

Use of Small-gauge Vitrectomy Systems in Ocular Trauma

BY CESARE FORLINI, MD; ADRIANA BRATU, MD; MATTEO FORLINI, MD;
AND PAOLO ROSSINI, MD

During the last decade, small-gauge vitreoretinal surgery has improved worldwide in regard to technological innovation and popularity. In 2001, Fujii and De Juan introduced the 25-gauge transconjunctival vitrectomy systems (TVS)¹; in 2005, Eckardt introduced 23-gauge system²; and in 2010, Oshima introduced the 27-gauge system.³ Thanks to all these systems, to the improvement of the machines that now operate at 5000 cuts per minute, to the introduction of new xenon light systems, to new instruments for retinal manipulation (such as Tano's diamond dusted spatula), and to directional laser probes, the approach to vitreoretinal pathologies has become simpler and facilitated better results in terms of anatomical and functional recovery.

There is no doubt that small-gauge vitreoretinal surgery

remains demanding, and there is no standardization in terms of surgical techniques and strategies as of yet. Initially, small-gauge vitrectomy systems were used to treat simple vitreoretinal pathologies, but as the technologies have improved and more surgeons have experience using them, small-gauge vitrectomy is routinely used with reliable results that, as many surgeons report, are superior to those with 20-gauge vitrectomy systems. According to the 2006 American Society of Retina Specialists Patterns and Trends (PAT) survey, 32.5% of surgeons performed small-gauge vitrectomy; in 2011, the PAT survey results indicated that only 3.58% did not perform small-gauge vitrectomy. The trend has been that more surgeons are using small-gauge vitrectomy for more complex cases such as complex retinal detachments, proliferative vitreoretinopathy, prolif-



Figure 1. Use of TKP in pole-to-pole surgery. Pole to pole means surgery including corneal graft, anterior segment, and vitreoretinal surgery.

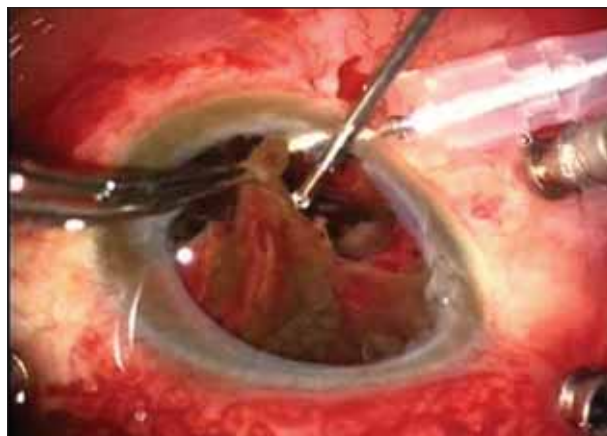


Figure 2. Open-sky vitrectomy with anterior chamber infusion through limbal tunnel with standard 25- and 23-gauge systems.



Figure 3. Bimanual surgical manipulation can be used to remove sub-retinal strands with the use of chandelier lighting systems.



Figure 4. Routine ILM peeling using different dyes to prevent the development of secondary macular pucker.



Figure 5. Implantation of posterior chamber iris-claw IOL yields better aesthetic result, more distance from the endothelium compared with the same implantation in the anterior chamber.

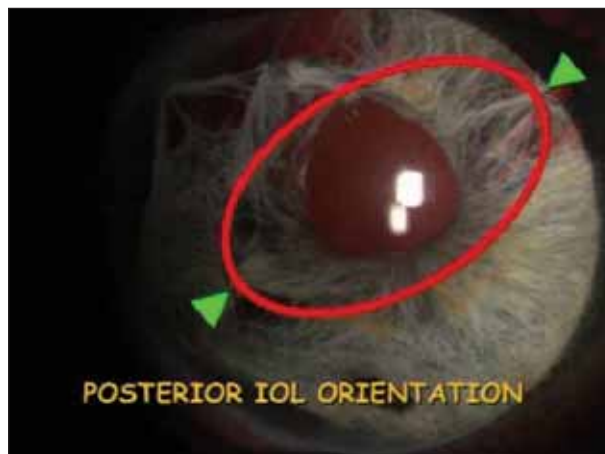


Figure 6. Postoperative appearance and orientation of posterior chamber iris-claw IOL implant.

erative diabetic retinopathy, and eye trauma that requires reconstructive maneuvers.

One of us (CF) coined the term *pole-to-pole surgery* in 2004, which is a global approach to ocular trauma surgery that considers the contemporaneous treatment of the anterior (cornea included) and posterior segment in 1 surgery. In our opinion, small-gauge vitrectomy

further the cause of the pole-to-pole approach because it reduces iatrogenic damage in ocular trauma, making the surgery easier for the surgeon and the recovery faster and more satisfactory for the patient.

CORE VITRECTOMY

In our small-gauge vitrectomy surgeries for ocular trauma cases, we use a wide-angle viewing system (BIOM, Oculus) and chandelier lighting for bimanual maneuvers. We prefer to use a 23-gauge system with valves for complex cases (Alcon Constellation, DORC Associate, and Oertli valved systems). Depending on the complexity of the case, the surgical strategy may include a standard vitrectomy via pars plana with or without the use of a temporary keratoprosthesis (TKP; Figure 1) sutured to the sclera. In highly complex cases, the first vitrectomy phases are very delicate. For example, in a case of a total funnel retinal detachment or massive or organized vitreous hemorrhage,

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Temporary Keratoprosthesis in Ocular Trauma

By Cesare Forlini, MD; Adriana Bratu; Matteo Forlini, MD; and Paolo Rossini, MD

*winner, ASRS 2011 Best in Show

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the first phases are very important to understand how to move forward as we approach the vitreous cavity. We typically make a corneal trephination (if there is significant corneal opacity) after having inserted the trocars and the light sources and proceed with an open-sky anterior vitrectomy (Figure 2) using 25- or 23-gauge instrumentation with infusion through a limbal tunnel. This choice of technique has a double aim. First, it obviates the need to implant a scleral Flieringa ring because the anterior infusion keeps the eyeball tone constant. Second, an open-sky technique utilizes the anterior infusion as a continuous source of washing to remove clots that move during surgical manipulations. Once it is possible to see the vitreous, the pars plana infusion can be shifted for implantation of the TKP, after which a standard vitrectomy can then be performed. It is important to note that injecting perfluorocarbon liquid (PFCL) early during vitrectomy stabilizes the central retina, making core vitrectomy safer.

MEMBRANE PEELING

The use of the BIOM and chandelier lighting allows for a panoramic view of the posterior chamber, allowing us to bimanually peel and delaminate the membrane (Figure 3). We are also able to shave close to the retina and accurately apply laser to the peripheral retina. Furthermore, the sur-

geon can perform scleral indentation maneuvers without the help of an assistant. During vitrectomy for both macula-on and macula-off retinal detachments, we peel the internal limiting membrane after staining with Membrane Blue Dual (DORC) or Brilliant Peel (Fluoron) dyes (Figure 4). For cases of macular detachment, our technique includes coloration under PFCL, in which we inject the dye directly on the retina, utilizing the PFCL bubble crush. Thus, the surgeon can peel on a "flat" retina, which is much easier, using a routine peeling method to avoid traction relapses and/or pucker on the macula.

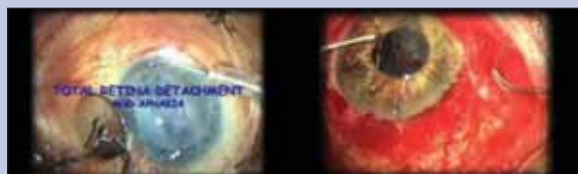
SILICONE OIL REMOVAL

Some retina surgeons have complained that for cases in which heavy silicone oil (Densiron 68 [Fluoron] or 5000 cs) is used, a 23- or 25-gauge vitrectomy system can make surgery time longer. It is possible, however, to avoid a long silicone oil removal time with small-gauge vitrectomy by using a short cannula (23-gauge MedOne) to allow adequate suction of the tamponade and to maintain contact with the oil bubble.

SECONDARY IOL IMPLANTATION

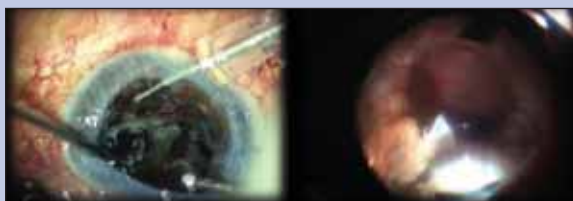
Because of the technology advances in small-gauge instrumentation, we are even able to use this technology

TAKE-HOME MESSAGE



Does MIVS in trauma case make sense?

Yes, you can do everything and minimize further trauma to an already traumatized eye!



Open-sky surgery is a good option for optimal clearance behind the iris, ciliary bodies and anterior retina portion

The anterior infusion via-limbus maintains an adequate IOP without using the Flieringa ring and clean the anterior chamber(blood) during the open sky portion of surgery

An early PFCL injection guarantees posterior displacement of the retina to reduce the risk of iatrogenic retinal damage



Staining under PFCL: trick- put the tip near the retinal surface (personal technique)

ILM peeling under PFCL when the retina is detached prevents secondary macular ERM



"Pole to pole" surgery is possible thanks to TKP use. It allows the passage from the surface (open sky) to the vitreous abyss (closed eye)



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1. For your most difficult cases, do you use small-gauge technology or 20-gauge?
 - ☐ 23 or 25 gauge
 - ☐ 20 gauge
2. Do you prefer not to use small-gauge technology in cases that require the use of heavy silicone oil?
 - ☐ Yes
 - ☐ No

for secondary IOL implantation. We began utilizing the iris enclavation IOL (Artisan, Ophtec) several years ago because we wanted to avoid the need to create conjunctival and scleral wounds. Since 1998, we have used these IOLs in the posterior chamber (Figure 5), although they were designed for implantation in the anterior chamber to correct aphakia. Implanting the Artisan IOL in the posterior chamber solves the problem of the aesthetically disturbing tilting of the IOL in the anterior chamber, and it obviates medium- to long-term complications due to contact with the corneal endothelium. In our experience, this method guarantees a secure placement (Figure 6) and is less invasive—2 benefits that are crucial for an eye that has experienced trauma.

SUMMARY

The use of small-gauge vitrectomy in cases of ocular trauma has clear and significant advantages in safety and efficacy for both the surgeon and the patient. It is our opinion that these systems will be considered standard for vitreoretinal surgery for ocular trauma in the near future. ■

Cesare Forlini, MD, is Chief of the Department of Ophthalmology at Santa Maria delle Croci Hospital in Ravenna, Italy. Dr. Forlini can be reached via email at forlinic@forlinic.it.



Adriana Bratu, MD; Matteo Forlini, MD; and Paolo Rossini, MD, are with the Vitreoretinal Surgery and Ocular Traumatology Unit at S. Maria delle Croci Hospital.

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