reached at (541) 687-2110; hfine@finemd.com.

Richard S. Hoffman, MD, is Clinical Associate Professor at Casey Eye Institute, Department of Ophthalmology, Oregon Health & Science University, and he is in private practice at Drs. Fine, Hoffman, & Packer in Eugene, Oregon. He stated that he holds no financial interest in the products and companies mentioned herein. Dr. Hoffman may be reached at (541) 687-2110; rshoffman@finemd.com.

Mark Packer, MD, FACS, is Clinical Assistant Professor at Casey Eye Institute, Department of Ophthalmology, Oregon Health & Science University, and he is in private practice at Drs. Fine, Hoffman, & Packer in Eugene, Oregon. He is a paid consultant for Advanced Medical Optics, Inc., and he has received travel support and honoraria from Alcon Laboratories, Inc. Dr. Packer may be reached at (541) 687-2110; mpacker@finemd.com.

1. Osher RH. Pupillary membranectomy [videotape]. *Audiovisual Journal of Cataract and Implant Surgery*. 1991;7(3).