

Suprachoroidal Steroid Delivery

Enforcing our management for refractory macular edema.

BY EHAB N. EL RAYES, MD, PhD

Refractory diffuse clinically significant macular edema is a special entity of diabetic macular edema (DME) that is difficult to treat, with limited role for laser in management. Vitrectomy has been shown to be effective in improving these cases, particularly those with taught hyaloids and vitreomacular traction (VMT).^{1,2} This is explained by its mechanisms of removing anteroposterior as well as tangential traction, removing VEGF and other vasopermeable factors, potentially increasing macular microcirculation, and improving retinal and vitreous oxygenation. Vitrectomy has also shown a potential role in managing DME without macular treatment.³⁻⁷

Despite reports in the literature, some cases still do not do well, and combining treatment modalities might be a better option.

INTRAVITREAL IMPLANT DELIVERY

The role of intravitreal steroids in the management of macular edema is well established, showing good short-term outcomes; however, recurrence of edema and increase in intraocular pressure (IOP) occurs in approximately 30% of cases, along with lens changes, risk of multiple injections, and finding poor prognosis if significant hyaloidal traction is present.⁸ We also know that effect of combining intravitreal steroid with vitrectomy is temporary due to the high clearance rate of a vitrectomized eye compared with a nonvitrectomized eye.

One solution to this fast clearance may be the use of extended-release intravitreal implants. The CHAMPLAIN study showed that treatment with the dexamethasone intravitreal implant (Ozurdex, Allergan Inc.) led to statistically significant improvements in both vision and vascular leakage from DME in difficult-to-treat vitrectomized eyes.⁹ This concept was also supported by Chang Lin et al,¹⁰ showing similar pharmacokinetics after implantation



Figure 1. Color photograph of the El Rayes catheter with the Y-connector. The device is primed with triamcinolone.

in vitrectomized and nonvitrectomized eyes, suggesting a potential role for extended-release steroid combined with vitrectomy in managing these difficult-to-treat cases. Extended-release steroids do have issues, however, including IOP increase and cataract formation.

SUPRACHOROIDAL DELIVERY

Suprachoroidal delivery has a therapeutic effect similar to that of the intravitreal route, with extended half-life (no washout, longer absorption time) and less incidence of IOP increase. Olsen et al¹¹ demonstrated in a pig model that the suprachoroidal space could serve as a reservoir for sustained-release formulations, establishing a steep concentration gradient for drug diffusion into the retina and choroid. They also showed a high local drug concentration in the choroid and retina in the macular region for at least 4 months. Rizzo and colleagues¹² showed resolution of massive subfoveal hard exudates in cases of DME unresponsive to multiple intravitreal injections using a combination of bevacizumab and triamcinolone administered to the submacular suprachoroidal space.

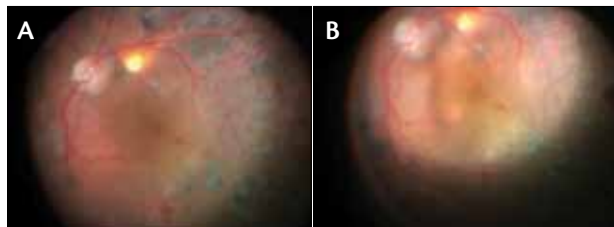


Figure 2. Color photographs of an intraoperative case. The catheter under the macular area before injection (A). Post injection, notice the macular area elevated by suprachoroidal steroid under the macular area (B).

VITRECTOMY COMBINED WITH SUPRACHOROIDAL STEROID DELIVERY

We have used the technique described below to treat different cases of refractory DME (watch the video by scanning the QR code here, or by following the quicklink). In this technique, we perform a classic 3-port pars plana vitrectomy with hyaloid removal and internal limiting membrane peeling in cases of evident traction on optical coherence tomography (OCT), followed by a 2-mm sclerotomy incision that is 3 to 4 mm behind and parallel to the limbus at the 12 o'clock position. The sclerotomy exposes the choroid. The choroid is separated from the sclera by a viscoelastic dissection bubble. We then introduce a specially designed suprachoroidal catheter (El Rayes catheter, MedOne Surgical), primed with preservative-free triamcinolone acetate (Figure 1). The catheter has 2 arms: 1 connected to the machine light source and the other connected to an injection syringe carrying the drug.

The 400- μ m catheter is threaded into the suprachoroidal space under direct visualization through the microscope to reach the submacular area in the suprachoroidal space. The light spot at the tip marks the target tissue. We then inject 8 mg under direct visualization (Figure 2). We then remove the catheter and close the sclerotomy.

We have used this technique in 38 patients with improvement in macular edema clinically as well as on OCT in all of them, even eyes with subretinal hard exudates. We have noticed immediate improvement in retinal thickness as early as 48 hours postoperative, compared with vitrectomy alone (Figure 3). We have seen IOP elevation only in 1 eye, and this was transient and was controlled medically. OCT improvement was stable over 4 to 5 month follow-up. There was a gradual increase in retinal thickness on OCT that was noted in 5 eyes. No thickness measurements reached 50% of the preoperative thickness.

Other than the patients in our trial, we have used escalating doses of triamcinolone up to 12 mg with the same

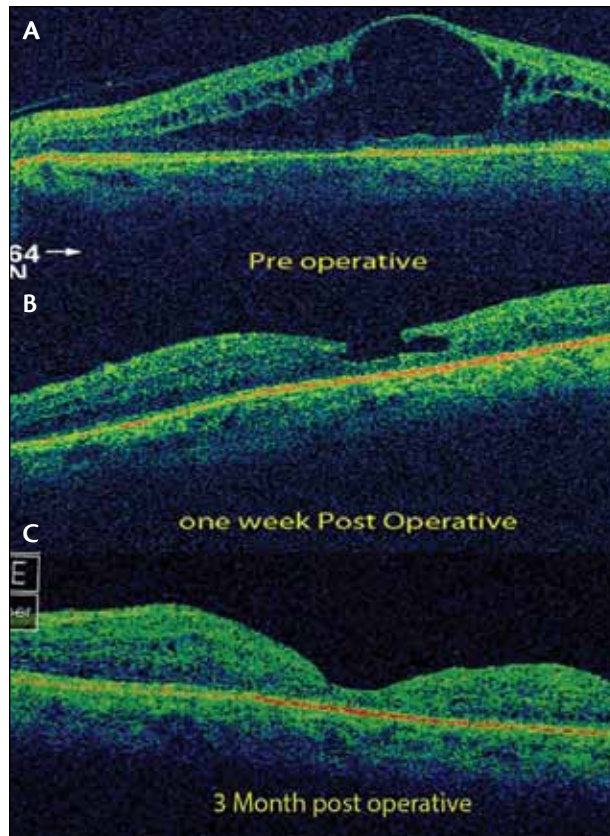


Figure 3. Pre- and postoperative OCT of a patient. Preoperative (A). One week postoperative (B). Three-months postoperative (C).

therapeutic effect and no increase in IOP. Even extrafoveal injection (around the arcades) had a therapeutic effect (watch the video by scanning the QR code here, or by following the quicklink).



SUPRACHOROIDAL DELIVERY ALONE FOR NONTRACTION REFRACTORY DME

Recently, we started using suprachoroidal delivery without vitrectomy for nontraction refractory DME. We use the catheter and a chandelier light (no vitrectomy infusion and tapping the anterior chamber) and have found this to have a therapeutic effect over 5 months of follow-up.

Suprachoroidal steroid delivery augments the therapeutic role of vitrectomy in retinal edema. It also has demonstrated a possible role as a sustained-release approach in nonvitrectomized eyes with no traction. Delivery through the suprachoroidal space acts as a slow-release reservoir and avoids the anterior chamber side effects of glaucoma and cataract when using intravitreal steroids. It also obviates washout and increases the duration of drug activity

Weigh in on this topic now!



Direct link: <https://www.research.net/s/RT17>

After reading this article, do you think that suprachoroidal delivery of steroids would be a valuable addition to your treatment armamentarium for refractory DME?

- ☐ Yes
☐ No

in a cost-effective approach as an adjunct to vitrectomy or as monotherapy for macular edema.

More study is needed to compare suprachoroidal steroid delivery as monotherapy for macular edema with catheterization and delivery under chandelier light to other modes of treatment. In my opinion, however, suprachoroidal drug delivery is a viable option and may also be used in the future with newer drugs still in the development pipeline. ■

Ehab N. El Rayes, MD, PhD, is a Professor of Ophthalmology in the Retina Department, Institute of Ophthalmology in Cairo, Egypt. Dr. El Rayes states that he is a consultant to MedOne Inc., is the patent holder of the suprachoroidal catheter and cannula for suprachoroidal buckling and drug delivery, and has received lecture fees from Novartis and travel support from Alcon. He states that he has no financial interests in relation to the content of this article. Dr. El Rayes may be reached at erayes1@hotmail.com.



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