Hybrid Technique for Silicone Oil Removal

Pearls for reducing complications.

BY MANISH NAGPAL, MS, DO, FRCS(UK); RITURAJ VIDEKAR, MD; AND NAVNEET MEHROTRA, MD

In this issue of Retina Today, *Manish Nagpal, MS, DO, FRCS(UK); Rituraj Videkar, MD; and Navneet Mehrotra, MD, discuss a hybrid technique for silicone oil removal that they believe reduces the risk of oil-related complications such as retinal redetachment.*

We extend an invitation to readers to submit pearls for publication in Retina Today. *Please send submissions for consideration to Dean Eliott, MD (dean_eliott@meei.harvard.edu); or Ingrid U. Scott, MD, MPH (iscott@psu.edu). We look forward to hearing from you.*

—Dean Eliott, MD; and Ingrid U. Scott, MD, MPH

Silicone oil is used in vitreoretinal surgery to provide long-term internal tamponade in cases of complicated retinal detachment. Silicone oil is generally removed after 3 months if the retina is attached and also must be removed upon the development of oil emulsification, band keratopathy, secondary glaucoma, or cataract.

The factors governing the timing of silicone oil removal are an enigma; reported timing for silicone oil removal ranges from 2 to 13 months.[1-5] It has been suggested that the timing of silicone oil removal does not affect the anatomic success rate;[1-2,4,6] however, it has also been reported that the duration of tamponade is a risk factor for retinal redetachment after silicone oil removal.[5]

Silicone oil removal is associated with complications, primarily retinal redetachment, and should be regarded as an important procedure because the final outcomes of surgery depend on its success. This article describes our approach to silicone oil removal and steps that can be taken to reduce complications, most notably retinal redetachment.

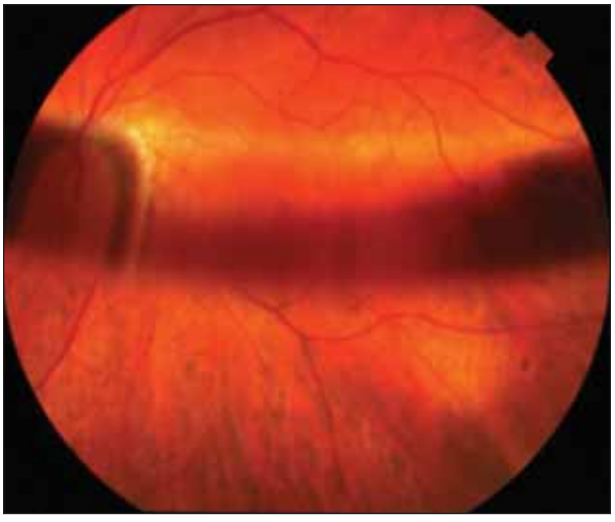

Figure 1. Incomplete retinal tamponade in the presence of emulsified oil.

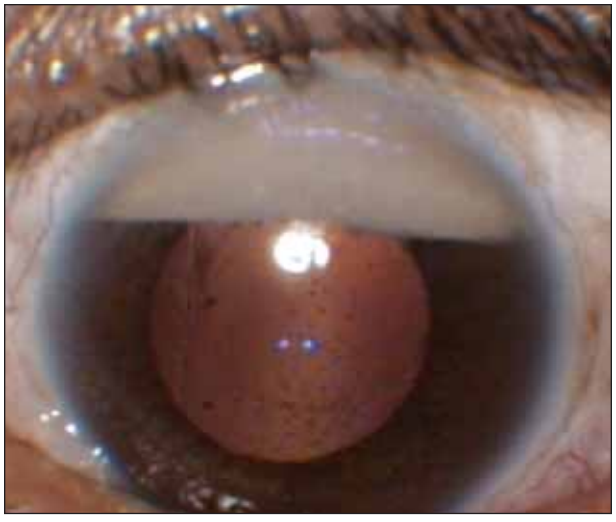

Figure 2. Emulsified silicone oil in the anterior chamber.

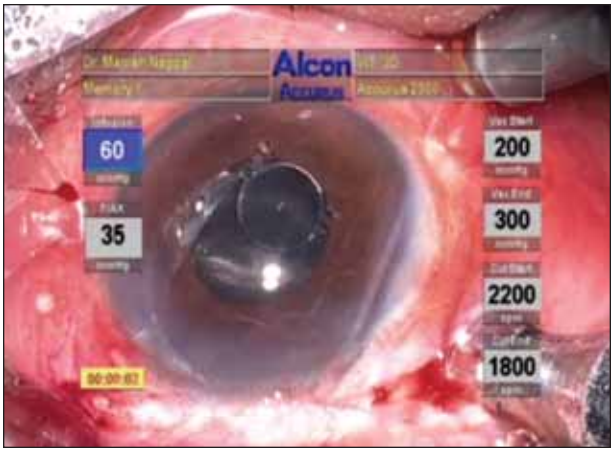

Figure 3. Pars plana removal of silicone oil using the hybrid technique with a 23-gauge infusion cannula and a 16-gauge silicone oil removal cannula.

HYBRID TECHNIQUE

Silicone oil is removed using a three-port, 20- and 23-gauge hybrid technique via a pars plana approach. The infusion cannula and light pipe are 23 gauge; the oil removal port is 20 gauge because it is much faster to aspirate oil through a large-bore cannula than a small one. The hybrid technique is less traumatic to the conjunctiva and allows faster rehabilitation without compromising the surgeon's ability to tackle intraoperative events. The latest generation of the Constellation Vision System (Alcon Laboratories, Inc., Fort Worth, TX) has advanced fluidics that help maintain constant infusion pressure throughout the procedure, thus maintaining a good tone of the globe. Wide-angle visualization is used so that the periphery of the retina can be inspected for retinal breaks.

OIL EMULSIFICATION

Silicone oil acts as an internal tamponade, approximating the neurosensory retina to the retinal pigment epithelium. Due to its high surface tension, silicone oil does not enter the subretinal space, and, in fact, it prevents the entry of fluid into the subretinal space because the surface tension of the silicone oil maintains its singular nature.[7] As the surface tension decreases, the silicone oil globule begins to emulsify. Decrease in surface tension can be due to inflammatory agents and blood that is released after surgery. Emulsified silicone oil does not serve as an effective internal tamponade (Figure 1) and can present in the form of hyperoleon, ie, the appearance of oil in the anterior chamber (Figure 2).

After the infusion cannula is placed, the silicone oil is removed from the pars plana with active suction

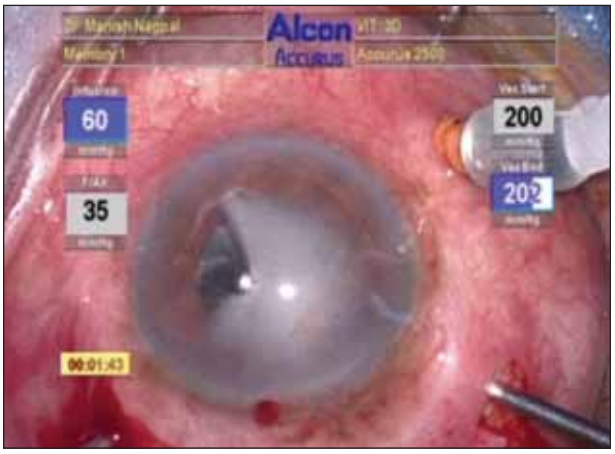

Figure 4. Removal of hyperoleon with cutter suction.

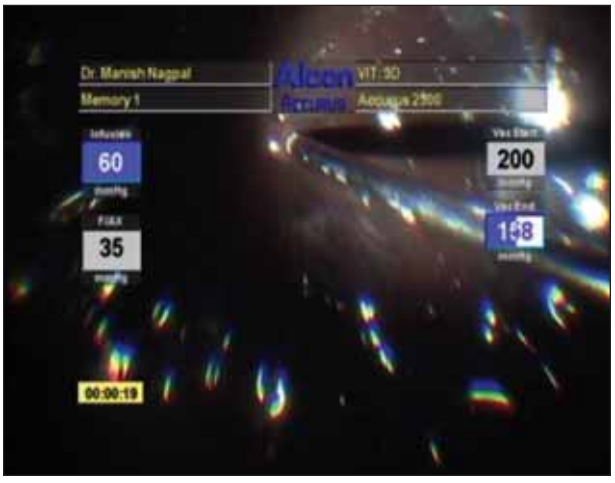

Figure 5. Multiple fluid-air exchanges are required to remove oil globules trapped in the retroiridial plane.

(Figure 3). Another method is passive removal, in which, after starting the cannula on fluid, one of the ports is kept open for passive egress of the silicone oil. In aphakic and pseudophakic patients, the hyperoleon is removed with the suction of the vitreous cutter (Figure 4); in phakic patients the hyperoleon is removed with a 26-gauge needle mounted on an open plunger syringe via the limbus. After the silicone oil is removed, the retina is inspected with a wide-angle visualization system for retinal pathology. This is followed by fluid-air exchange (Figure 5). Multiple fluid-air exchanges are performed to ensure that the silicone oil globules trapped in the retroiridial plane are flushed and removed. These exchanges also allow an occult break to collect subretinal fluid, and this will reveal a subtle detachment that otherwise may have been recognized only postoperatively. Should a subtle detachment occur, I recommend performing endodrainage and laser to that area, followed, if needed, by injection of gas or repeat silicone oil. Membranes around the silicone oil can also be removed if they affect the papillomacular bundle (Figure 6).

> Our goal is to remove silicone oil in a way that will result in a low incidence of retinal redetachment.

CATARACT

Silicone oil removal and cataract extraction can be performed during the same procedure. Phacoemulsification and IOL implantation can be performed before the hybrid silicone oil removal technique, or, alternatively, the infusion cannula can be placed before cataract surgery. Special consideration must be given to IOL power measurements in the presence of oil. Additionally, care is needed because the anterior chamber can shallow during surgery as the silicone oil pushes against the posterior capsule. Hence, the anterior chamber should be well maintained at all times to avoid a surge and to prevent silicone oil globules from trickling into the anterior chamber. If silicone oil enters the anterior chamber, it should be routinely aspirated with the phaco probe. Judicious use of viscoelastics will also help to maintain the anterior chamber depth.

SECONDARY GLAUCOMA

Most glaucoma cases can be controlled medically; however, silicone oil must be removed in cases in which the intraocular pressure (IOP) is persistently high despite medical management. In some cases of high IOP, endocyclophotocoagulation must be carried out immediately after oil removal to prevent high IOP postoperatively.

RETINAL REDETACHMENT

Silicone oil removal carries a risk of retinal redetachment. Reported rates of retinal redetachment after silicone oil removal vary, ranging from 10% to 25%.[2-4,6,8-11] Redetachment may be caused by the reopening of retinal breaks, posterior migration of an occult retinal detachment, formation of new retinal breaks,[6] and traction at the vitreous base.[12] Various prognostic factors for retinal redetachment after silicone oil removal have been reported, such as the presence of peripheral

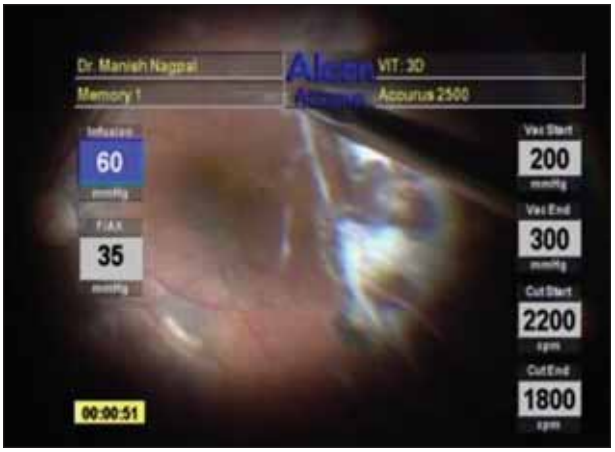

Figure 6. Removal of membranes around silicone oil.

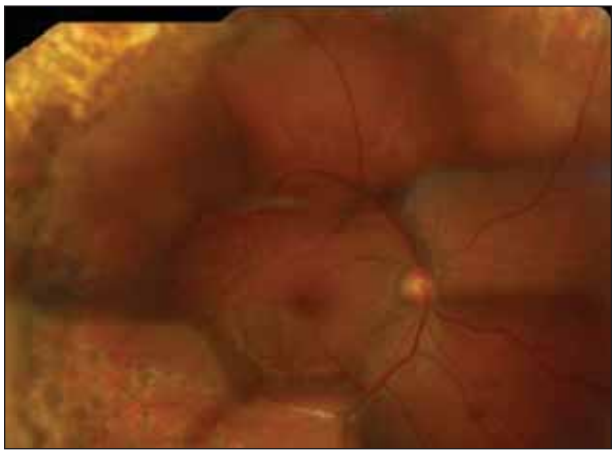

Figure 7. 360° laser retinopexy treats unseen breaks and prevents the formation of new breaks.

vitreous remnant,[4] endovitreal hemorrhage at the time of silicone oil removal,[4] aphakia, giant retinal tears, high myopia, and failed retinal detachment surgery.[9]

Panretinal photocoagulation and 360° retinopexy have been used to reduce the incidence of retinal redetachment. The latter method has been reported to reduce the incidence of retinal redetachment after silicone oil removal from 26% to 14%.[5] According to Pavlovich et al,[13] 360° retinopexy has been efficacious in eyes with unstable retinal conditions, reducing retinal redetachments from 53% to 25%, but its effect was not significant in stable retinal conditions. Laidlaw et al[5] proposed that 360° retinopexy can treat unseen breaks and prevent the formation of new breaks after silicone oil removal (Figure 7). This method may close occult breaks or may act as a demarcation against the posterior migration of anterior retinal detachment.[5] Tufail et al[14] reported a reduction in the incidence of retinal redetachment (25% to 6.7%) with 360° retinopexy. Similarly, Ahluwalia and Gray[15] reported a reduction (44% to 11%) in the rate of retinal redetachment.

Studies evaluating the effects of an encircling scleral buckle in patients with retinal redetachment after silicone oil removal have produced conflicting results. For example, Jonas et al[4] reported low redetachment rates with the use of an encircling scleral buckle whereas Laidlaw et al[6] reported no difference with this technique. To reduce the risk of retinal redetachment with an encircling scleral buckle, the vitreous is removed as completely as possible because remnants of the vitreous are associated with increased risk of retinal redetachment after silicone oil removal. An encircling scleral buckle can be placed at the time of primary vitrectomy. The encircling band supports the vitreous base, ensures meticulous removal of the peripheral vitreous, and

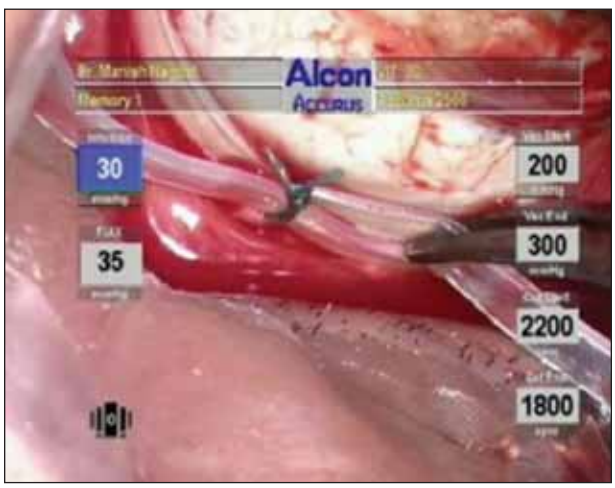

Figure 8. The presence of an encircling element helps support the vitreous base and allows nearly complete removal of the vitreous.

decreases traction at the vitreous base (Figure 8). Complete removal of vitreous at the time of primary surgery and reduced traction at the vitreous base may prevent the development of new retinal breaks, decreasing incidence of retinal redetachment.[4] Advances in high-speed vitrectomy cutters allow a closer shave of the vitreous without compromising safety.

HYBRID TECHNIQUE: RESULTS

At the Retina Foundation & Eye Research Centre we perform silicone oil removal in all cases with anatomically stable retinal conditions and in cases associated with oil-related complications. Our goal is to remove silicone oil in a way that will result in a low incidence of retinal redetachment.

My colleagues and I conducted a study of 300 eyes

with attached retinas undergoing silicone oil removal using the hybrid approach.[16] We evaluated factors such as previous 360° endolaser barrage, presence of encircling buckle, number of previous surgeries, presence of silicone oil emulsification, duration of tamponade, presence of proliferative vitreoretinopathy (PVR), and lens status. Patients were followed for 6 months.

The anatomic success rate was 87.3%, which is comparable to that reported by Hutton et al[6] (86%) in a subgroup analysis of the Silicone Study and to those reported in other case series (72% to 91%).[1,2,4,5] We found that the rate of retinal redetachment was lower when silicone oil removal was performed in the presence of emulsified silicone oil (6.17%) compared with when the oil was not emulsified (17.78%). We hypothesize that if the retina is attached in the presence of emulsified oil it is more likely to remain attached when the emulsified oil is removed.

Factors that reduced the incidence of retinal redetachment after silicone oil removal in cases of rhegmatogenous retinal detachment included 360° endolaser barrage before silicone oil removal, presence of an encircling buckle, a combination of 360° barrage and encircling buckle, and silicone oil emulsification before silicone oil removal.

Previous retinal surgery has been reported to be a significant risk factor for predicting retinal redetachment after silicone oil removal.[3-5,9] In our study, the risk was 21.79% in cases with more than one retinal surgery before silicone oil removal, compared with12.10% in cases with one surgery before silicone oil removal. This difference was not statistically significant (*P*=.192).

CONCLUSION

Based on our experience with the hybrid technique for silicone oil removal, endolaser barrage, presence of an encircling scleral buckle, and the combination of the two, as well as the presence of oil in the anterior chamber, are determining factors of retinal redetachment rate. These data suggest that the number of previous surgeries and status of PVR at the time of primary surgery are not strongly associated with retinal redetachment after silicone oil removal. ■

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