

Advances in the Surgical Management of Ocular Trauma

Small-gauge pars plana vitrectomy without a surgical assistant.

BY ERIC D. WEICHEL, MD

Most advances in ocular trauma management have been adopted from new technologies in the private sector. Newer diagnostic tests, medicines, and surgical techniques obtained from the standard of care in the management of vitreoretinal surgical diseases have been implemented into the realm of ocular trauma. The explosion of medical and surgical advances has translated in novel surgical techniques for patients who have sustained ocular trauma.

Ocular trauma surgical cases often present after clinic hours or on weekends. Frequently, ocular trauma cases are associated with other severe injuries that may not be amenable to surgery in an ambulatory care setting with the usual operating room of highly trained and efficient support staff needed for complex vitreoretinal surgery techniques. The vitreoretinal surgeon may be forced to operate with an inexperienced support team that potentially could be unsafe for the patient.

Over the past few years, tremendous advances have occurred in vitreoretinal surgery to enable vitreoretinal surgeons to perform complex ocular trauma cases without the need for a skilled surgical assistant. Performing pars plana vitrectomy (PPV) in ocular trauma cases still requires a competent anesthesiologist and technician and/or operating room circulating nurse who can set up the vitrectomy machine for the surgical case. This article focuses on the necessary equipment and instrumentation to safely and efficiently perform selected small gauge ocular trauma vitrectomy cases without the need for a skilled operating room technician or surgical assistant.

VITRECTOMY SURGICAL SYSTEMS

A small-gauge (23-gauge or 25-gauge) PPV must have a surgical system to support ocular trauma cases. The

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Accurus (Alcon Laboratories, Inc., Fort Worth, TX) vitrectomy system has supported small-gauge vitrectomy for more than 5 years and is useful for all ocular trauma cases, particularly when using the 20-gauge vitrectomy system. The latest technologic advance is the introduction of the Constellation Vision System (Alcon Laboratories, Inc.). The Constellation provides the vitreoretinal surgeon more autonomy with high-speed vitreous cutting coupled with duty-cycle control, intraocular pressure (IOP) regulation during fluid infusion, foot pedal control of air infusion, xenon illumination, endolaser control, and intraocular gas tamponade. The foot pedal also allows toggling through different cycles of the case such as vitrectomy, vitreous base shaving, extrusion, laser, fragmatome, scissors, and viscous fluid extrusion/infusion with additional foot controls such as proportional diathermy and proportional reflux.

The Constellation enables the surgeon to rely less on an assistant compared with the Accurus, and it provides vitrectomy cutting control for both 23- and 25-gauge high-speed cutters. IOP regulation with foot pedal controls negates the need for the technician to manipulate the intraoperative IOP. Air fluid exchanges are also foot-pedal controlled. The most useful feature for elimination of the surgical assistant is the full control of the endolaser, including standby-to-ready and power up/down.



Figure 1. The 25-gauge trocars and a Tornamebe Torpedo Mini Light placed at the 6 o'clock position were inserted 3.5 mm posterior to the limbus.

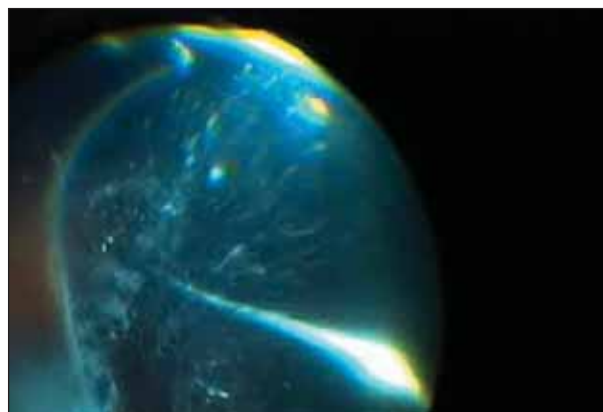


Figure 2. Preservative-free triamcinolone was placed on top of the perfluorocarbon liquid to identify retained cortical vitreous.

NONCONTACT WIDEFIELD VIEWING SYSTEMS

Ocular trauma patients frequently have recently repaired open-globe wounds. Using corneal contact widefield viewing systems is not ideal for vitrectomy following a corneal laceration repair. The noncontact visualization systems prevent manipulation of the globe and opening of newly sutured wounds. The noncontact widefield viewing allows visualization through very small areas of clear cornea, whether they are within the visual axis or eccentrically located. Flexible iris hooks are sometimes needed to create an eccentric pupil to view the vitreous cavity in ocular trauma patients.

The BIOM (binocular indirect ophthalmic microscope) noncontact widefield viewing system (Oculus Optikgeräte GmbH, Wetzlar, Germany) with the automated inverter has been the ideal visualization system for posterior segment trauma cases. Usually the assistant or the surgeon must stop in the middle of the case to manually turn the inverter button, which can lead to unnecessary intraoperative delays. The BIOM, equipped with an automatic inverter pedal and an autofocus, will spare the need for a surgical assistant to touch the viewing system during a case.

CHANDELIER ILLUMINATION SYSTEMS

Xenon illumination systems have enabled the attachment of various chandelier light sources. The chandelier light allows both bimanual surgery and scleral depression with vitrectomy or endolaser by the surgeon, negating the need for an assistant. Ocular trauma cases usually occur in younger phakic patients with peripheral retina pathology. The ability for the surgeon to perform a scleral depressed vitreous base shave and treat retinal tears without the worry of an inexperienced

technician complicating the case with poor scleral depression techniques.

My ocular trauma surgical experiences have been with the Tornamebe Torpedo Mini Light (Insight Instruments, Inc., Stuart, FL) attached to a xenon illuminating light source. The insertion of the Tornamebe Torpedo can be difficult at first. A 25-gauge 0.5-inch needle on a 1-cc syringe is inserted 3.5 to 4.0 mm posterior to the limbus at the 6 o'clock position. The syringe with the needle is angled 45° upon removal from the sclera to slightly enlarge the sclerotomy. Using forceps, the Torpedo mini light is quickly inserted through the 25-gauge sclerotomy under direct visualization. A small conjunctival cut down may be necessary if insertion is difficult.

ILLUMINATED ENDOLASER PROBES

Small-gauge illuminated laser probes in both 23-gauge and 25-gauge sizes are crucial for repairing retinal breaks or retinal detachments without an assistant. The curved illuminated small-gauge endolaser probes allow 360° of vitreous base endolaser capability with the surgeon performing scleral depression. Iridex (Mountain View, CA) first introduced an illuminated curved 25-gauge endolaser probe in 2008 with the addition of 23-gauge probes in 2009.

The Iridex curved illuminated 25-gauge endolaser probe is the most versatile for any ocular trauma case. This endolaser probe is curved for laser at the 12 o'clock position and avoids the phakic lens 180° from the trocar. The 25-gauge probe can also be used for 20-gauge and 23-gauge ocular trauma cases. Xenon illumination is sufficient for a surgeon to perform scleral depression with simultaneous endolaser for treatment of peripheral retina pathology.

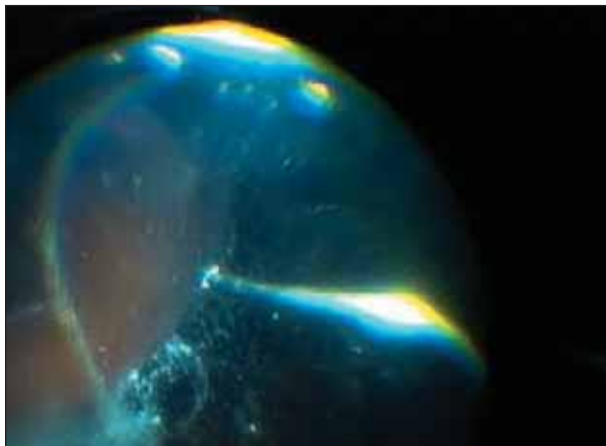


Figure 3. A scleral-depressed 360° vitreous base shave was completed with the illumination from the Tornambe Torpedo, 25-gauge vitrector in one hand and scleral depressor in the other hand.

SMALL GAUGE VITRECTOMY FOR OCULAR TRAUMA: 23 GAUGE VS 25 GAUGE

Both Alcon 23-gauge and 25-gauge vitrectomy systems work well with the Constellation. There are some advantages to the 23-gauge system for ocular trauma cases. The most common vitreoretinal ocular trauma case is a nonclearing vitreous hemorrhage with a high index of suspicion for a retinal tear or detachment. These cases often have associated dense vitreous hemorrhage, which is removed faster with a 23-gauge vitrector compared with the 25-gauge. The 23-gauge system is also more efficient for removal of a traumatic cataract via a pars plana lensectomy in young patients. Furthermore, the increased diameter of the 23-gauge trocar (0.7 mm) compared with the 25-gauge trocar (0.5 mm) allows removal of slightly larger intraocular foreign body material without enlarging the sclerotomy. The repair of traumatic retinal detachment can safely be performed using either the 23-gauge or 25-gauge vitrectomy technique. The introduction of the Alcon 25+ vitrectomy system in 2009 has brought fluidics nearly



Figure 4. The sclerotomies were not sutured in this retinal detachment repair case.

equivalent to the Alcon 23-gauge vitrectomy with a smaller sclerotomy site of 500 μ m compared with 750 μ m for the 23-gauge system. The Alcon 25+ compared with the Alcon 25-gauge has a larger internal lumen with the port closer to the tip of the cutter. The 25+ also has a less flexible shaft and light pipe.

With the surgical equipment and instrumentation listed in this article, the vitreoretinal surgeon can repair traumatic retinal detachments without the need of a skilled surgical assistant. The corresponding video on this topic, which can be found on www.eyetube.net under the *Retina Channel/VitBuckleSociety Collection*, demonstrates repair of a pseudophakic bullous macula rhegmatogenous retinal detachment using the 25-gauge Alcon vitrectomy system without surgical assistance.

The 25-gauge trocars and a Tornambe Torpedo Mini Light placed at the 6 o'clock position were inserted 3.5 mm posterior to the limbus (Figure 1). Perfluorocarbon liquid (Perfluoron, Alcon Laboratories, Inc.) was placed in the vitreous cavity via a soft tip 25-gauge cannula following the core vitrectomy.

Preservative-free triamcinolone (Triesence, Alcon Laboratories, Inc.) was placed on top of the perfluorocarbon liquid to identify retained cortical vitreous (Figure 2). A scleral-depressed 360° vitreous base shave was completed with the illumination from the Tornambe Torpedo, 25-gauge vitrector in one hand and scleral depressor in the other (Figure 3). Subretinal fluid was drained from the anterior retinal break at 12:00. Use of the Iridex 25-gauge curved illuminated endolaser with scleral depression provided photocoagulation around the retinal break. The Perfluoron was removed and an air-SF₆ 25% exchange was completed. The 25-gauge trocars and chandelier were removed

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23G Peripheral Vitreous Shaving and Endolaser in Phakic Patients
direct link to video:

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without evidence of gas leakage. The sclerotomies were not sutured in this retinal detachment repair case (Figure 4).

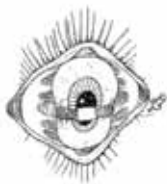
SUMMARY

Technology and instrumentation currently exists to allow safe and efficient small-gauge vitrectomy surgery on a subset of posterior segment ocular trauma patients without the need for a skilled surgical assistant. ■

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