

# Unexpected Complication Related to Gas Tamponade After Macular Hole Surgery: A Case Report

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## ABSTRACT

We report a case report of a 55-year old man who developed an unexpected complication after 23-gauge pars plana vitrectomy (PPV) with perfluoropropane (C3F8) gas tamponade for the full thickness macular hole (MH).

On postoperative day 3, he presented with vision loss, severe pain in his operated eye. His examination revealed edema in the lower and upper lid, proptosis, gas expansion in fundus and increased intraocular pressure (IOP). Computed tomography demonstrated gas migration into the subconjunctival and retrobulber areas. As orbital compartment syndrome (OCS) was thought to have developed, gas aspiration from the subtenon space and vitrectomy with gas to fluid exchange were performed. All symptoms resolved after the removal of the gas. However, visual acuity could not improve further than finger counting from 1 meter distance during his follow up since optical atrophy developed.

Surgeons should be careful while adjusting the concentration of intraocular gas application, while patients for whom gas was applied should be closely followed after surgery.

**Keywords:** Macular hole, Pars plana vitrectomy, Perfluoropropane, Proptosis, Orbital compartment syndrome.

## INTRODUCTION

There are many factors considered to play an important role in the success of MH surgery such as staining and peeling of the internal limiting membrane (ILM), type of tamponade agents and the necessity or duration of face-down posturing.<sup>1</sup>

Intraocular gases are capable of isolating and sealing the area of the hole; moreover, the buoyancy of the gas creates a mechanical tamponade effect and they provide a template for glial cell migration and promote the healing of the hole.<sup>2</sup>

Superiority of C3F8 and sulfur hexafluoride (SF6) gas to one another is disputed; however, larger anatomic and functional success can be achieved with C3F8 that has a long-term tamponade effect.<sup>3</sup> On the other hand, with the increased C3F8 concentration, the duration of retention in the eye and also expansion increase.<sup>4</sup> IOP can be elevated to catastrophic levels due to incorrect gas concentrations, which may blind the eye.<sup>5</sup>

We aimed at presenting massive gas expansion and OCS after intraorbital gas migration, which is rarely observed in vitrectomy, in our patient for whom non-expansive C3F8 gas mixtures were used at a concentration of 14% in addition to PPV, ILM peeling that were intraoperatively uneventful.

## CASE REPORT

A 55-year-old man presented with full thickness MH and visual acuity of finger counting from 2 meters in the left eye. The right eye was pseudophakic, epiretinal membrane was present in fundus and his visual acuity was 20/100. He underwent uneventful 23-gauge PPV, ILM peeling in the left eye with presumed 14% C3F8 gas tamponade. Sclerotomies were closed with suturing. The combination of topical moxifloxacin, cyclopentolate, dexamethasone, timolol and brinzolamide was started. He was asked to maintain prone position for the first five postoperative days. He was discharged after the postoperative day 1 with close follow-up. He presented with total vision loss, severe

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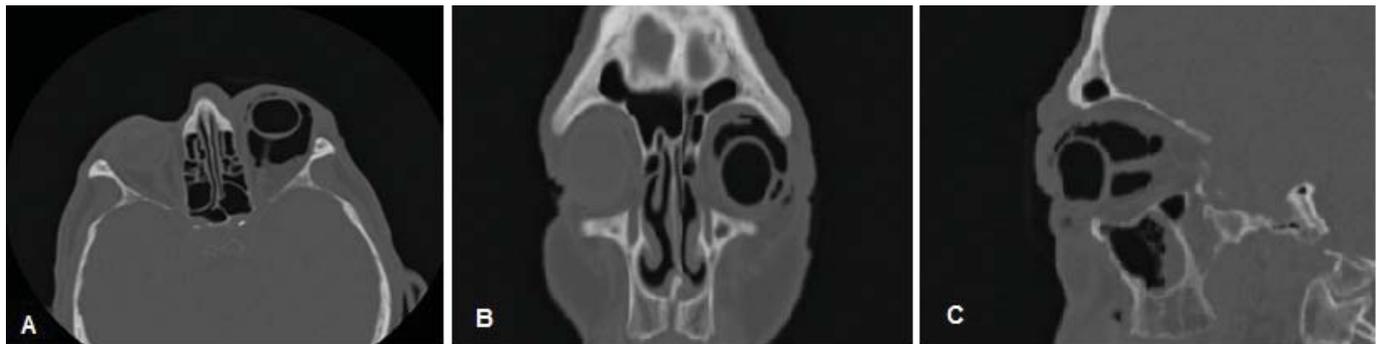
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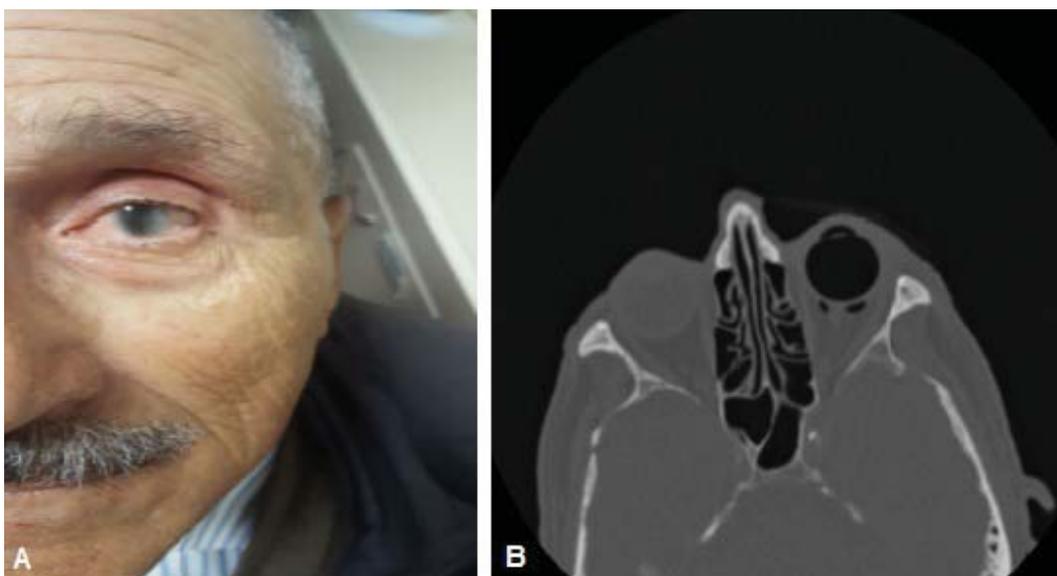
pain in the left eye, swelling and rash in the lids on the postoperative day 3. Examination of the anterior segment revealed edema in the lower and upper lids, extensive chemosis, proptosis and marked restriction of globe movement (Figure 1). Corneal edema and slightly shallow anterior chamber were observed. IOP was 62 mmHg. Total gas expansion in the fundus and swelling in the optical disc were found. Oral and topical antiglaucoma treatment was initiated. The computed tomography revealed dislocation towards the anterior part in the globe and gas densities in the intraconal and extraconal regions (Figure 2). As orbital compartment syndrome was thought to have developed, subtenon gas aspiration was performed immediately and then 23-gauge vitrectomy with gas to fluid exchange was performed. His examination on the following day showed that his complaints were resolved, IOP declined to 20 mmHg, and the symptoms of the anterior segment regressed. Since optical atrophy developed at month 1 (Figure 3), his visual acuity was at the level of finger counting from 1 meter. The patient was advised regular follow-up.



**Figure 1.** Postoperative day 3; proptosis, chemosis and restriction of globe movement.



**Figure 2.** Computed tomography. **A** Axial. **B** Coronal. **C** Sagittal sections.



**Figure 3.** Postoperative month 1. **A** the symptoms of the anterior segment totally regressed. **B** minimal gas adjacent to the globe on computed tomography scan.

## DISCUSSION

After vitreoretinal surgery, due to the use of intraocular gas; complications such as increased IOP pressure, cataract, gas bubble migration, insufficient gas bubble size and hypotony, and rarely iatrogenic retinal tears, proliferative vitreoretinopathy and permanent visual field defects may be observed.<sup>6,7</sup> Gas migration to the anterior chamber, subretinal area from the underneath the tears, and subconjunctival area from sclerotomies may happen after surgery in the event of pseudophakic or zonal failure. However, orbital compartment syndrome that occurs as gas migration to the retrobulber area after total gas expansion is much rarer.

Orbital compartment syndrome is a rare complication that occurs due to the increased pressure within the confined orbital space.<sup>8</sup> It may develop as a result of retrobulbar hemorrhage (due to traumatic and nontraumatic causes), expanding intraorbital lesions, complications associated with orbital or zygomatic surgery, orbital emphysema and inflammation.<sup>9,10</sup> Irreversible retinal damage may be caused by direct optical nerve and afferent blood supply compression leading to neuropathy, compression or stretching of optic nerve vasculature inducing ischemic optic neuropathy, or retinal ischemia and cellular hypoxia.<sup>11</sup> Therefore, surgical decompression should be performed as soon as possible to preserve vision. In most of the cases, the time from the onset of OCS to surgical decompression is not exactly known; therefore, the time for the development of irreversible damage is not clear. However, it is widely acknowledged that the best result is achieved by intervening in the first 90 minutes.<sup>12</sup> Soare et al. demonstrated that surgical intervention in the first 48 hours could also be effective.<sup>13</sup> Considering the low visual acuity of our patient, its onset was thought to be around 24-28 hours before.

As regards the previous studies similar to our case, Roth et al. also observed retrobulber gas migration after sutureless MH surgery in which they used C3F8 gas similar to our case and applied vitreous tap. Visual acuity of patients they followed up for 2 years increased to 20/100.<sup>14</sup> Similarly, Kumar et al. also performed retinal detachment surgery with C2F6 (perfluoroethane) for their patients and performed exchange with silicon oil tamponade while observing a similar situation, whereas visual acuity remained at the level of hand movement due to optical atrophy.<sup>15</sup> Iniesta-Sanchez et al. compared retinal detachment surgery they performed using SF6 gas with orbital emphysema; while they observed relapse in their patients although they performed fine needle aspiration and gas-fluid exchange. The decompression was observed to be resolved rapidly

with hyperbaric oxygen therapy and visual acuity increased to 20/60.<sup>16</sup>

Sutureless vitrectomies were performed in these 3 cases and possible mistakes in preparing the gas dilution were highlighted as the reason of escape from the globe through subconjunctival and intraorbital spaces. Rapid response with hyperbaric oxygen therapy reported by Iniesta-Sanchez et al. was interesting.

The risk can be reduced with single-use gas tubes at standard concentration that may be developed in the future. Currently in the daily practice, however, surgeons should be present while the intraocular gas concentration is prepared and the patients for whom gas is applied should be closely followed-up after surgery for the possible development of orbital compartment syndrome even though it may be rare.

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