Diathermy to tissue adhesives for retinal tears: The future of retinal reattachment surgery

The clinical practice of retinal surgery has always been challenging, and it is precisely these challenges and the rewards of meeting them that draw many of us into this career. Employing the latest and greatest technology to benefit patients has always been and will always remain an important source of gratification and fulfillment for the retinal surgeon. Advancing technologies such as heads-up three-dimensional surgery, intraoperative optical coherence tomography, suprachoroidal buckling, and many more recent advancements in therapeutic armamentarium will sustainably help us to take better care of more diseases in greater numbers of patients with better outcomes.[1,2]

Currently, laser photocoagulation is used during parsplana vitrectomy surgery to build chorioretinal adhesion around the retinal break, and silicone oil or gas tamponade keep the neuroretina attached to the retinal pigment epithelium (RPE) until the retinopexy becomes effective.[3-5] These tamponade agents require patient positioning and cause substantial discomfort and complications. Furthermore, it takes up to 2 weeks for the laser scar to develop, during which time the unsealed tear may allow the release of RPE, inflammatory cells and serum components from the subretinal space into the vitreous allowing proliferative vitreoretinopathy (PVR).[6]

The quest to have a faster sealing of the retinal tear avoiding complications and resurgeries has brought us from Gonin era of diathermy passing through laser photocoagulation and cryopexy toward tissue adhesives for sealing the retinal tears. The advantage of using retinal adhesives is that they can eliminate the need for gas or silicone oil tamponade.

Some adhesives, such as cyanoacrylate, fibrin glue, sodium hyaluronate/carboxymethylcellulose absorbable film, transforming growth factor-β, and polysiloxanes, have been used to seal retinal breaks in the treatment of retinal detachment for many years;[7] however, each has its own disadvantages, such as potential ocular toxicity, difficulty in intraocular delivery, weak adhesive force, inflammatory response, and granulomatous tissue reaction. For these reasons and others, the use of glue has not yet become a standard procedure in the treatment of retinal detachment.

To make sealing retinal breaks easier and more effective, polyethylene glycol-based synthetic hydrogel sealant (PEG sealant), which has been used to seal cerebrospinal fluid leak after posterior fossa surgery, nerve sciatic anastomosis, vascular closure, hemostasis in anastomotic bleeding wound closure and prevent air leaks from pulmonary resections in humans,[8] is really a welcoming innovation.

There are two shortcomings of hydrogels used as retinal glue: one, the need to mix two constituents of the glue (one gel and the other liquid) for polymerization,[9] and the other, long duration of 2–3 min required for polymerization.[7] Due to these drawbacks, the application area is restricted to the posterior pole of the eye as the glue may spill downward from peripheral breaks before polymerization, moreover, when liquid glue is applied to retinal breaks, the glue tends to slip under the retina. Sueda *et al*.[9] partially solved these problems by using a double syringe system and a modification to the DuraSeal Dural Sealant (Confluent Surgical, Waltham, MA, USA), of which the curing time was 8–10 s. However, it was still difficult to handle the liquid glue, as they observed a case with glue entering the subretinal space in their experimental retinal reattachment surgery.

In the current volume of IJO, we have an article on transscleral, delivery method of duraseal sealant in rabbit eyes that takes into consideration the anatomical and physiological constraints of the eye and results are really encouraging.[10] Although the authors have described the results in experimental shallow retinal detachment in rabbit eyes, the utility in bullous retinal detachments with PVR changes still needs to be studied. More such studies are needed to further validate the efficacy of Dura seal before it can be considered for clinical use, and still there is a lot to understand and learn, but the concept is interesting and promising.

The surgical treatment of rhegmatogenous retinal detachment has come a long way over the past decades, making the once untreatable condition a very manageable one. Significant advances have been made, and a variety of techniques are now available, with new instruments and modifications constantly being reported. As progress continues, further improvements are expected to develop a safe technique with the fast closure of retinal tear resulting in less PVR and reduced recurrent retinal detachment rate.

Ekta Rishi, Niharika Singh

Shri Bhagwan Mahavir Vitreoretinal Services, Medical Reasearch Foundation, Chennai, Tamil Nadu, India.

Correspondence to: Ekta Rishi, Senior Consultant, Shri Bhagwan Mahavir Vitreoretinal Services, Sankara Nethralaya, 18 College Road, Chennai - 600 006, India.
E-mail: ek_and@yahoo.com

References

1. El Rayes EN, Elborgy E. Suprachoroidal buckling: Technique and indications. J Ophthalmic Vis Res 2013;8:393-9.
2. Carrasco-Zevallos OM, Viehland C, Keller B, Draelos M, Kuo AN, Toth CA, *et al.* Review of intraoperative optical coherence tomography: Technology and applications [Invited]. Biomed Opt Express 2017;8:1607-37.
3. Gonvers M. Temporary silicone oil tamponade in the management of retinal detachment with proliferative vitreoretinopathy. Am J Ophthalmol 1985;100:239-45.
4. Machemer R, Laqua H. A logical approach to the treatment of massive periretinal proliferation. Ophthalmology 1978;85:584-93.
5. Tiedeman JS. The role of intraocular gases and air in scleral buckling surgery. Semin Ophthalmol 1995;10:74-8.
6. Paulus YM, Jain A, Gariano RF, Stanzel BV, Marmor M, Blumenkranz MS, *et al.* Healing of retinal photocoagulation lesions. Invest Ophthalmol Vis Sci 2008;49:5540-5.

7. Margalit E, Fujii GY, Lai JC, Gupta P, Chen SJ, Shyu JS, *et al.* Bioadhesives for intraocular use. Retina 2000;20:469-77.
8. Heymanns V, Oseni AW, Alyeldien A, Maslehaty H, Parvin R, Scholz M, *et al.* Sandwich wound closure reduces the risk of cerebrospinal fluid leaks in posterior fossa surgery. Clin Pract 2016;6:824.
9. Sueda J, Sakuma T, Nakamura H, Usumoto N, Okuno T, Arai M, *et al. In vivo* and *in vitro* feasibility studies of intraocular use of seprafilm to close retinal breaks in bovine and rabbit eyes. Invest Ophthalmol Vis Sci 2006;47:1142-8.
10. Barliya T, Sandalon S, Ofri R, Livnat T, Weinberger D. Transcleral approach for closing retinal tears using DuraSeal™ hydrogel sealant. Indian J Ophthalmol 2018;66:238-43.

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