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Treating Submacular Hemorrhage with Intravitreal tPA Injection and Pneumatic Displacement

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Authors' contributions

This work was carried out in collaboration among all authors. All authors read and approved the final manuscript.

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Case Report

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ABSTRACT

Background: This report describes the clinical outcome in an adult male with spontaneous submacular hemorrhage who underwent successful intravitreal tPA injection and pneumatic displacement.
Case Presentation: A 30 yr old male patient presented with complaints of sudden painless diminution of vision in left eye since one day. The vision on presentation was Hand Movements +. Fundus showed a submacular hemorrhage with breakthrough vitreous hemorrhage. Injection tPA (25μg in 0.05 mL) and pure sulfur hexafluoride (SF6, 0.3 mL) was injected into the vitreous cavity. After surgery the patient was instructed to maintain a prone position. This was followed by a vitrectomy after 2 weeks. Postoperatively, patient had significantly improved having an unaided vision of 6/9P in the left eye which improved to 6/6 on correction.
Conclusion: Intravitreal tPA and pneumatic displacement using pure SF6 is an effective treatment for submacular hemorrhage.

Keywords: Submacular hemorrhage; pneumatic displacement; tPA; SF6 gas.

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1. INTRODUCTION

Submacular hemorrhage (SMH) describes a condition characterized by the hematic collection in the potential space between the retinal pigment epithelium and the neurosensory retina in the macular region. It occurs in several conditions, but is most commonly associated with Age-Related Macular Degeneration, Presumed Ocular Histoplasmosis, High Myopia, Retinal Arterial Macroaneurysm, Angoid Streaks and trauma [1].

SMH is classified according to size: small SMH measures less than 4 disc diameters; medium SMH is greater than 4 disc diameters but within the extend of the temporal arcade; massive SMH overspreads the temporal arcade [2].

The visual outcome is such patients is typically poor. Since, photoreceptor damage has been noted as early as within 24 hr after the hemorrhage, the need of prompt intervention in these cases is of paramount importance. Without appropriate treatment, SMH patients usually end up with poor final vision.

The Submacular Surgery Trial reported that physical removal of blood through a posterior pole retinotomy did not improve best corrected visual acuity (BCVA).

In 1996, Herriot reported a technique for treating submacular hemorrhage using intravitreal tissue plasminogen activator (tPA) and gas injection [3]. Since then many treatment modalities have been put to practice including subretinal tPA injection with pneumatic displacement, pneumatic displacement alone, Anti VEGF Agents.

In this case report, we used intravitreal tPA injection for pneumatic displacement followed by vitrectomy to good result in a young patient with spontaneous submacular hemorrhage. The objective of this report is to highlight the importance of this method of treatment and to call attention to the need for early intervention in these cases.

2. CASE PRESENTATION

A 30 yr old male patient was referred to us from a local hospital with complaints of sudden, painless diminution of vision in left eye since one day. There was no history of trauma or any systemic illness. The vision on presentation was Hand Movements + in Left Eye and 6/6 in Right Eye. The Anterior Segment examination was normal and intraocular pressure was 10mmHg OS. Fundus showed a hemorrhage in the submacular area with breakthrough vitreous hemorrhage [Fig. 1]. B Scan of the left eye showed a submacular hemorrhage, vitreous hemorrhage and retina was attached. Paracentesis (0.3 mL) was done under local anaesthesia to reduce the intraocular pressure. Next, tPA (25μg in 0.05 mL) was injected into the vitreous cavity and 15 minutes were given for the hemorrhage to dissolve. Then a further paracentesis (0.1 mL) was done, followed by injection of pure sulfur hexafluoride (SF6, 0.3 mL) into the vitreous cavity. After surgery, the patient was instructed to maintain a prone position. This was followed by a vitrectomy after 2 weeks. Intraoperatively, a retinal break was identified at 12 o'clock position which was lasered. 3 weeks postoperatively, patient had significantly improved [Fig. 2], macula was intact [Fig. 3], having an unaided vision of 6/9P in the left eye which improved to 6/6 on correction.

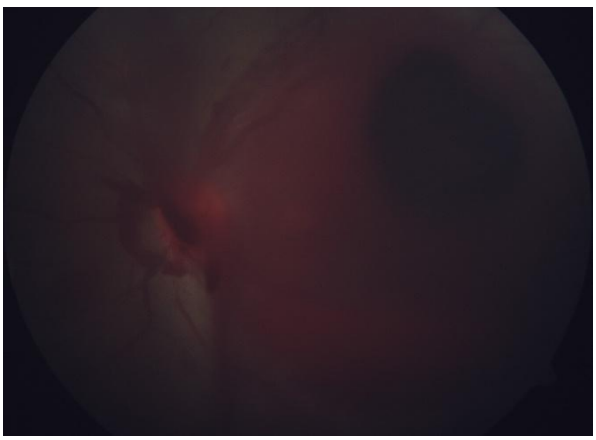

Fig. 1. Fundus image showing submacular hemorrhage and breakthrough vitreous hemorrhage

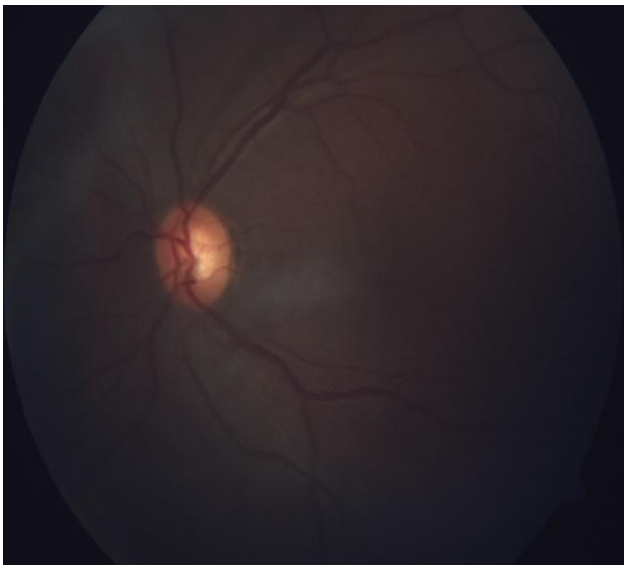

Fig. 2. Postoperative Fundus image

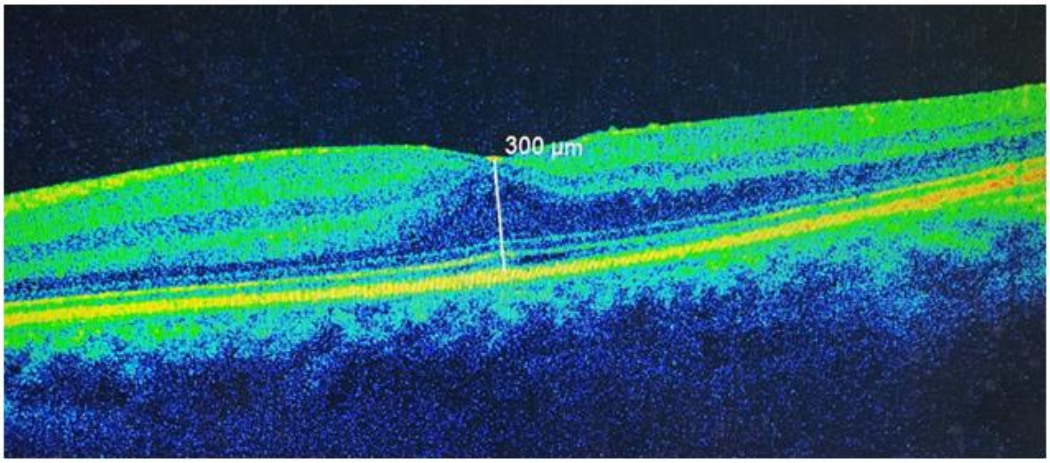

Fig. 3. Postoperative OCT image showing intact macula

3. DISCUSSION

Submacular hemorrhage is an accumulation of blood between the neurosensory retina and the retinal pigment epithelium arising from the choroidal or retinal circulation. The most common etiology is Choroidal Neovascularization in patients with Age Related Macular Degeneration. VEGF present in CNV may cause opening of capillary fenestrae increasing permeability and risk of bleeding. The other causes include High Myopia, Trauma, Angoid Streaks, Ocular Histoplasmosis, Retinal Macroaneursyms, Sickle Cell Disease, Coagulopathies, Central Retinal Vein Occlusion, Diabetic Retinopathy, Inflammation of the retina/ choroid, Idiopathic [1,2,3].

The patient presents with sudden, profound and painless loss of central vision with metamorphopsia [4].

There is disruption of the connections between the RPE and photoreceptor cells which inhibits the normal diffusion leading to rapid photoreceptor atrophy. Contraction of the fibrin clots lead to shear stress on the attached retina forming scars and fibrovascular proliferations. Iron derived from haemoglobin may have a toxic effect on the outer layers of the retina [3,4,5].

Tissue plasminogen activator (tPA) is a serine protease with fibrin-specific thrombolytic activity that forms a complex with fibrin to activate plasminogen to plasmin which then cleaves fibrin and dissolves the clot. Advantages include

decreased fibrin-mediated photoreceptor damage, early lysis allowing and shorter duration of toxic effect of blood on retina [3,6].

There has been some doubt with regard to whether int ravitreal tPA is able to penetrate into the subretinal space in sufficient quantities to induce clot liquefaction Coll et al. reported that intravitreal injection of tPA can penetrate the subretinal space via the intact rabbit retina and promote lysis of blood clots that have been present under the retina for 24 hours [7,8,9]. Boone et al. demonstrated that subretinal clots were partially liquefied 24 hours after administration of intravitreal TPA in a pig model [10]. In humans, Kimura et al, treated 6 patients of acute subretinal hemorrhage with intravitreal tPA 12 to 36 hours before surgery and noted liquefied blood intraoperatively [11].

In 1996, Herriot introduced a simple technique using intravitreal tPA injection to liquefy the subretinal blood clot and long-acting intravitreal injection of expansile gas in combination with postoperative face-down positioning to displace the submacular hemorrhage pneumatically. This technique reported a high anatomic success rate with few complications [3,12].

Goldman et al. reported that pneumatic displacement using SF6 gas improved visual acuity in a 25yr patient with traumatic submacular hemorrhage [13]. Holland and Wiechens reported that pneumatic displacement using tPA (50 μg per 0.1 mL) and SF6 gas was an effective treatment for traumatic submacular hemorrhage in a 37-year-old man [14]. Tsuyama et al. reported displacement of submacular hemorrhage and improvement in final visual acuity in a 10yr old boy with traumatic macular hemorrhage using pneumatic displacement using tPA (12.5 μg in 0.05 mL) and 0.3 mL of pure sulfur hexafluoride gas injection in the vitreous [15].

Other treatment modalities include Intravitreal injection of Anti-Vascular Endothelial Growth Factor drugs, Pneumatic displacement without tissue plasminogen activator, Vitrectomy, Photodynamic therapy and Macular translocation [6,16].

The prognosis of submacular hemorrhage depends on various factors including thickness, size and extend, underlying pathology, time and mode of intervention [3,6,7,10].

4. CONCLUSION

In conclusion, pneumatic displacement is an effective and simple treatment for submacular hemorrhage. However, this is a single case report, and a prospective randomized controlled trial in a larger number of patients would be needed to assess the benefit of this technique in the management of patients with submacular hemorrhage of various etiologies [17,6,18,19].

CONSENT

Written informed consent for publication was obtained from the patient.

ETHICAL APPROVAL

Authors have obtained ethical approval from Institutional Ethical Committee.

COMPETING INTERESTS

Authors have declared that no competing interests exist.

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