

Pars Plana Vitrectomy and Lensectomy with a 23-gauge Vitrectomy System

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Since it was first reported in 2005 by Eckardt,¹ the utilization of 23-gauge pars plana vitrectomy (PPV) has rapidly increased. Intermediate in size, 23-gauge PPV has several reported advantages over both larger (20-gauge) and smaller (25-gauge) vitrectomy techniques. Compared with 20-gauge PPV, there is less need to close the sclerotomies with sutures, approaching sutureless retinal surgery.² Compared with 25-gauge instruments, 23-gauge instruments are less flexible, allowing the surgeon to more closely replicate experience with large gauge vitrectomy.

Pars plana lensectomy of the crystalline lens in situ and management of the subluxated or posteriorly dislocated (ie, luxated) crystalline lens are examples of an expanding list of indications for exploiting these advantages. Regardless of the etiology for lens subluxation or dislocation, whether it is pseudoexfoliation syndrome, trauma, hyperhomocystinuria, ectopia lentis, or Marfan syndrome, the surgical approach with the 23-gauge PPV system will be the same. Long-term outcomes of dislocated lens fragments managed with 23-gauge PPV have not been reported. However, outcomes with 25-gauge surgery have shown promising results.^{3,4} This article focuses on the technique employed to manage the crystalline lens with 23-gauge vitrectomy technology.

REMOVAL OF THE CRYSTALLINE LENS IN SITU

When phacoemulsification of the crystalline lens with an anterior or limbal approach is undesirable, such as with lens instability secondary to zonular dehiscence, violation of the lens capsule following penetrating ocular trauma, or mature nuclear sclerosis, a pars plana approach is preferable. Whereas 20-gauge technology would be adequate for lens

extraction, a 23-gauge system may be beneficial. Similar to other indications for 23-gauge PPV, the three standard ports are created through the pars plana with angled incisions. Because the goal is removal of the lens, the trocars can be placed 3.0 mm posterior to the limbus. If the infusion cannula cannot be visualized because of dense cataract, an anterior chamber maintainer can be placed until removal of the lens is sufficient to allow verification of the cannula's position in the vitreous cavity.

Incision of the lens capsule and cleavage of the lens nucleus is achieved in one of two ways: either a 23-gauge microvitrectoretinal (MVR) blade can be passed through the cannula and into the lens equator, or the 23-gauge trocar can be used in a similar fashion after the cannula is placed in the appropriate location. Once this is performed from both the nasal and temporal directions, the surgeon can use the vitrector to engage the lens through these incisions and begin removing the nuclear material, taking care to avoid the anterior and posterior capsules. The endoilluminator can act as a second instrument from the opposite port, stabilizing the lens during removal.

If the lens material is too hard from cataractous changes, the phacofragmatome can be used. This requires removing of the 23-gauge sclerotomy, creating a local conjunctival peritomy, and enlarging the scleral wound with a 20-gauge MVR blade. Marking the 23-gauge trocar blade with a pen prior to transconjunctival sclerotomy formation often facilitates finding the conjunctival incision and sclerotomy for future enlargement, if necessary. Phacofragmentation of the lens can then take place in a fashion similar to a 20-gauge approach. Care must be taken not to engage vitreous with the phacofragmatome because cutting of the vitreous collagen does not occur; only suction and subsequent vitreoretinal traction occurs. To avoid this, once a red reflex is pres-



Figure 1. A 70 year-old man with pseudoexfoliation syndrome had retained lens fragments following phacoemulsification cataract extraction and anterior chamber intraocular lens placement in his right eye. A 23-gauge vitrector is shown removing lens cortical material in the mid-vitreous cavity.

ent, vitrectomy just posterior to the posterior lens capsule should be performed prior to reintroduction of the phacofragmatome. Once all lens material has been removed, we suggest removal of the remaining capsular bag. In our experience, the lens capsule can be engaged and removed efficiently with disposable 23-gauge serrated forceps (Alcon Laboratories, Fort Worth, TX).

POSTERIORLY DISLOCATED LENS MATERIAL

The vitreoretinal surgeon encounters retained lens fragments following phacoemulsification cataract extraction with posterior capsule compromise (either same day or several days following) or in relation to pars plana lensectomy (same day). Timing of PPV for retained lens fragment following phacoemulsification does not appear to affect visual outcomes with 20-gauge instrumentation,⁵⁻⁹ and the same can probably be assumed for a 23-gauge approach. The strategy for lens

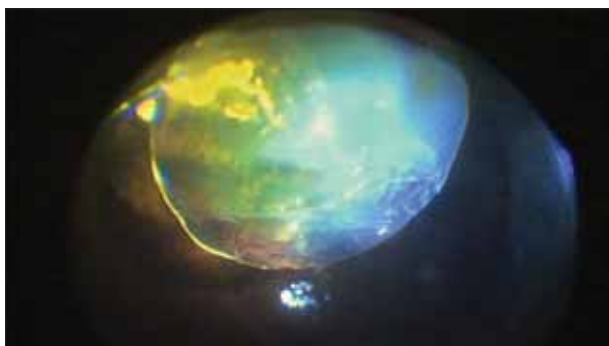


Figure 2. A 62-year old man was noted to have posterior dislocation of his crystalline lens following blunt trauma to his left eye. The cataractous crystalline lens is shown floating on a bubble of perfluorocarbon liquid that was placed to protect the macula. The 23-gauge vitrector is located directly behind the lens in an attempt to position the lens anteriorly.

removal is to avoid vitreoretinal traction, and all vitreous associated with the lens or lens fragments should be removed prior to removing the lens material. Vitreous staining with triamcinolone acetate is an excellent way to ensure that all traction is removed.¹⁰

Whether the vitrector or the phacofragmatome is used, the lens fragments should be gently aspirated into the mid-vitreous cavity and then be cut or fragmented and suctioned out (Figure 1). To protect the macula during removal, injection of perfluorocarbon liquid (PFCL) or viscoelastic to elevate large, dense lens fragments has been suggested (Figures 2 and 3).¹¹⁻¹⁴ However, limited data with larger gauge vitrectomy does not suggest any improvement in outcomes such as retinal breaks, retinal detachments, or cystoid macular edema (CME). Also, great care must be taken to remove all PFCL to avoid further complications. Following removal of all the apparent lens material, a thorough search for both residual lens fragments and retinal breaks should be performed. Lens fragments and retinal breaks are often located in association with the vitreous base, and, therefore, scleral depression should be performed.

The high flow rate as well as the large size and distal location of the 23-gauge vitrector port facilitate gentle dissection of vitreous associated with anterior lens fragments. Also, the relative stiffness of the 23-gauge instrumentation facilitates this search greatly compared with smaller gauge vitrectomy. For similar reasons, any repair of retinal detachment may be easier with 23-gauge instrumentation compared with a 25-gauge approach. However, one study comparing 25- and 20-gauge vitrectomy for retinal detachment repair found similar outcomes with the two techniques.¹⁵ Thus, experience with the smaller gauge system may be more important than instrument flexibility in this regard. Additionally, with the advent of improved 25-gauge instrumentation (eg, 25+; Alcon Laboratories), the 25-gauge approach may be significantly improved.



Figure 3. The same patient as in Figure 2. The 23-gauge vitrector is shown engaging the lens floating on perfluorocarbon liquid. Following removal, an anterior chamber IOL was placed.

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CURRENT CHALLENGES AND FUTURE DIRECTIONS

All cases of retained lens fragments may be complicated by glaucoma, CME, and retinal break or detachment. A challenge specific to 23-gauge vitrectomy surgery system is ocular hypotony because at least two of the three sclerotomies are ideally sutureless. The need to suture the enlarged sclerotomy used for the phacofragmatome (if needed) is another potential limitation, but this limitation is present in all vitrectomy systems. The development of a smaller gauge phacofragmatome would eliminate this limitation and make a 23-gauge approach even more appealing. Ho and colleagues⁴ reported 17 cases of retained lens fragment removal with a 25-gauge vitrectomy system that employed a high flow rate, long duty cycle, and large port size on the vitreous cutter. In addition, they utilized a bimanual technique with the endoillumination, guiding and forcing lens pieces into the cutter's port. Newer surgical systems may also facilitate lens removal with the vitreous cutter by improvements in flow, cut rate, and duty cycle parameters, and possibly obviate the need for a phacofragmatome in 23-gauge vitreoretinal surgery. ■

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