

# Orbital emphysema with loss of vision following undiluted intravitreal perfluoropropane administration

## Abstract

We present a case of orbital emphysema leading to orbital compartment syndrome and permanent visual loss secondary to expansion of perfluoropropane (C3F8) gas, which was injected into the vitreous cavity as a gaseous tamponade during vitreoretinal surgery and inadvertently undiluted. Orbital emphysema leading to orbital compartment syndrome resulted in visual loss despite treatment with lateral canthotomy, cantholysis and surgical decompression. Orbital compartment syndrome is an ophthalmic emergency and should be treated immediately with lateral canthotomy and cantholysis. There is little literature on the management and outcomes of orbital compartment syndrome with expansile gases such as C3F8 which may quadruple in volume within 96 hours. Hyperbaric oxygen has been reported to be of benefit but patients may require orbital decompression for definitive treatment. Although orbital emphysema with air rarely threatens vision orbital emphysema with expansile gases can lead to orbital compartment syndrome and visual loss.

**Keywords:** vitreoretinal surgery, orbital emphysema, expansile gases, canthotomy and cantholysis

Volume 9 Issue 2 - 2019

Ahmad Aziz, Sonali Nagendran, Mike Perry,  
Vickie Lee

Western Eye Hospital, United Kingdom

**Correspondence:** Ahmad Aziz, Western Eye Hospital, 153-173 Marylebone Road, London NW1 5QH, United Kingdom, Email [ahmad.aziz@nhs.net](mailto:ahmad.aziz@nhs.net)

**Received:** April 18, 2019 | **Published:** April 24, 2019

## Introduction

Gaseous tamponade in vitreoretinal surgery creates a buoyant force pushing the retina to the retinal pigment epithelium and prevents fluid accessing the sub retinal space. 100% C3F8 expands to four times its original volume over 4 days and may remain in the eye for up to 8 weeks. For this reason C3F8 gas is usually diluted to a concentration of 12% for vitreoretinal surgery.<sup>1</sup> Orbital emphysema following orbital fractures is a common phenomenon caused from air entering the orbit from the sinuses and rarely threatens vision.<sup>2</sup> Orbital emphysema secondary to gas tamponade in vitreoretinal surgery is rare, with only 4 previous cases reported.<sup>3,4</sup> Only 2 of these cases resulted in orbital compartment syndrome and both were thought to arise from gas expansion.<sup>4</sup> A further 2 cases have been reported following fluid-air exchange during vitreoretinal surgery, the first in the context of previous facial fractures<sup>5</sup> and the second in the context of globe perforation following peribulbar anesthesia.<sup>6</sup> We present a case of orbital emphysema leading to permanent visual loss following the expansion of undiluted perfluoropropane (C3F8) gas, which was inadvertently injected during gaseous tamponade in vitreoretinal surgery.

## Case report

A 54 year old female with a right full thickness 510µm macula hole consented to undergo a right pars plana vitrectomy and internal limiting membrane peel with perfluoropropane (C3F8) gas tamponade. Her vision was 0.60 LogMAR right eyes and 0.00 LogMAR left eye and no other ocular pathology was noted pre-operatively. Four days post-operatively the patient presented as an emergency with right lid swelling and loss of vision. On examination her vision in the right eye was perception of light with proptosis, upper and lower lid surgical emphysema, conjunctival chemosis and a flat anterior chamber with iridocorneal touch. She also had a fixed dilated right pupil with a reverse RAPD evident and a right intraocular pressure of 30mmHg. Fundoscopy was difficult due to the presence of gas but

demonstrated peripheral retinal necrosis. She was reviewed by the vitreoretinal team and underwent immediate removal of intraocular C3F8 gas, removal of intraocular lens and capsular bag, retinectomy of necrotic retina, peripheral iridotomy and silicone oil insertion to the posterior chamber. The following day her vision had reduced further to no perception of light with an increased proptosis of 9mm. Computerised tomography imaging showed gas in the right orbit and periorbital tissues. She was referred to the oculoplastic team, who performed an immediate lateral canthotomy and cantholysis. Despite removal of intraocular C3F8 gas the patient's proptosis continued to increase causing significant exposure keratopathy, which was initially managed with botulinum toxin to the levator palpebrae superioris and ocular lubricants, as the patient was averse to further surgery. She eventually underwent right medial endonasal orbital decompression 12 days after her initial vitreoretinal surgery, as her proptosis had resulted in corneal breakdown and threatened the integrity of the eye. Orbital decompression surgery resulted in release of gas into the nasal space and resolution of her proptosis. Although the eye was preserved she has since developed right phthisis. A retrospective route cause analysis for this case found that the initial C3F8 gaseous tamponade had not been diluted to 12% as planned but injected at 100% concentration.

## Discussion

This is the first case of orbital emphysema to arise from the injection of undiluted C3F8 gas during vitreoretinal surgery. This resulted in excessive expansion of gas within the globe, causing retinal necrosis and a central retinal artery occlusion. The expanding gas was thought to have exited the globe through the vitrectomy ports and entered the orbit, where continued expansion within the orbit led to orbital compartment syndrome. Undiluted C3F8 gas continued to expand within the orbit even after it was removed from the globe, causing rapidly increasing proptosis, which required orbital decompression to preserve the eye. This case highlights the dangers of

undiluted C3F8. Rapid expansion of gas can lead to permanent visual loss and potentially loss of the eye. Orbital compartment syndrome secondary to orbital emphysema is an ophthalmic emergency and should be treated immediately. Initial treatment options include lateral canthotomy, cantholysis and needle decompression.<sup>2</sup> Hyperbaric oxygen may be another treatment option<sup>4</sup> but patients may require orbital decompression for definitive treatment.

## Acknowledgments

Patient consent has been obtained for publication and is on file. Not presented to date, No financial support

No financial interests.

## Conflicts of interest

Authors declare that there is no conflict of interest.

## References

1. Lincoff A, Haft D, Liggett P, et al. Intravitreal expansion of perfluorocarbon bubbles. *Arch Ophthalmol*. 1980;98(9):1646.
2. Hunts JH, Patrinely JR, Holds JB, et al. Orbital emphysema. Staging and acute management. *Ophthalmology*. 1994;101(5):960–966.
3. Blanco-D’Mendieta A, Camacho-Cid C, Hernández-López A, et al. Orbital emphysema due to perfluoropropane gas anesthesia in retinal surgery. A case report. *Rev Med Inst Mex Seguro Soc*. 2010;48(3):321–324.
4. Rodríguez-Cabrera L, Rodríguez-Loaiza JL, Tovilla-Canales JL, et al. Orbital Emphysema as a Rare Complication of Retina Surgery. *Ophthalm Plast Reconstr Surg*. 2017;33(6):e141–e142.
5. Damasceno EF, Damasceno N, Horowitz S, et al. Emphysema following vitrectomy with fluid-gas exchange: description of a rare complication. *Clin Ophthalmol*. 2014;11;8:401–403.
6. Asnani HT, Mehta VC, Nair AG, et al. Bilateral periorbital and cervicofacial emphysema following retinal surgery and fluid gas exchange in a case of inadvertent globe perforation. *Indian J Ophthalmol*. 2015;63(6):541–542.