

Case Report

# Preserflo Microshunt Surgery for Ocular Hypertension following Intravitreal Fluocinolone Acetonide Implant Removal: A Case Report

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## Keywords

Microinvasive bleb surgery · Steroid-induced ocular hypertension · Fluocinolone acetonide implant

## Abstract

Diabetic macular edema (DME) is now a well-known condition for which a number of treatments have been shown to be effective. Intraocular corticosteroids are part of this therapeutic arsenal but are sometimes responsible for ocular hypertension. We describe here the case of a 60-year-old man with a history of bilateral DME who received an intravitreal injection of 190 µg fluocinolone acetonide (FAC) (ILUVIEN<sup>®</sup>, Alimera Sciences, Alpharetta, GA, USA) who presented a persistent ocular hypertension in one eye despite FAC removal by pars plana vitrectomy and was successfully managed by Preserflo<sup>®</sup> microshunt surgery.

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## Introduction

The 190 µg fluocinolone acetonide (FAC) intravitreal implant (ILUVIEN<sup>®</sup>, Alimera Sciences, Alpharetta, GA, USA) is approved in the USA as a second-line treatment for diabetic macular edema (DME) in patients who have already received intraocular corticosteroids without occurrence of a clinically significant ocular hypertension (OHT). The efficacy of the FAC intravitreal injection (IVI) has been demonstrated in both pivotal and real-life studies [1–3]. As a steroid, the main adverse events after an FAC-IVI are cataract and OHT, the latter

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occurring in 7–18% of patients and requiring intraocular pressure (IOP)-lowering medication or surgery in most cases [4, 5]. Topical IOP-lowering therapy and laser trabeculoplasty are usually sufficient to treat the patient, but sometimes, more aggressive therapy such as microinvasive or conventional filtering surgery is required to normalize IOP [4, 5]. In case of FAc removal without a previously known history of OHT/glaucoma, it can be expected that IOP decreased as the main source of steroid delivery is removed from the eye. To our knowledge, there are no cases of persistent OHT following FAc removal, requiring filtering surgery has been described in the literature.

### Case Description

A 60-year-old man without glaucoma optic neuropathy and with a history of bilateral DME refractory to anti-VEGF therapy was referred to our center. His visual acuity was 20/63 on his right eye and 20/32 on his left eye. He was treated by 7 bilateral dexamethasone intravitreal injections (DEX-IVIs) over a period of 2 years with a good anatomic and functional efficacy. The recurrence of the DME in both eyes occurred on average 3 months after each DEX-IVI. The patient had never received any IOP-lowering treatment and there was no occurrence of OHT throughout the follow-up. IOP 1 month after the 7th DEX-IVI was 16 mm Hg in the right eye and 15 mm Hg in the left eye.

Because of frequent DME recurrence, a bilateral FAc-IVI was scheduled 1 month after the seventh DEX-IVI according to the international experts' panel consensus guidelines [6]. Four months after the FAc-IVI (5 months after DEX-IVI), there was a recurrence of DME in both eyes, and IOP raised to 21 mm Hg in the right eye and 28 mm Hg in the left eye. DME recurrence was treated by an 8th DEX-IVI in both eyes, and OHT was managed with a preservative-free fixed combination of dorzolamide 2 g and timolol 500 mg twice a day on the left eye. IOP 1 month later was 13 mm Hg in both eyes; OHT treatment was discontinued. IOP in the right eye remained normal throughout follow-up without treatment. IOP in the left eye increased to 31 mm Hg 3 months after the 8th DEX-IVI (8 months after FAc-IVI). The same combination of dorzolamide and timolol was reintroduced, and IOP lowered to 18 mm Hg a month later. OHT treatment was continued, but reported observance was bad and IOP increased to 32 mm Hg 2 months later (10 months after FAc-IVI and 5 months after the last DEX-IVI). Despite reinforced patient education and good observance, IOP remained at 36 mm Hg a month later (11 months after FAc-IVI). Apraclonidine 0.5% three times daily was added to the OHT therapy. Oral acetazolamide was contraindicated by the nephrologist because of the chronic kidney disease. IOP remained at 26 mm Hg after a month (12 months after FAc-IVI), and the patient was treated by 360° selective laser trabeculoplasty in one session, with no efficacy on IOP a month later (IOP at 31 mm Hg under 3 IOP-lowering medications).

It was decided to remove the FAc by fast pars plana vitrectomy. Seven days after surgery, IOP remained at 39 mm Hg in the left eye despite three topical IOP-lowering medications. The patient reported a good treatment adherence. Visual acuity was 20/200 in the left eye and slit-lamp examination showed corneal edema. No glaucoma optic neuropathy was found. The patient was scheduled for a Preserflo® microshunt implantation. Surgery was performed in the superotemporal quadrant using pre-operative subconjunctival injection of 0.1 mL of 0.02% mitomycin C. Two hours after surgery, IOP was 9 mm Hg. Post-operative treatment included dexamethasone 1 mg five times a day and an eye ointment with dexamethasone 0.267 mg and oxytetracycline 1.335 mg three times a day. At 1 week, the eye examination showed an IOP of 9 mm Hg and a well-formed posterior bleb. Gonioscopy showed correct placement of the Preserflo® microshunt in the iridocorneal angle, which was confirmed on ultrasound biomicroscopy. Fundus examination showed no complications. At 1 month, IOP was 7 mm Hg, and the bleb was well

formed. Neither hyphema nor intravitreal hemorrhage nor choroidal detachments were seen. At last follow-up (16 months after FAc-IVI and 4 months after the surgery), there was no recurrence of DME in both eyes and IOP was 9 mm Hg without any lowering medication.

## Discussion

Steroid-induced OHT results from the inhibition of proteases and phagocytosis of the trabecular cells, which reduces damage to the extracellular matrix of the trabecular meshwork [7, 8] and induces an increased resistance to aqueous humor drainage, leading to reduced filtration and consequent OHT [7, 8]. OHT resulting from DEX-IVI is usually successfully managed with IOP-lowering therapy [9, 10], but there are rare cases, accounting for about 0.3% of injected eyes, requiring glaucoma surgery. Retinal vein occlusion or uveitis seems to be a risk factor for OHT, and there have been two reports of refractory cases requiring implant removal [11, 12] and glaucoma surgery in uveitis patients. Our team recently published a real-life observational study that presented the efficacy and safety of the FAc in the treatment of chronic DME in 62 eyes. The safety profile of FAc showed good tolerance throughout follow-up. Despite the inclusion of eyes with a history of IOP-lowering procedures, only 11% of the eyes had OHT during follow-up, and less than 18% required an IOP-lowering procedure. Among them, only one eye required IOP-lowering surgery. Interestingly, we found that the number of DEX-IVI before FAc-IVI was significantly higher in the group with OHT and that younger patients were more at risk of OHT [3]. This suggests a cumulative effect of steroids on the incidence of OHT. Our patient underwent 7 DEX-IVI before the first FAc-IVI. A recent study also confirmed that the mean IOP remained normal during the first year after FAc-IVI and that OHT was successfully managed with topical IOP-lowering therapy most of the time [13]. Patients with IOP-lowering therapy before the FAc-IVI seem to be more likely to have additional IOP-lowering treatments during the 12-month follow-up [13].

In the FAME studies, about 18% of eyes had a significant OHT after FAc-IVI, managed by IOP-lowering therapy (40% of cases), SLT (1.3% of cases), or IOP-lowering surgery (4.8% of cases) [14]. There is currently no consensus on the need to remove the FAc if IOP is not controlled medically or by laser trabeculoplasty. One would think that withdrawing the repository of corticosteroids could allow for IOP control without the need for glaucoma surgery, as is the case in topical steroid-induced OHT [15]. IOP response usually occurs between 1 and 3 months after steroid withdrawal, but after this delay most patients are free from IOP-lowering medication [15]. To our knowledge, there is no report in the literature of FAc removal because of uncontrolled OHT.

SLT is a safe and effective procedure that can result in well-controlled IOP in patients with steroid-induced OHT and glaucoma [16]. In a recent study, the overall success rate at 12 months was 72%. It can be used as a temporizing procedure in patients with steroid-induced OHT, allowing for IOP control while steroids are tapered down [17]. The effectiveness of pressure reduction can be obtained within 1 month of the SLT procedure [18]. In FAc-induced OHT, SLT has been reported in several studies with good efficacy. For our patient, the SLT was ineffective at 1 month, and IOP remained high while visual acuity was significantly altered. In such cases, microshunt surgery can be considered so as to reduce the risk of hypotony and wipe out that can be induced by conventional filtering surgery [19]. Indeed, this surgical technique, which is less prone to post-operative complications, was chosen over a conventional trabeculectomy [20]. The good IOP control for our patient can be a combination of the SLT and the microshunt surgery efficacy.

Microinvasive bleb surgery aims to provide an alternative surgical treatment for reducing IOP that is less invasive than filtering surgery and seems to provide interesting short-term

[21] and long-term results and safety profile [22]. The Preserflo<sup>®</sup> microshunt is available for the surgical management of refractory glaucoma [23]. Its current use in corticosteroid-induced OHT is off label. In our patient, Preserflo<sup>®</sup> microshunt was implanted 1 month after SLT and achieved IOP control with no post-operative complications.

This case is original for several reasons. First, the patient had few risk factors for OHT, being 60 years old, treated for diabetes and not RVO or uveitis, and had no history of IOP increase under DEX treatment. The main risk factor was the number of DEX-IVI received in both eyes. The second atypical finding is the complete asymmetry in IOP response to FAc between the right and left eye. The right eye underwent the same procedures as the left eye until the 8th DEX-IVI, but only the left eye showed uncontrolled IOP. Third, OHT in the left eye was uncontrolled under optimal medical treatment, trabeculoplasty, and shortly after FAc removal but was successfully managed by microshunt surgery.

## Conclusion

Our case confirms the importance of a regular IOP control in all eyes treated by intravitreal FAc, despite a good initial steroid IOP-response test and a well-controlled IOP in the first few months after implantation. The number of previous DEX-IVI is a risk factor for OHT under FAc. FAc removal does not seem to achieve short-term IOP control but may help in the long term by preventing further remodeling of the trabecular meshwork. The Preserflo<sup>®</sup> microshunt represents an alternative to trabeculectomy that can be used in corticosteroid-induced refractory OHT and glaucoma. The CARE Checklist has been completed by the authors for this case report, attached as online supplementary material (for all online suppl. material, see [www.karger.com/doi/10.1159/000527672](http://www.karger.com/doi/10.1159/000527672)).

## Statement of Ethics

Ethical approval is not required for this study in accordance with local or national guidelines. Written informed consent was obtained from the patient for publication of the details of their medical case and any accompanying images.

## Conflict of Interest Statement

Olivier Loria, Amina Rezkallah, and Samuel Chacun have no conflict of interest. Thibaud Mathis is a consultant for Abbvie, Bayer, GSK, Horus, and Novartis. Laurent Kodkijian is a consultant for Abbvie, Bayer, Horus, Novartis, Roche, and Thea. Philippe Denis is a consultant for Abbvie, Thea, Horus, and Santen.

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## Author Contributions

Validation, data curation, and writing – review and editing: Amina Rezkallah, Oliver Loria, Thibaud Mathis, Philippe Denis, and Laurent Kodkijian. Investigation: Amina Rezkallah, Oliver

Loria, Thibaud Mathis, Samuel Chacun, Philippe Denis, and Laurent Kodjikian. All authors have read and agreed to the published version of the manuscript.

### Data Availability Statement

All data generated or analyzed during this case are included in this article and its online supplementary material. Further inquiries can be directed to the corresponding author.

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