

RETINA SURGERY **SURGICAL UPDATES**

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# The Silicone Sandwich Technique

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Successful surgical management of complex retinal detachment often requires the use of long-acting intraocular tamponades to achieve anatomical success. Choice of endotamponade varies depending on the extent and location of the detachment as well as other factors such as ability of the patient to maintain postoperative positioning. Silicone oil has been widely used for many years with good success as an endotamponade for retinal detachment.<sup>1</sup> Silicone oil is considered to be a safe long-term endotamponade, although some recent studies using more modern imaging techniques including optical coherence tomography suggest that the use of silicone oil may have a long-term effect on retinal thinning.<sup>2</sup>

Despite this, there are some cases with significant inferior pathology including giant retinal tears or significant proliferative vitreoretinopathy (PVR) where use of silicone oil may be necessary to achieve long-term endotamponade. One must take special care to ensure a silicone-oil fill that is as complete as possible. This is sometimes difficult to achieve because a complete infusion of silicone-oil must be balanced with other considerations including final postoperative intraocular pressure which can be elevated in cases of overfill, as well as anterior migration of silicone oil into the anterior cham-



ber in cases where the eye is overfilled.

Underfilling the eye with silicone oil, on the other hand, is also problematic since this leads to failure of tamponade of inferior pathology and subsequent re-detachment of the retina. For this reason, use of "heavy" silicone oils including Densiron 68 (Fluoron, Ulm, Germany),<sup>3</sup> F<sub>6</sub>H<sub>8</sub> (Fluoron),<sup>4</sup> and Oxane HD (Bausch + Lomb, Rochester, NY)<sup>5</sup> are being investigated as alternatives. Some studies have even advocated the very short term use of perfluorocarbon heavy liquid despite concerns of intraocular toxicity.<sup>6</sup>

In cases where inferior redetachment occurs in a patient already with silicone oil, few options remain. It is important to first ensure that the reason for redetachment is not a result of tractional forces including formation of PVR. In these cases, it may be necessary to place a scleral buckle for inferior support of the detachment and also to remove tractional membranes with vitrectomy techniques. To achieve this, it is often necessary to remove the existing silicone oil and proceed with mem-

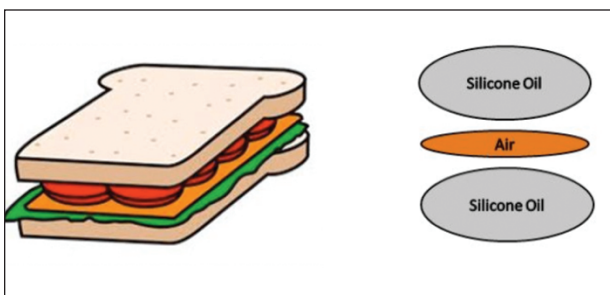


Figure 1. The top piece of bread represents silicone oil in the anterior chamber, the bottom piece of bread represents silicone oil in the vitreous, and the air is the filling between the 2 locations of oil.

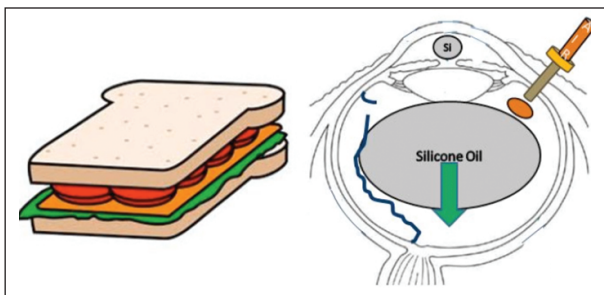


Figure 2. As the air bubble gets larger, silicone oil is pushed posteriorly keeping the retina attached and at the same time, the silicone oil is prevented from migrating anteriorly.

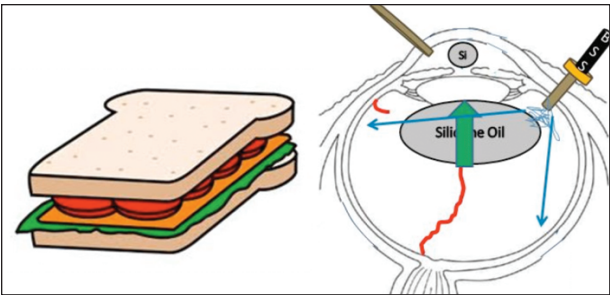


Figure 3. As irrigating fluid enters the vitreous cavity, the oil tends to float anteriorly because it is lighter than balanced salt solution.

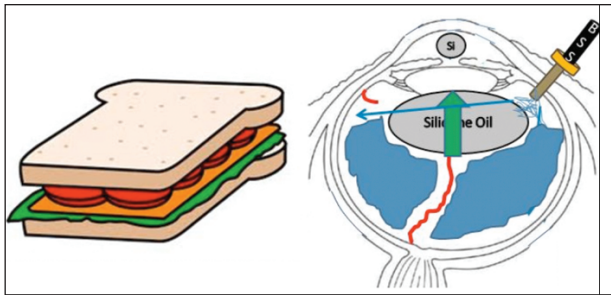


Figure 4. As more balanced salt solution is infused, the retinal detachment will become large, because fluid migrates into the subretinal space as the oil floats anteriorly.

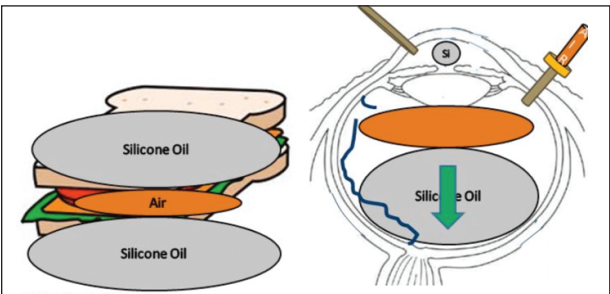


Figure 5. Air in the silicone sandwich acts as a buffer to prevent any more oil from coming anteriorly into the anterior chamber as oil is removed.

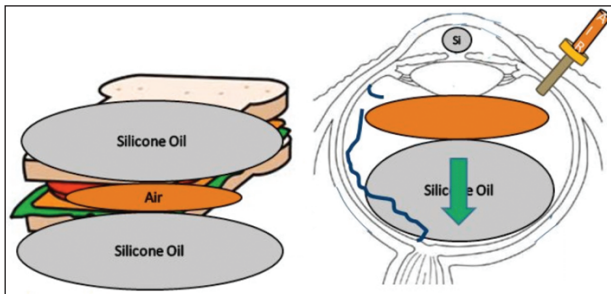


Figure 6. The silicone sandwich also compresses the detachments because the silicone oil is heavy under air, so the retinal detachment does not increase.

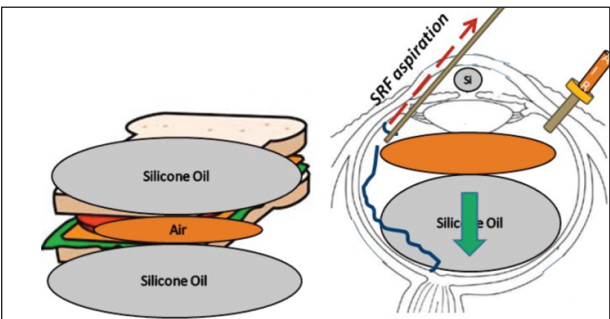


Figure 7. The silicone sandwich also allows for easy air-fluid exchange with limited retinal detachment at the beginning of the case.

brane stripping under fluid infusion followed by reattachment of the retina under F-Octane (Fluoron) heavy liquid or direct air-fluid exchange, followed by silicone reinfusion.

These cases tend to be lengthy, costly, and often complicated. In the majority of cases of redetachment under silicone oil, however, an inadequately silicone filled vitreous cavity is the primary reason for persistent inferior retinal detachment. It is in these not too infrequently encountered situations that we employ a method that is efficient and highly successful in retinal reattachment. This method also elegantly deals with the

concomitant issue of silicone oil that has inadvertently migrated into the anterior chamber, thereby also reducing the silicone oil volume in the vitreous cavity that has led to the increasing inferior retinal detachment.

### **SURGICAL TECHNIQUE**

This surgical technique is useful in dealing with 2 situations not infrequently encountered by vitreoretinal surgeons. The first is the simpler case in which there is residual retinal detachment and an incomplete filling of the vitreous cavity with silicone oil. The surgeon would like to add oil and, at the same time, avoid having silicone oil prolapsing into the anterior chamber. The second case is that of silicone oil prolapsed in the anterior chamber with simultaneous incomplete fill of silicone oil in the vitreous cavity and residual inferior retinal detachment. The surgeon would like to remove the oil from the anterior chamber, supplement silicone oil in the vitreous cavity to reattach the retina, and finally prevent more silicone oil from prolapsing again into the anterior chamber during surgery.

The essence of this technique is to create a barrier which prevents silicone oil that is more posterior from migrating anteriorly. This then allows the surgeon to remove the oil from the anterior chamber and later to add more oil to the vitreous cavity.

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Use of the silicone sandwich technique with immediate infusion of air at the start of the case will simplify cases for the vitreoretinal surgeon significantly.

In this silicone sandwich (Figure 1), the top piece of bread represents silicone oil in the anterior chamber, the bottom piece of bread represents silicone oil in the vitreous, and the air is the filling between the 2 locations of oil. The air acts as a buffer by preventing the posterior oil from migrating anteriorly while at the same time keeping the retina tamponade posteriorly by compressing silicone oil already present since silicone oil is heavier than air.

The first step is to immediately infuse air. It is important not to infuse any BSS fluid or else the oil will float anteriorly and defeat the purpose of the technique.

As the air bubble gets larger, silicone oil is pushed posteriorly keeping the retina attached and at the same time, the silicone oil is prevented from migrating anteriorly (Figure 2). At this stage, it is relatively easy through a paracentesis incision to remove the oil from the anterior chamber and replace it with viscoelastic. Viscoelastic maintains anterior chamber depth during extrusion of silicone oil. Use of other agents to maintain a deep anterior chamber, such as balanced salt solution would also defeat the purpose of this technique because the balanced salt solution would migrate posteriorly and increase the volume of vitreous and subretinal fluid.

The 2 main problems with infusing balanced salt solution are as follows. As irrigating fluid enters the vitreous cavity, the oil tends to float anteriorly because it is lighter than balanced salt solution (Figure 3). This increases the probability that more oil will now prolapse into the anterior chamber. Moreover, as more balanced salt solution is infused, the retinal detachment will become large (Figure 4), because fluid migrates into the subretinal space as the oil floats anteriorly.

Use of the silicone sandwich technique with immediate infusion of air at the start of the case will simplify these

cases for the vitreoretinal surgeon significantly (Figures 5-7). The usual means of retinal detachment repair including F-octane heavy liquid injection and air-fluid exchange with a mobile detached retina are avoided with this technique. This method results in a more efficient surgery with much lower costs and, ultimately, less morbidity to the patient. ■

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