



## Management of complex retinal detachment from intraocular invasion of MIRAgel—a case report

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### ABSTRACT

**Purpose:** To retrospectively report a case of complex retinal detachment secondary to an intraocular episcleral hydrogel explant (MIRAgel, MIRA Inc., Waltham, MA, USA) invasion.

**Observations:** The severe vitreous inflammation, shifting nature of the subretinal fluid, and absence of proliferative vitreopathy 2 months following multiple surgeries for removal of fragmented MIRA gel in the present case made the diagnosis of complex retinal detachment. With the assistance of the fragmatome and Perfluorocarbon, the subretinal MIRA gel, and turbid, yellowish subretinal fluid were removed successfully. The retina was reattached without recurrence.

**Conclusions and importance:** By using the pars plana ultrasonic fragmatome, the intraocular MIRAgel was able to be removed while maintaining the integrity of the retina and globe.

### Introduction

The episcleral hydrogel explant (MIRAgel, MIRA Inc., USA) was introduced in 1985 as an alternative to silicone explants for the treatment of rhegmatogenous retinal detachment (RRD).<sup>1,2</sup> It is no longer being chosen because of the associated late complications, which include but are not limited to extrusion, intrusion, eye motility disorder, cosmetic deformities, and periocular infections.<sup>1,2</sup>

Here, we report a case of complex retinal detachment induced by the intraocular invasion of MIRAgel. The clinical course and the surgical procedures for implant removal are also presented.

### Case report

This is a retrospective case report study. The study adheres to the tenets of the declaration of Helsinki. Ethical approval was obtained from the IRB of Changhua Christian Hospital.

A 45-year-old man presented to our clinic complaining of blurry vision and pain in the left eye. Reviewing the history, he had undergone MIRAgel scleral buckle implantation at 120° on the temporal side for RRD in the left eye approximately 26 years ago, and the retina had been

successfully reattached. Ocular discomfort and chronic conjunctival congestion were noted 10 years later; he had experienced incomplete MIRAgel removal by the previous surgeon. Unfortunately, the ocular discomfort and chronic conjunctival congestion still bothered him, and the symptoms had recently worsened.

At his initial presentation, his best-corrected decimal visual acuity was 0.5 (OS). A congested, bulging conjunctiva with gel-like degraded MIRAgel extrusion on the temporal side was noted in the left eye. MIRAgel removal was performed. After dissecting the conjunctiva, the degraded, fragmented MIRAgel was removed with blunt-tipped forceps and scoop. A scleral perforation was noticed intraoperatively on the temporal lower aspect during mechanical extraction. MIRAgel was partially removed, and the wound was closed.

One day postoperatively, his vision decreased to light perception, while the intraocular pressure remained around 20–30 mmHg. The fundus was invisible with severe vitreous inflammation. B-scan showed choroidal detachment at the inferior aspect (Fig. 1-A). Since endophthalmitis could not be ruled out, intravitreal antibiotics were injected. Six days later, his vision was hand motion. Vitreous opacity, retinal detachment at the upper and nasal aspects, and choroidal detachment inferiorly were noticed via B-scan sonography (Fig. 1-B). As

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endophthalmitis and recurrent RRD were suspected, pars plana vitrectomy (PPV) was arranged. During the operation, the detached retina was noted to extend from the nasal upper to the inferior aspect, while the retina around the perforated site remained attached. No break was found after 360° of scleral indentation. Ceftazidime and teicoplanin were injected intravitreally. Under the suspicion of exudative retinal detachment, retinotomy and subretinal fluid drainage were not performed. Due to the fear of undetected break, the vitreous cavity was filled with silicone oil after the removal of vitreous fluid with gas-fluid exchange. He was admitted to our ward for intensive wound care and intravitreal and subconjunctival antibiotic treatment for one week, followed by frequent clinical appointments.

Two months later, the surgical wound became more stable, but the inferior peripheral retina remained detached (Fig. 2-A). In addition, an intruding, triangular whitish material located at the temporal upper aspect was noted (Fig. 2-A). Moreover, shifting of the subretinal fluid was noticed via B-scan sonography while the patient changed his position (Fig. 3). PPV was arranged due to persistent retinal detachment. Subretinal MIRAgel at the temporal upper aspect was dislodged through retinotomy. MIRAgel was then removed with a fragmatome (video). When peeling the peripherally organized vitreous, an iatrogenic retinal break was made at the site of previous cryotherapy. Perfluorocarbon was injected into the vitreous cavity to drain the turbid, yellowish subretinal fluid, followed by air-fluid exchange and silicone oil tamponade. No re-detachment was noted during the follow-up period (Fig. 2-B).

Supplementary video related to this article can be found at [doi:10.1016/j.ajoc.2021.101103](https://doi.org/10.1016/j.ajoc.2021.101103)

## Discussion

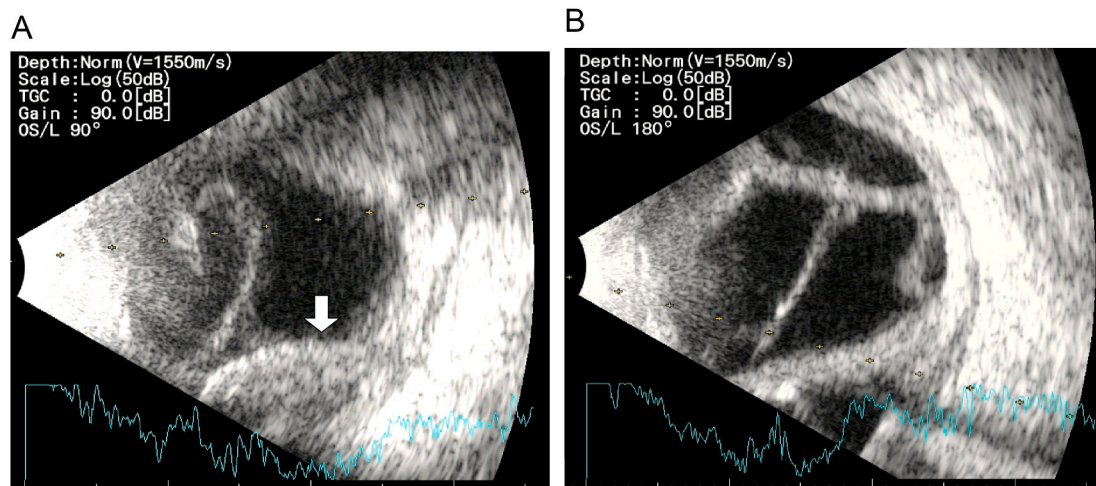
MIRAgel buckle material is no longer in use because of the related late complications, including pain or discomfort (70%), cosmetic problems (49%), eye motility disorders (39%), diplopia (29%), periocular infection (27%), exposure/extrusion of explants (26%), and painful blind eyes.<sup>1,2</sup> Removal is performed when complications occur. More than 34% of MIRAgel implants were reported to have been removed in a recent case series.<sup>2</sup> However, the procedure is difficult because of the friable nature of the degrading MIRAgel; in addition, sclera erosion and thinning underneath the material makes scleral perforation likely to occur before or during removal, which makes MIRAgel removal even more challenging.<sup>2,3</sup> Crama and Klevering previously reported an incidence of intraoperative scleral perforation of 11% in 467 consecutive MIRAgel cases.<sup>2</sup> The presence of an active ocular infection and a history

of more than one preceding procedure were significantly associated with a higher risk of scleral perforation during the removal procedure in their study.<sup>2</sup>

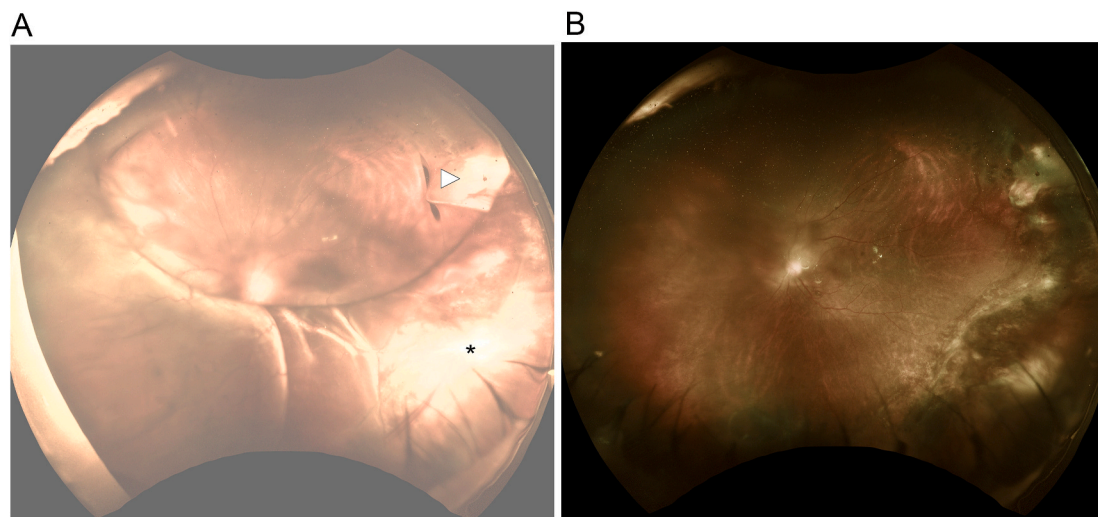
In the present case, scleral perforation occurred intraoperatively when mechanical extraction of the material was performed. However, later retinal detachment did not seem to result from this perforation because the surrounding retina remained attached during the whole follow-up period, and no visible breaks were noted even after 360° of careful scleral indentation during vitrectomy. Although the severe vitreous inflammation, the shifting nature of the subretinal fluid and the absence of proliferative vitreopathy after 2 months of retinal detachment made the diagnosis of exudative retinal detachment more favorable, the precise mechanism in the present case might be more complicated. Besides, the shifting fluid was not only pathognomonic to exudative detachment, it was also previously reported from chronic retinal detachment or rhegmatogenous retinal detachments with tiny holes.<sup>4</sup>

Roldan-Pallares et al. previously examined the immunochemistry component of MIRAgel's capsule, which demonstrated CD3<sup>+</sup> and CD20<sup>-</sup> predominant expression.<sup>5</sup> Cases of retinal detachment after scleral perforation and MIRAgel intraocular exposure immediately after surgery have also shown higher CD3 and CD68 expression.<sup>5</sup> In our case, the intruding MIRAgel probably induced a similar inflammatory response within the eye, which explains the severe vitreous inflammation. The inflammation possibly caused a secondary tractional component, which eventually became one of the factors of retinal re-detachment. And the organized vitreous at the periphery vitreous base may also contributed to re-detachment. After removing the intruding MIRAgel, completely peeling the vitreous and reattaching the retina, the intraocular inflammation stabilized without recurrent retinal detachment.

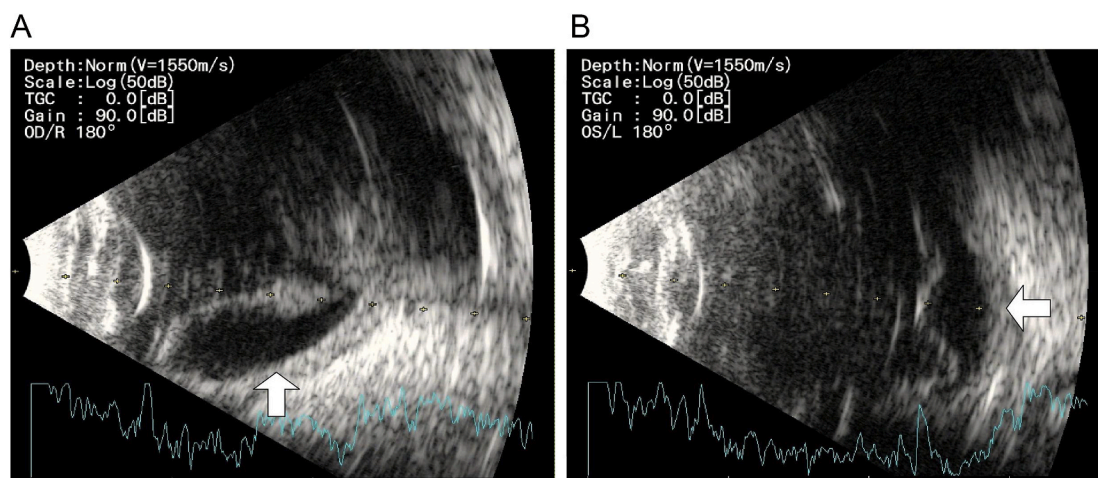
Compared with extrusion, MIRAgel intrusion may be more complicated to address. In 2005, Çekiç et al. first introduced the usage of the fragmatome for removing intravitreal MIRAgel.<sup>6</sup> Hatori et al. later announced that MIRAgel could not be fragmented easily in the vitreous cavity; instead, they made a sizeable corneoscleral incision to remove the entirety of the material at once.<sup>7</sup> Furthermore, evisceration was still necessary for some blind, painful eyes but failed after implementation of the procedures mentioned above, resulting in retention of the intravitreal MIRAgel.<sup>8</sup> Fortunately, in the present case, we removed the intruding MIRAgel through retinectomy and with the use of a fragmatome and drained the subretinal fluid with the assistance of perfluorocarbon liquid.



**Fig. 1.** The series of b-scan ultrasonography. A: B-scan ultrasonography showed choroidal detachment at the inferior aspect 1 day after surgery (arrow). B: Vitreous opacity and retinal detachment at the upper and nasal aspect, and choroidal detachment inferiorly were noticed via b-scan ultrasonography 1 week postoperatively, acute endophthalmitis and recurrent retinal detachment were suspected.



**Fig. 2.** The series of the color fundus photography. A: two months after vitrectomy and silicone oil tamponade, the retina remained detached without obvious proliferative vitreoretinopathy. An intruding, triangular whitish material located at the temporal upper aspect was noted (arrowhead). But the previous perforated wound stayed stable (asterisk). B: After repeated vitrectomy and removal of intraocular MIRAgel, the retinal break at previous MIRAgel intruding area was surrounded by laser. The retina was re-attached with silicone oil tamponade. (For interpretation of the references to color in this figure legend, the reader is referred to the Web version of this article.)



**Fig. 3.** The shifting of the sub-retinal fluid (arrow) was noticed while the patient changed his position. A: the image was obtained while the patient was sitting with heads up. B: the image was obtained while the patient was lying down.

**Conclusion**

We report a case of complex retinal detachment after MIRAgel intraocular invasion. After retinotomy and the assistance of Fragmatome, the subretinal MIRAgel was dislodged and removed. No recurrent retinal detachment was noted after the surgery.

**Patient consent**

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and that due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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**Authorship**

All authors attest that they meet the current ICMJE criteria for Authorship.

**Declaration of competing interest**

None.

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**References**

1. Roldán-Pallarés M, Hernández-Montero J, Llanes F, Fernández-Rubio JE, Ortega F. MIRAgel: hydrolytic degradation and long-term observations. *Arch Ophthalmol.* 2007; 125(4):511–514.

2. Crama N, Klevergin J. The removal of hydrogel explants: an analysis of 467 consecutive cases. *Ophthalmology*. 2016;123(1):32–38.
3. Santorum P, De Vitto AML, Bertelli E. Removal of MIRAgel scleral buckle implants: the direct aspiration technique. *Retina*. 2019 (ahead of print).
4. Kirkby GR, Chignell AH. Shifting subretinal fluid in rhegmatogenous retinal detachment. *Br J Ophthalmol*. 1985 Sep;69(9):654–655.
5. Roldan-Pallares M, Llanes-Estrada M, Llanes-Menendez F. MIRAgel: the immunohistochemical expression of CD3, CD34, and CD68 in the surrounding capsule. *Eye*. 2016;30:1381–1388.
6. Çekiç O, Chang S, Schiff WM, Barile GR. Removal of the intruding MIRAgel's scleral buckle by pars plana ultrasonic fragmentation. *Am J Ophthalmol*. 2005;139(1):209–210.
7. Hatori T, Imai M, Iijima H. Intravitreal intrusion of an intrascleral MIRAgel buckling implant. *Jpn J Ophthalmol*. 2011;55:310–311.
8. Rubinstein TJ, Choudhary MM, Modi YS, Ehlers JP, Perry JD. Globe loss from intraocular invasion of MIRAgel scleral buckle components. *Ophthalmic Plast Reconstr Surg*. 2016;32(5):329–332.