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Trocar-based Surgical Technique for Drainage of Suprachoroidal Hemorrhages

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Financial Disclosures:
None to report

Introduction:
Suprachoroidal hemorrhage (SCH) most commonly occurs during or following intraocular surgery or in the setting of trauma. SCH requires early recognition and appropriate monitoring to prevent severe vision loss. Fortunately, some cases of SCH are self-limited and can resolve spontaneously with careful observation. However, in cases of large, progressive or appositional SCH, surgical drainage is often necessary to prevent further complications such as retinal detachment; angle-closure glaucoma; retinal incarceration; or expulsion of intraocular contents, all of which can be associated with permanent vision loss and a guarded prognosis.[1-3]

The traditional approach to SCH drainage involves external drainage via a 2.0 mm to 3.0 mm sclerotomy window or tunnel at the apex of the choroidal detachment. In some cases, a cyclodialysis spatula can be introduced into the suprachoroidal space to expedite outflow.[1] Problematically, this technique can often result in post-operative leakage and hypotony, endophthalmitis, retinal incarceration, and the need for subsequent pars plana vitrectomy (PPV). Although transconjunctival trocar-cannula drainage techniques have been previously described in the literature, there is often ambiguity and ambivalence regarding vitreous substitutes (e.g., air vs gas, vs silicone oil tamponade) following drainage of choroidal hemorrhage. Here, we discuss and present a case demonstrating external trans-conjunctival drainage of SCH utilizing vitreoretinal trocar-cannulas on a patient with SCH following glaucoma surgery. Additionally, we discuss the efficacy and safety advantages of this surgical approach compared to those of previous drainage methods.

Painful Loss of Vision Following Glaucoma Surgery
A 92-year-old female presented with painful vision loss in the left eye (OS) and was found to have appositional (“kissing”) SCH following trabeculectomy surgery for advanced glaucoma **(Figure 1)**. Past ocular history included selective laser trabeculoplasty, trabeculectomy with mitomycin C and a Baerveldt glaucoma drainage device with scleral patch OS. Presenting best-corrected visual acuity (BCVA) was counting fingers at 3 feet with an intraocular pressure of 8 mmHg OS. Anterior segment examination demonstrated pseudophakia, a well-positioned Baerveldt tube and a 1 mm hyphema. The patient was monocular with hands motion vision OD secondary to advanced glaucoma. After discussing treatment options with the patient and her family, the decision for surgical drainage of the SCH OS was made given the patient’s monocular status and persistent ocular pain OS.

Trocar-based Surgical Technique
Pre-operative B-scan echography was first performed to determine the ocular quadrant with the largest

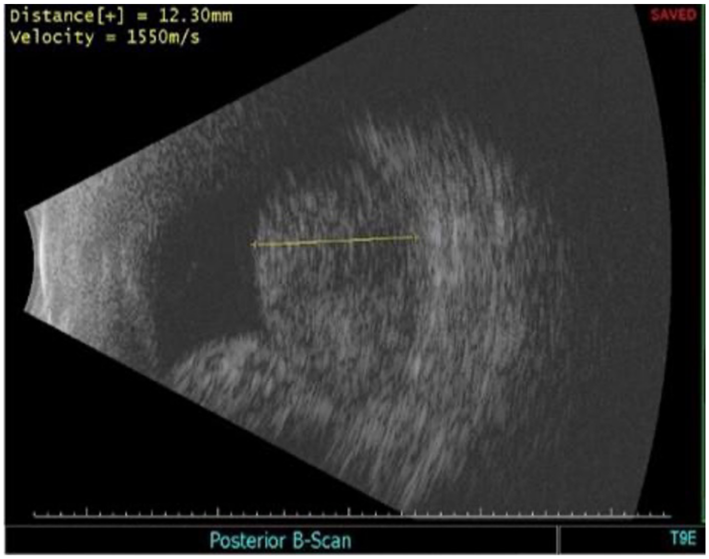

Figure 1. *B-scan echography performed before surgical intervention demonstrates a large suprachoroidal hemorrhage with retinal contact OS; image courtesy of David Almeida, MD*

component of SCH. Ultrasound B-scan is a valuable tool in evaluating suprachoroidal hemorrhage (SCH). In cases where blood has liquified, the echogenicity of the hemorrhage decreases, appearing as a more hypoechoic region compared to the surrounding structures. This change in echogenicity can be attributed to the breakdown of the blood clot into smaller components and its subsequent liquefaction. Moreover, a liquified suprachoroidal hemorrhage often exhibits a more distinct, well-defined border with adjacent structures. This feature helps differentiate it from other causes of choroidal detachments or masses, which may have a more irregular or ill-defined border. The presence of fluid-fluid levels can be indicative of blood liquefaction in suprachoroidal hemorrhage. This phenomenon occurs when the red blood cells settle at the bottom, while the serum portion remains at the top, creating a layering effect within the hemorrhage. This layering can be identified on B-scan ultrasound as a distinct horizontal line separating the hypoechoic upper layer from the more echogenic lower layer. It is essential to consider these ultrasound characteristics when evaluating suprachoroidal hemorrhages to determine if the blood has liquified, as this information can impact management decisions and provide prognostic information.

The quadrant with an SCH height greater than 5 mm for optimal drainage was selected. Subsequently, an anterior infusion was secured at the corneal limbus using a 25-gauge trocar-cannula, and the IOP was temporarily elevated to 60 mmHg. With the IOP elevated to 60 mmHg, a 23-gauge, non-valved trocar-cannula was inserted approximately 7 mm posterior from the corneal limbus (i.e., roughly near

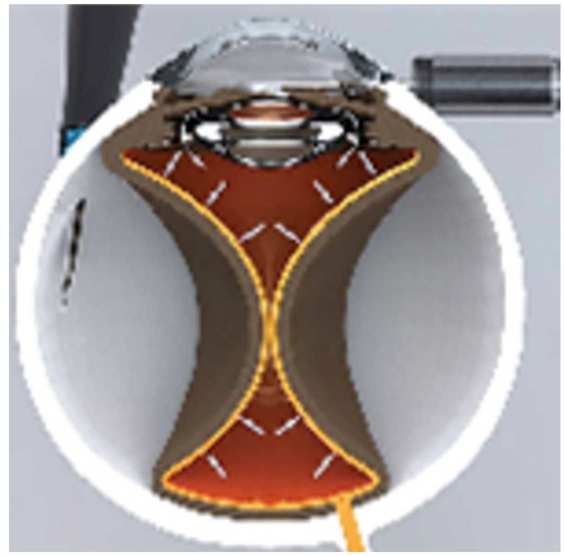

Figure 2. *Schematic illustration demonstrating insertion of a vitreoretinal trocar-cannula at a flat angle of incidence (approximately 20 degrees) to the sclera and positioned towards the functional equator; image courtesy of David Almeida, MD*

the functional equator) in the previously identified quadrant with the largest SCH component. It is critical to technique success that the trocar-cannula is inserted parallel to the functional equator, and nearly flat or parallel to the conjunctiva and sclera with an angle of incidence of approximately 15-20 degrees. The trocar-cannula should be positioned toward the functional equator to ensure proper positioning for drainage (**Figure 2**).

Next, drainage of the SCH can proceed with minimal manipulation employing the non-valved 23-gauge cannula. Once the SCH is drained, the 23-gauge cannula can be removed; we recommend leaving the drainage site open without suture closure. When required, PPV can be performed in eyes with concomitant pathology. In the case described above, the patient improved to a visual acuity of 20/200 with stable IOP OS.

Surgical Pearls

The technique described here provides an efficient, efficacious and reproducible surgical approach to managing SCH. Note that smaller 25-gauge non-valved trocars can be used for drainage; however, blood drainage may be slower and more likely to occlude with small blood clots. The sutureless approach uses beveled incisions to allow for slow passive effusion and adequate drainage of the choroidal hemorrhage, minimizing the likelihood of the post-operative hypotony sometimes seen in external drainage via larger sclerotomy wounds.

Several surgical pearls should be noted, including avoiding drainage at the 3- and 9-o-clock meridians to spare possible iatrogenic trauma to the ciliary nerve. Moreover, if possible, it is advised to drain the inferotemporal quadrant, as this will facilitate surgical access and be gravity-dependent for optimal blood evacuation. Finally, if concomitant PPV is required, limbal-based vitrectomy is preferred to avoid instruments inadvertently entering the suprachoroidal space.

When PPV is performed following SCH drainage, if endotamponade is desired, we recommend avoiding air as choroidal formation and possible SCH often recur during this step. A non-compressible medium such as balanced salt solution or silicone oil will prevent choroidal formation from pushing fluid posteriorly, thereby protecting the macula. Given the possibility of recurrent SCH, a non-compressible medium such as silicone oil or fluid offers the optimal mechanical approach to mitigating this risk.

Conclusion

Trocar-based vitreoretinal drainage is a viable surgical technique to treat some types of suprachoroidal hemorrhage. Our case provides an overview of the surgical management of SCH utilizing external vitreoretinal trocar-cannula-based drainage. This safe and reproducible technique affords vitreoretinal surgeons improved maneuverability when encountering these uncommon but challenging cases of SCH.

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