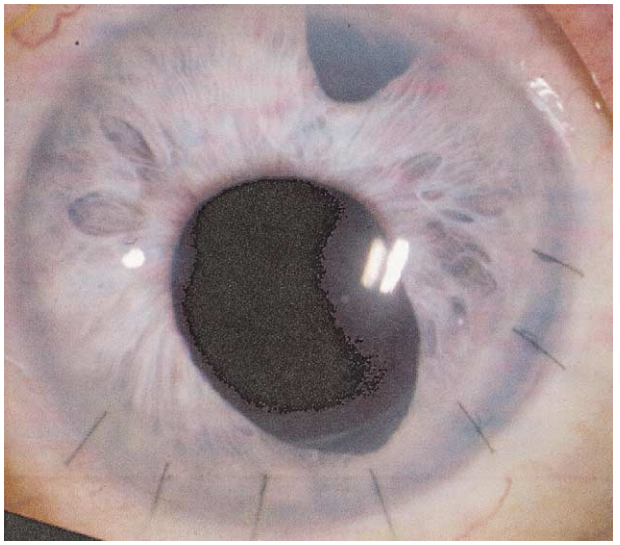

Figure 3. (Masket) An example of an inferior approach for extracapsular cataract surgery in a similar case with a preexisting bleb.

without concurrent filtration surgery also enhances the likelihood of dramatic early postoperative IOP elevation.[1] Combined glaucoma surgery must be considered but, penetrating or not, invites other potential complications.

Considering all these issues, the safest option would be an extracapsular procedure with a posterior chamber intraocular lens (IOL) from the inferior approach that conserves the superior conjunctiva (Figure 3). Although the patient is described as microphthalmic, the axial length of 24.6 mm is consistent with a normal to large cataractous lens and dictates a generous incision size. Two superiorly placed nylon iris retractors and capsule staining would allow for an adequate capsulorhexis and gentle hydrodissection, after which radial capsule relaxing incisions would be created. I would use a dispersive viscoelastic material to tamponade the area of the zonular opening and viscodissect and deliver the nucleus.

Cortical cleanup would likely be minimal. A 3-piece, 13.0 mm long acrylic IOL could be placed horizontally in the sulcus and the incision closed after careful aspiration of the viscoelastic material at a low bottle height.

In cases similar to this, intraoperative optic nerve examination through a gonio prism at the time of dense cataract surgery has been helpful in deciding whether to combine simultaneous filtration surgery. This examination might provide limited optic nerve information in this patient if there is relatively disturbed anatomy of a colobomatous disc. With preservation of the superior conjunctiva along with close observation and aggressive medical therapy, glaucoma surgery in this patient could be deferred indefinitely or until virtually "anytime" in the early or late postoperative period, depending on the clinical course.[2]

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■ This patient could provide the curriculum for a course on complicated cataract surgery. Her remaining sighted eye presents the problems of a small pupil; a mature, ultrabrunescent nucleus; loose or absent zonules; glaucoma; a history of contralateral corneal decompensation; and an extremely crowded anterior chamber. Although standard extracapsular cataract extraction (ECCE) is a consideration in light of the nuclear density and shallow anterior chamber, there are several advantages to a small-incision approach. First, the patient has glaucoma and may need future filtering surgery, particularly because the vision in the first eye was lost to excessive IOP. Second, microphthalmic eyes may be predisposed to intraoperative suprachoroidal hemorrhage or effusion. Finally, the pupil configuration complicates nuclear expression through a superior incision and phacoemulsification should facilitate lens removal through the smaller, down-drawn pupil.

This eye is described as microphthalmic. The Holladay 2 formula excels in short eyes by factoring in the corneal diameter and anterior chamber depth (ACD) to better predict the effective IOL position. With respect to IOL selection, the axial length should be rechecked with an immersion scan because of the presumed poor fixation of this eye with LP. If an axial length of 24.6 mm is confirmed, this might represent a case of microcornea. These eyes have a very small and crowded anterior segment, and there is an association with coloboma. In this

case, no special IOL power considerations, such as piggybacking, will be necessary.

A maximally cohesive and retentive ophthalmic viscosurgical device (OVD) is preferable for shallow anterior chambers. Sodium hyaluronate 2.3% (Healon®5) or a combination OVD such as sodium hyaluronate 3%–chondroitin sulfate 4% and sodium hyaluronate 1% (DuoVisc®) is ideal. However, in my experience, an anterior chamber as shallow as the slitlamp photograph indicates will not deepen sufficiently with an OVD alone, even if preoperative mannitol and ocular compression are used. An anterior chamber compartment this tiny means that the globe will become excessively firm before enough OVD can be injected to create sufficient space.

Phacoemulsification with a shallow anterior chamber presents multiple challenges. A proper keratome entry may be difficult. There may be insufficient space for iris hooks or other instrumentation that is necessary to expand the pupil. The capsulorhexis will tend to veer radially because of the anterior capsule convexity. Finally, emulsification of the brunescent nucleus must be performed so close to the endothelial surface that excessive cell loss is unavoidable.

To overcome these difficulties, a pars plana vitreous tap can be performed, followed by immediate injection of an OVD through the paracentesis. This technique, which I described in a small case series,[1] should use an automated vitreous cutter without infusion to blindly excise approximately 0.5 mL of vitreous. At present, I advocate using a 23-gauge, MVR-tipped vitreous cutter (BD-Visitec) for this purpose. Designed by Josephberg for office vitreous biopsy, this 23-gauge guillotine vitrectomy instrument has an MVR blade as its tip.[2] This can be inserted 3.5 mm behind the limbus directly through the conjunctiva and sclera. Because the sclerotomy and conjunctival openings should seal without sutures, this microvitrectomy instrument is ideal for this application. Alternatively, a standard vitreous cutter without an infusion sleeve can be used through a sclerotomy created with a #20 MVR blade (Alcon).

Sufficient expansion of the anterior chamber will permit placement of iris and capsule retractors, facilitate the continuous curvilinear capsulorhexis (CCC), and further distance the endothelium from the nuclear emulsification. I would operate through a temporal clear corneal incision and place 3 iris retractors at the 9, 12, and 3 o'clock positions to expand the pupil. As described by Oetting and Omphroy,[3] the subincisional iris retractor is placed through a separate opening just posterior to the clear corneal incision. This creates a diamond-shaped pupil for optimal instrument access and avoids tenting the iris upward just in front of the incision. If available to the surgeon, trypan blue dye provides better capsule visualization than indocyanine green (ICG) for ultrabrunescent nuclei.[4]

The degree of zonular support is often apparent during the capsulorhexis. The Mackool titanium capsule support system (Duckworth & Kent) is ideal for focal zonular defects. Two can be placed around the capsulorhexis edge inferiorly to further support the capsular bag during phacoemulsification. Capsular tension rings (CTRs), if available, can be inserted before emulsification or during cortical cleanup. The timing would depend on the severity of the zonular weakness.

With such a thick nucleus, sculpting a small central pit in the nucleus will facilitate vertical phaco chop, which is my strong preference for black cataracts. When approximately one half the nuclear fragments have been removed, I would pause to place additional sodium hyaluronate 3%–chondroitin sulfate 4% (Viscoat®) against the endothelium and behind the remaining chopped pieces. The Viscoat can insulate the posterior capsule from the sharp fragments in the absence of an epinuclear shell.

Even if available, an iris coloboma ring (Morcher) is probably unnecessary for this patient. Because the inferior IOL edge is inevitably exposed, the ring is very helpful in coloboma patients with good macular function. However, in my experience, coloboma patients with poor central vision are unlikely to experience edge dysphotopsias. I would, however, place a 3-piece, 6.0 mm optic, silicone IOL such as the Clariflex with the OptiEdge (AMO) to minimize edge reflections. If no CTR is used, I favor stiff poly(methyl methacrylate) haptics in the setting of loose zonules to better resist capsulorhexis contraction. With silicone, I would anticipate opacification of the overlapping anterior capsule, which might provide some occlusive benefit in the area of the iris defect inferiorly.

Finally, one must be prepared in such a complicated case to convert to a standard ECCE technique through a superior incision if complications such as posterior capsule rupture occur. Anticipating this possibility in addi-

tion to the prospect of a vitreous tap, it would be prudent to use a retrobulbar or peribulbar anesthetic block.

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■ We are concerned with the extraction of a hard, mature cataract in a patient who has microcornea with anterior microphthalmos, causing anterior segment crowding and associated with glaucoma and inferior colobomata. The surgical strategy must address the problems of the shallow anterior chamber, miotic pupil, lack of red reflex, possible lens instability, hard nucleus, and iris defect.

Preoperatively, I would perform immersion B-scan to exclude retinal detachment (which can be associated with coloboma) and to identify the position of the pars plana (in case a vitrectomy port is required) as the limbus in this case will not necessarily be a reliable landmark.

This patient has glaucoma and is on 3 medications, and all efforts must be taken to preserve conjunctiva superiorly should filtering surgery be required. Thus, I would use a clear corneal incision. Both the main and side-port wounds should be positioned away from the area of zonular loss.

Assuming the patient is is in good general health, I would use intravenous (IV) mannitol preoperatively to dehydrate the vitreous cavity and perhaps assist in deepening the anterior chamber. However, if it is inadequate, I would suggest creating a single incision through the pars plana and inserting a vitrector and aspirating without irrigation. This will reduce the vitreous size and greatly facilitate deepening the anterior chamber with viscoelastic material.

The next step is to create a CCC. In the absence of a red reflex, visualization will be enhanced by the use of trypan blue 0.1%. A viscoelastic plug around the area of absent zonules will minimize dye entering the posterior segment. The dye can be introduced under air and then replaced with a viscoelastic material. My choice would be Viscoat because of its dispersive qualities.

Mechanical pupil dilation will be required. My usual device is the PefectPupil. However, in this case of a small anterior segment, I would use iris hooks. First, they are smaller and in this crowed anterior segment would be easier to manipulate. Second, they can be used to hook the edge of the capsulorhexis and provide capsule stability if necessary. As a segment of iris is missing inferiorly, only 3 hooks may be necessary. A generous-sized capsulorhexis will minimize zonular stress. Then, gentle but thorough hydrodissection and hydrodelineation would be performed.

A lot of phaco energy is likely to be required to fragment this hard nucleus. Excessive heat production is a possible problem. The WhiteStar enhancement to the Sovereign (AMO) enables efficient delivery of phaco power to the nucleus with no significant heat buildup. A phaco-chop technique will minimize zonular stress and is particularly efficient in cases of hard cataract. I have successfully used a bimanual phaco-chop technique with WhiteStar even for hard nuclei. The advantage is a smaller phaco needle (as there is no irrigation sleeve), which will be of value in this small anterior chamber, and improved fluid dynamics as the irrigation inlet is moved away from the aspiration port. Thus, lower flow rates can be used, which is of particular value in eyes with missing zonules.

Only a couple of clock hours of zonules will likely be missing, and the capsular bag should be fairly stable. However, a CTR (freely available in Australia) should be available in the event of an unstable capsular bag.

Once the capsular bag is empty, an assessment if its stability is required. If the bag seems unstable, a 3-piece, foldable IOL should be placed in the sulcus with optic capture through the capsulorhexis. Otherwise, the IOL can be placed in the bag with the haptic positioned over the area of zonular absence to keep the bag open. Artificial iris segments can be then placed in the bag to repair the inferior defect.