

Pupilloplasty for small pupil phacoemulsification

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ABSTRACT

In the pupilloplasty technique, the surgeon creates multiple partial sphincterotomies and stretches the sphincterotomies to enlarge any inadequately dilated pupil so that phacoemulsification can be safely performed. The technique recovers excellent physiologic function and cosmesis postoperatively.

Key Words: iridectomy, mechanical reduction, partial sphincterotomy, phacoemulsification, pupillary synechias, pupilloplasty, Rappazzo scissors, sphincterotomy

A pupil that dilates poorly is frequently the determining factor in a decision not to proceed with phacoemulsification. New techniques that allow phacoemulsification in the poorly dilated eye have been developed. They involve creating a superior sector iridectomy or a superior peripheral iridectomy with a sphincterotomy. Masket¹ described the use of an inferior sphincterotomy with a preplaced suture. Mackool² described the use of hooks placed through paracentesis incisions into the anterior chamber, which hold the pupil in a dilated configuration. Freeman et al.³ described preplacing sutures so that a loop is created with one end exiting through the ciliary sulcus and the other through the anterior chamber angle. This enables the surgeon to draw the pupil peripherally in several locations.

I will describe a technique I have used over the past decade with uniform success. This technique produces a pupil with a diameter adequate for phacoemulsification and results in a cosmetically acceptable and physiologically functional pupil postoperatively.

SURGICAL TECHNIQUE

The Rappazzo scissors (Storz E 1961-A) (Figure 1) has an outer cylinder with a blade at the end and a central rod with a blade at the tip that can be brought down against the blade attached to the cylinder, creating a shear force. The scissors is small enough to fit through the smallest paracentesis incision used for capsulotomy.

Shear is created when the surgeon presses the spring-loaded hemicylinders on the instrument's handle

(Figure 2). The procedure is performed in an anterior chamber in which aqueous humor has been replaced by viscoelastic.

Eight tiny sphincterotomies (Figure 3) measuring approximately 0.50 mm to 0.75 mm are cut at equal intervals around the pupillary border. This results in a dramatic increase in pupil size (Figure 4).

It is best not to cut completely through the sphincter and into the iris stroma. After sphincterotomies have been cut in the inferior two-thirds of the pupillary circumference, the blades of the scissors must be rotated to make sphincterotomies in the superior one-third of the pupil.

After the sphincterotomies, the chamber is deepened more with viscoelastic, resulting in further dilation of the pupil, usually to 5.5 mm to 6.0 mm in diameter. If, however, the pupillary size is still inadequate, a Lester hook is used to stretch the pupil slowly to the root of the iris at each sphincterotomy site (Figure 5). I believe that this maneuver results in a rupturing of fibrous elements in the pupil while the muscular elements are only stretched. This will almost always result in a pupil at least 7.0 mm in diameter through which cataract extraction can be easily conducted (Figure 6). Intraoperative miosis does not occur in pupils manipulated in this way, and the post-implantation pupil is the same size as the pupil before capsulorhexis (Figure 7).

After cataract extraction and lens implantation, the pupil is reduced mechanically by stroking the iris mid-periphery toward the center of the pupil with a Lester hook (Figure 8). Residual viscoelastic is evacuated and

Published in part in Koch PS, Davison JA, eds. Textbook of Advanced Phacoemulsification Techniques. Thorofare, NJ, Slack, Inc., 1991; Nordan LT, Maxwell WA, Davison JA, eds. The Surgical Rehabilitation of Vision. New York, Gower Medical Publishing, 1992.

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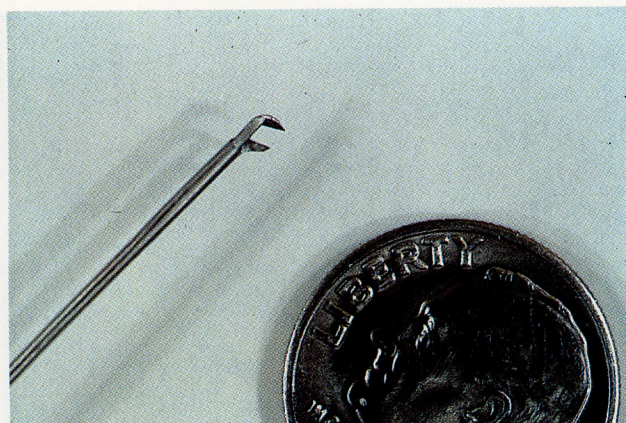


Fig. 1. (Fine) The blades of the Rappazzo scissors.

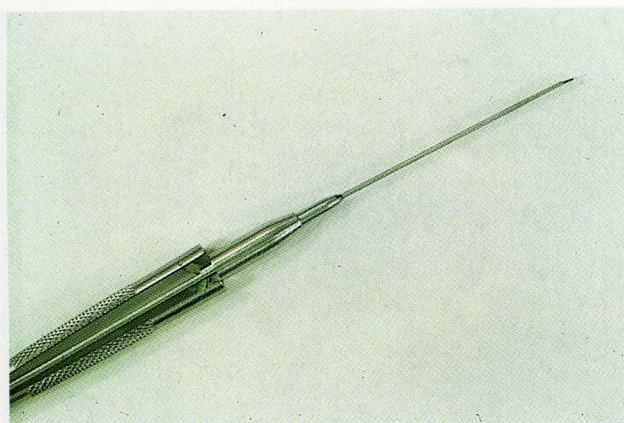


Fig. 2. (Fine) Rappazzo scissors showing hemicylindrical handles.

acetylcholine chloride (Miochol®) instilled into the anterior chamber. At the conclusion of the operation, the pupil is usually 3.0 mm to 4.0 mm in diameter (Figure 9). For the first two postoperative weeks, patients use 2% pilocarpine drops, an antibiotic/steroid drop, and a nonsteroidal anti-inflammatory drop, all three times a day in the operated eye.

RESULTS

Within a few days after surgery, the pupils on which this procedure has been performed normally return to a diameter of approximately 2.5 mm to 3.5 mm and have an excellent cosmetic appearance. Figure 10 shows the postoperative appearance of an eye of a patient who was on miotics for decades before having pupilloplasty and phacoemulsification of a dense cataract. Figure 11 shows the postoperative appearance of the eye of a patient who had multiple episodes of iritis over a period of years with nearly complete synechias of the pupil and a pupil that

would not dilate preoperatively to more than 3.0 mm. Figure 12 shows the postoperative appearance of an eye of a long-term glaucoma patient on miotics after pupilloplasty and cataract extraction.

The pupils of eyes on which this technique is used usually dilate well postoperatively. Figure 13 shows a pupil after pupilloplasty and phacoemulsification in the undilated state; Figure 14 shows the pupil after it was dilated with 2.5% phenylephrine and 1% tropicamide (Mydriacyl®) for funduscopy.

Postoperatively, these pupils usually respond physiologically to light. Figure 15 is a patient, postoperatively, who has had multiple episodes of iritis over a period of years, resulting in posterior synechias and pupillary margin fibrosis of the pupil in all positions except for the superior hour and one-half of the clock. Six sphincterotomies were made, after which the synechias were lysed, the pupil was stretched, and phacoemulsification was performed.

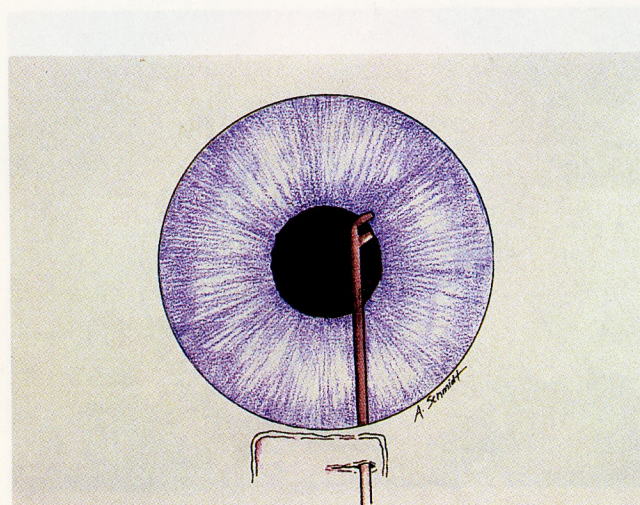


Fig. 3. (Fine) Application of the scissors to the pupillary margin.

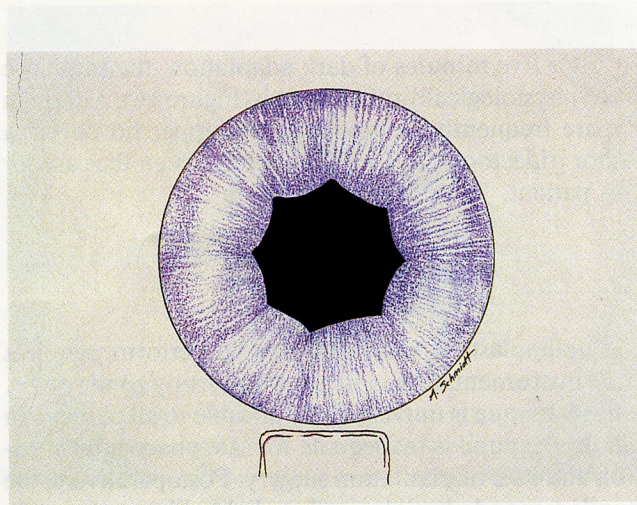


Fig. 4. (Fine) Pupil after eight partial sphincterotomies.

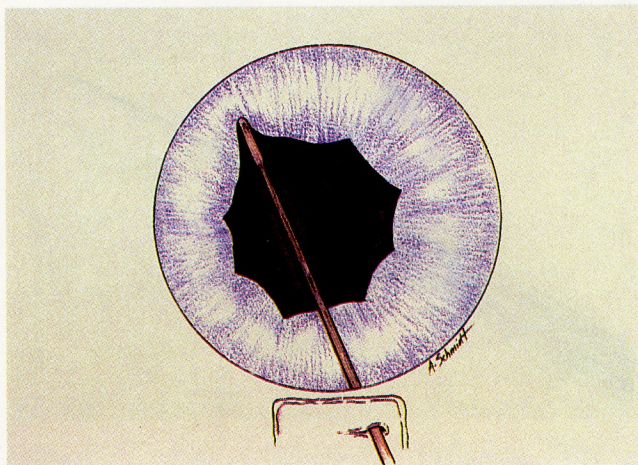


Fig. 5. (Fine) The pupil is stretched to the root of the iris.

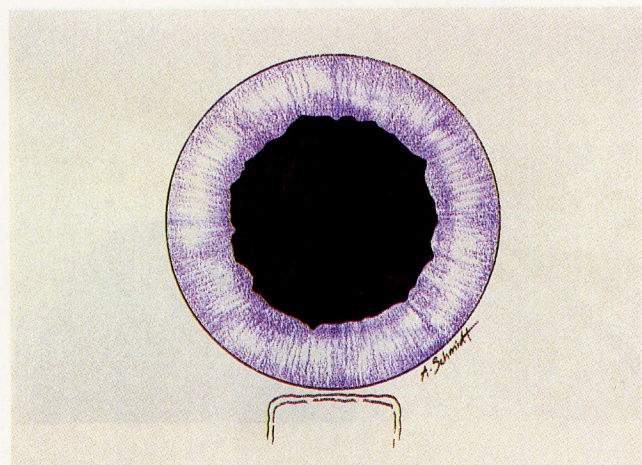


Fig. 6. (Fine) The pupil after circumferential stretching.

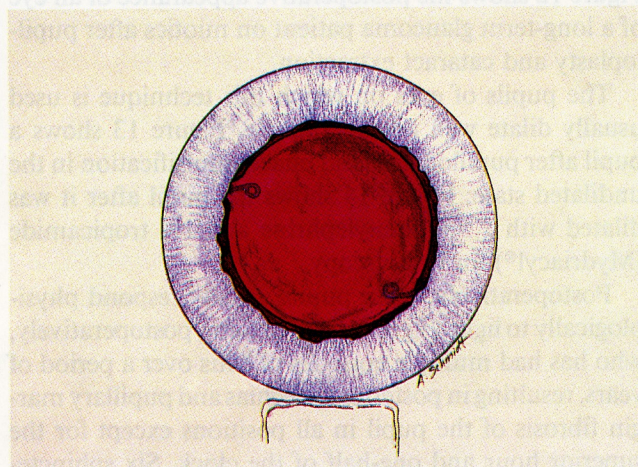


Fig. 7. (Fine) The pupil after phacoemulsification and lens implantation.

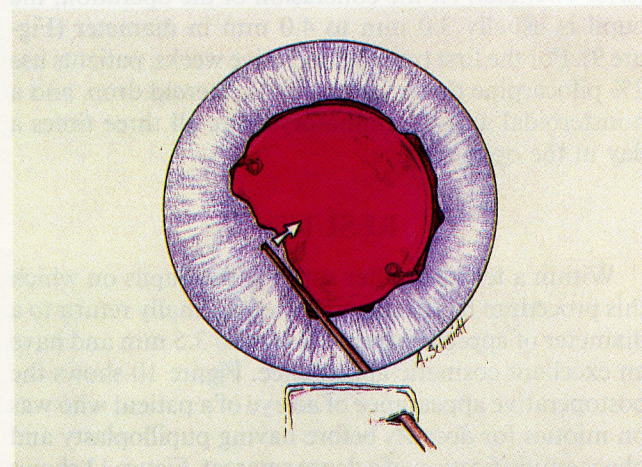


Fig. 8. (Fine) Mechanical reduction of the pupil.

After five minutes of dark adaptation, the same eye has a physiologically dilated pupil (Figure 16). Although we are frequently assured that the upper lid covers a sector iridectomy, this would not have been the case for this patient.

DISCUSSION

Pupilloplasty is rapid and easy to perform, requires little instrumentation, and gives uniformly good results. The technique is universally applicable to all patients in whom the pupil is inadequate for safe phacoemulsification and IOL implantation surgery. Postoperatively, the pupils respond physiologically to light, dilate adequately for funduscopy, and have an excellent cosmetic appearance.

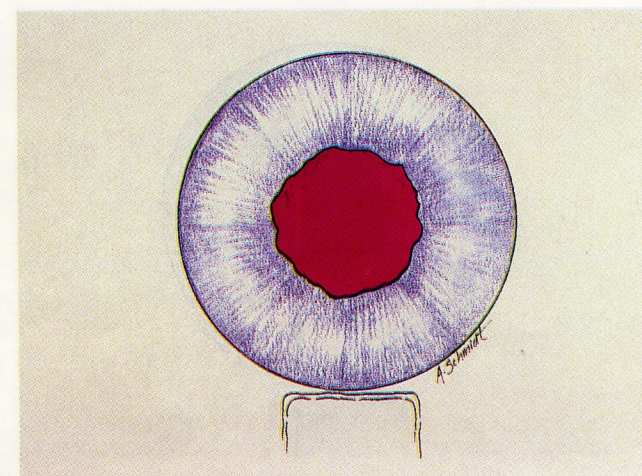


Fig. 9. (Fine) The pupil immediately after surgery.

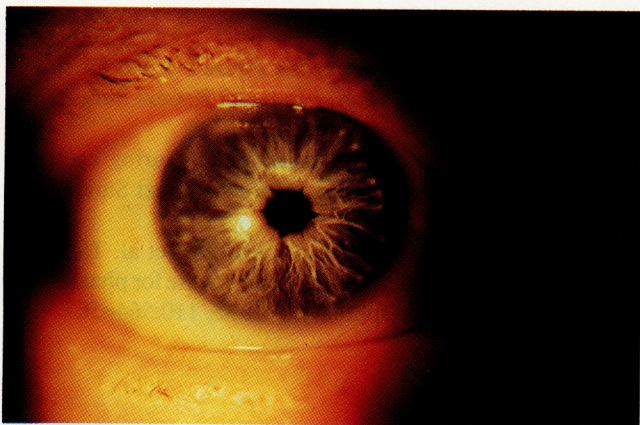


Fig. 10. (Fine) The eye, after pupilloplasty, of a patient on miotics for decades.

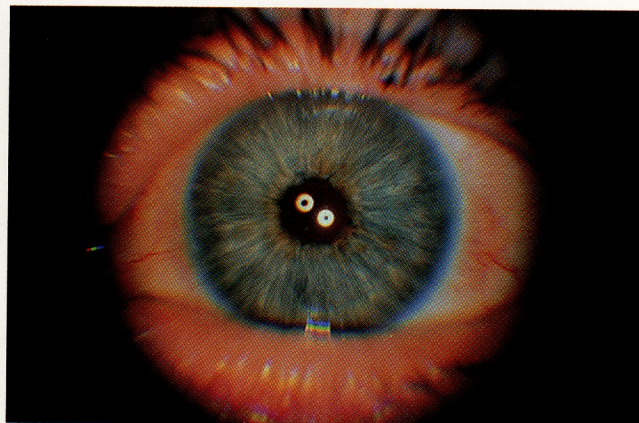


Fig. 11. (Fine) Postoperative appearance of an eye with a long history of recurrent iritis, miotic pupil, and synechias.

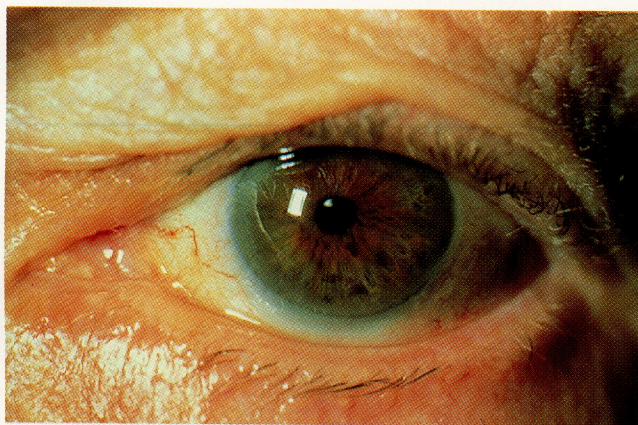


Fig. 12. (Fine) Postoperative appearance of an eye of a patient who was on miotics for decades; the sphincterotomies have apparently healed.



Fig. 13. (Fine) The eye after pupilloplasty and phacoemulsification.

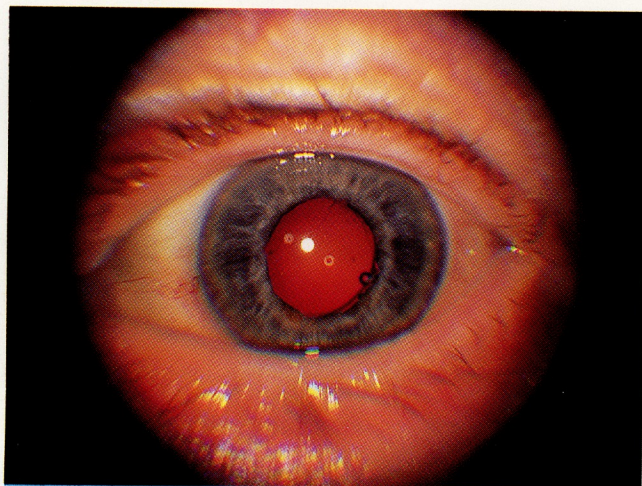


Fig. 14. (Fine) The eye in Figure 13 after dilation for funduscopy.

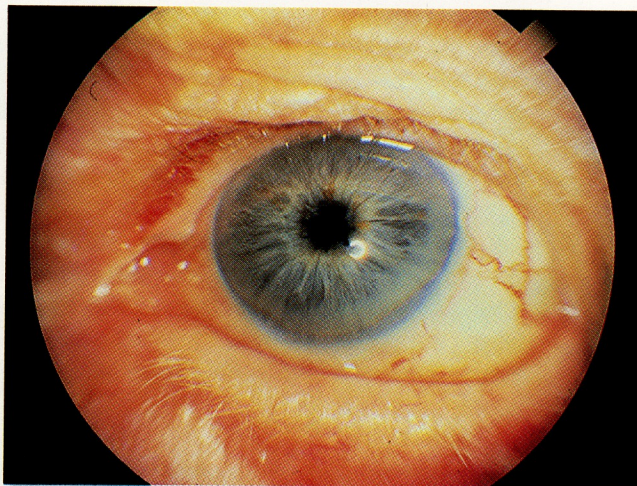


Fig. 15. (Fine) Postoperative appearance of an eye with six inferior sphincterotomies.

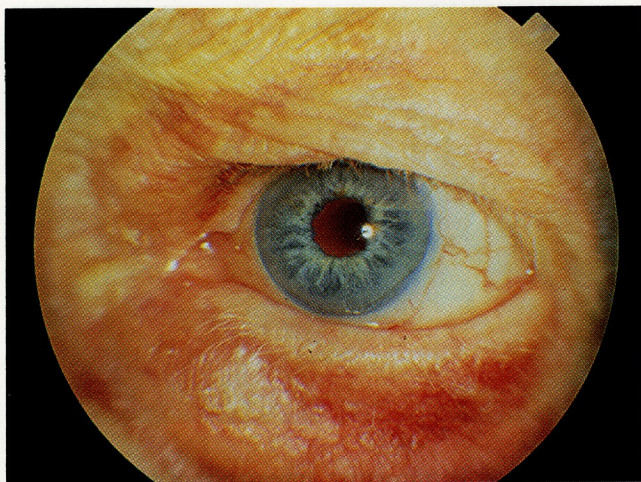


Fig. 16. (Fine) The eye in Figure 15 after five minutes of dark adaptation, showing physiologic dilation.

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