Surgical Technique

Not-so-minimal for minimally invasive surgery

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Sub-macular hemorrhage poses a potential threat to vision if left untreated. The preferred surgical technique to clear sub-macular hemorrhage includes vitrectomy followed by retinotomy using a 41G needle with subsequent injection of recombinant tissue plasminogen activator (r-tPA) followed by air/SF6 injection into the sub-retinal space. A malleable nature, increased resistance, and the cost of the 41G needle limit its use. We evaluated the safety and efficacy of a 26G needle for retinotomy as a supplement for the 41G needle in a series of six subjects with sub-macular hemorrhage. A slight modification in the procedure was done by injecting air into the sub-retinal space prior to the r-tPA injection. We found that our technique of using the 26G needle for retinotomy is safe and effective due to its stable nature and self-sealing properties. An air injection prior to r-tPA allows for increased bioavailability of the drug by preventing efflux due to its tamponading effect.

Key words: 26G needle, recombinant tissue plasminogen activator (r-tPA), retinotomy, sub-macular hemorrhage

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Sub-macular hemorrhage poses a threat to vision due to the toxic effects of accumulated blood between the photoreceptors and retinal pigment epithelial cells (RPE).[1,2] The available treatment options include conservative management such as observation alone,[3] minimal invasive procedures such as Anti-Vascular endothelial growth factor (anti-VEGF) monotherapy,[4] pneumatic displacement alone[2] or their combination.[5,6] The active intervention includes pars plana vitrectomy with sub-retinal r-tPA and anti-VEGF injection with pneumatic displacement.[7,8] The latter being the preferred technique involving retinotomy using the 41G needle. The malleable tip of the 41G needle with unsteadiness while passing through the 23G port (please refer to Clip 1 for our experience with the 41G needle causing inadvertent retinotomy extensions due to loose fit through the 23G pars plana cannula) and resistance for drug injection into the sub-retinal space are some drawbacks. In our case series, we describe retinotomy using the 26G needle instead of the 41G with unique advantages.

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We describe our technique in six patients with sub-retinal hemorrhage of various etiologies. We performed chandelier-assisted four ports pars plana vitrectomy through the 23G system which included complete vitrectomy with Internal limiting membrane (ILM) peeling. After visualizing the sub-macular hemorrhage, retinotomy was performed using the readily available and cost-effective 1.5 in 26G needle. The injection of the air bubble was done through the retinotomy site into the sub-retinal space, followed by an injection of sub-retinal recombinant tissue plasminogen activator (r-tPA) 25 µg with the 26G needle *in situ* following which intravitreal anti-VEGF injection was done. An air bubble due to its buoyancy forces provides a uniform plane underneath it for the spread of r-tPA. Also, by tamponading the retinotomy site, the air prevents the efflux of the injected drug back into the vitreous cavity, and thus, increases its bioavailability in the sub-retinal space. Retinotomy with the 26G needle was self-sealing, hence, it did not require to be lasered.

For representation, we hereby showcase a 67-year-old male patient (case 1) with massive persistent sub-macular hemorrhage secondary to polypoidal choroidal vasculopathy (PCV) status post-multiple anti-VEGF injections. His best-corrected visual acuity (BCVA) was finger counting close to face [Fig. 1a and b]. The pneumatic displacement of the hemorrhage was done using the above technique with air gas injected into the sub-retinal space along with r-tPA, 1.25 mg/0.01 mL of bevacizumab was injected intravitreally. One month post-operative picture shows the heme to be displaced off the macula with the restoration of near-normal foveal contour with the BCVA improved up to 6/60 on the Snellen acuity chart [Clip 2 and Fig. 2a, b].

The second case was a 62-year-old female with breakthrough vitreous hemorrhage and sub-macular hemorrhage secondary to the neovascular age-related macular degeneration (n-AMD) with a BCVA of 6/60. A similar procedure to displace the heme was undertaken. A 1-month post-operative picture shows an inferiorly displaced heme with relative flattening of the foveal contour with improvement in the BCVA up to 6/24 on the Snellen visual acuity chart [Clip 3 and Fig. 3].

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Table 1: The details of the subjects who underwent the procedure with the comparison of the outcomes

Case number	Cause of sub-macular hemorrhage	Pre-operative BCVA	Post-operative BCVA (at 1 month)
1	Polypoidal choroidal vasculopathy	CFCF	6/60
2	Neovascular AMD - type 2 MNV	6/60	6/24
3	Polypoidal choroidal vasculopathy	1/60	6/60
4	PEHCR	6/60	6/18
5	PEHCR	1/60	6/60
6	Neovascular AMD-MNV? type 2	4/60	6/24

BCVA - Best-corrected visual acuity; AMD - Age-related macular degeneration; CFCF - counting fingers close to face; MNV - macular neovascularization; PEHCR - peripheral exudative hemorrhagic chorioretinopathy

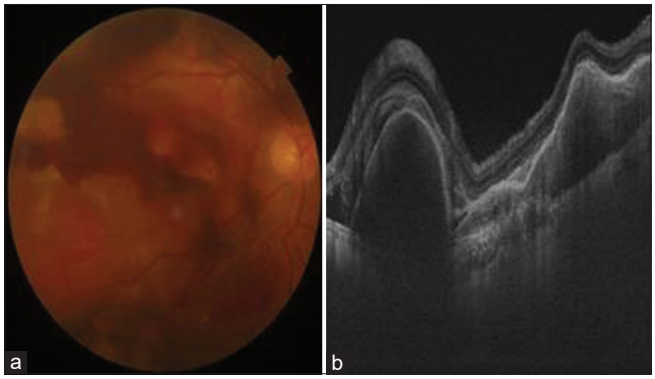

Figure 1: (a) Pre-operative color fundus photograph of case 1 showing the presence of sub-macular hemorrhage. (b) OCT image of Figure 1a showing sub-macular hemorrhage

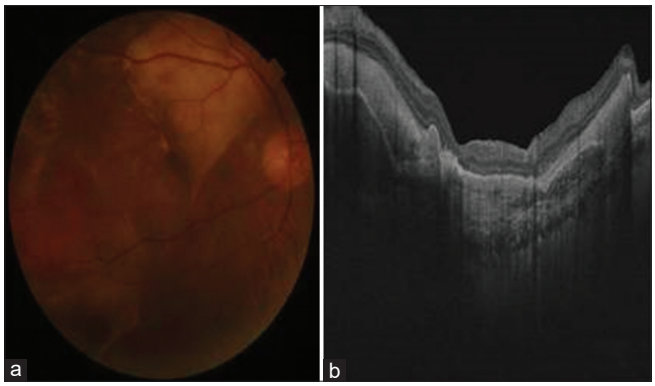

Figure 2: (a) Post-operative color fundus photo of case 1 showing the resolution of hemorrhage. (b) OCT image of Figure 2a showing displacement of heme from the foveal center

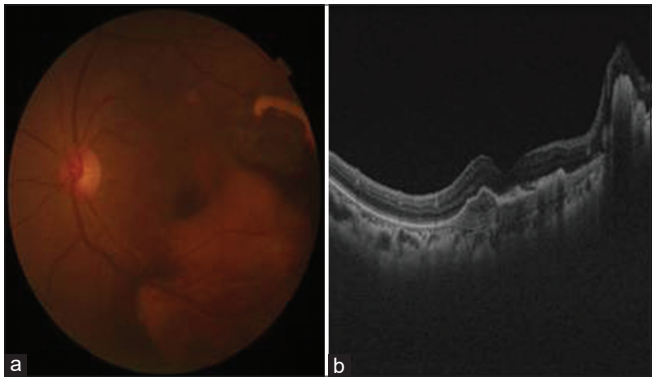

Figure 3: (a) Post-operative color fundus photo of case 2 showing inferiorly displaced heme. (b) OCT image of Figure 3a showing displaced heme

Furthermore, four more patients were evaluated using the same technique with a similar outcome, and none of the subjects required any lasering of the retinotomy site. None of them required a second procedure. The details of all the patients are enumerated in Table 1.

Conclusion

Using a 26G 1.5 in needle for retinotomy to inject r-tPA in the sub-retinal space is relatively easy due to its stable nature while passing through the 23G vitrectomy port, preventing inadvertent intraocular movements of the needle tip. Retinotomy is of the intended size and self-sealing; also, the 26G needle being cheaper and readily available is of great advantage in developing countries and can be used as a cheaper alternative to the 41G needle. The injection of the air bubble before the r-tPA injection provides increased bioavailability of the drug in the sub-retinal space by preventing the efflux into the vitreous cavity.

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Conflicts of interest

There are no conflicts of interest.

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