

Case Report

Intravitreal r-tPA Injection and Pneumatic Displacement for Submacular Retinal Hemorrhage: A Case Series

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Keywords

Age-related macular degeneration · Subretinal macular hemorrhage · Vitreoretinal surgery · Subretinal r-tPA

Abstract

We describe the results of very early pars plana vitrectomy, subretinal r-tPA, and gas tamponade in patients with subretinal macular hemorrhage secondary to neovascular age-related macular degeneration. The patients ended up with a favorable functional recovery. We conclude that very early treatment might lead to a good functional prognosis.

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Introduction

Retinal hemorrhages are some of the most common clinical signs in retinal disease and consist of a spectrum of blood collection differing in location, size, distribution, and etiology [1]. Among subretinal hemorrhages, fovea-involving subretinal macular hemorrhage (SRMH) is a sight-threatening condition defined as blood collection between the neurosensory retina

and the retinal-pigmented epithelium [2]. It can be caused by a plethora of eye conditions including neovascular age-related macular degeneration (n-AMD), pathologic myopia, polypoidal choroidal vasculopathy, rupture of retinal arterial macroaneurysms, presumed ocular histoplasmosis syndrome, and blunt trauma [3–7]. Without prompt treatment, visual prognosis is poor [8–10].

AMD is the leading cause of legal blindness in the industrialized world [11]. The real incidence of SRMH among patients with n-AMD is unknown [12], even though n-AMD has long been known to be a risk factor for submacular bleeding [8].

The scientific literature reports a wide range of possible procedures for SRMH, either stand-alone or combined, including vitrectomy, intravitreal recombinant tissue plasminogen activator (r-tPA) injection, subretinal r-tPA injection, subretinal BSS injection, air or gas endotamponade injection [13, 14]. In many circumstances, however, such interventions are not enough to improve visual acuity to that before SRMH, with chances for improvement being reduced the more delayed the intervention is performed [15–17].

Timing for administration of treatment has long been considered to be crucial [18]. Recently, the best final visual outcome has been reported when the duration of SRMH was less than 14 days, while no visual improvement was noticed when treatment was delayed by more than 21 days [19].

There is no consensus regarding treatment strategies, while the treatment technique is often determined by the dimension or duration of the hemorrhage and preference of the surgeon [20]. Since early photoreceptors' damage has been reported as early as 24 h after SRMH [21, 22], we expect that an earlier treatment can provide a better functional outcome. To underpin the role of such an early treatment of SRMH, we hereby report 3 cases of prompt PPV, subretinal r-tPA injection, and gas tamponade for dense SRMH.

Case Report

Case 1

An 80-year-old woman with known n-AMD presented to the Department of Ophthalmology, Oslo University Hospital, Oslo, Norway, with a sudden decrease of vision and a central scotoma in the left eye soon after onset of symptoms, estimated as less than 24–48 h before. A hemorrhage was found at the fundus examination, so the patient was referred to the vitreo-retinal section, where a dense SRMH was documented through fundus imaging (Fig. 1). The hemorrhage was 4-disc diameters on the largest meridian. Best corrected visual acuity in the left eye (Snellen chart) was 0.05 and intraocular pressure was 8 mm Hg. Optical coherence tomography scanning of the left eye showed a large SRMH (Fig. 2). The patient was operated on within 48–72 h from the diagnosis. PPV was performed under retrobulbar anesthesia. Subretinal injection of r-tPA (25 µg in 0.1 mL) in the inferotemporal quadrant was performed through a 41-gauge cannula. The vitreous cavity was filled with gas tamponade (20% SF₆) after fluid/air exchange. The patient was instructed to maintain a prone position for 3 days postoperatively. The next day, the hemorrhage had started to move away from the fovea. BCVA improved to 0.5 by 5 weeks. Eleven weeks later, the patient underwent cataract surgery with IOL implantation in the capsular bag. A month after the cataract surgery, BCVA was 0.4 due to secondary macular edema and remained stable with intravitreal anti-VEGF treatment. Currently, AMD is stable with smaller size PED and slight fibrosis with intraretinal edema, which is now treated further with intravitreal injection of aflibercept. At the 5-week and 4-month control, the submacular hemorrhage had been successfully displaced out of the fovea (Fig. 3, 4). Despite the remaining n-AMD, the patient has not complained of any additional symptoms secondary to the SRMH.

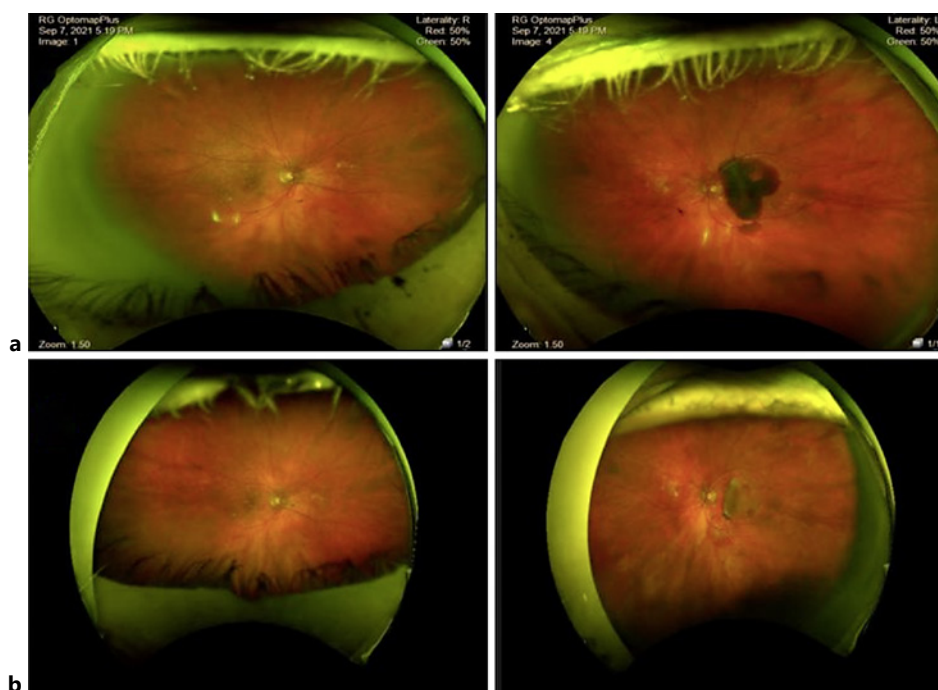


Fig. 1. **a** Preoperative fundus image of dense SRMH (left eye) and contralateral eye with dry AMD. **b** Same fundus images 4 months postoperatively.

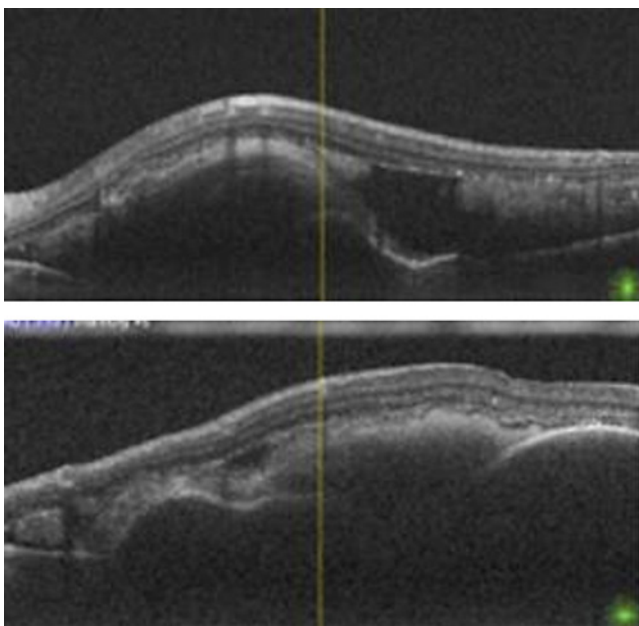


Fig. 2. Preoperative OCT horizontal (upper) and vertical (lower) line scan of the macula. Large SRMH is evident in the left eye.

Case 2

A 71-year-old man previously treated for n-AMD was referred to the Eye Hospital, Ljubljana, Slovenia, complaining of sudden decreased vision and central scotoma in his right eye after waking up that same day. BCVA in the right eye was counting fingers at 10 cm.

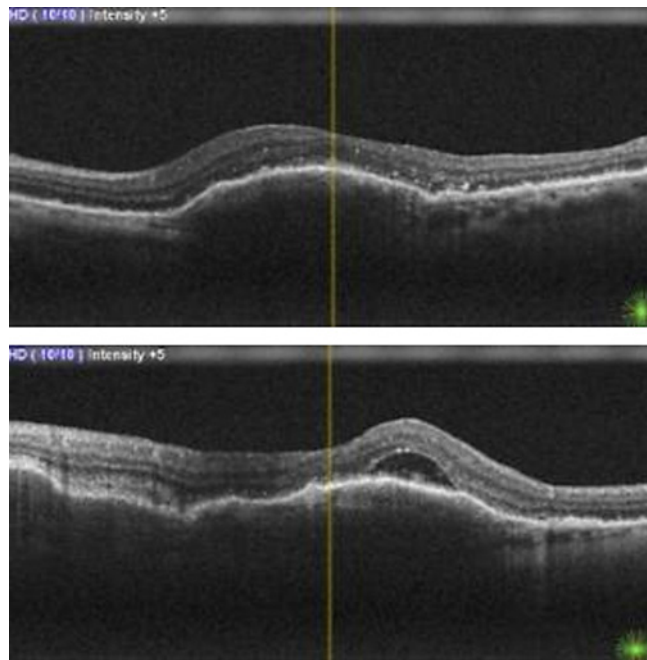


Fig. 3. One-month postoperative OCT horizontal (upper) and vertical (lower) line scan of the macula. Partial reabsorption of the SRMH is evident in the left eye.

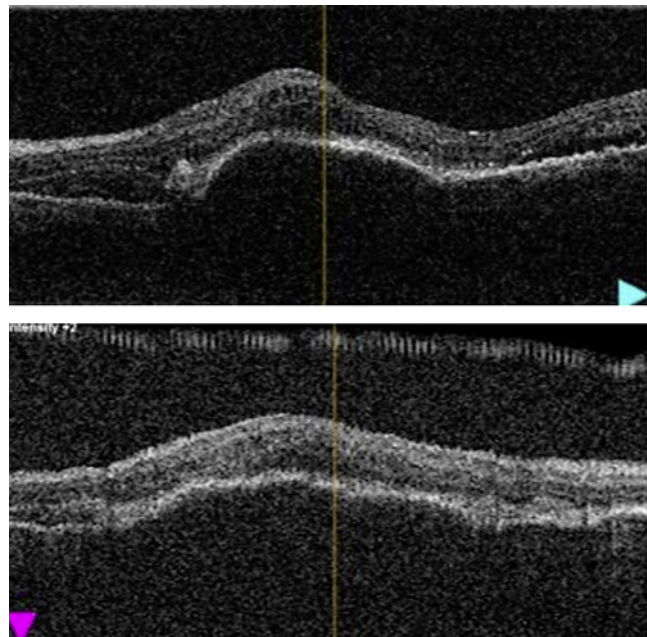


Fig. 4. Four-month postoperative OCT horizontal (upper) and vertical (lower) line scan of the macula of the left eye showing further resolution of the SRMH and subretinal fluid.

Ophthalmoscopy revealed dense SRMH involving the central fovea. The size of the hemorrhage was 4-disc diameters. The patient was operated on the next day and underwent PPV with subretinal r-tPA injection and gas tamponade (10% C3F8). At the 5-week and 4-month control, the submacular hemorrhage had been successfully displaced out of the fovea (Fig. 5), and, despite the remaining neovascular AMD, visual acuity remained stable at 0.25 (Snellen chart). The patient continued regular intravitreal anti-VEGF treatment in the postoperative period.

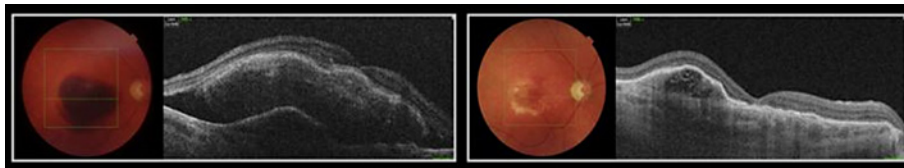


Fig. 5. Left panel shows the preoperative fundus image and OCT demonstrating subretinal hemorrhage. Right panel shows the complete displacement of the hemorrhage in the subfoveal area 3 months after surgery.

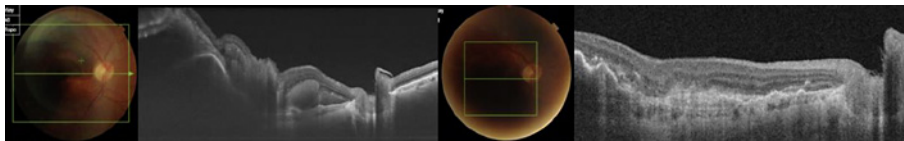


Fig. 6. Left panel shows the preoperative fundus image and OCT demonstrating subretinal hemorrhage. Right panel shows the displacement of the hemorrhage in the macular region 6 months after surgery.

Case 3

An 86-year-old man previously treated for n-AMD presented to the emergency section of the Eye Hospital, Ljubljana, Slovenia, complaining of a sudden decreased vision and central scotoma in his right eye soon after onset of symptoms, estimated as less than 24–48 h before. BCVA in the right eye was hand motion. A dense SRMH involving the macula was observed in the involved eye. The size of the hemorrhage was 5-disc diameters. The patient was operated on within 24 h from the diagnosis and underwent PPV with subretinal r-tPA injection and gas tamponade (10% C3F8). At the 5-week and 6-month control, the submacular hemorrhage had been successfully displaced out of the fovea (Fig. 6), and, despite the remaining n-AMD, visual acuity was stable at 0.16. The patient continued regular intravitreal anti-VEGF treatment.

Discussion

We report a case series of 3 patients with recent-onset SRMH that underwent PPV, subretinal r-tPA injection, and nonexpansile concentration of gas tamponade that resulted in an improved visual acuity. Dense SRMH is a common manifestation of neovascular AMD. It is associated with sudden visual loss, and the functional prognosis is often poor. The functional outcome may also be influenced by the duration and the size of submacular hemorrhage. Persistent SRMH damages the photoreceptors through three main mechanisms: iron-related toxicity, impairment of diffusion of oxygen and nutrition, and mechanical damage due to clot contraction [23–28].

The timing of treatment is believed to be crucial in resolving SRMH, and this is the reason why a prompt displacement of subretinal blood from the macula is supported by experts. Most of the studies carried out so far include patients with hemorrhage of ≤ 14 days, while older SRMH have been associated with significantly worse functional outcome [8, 18, 21, 23, 26, 29].

Recently, adverse prognostic factors have been identified as older age at diagnosis, higher SRMH elevation, and previous pro re nata intravitreal regime [17]. However, it is common that very seldom the patient presents early enough to be operated on within a few hours of

symptoms onset, so that in most recent studies, 14 days cut-off time from symptoms onset has been used as inclusion criterium in the studies. Moreover, very seldom has such a good functional improvement or outcome been reported [13, 14, 30, 31].

Our results are encouraging and underpin the role of timing in the treatment of SRMH. This case series can spur further research on the management of SRMH secondary to n-AMD and can shift the paradigm or approach to the disease into an ophthalmological emergency.

Conclusion

We hereby show through a small case series that very early PPV, subretinal r-tPA, and nonexpansile gas tamponade can lead to a favorable functional prognosis.

Statement of Ethics

The research was conducted ethically in accordance with the World Medical Association Declaration of Helsinki. Ethical approval was not required for this study in accordance with local or national guidelines. Written informed consent was obtained from patients for publication of the details of their medical case and any accompanying images.

Conflict of Interest Statement

Filippo Confalonieri, Ingar Stene-Johansen, Xhevat Lumi, and Goran Petrovski have no conflicts of interest to declare.

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Author Contributions

Study conception and design and analysis and interpretation of results: Filippo Confalonieri, Xhevat Lumi, and Goran Petrovski; data collection: Filippo Confalonieri, Ingar Stene-Johansen, Xhevat Lumi, and Goran Petrovski; draft manuscript preparation: Filippo Confalonieri. Filippo Confalonieri, Ingar Stene-Johansen, Xhevat Lumi, and Goran Petrovski reviewed the results, approved the final version of the manuscript, and attest that they meet the current ICMJE criteria for authorship.

Data Availability Statement

All data generated and analyzed during this study are included in this published article. Further inquiries can be directed to the corresponding author.

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