Heavy Liquid-assisted Drainage of Subretinal Hemorrhage

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In this issue of Retina Today, Andrew Chang, MBBS, PhD, FRANZCO, FRACS, describes a technique of using heavy liquid as temporary tamponade to drain a large subretinal hemorrhage.

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

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

Massive subretinal hemorrhage may complicate conditions such as exudative macular degeneration, polypoidal vasculopathy, or trauma. Irreversible and severe vision loss may follow due to mechanical traction to the photoreceptors by fibrin, toxicity by iron breakdown products, and impaired diffusion of nutrients from the choroid to the photoreceptors.

The vitreoretinal surgeon has a number of tools and techniques to manage these hemorrhages, including intravitreal gas, tissue plasminogen activator (tPA), surgical approaches (vitrectomy), anti-VEGF drugs, and thermal and nonthermal laser. When selecting a treatment option, considerations include the vision in the eye, the patient’s ability to posture, and the extent and location of the hemorrhage.

For small submacular hemorrhages, pneumatic displacement with intravitreal gas in conjunction with tPA to displace the hemorrhage has been described. Subsequent concerns regarding potential tPA retinal toxicity led to reports that subretinal blood could be displaced with a gas bubble without tPA. The addition of anti-VEGF agents to the technique of gas displacement either at the time of the injection or sequentially may improve the visual outcome.

For thicker and more extensive subretinal hemorrhages, vitrectomy and submacular drainage of the blood may be considered. Vitrectomy with a large retinotomy with or without macular translocation was initially described. However, visual outcomes were poor due to trauma and scarring. Significant complications include retinal detachment with proliferative vitreoretinopathy.

This article describes a technique of using heavy liquid as temporary tamponade to drain a large subretinal hemorrhage.
A 52-year-old Thai woman presented with sudden loss of vision due to a vitreous hemorrhage. There was no previous significant ocular or medical history. Visual acuity was counting fingers.

An Optos wide-angle color fundus photograph (Figure 1) showed a vitreous hemorrhage and retinal elevation suggestive of a retinal detachment. B-scan ultrasound demonstrated a retinal detachment with high internal reflectivity, suggesting the presence of a subretinal hematoma. A peripheral cataract was present.

**Surgical Steps**

No. 1: A 3-port 23-gauge pars plana vitrectomy was performed. The vitreous hemorrhage was removed. The vitreous hyaloid was separated, and peripheral vitrectomy was performed. After removal of the vitreous hemorrhage, a large subretinal hemorrhage, which extended to the temporal retina and to the edge of the fovea, was visualized. A lesion suggestive of polypoidal vasculopathy was noted in the superotemporal retinal periphery (Figure 2).

No. 2: A small peripheral retinotomy in the temporal retina was created using endodiathermy to allow drainage of the subretinal clot.

No. 3: Heavy liquid was injected slowly over the posterior pole until the subretinal blood was displaced peripherally (Figure 3). The heavy liquid serves to protect the macula from the hemorrhage dissecting the fovea. The Alcon Constellation machine allows stable intraocular pressure (IOP) management during the injection of the heavy liquid using IOP control (Figure 4).
No. 4: The blood was drained through the peripheral retinotomy by rocking the eye gently from side to side. This allows the heavy liquid to push the blood toward the retinal periphery through the peripheral retinotomy.

No. 5: External scleral pressure was applied using a retinal cryotherapy probe to squeeze the blood clot out through the peripheral retinotomy. The blood that was displaced through the retinotomy into the vitreous cavity floated on the surface of the heavy liquid and passed quickly and directly out of the vitreous cavity through the open 23-gauge cannula (Figure 5).

No. 6: The heavy liquid was left in situ for 5 days to encourage further drainage of blood through the peripheral retinotomy. The patient was instructed to posture supine postoperatively.

No. 7: The heavy liquid was removed 5 days later with a 3-port pars plana vitrectomy approach. Additional retinopexy was performed to the peripheral retinotomy (Figure 6).

The postoperative wide-angle Optos fundus photograph shows that the blood was removed from the subretinal space. Visual acuity improved to 20/40. The retina is attached (Figure 7). A residual gas bubble is visible.

**SPECIFIC ASPECTS OF THE TECHNIQUE**

**Small Peripheral Retinotomy**

A small and peripheral drainage retinotomy allows drainage of the subretinal clot. This reduces the complications of the retinotomy, including subretinal fibrosis and trauma to the retinal pigment epithelium (RPE), which may be associated with a larger and more posterior retinotomy. A smaller retinotomy may also reduce the risk of retinal detachment and proliferative vitreoretinopathy. The retinotomy is made with endodiathermy to ensure that the edges of the retinotomy are surrounded by diathermy reaction.

**Heavy Liquid**

Heavy liquid has been described in assisting drainage of blood through a peripheral retinotomy. This may potentially reduce the risks of a larger retinotomy. The heavy liquid displaces the blood peripherally and protects the macula. Gently rocking the globe from side to side facilitates drainage of the liquefied component of the clot, minimizing trauma to the retina and RPE through the retinotomy. Gradually, more of the clot can be gently removed. External scleral depression using a retinal cryotherapy probe or other instrument such as a scleral depressor or strabismus hook aids in pushing the clot out through the retinotomy like squeezing a tube of toothpaste.

The extracted clot passes on the surface of the heavy liquid and exits the globe through the open 23-gauge cannula. Using IOP control and raising the infusion pressure facilitates this maneuver.

**Tissue Plasminogen Activator**

The effectiveness in removing the clot depends on the location of the clot (sub-RPE or subretinal) and whether it is liquefied. Preoperative B-scan ultrasonography may be useful in assessing liquefaction of the clot. tPA can be administered either as an intravitreal or subretinal injection using a subretinal cannula. There is some evidence for penetration of tPA into the subretinal space when given intravitreally.

**Temporary Tamponade With Heavy Liquid**

The heavy liquid is retained in the eye as temporary...
tamponade for 3 to 5 days. The patient is postured supine, allowing stabilization of the retina and protection of the macula. The retained heavy liquid encourages continued drainage of the clot from the peripheral retinotomy in the postoperative period.

The concept of retaining heavy liquid as temporary tamponade has been found to be well tolerated and successful in the repair of giant retinal tears. A granulomatous inflammatory reaction to the heavy liquid may develop if the heavy liquid is kept in situ for more than 5 to 7 days. This macrophage response can be seen as inflammatory precipitates on the posterior surface of the lens and the retinal surface. These precipitates usually resolve with removal of the heavy liquid and do not require specific treatment.

CONCLUSION

Modern vitrectomy techniques and use of surgical aids such as heavy liquid perfluorocarbon and tPA facilitate the management of selected cases of large subretinal hemorrhage, which may otherwise be associated with potentially devastating visual loss.

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