

A case of malignant glaucoma following insertion of Preserflo™ MicroShunt

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Abstract

Purpose: To describe a case of malignant glaucoma following insertion of a Preserflo™ MicroShunt in a patient with primary open angle glaucoma (POAG).

Design: Case report.

Case: A 46-year-old Caucasian man with medically uncontrolled POAG developed malignant glaucoma 1 day after an uncomplicated insertion of a mitomycin C (MMC) augmented Preserflo MicroShunt (PMS).

Results: Initial medical treatment with aqueous suppressants and atropine 1% resulted in temporary resolution of the episode, although partial occlusion of the PMS with iris required a Nd:YAG laser iridotomy to open the inlet of the device. However, the malignant glaucoma recurred 6 days later. Temporary resolution was subsequently achieved with an Nd:YAG laser peripheral irido-zonulo-hyaloidotomy in combination with topical atropine, though a subsequent PMS revision was required due to bleb encapsulation. Unfortunately, the revision procedure was followed 2 days later, by a further recurrence of malignant glaucoma which was eventually resolved by left pars plana vitrectomy (PPV) in combination with clear lens extraction (CLE) and surgical irido-zonulo-hyaloidectomy. Subsequently, the eye remained stable, with a deep anterior chamber (AC), a partially functioning bleb, and an intraocular pressure (IOP) of 14 mmHg on one topical IOP-lowering agent, 8 months after the last procedure.

Conclusions: The management of malignant glaucoma after PMS insertion and its subsequent clinical course is described. Apart from the propensity for a small tube such as the PMS to obstruct with iris when the AC is shallow, management is similar to other scenarios in which malignant glaucoma may develop.

Keywords

Malignant glaucoma, aqueous misdirection, MicroShunt, InnFocus, Preserflo, glaucoma, glaucoma surgery

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Introduction

We describe a case of malignant glaucoma following insertion of a Preserflo™ MicroShunt (PMS, Santen Pharmaceutical Co. Ltd., Osaka, Japan). Given the presence of the small tube in the anterior chamber, which can easily be obstructed by iris tissue apposition, the management of the case offers some additional challenges that are discussed.

We believe this case report will help to raise the awareness on this complication and will also offer a reference for its management in a similar scenario.

Case report

A 46 year-old Caucasian male with a history of left keratoconus (KC) and left primary open angle glaucoma (POAG),

uncontrolled on three drugs was listed for a mitomycin C (MMC) augmented Preserflo™ MicroShunt (PMS, Santen Pharmaceutical Co. Ltd., Osaka, Japan) insertion under local anaesthesia.

The patient was not significantly hyperopic (left prescription: $-0.75 + 1.75 \times 170^\circ$) with corrected visual acuities (VA) in each eye of 6/7.5 and intraocular pressures (IOP) of 14 mmHg (right) and 27 mmHg (left) on

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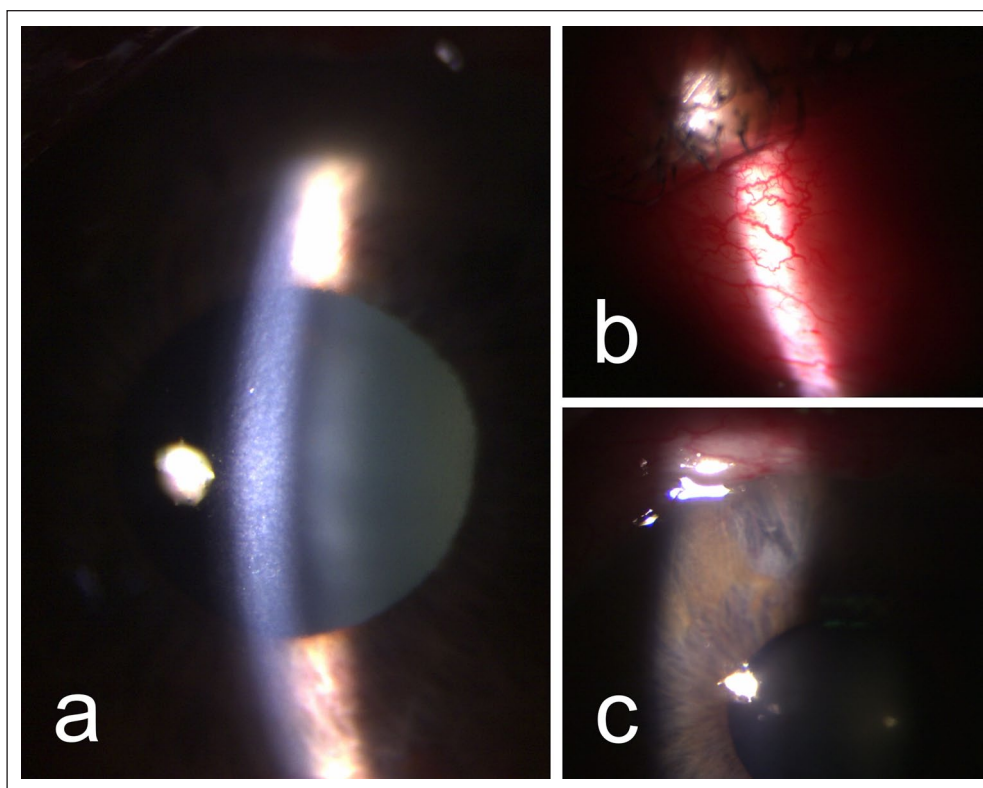


Figure 1. Slit-lamp pictures 1 day after PMS insertion: (a) AC looks diffusely shallow, (b) superior bleb has mild to moderate inflammation and (c) PMS can be seen lying in front of the iris (following Nd:YAG laser to release PMS obstruction).

Goldmann applanation tonometry (GAT) and normal anterior segments on examination. The right optic disc was healthy, the left displayed the typical signs of glaucomatous optic neuropathy, with 0.75 cup:disc ratio, an inferior rim notch and typical findings of a superior visual field defect and inferior RNFL thinning on optical coherence tomography (OCT).

PMS insertion was performed under peribulbar anaesthesia (10 ml of Ropivacaine hydrochloride 7.5 mg/ml, topped-up with a further 5 ml due to incomplete akinesia) and via a wide superior fornix-based conjunctival-Tenon pocket after a 3-min sub-Tenon's exposure to 0.4 mg/ml MMC on three polyvinyl acetate (PVA) corneal light shields. The PMS was inserted via a 1 mm wide lamellar scleral tunnel stretching 3 mm posteriorly and radially from the superior limbus, with a 25 gauge needle entry site at the apex. The PMS was inserted so that it could be seen in the AC and the fins securely lodged in the tunnel. Spontaneous flow was observed before conjunctival and Tenon's closure. Tenon's was carefully reapposed to avoid occlusion and the conjunctival-Tenon pocket closed with two interrupted 7/0 vicryl sutures at the limbus. The surgery was unremarkable and the AC was maintained throughout the procedure.

On postoperative day 1, the best corrected VA was 6/19 but the AC was shallow with peripheral iris-cornea touch (Figure 1). Despite the very shallow AC and a formed

drainage bleb, the IOP was 35 mmHg on GAT. Choroidal effusions or haemorrhage were excluded by B-scan ultrasonography. Given the shallow central AC and absence of iris convexity, a provisional diagnosis of malignant glaucoma was made and the patient treated with atropine 1% and timolol 0.5% + brimonidine 0.2% fixed combination to the left eye, together with acetazolamide 500 mg orally. After 30 min the patient developed acute left eye pain and vomited. On examination, the PMS lumen was occluded with iris in the AC and the IOP was 47 mmHg on GAT. The patient was given 500 ml of intravenous mannitol 20% and an urgent Nd:YAG laser iridotomy performed to unclog the PMS inlet, resulting in immediate symptomatic relief with deepening of the AC and reduction of the IOP to 22 mmHg. The patient was discharged on atropine 1% three times daily, timolol 0.5% + brimonidine 0.2% fixed combination twice daily, acetazolamide 250 mg tablets twice daily, in addition to routine postoperative glaucoma surgery medication (dexamethasone 0.1% every 2 h by day and chloramphenicol 0.5% four times daily). Over the following days the situation improved gradually, with the left visual acuity of 6/12 best corrected. The AC remained deep with a diffuse bleb and an IOP of 16 mmHg on the same treatment.

On postoperative day 6 the patient complained of discomfort in the left eye. The left VA had deteriorated to 6/24 best corrected; the AC was shallow again though the

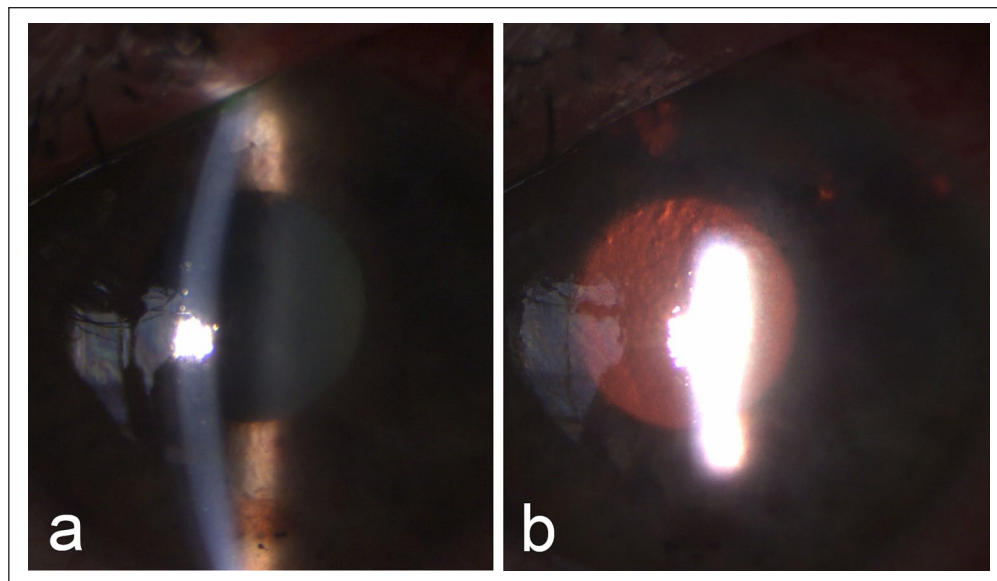


Figure 2. Slit-lamp pictures immediately after Nd:YAG laser irido-zonulo-hyaloidotomy: (a) AC appears deep and (b) retroillumination highlights the presence of a patent laser peripheral iridotomy at 2 o'clock.

bleb was diffuse with mild to moderate conjunctival injection and the IOP was 42 mmHg. Recurrent left malignant glaucoma was diagnosed and a Nd:YAG peripheral irido-zonulo-hyaloidotomy was performed. One hour later, the patient's symptoms had resolved and the AC had deepened (Figure 2). The left IOP had reduced to 23 mmHg and the patient was discharged with the same medical treatment.

Over the following 2 weeks the left IOP increased to 25 mmHg, requiring revision of the PMS which was found to be encased in fibrous tissue on exploration. The day after revision the left VA was 6/12 best corrected, the AC was deep and quiet, the bleb diffuse and IOP was 7 mmHg. Unfortunately, 1 day later, despite three times daily atropine treatment, the left malignant glaucoma recurred with an even shallower AC. A pars plana vitrectomy (PPV) combined with clear lens extraction and surgical irido-zonulo-hyaloidectomy was then performed, leaving an air bubble in the AC at the end (Figure 3(a)).

The following day, the AC was deep and partly filled with air, the bleb was still diffuse and the IOP was 18 mmHg. Over the following 2 weeks, the left VA improved to 6/9 best corrected, the cornea remained clear and the AC formed (Figure 3(b)–(d)). The IOP crept up to 24 mmHg and the patient commenced timolol 0.1% gel once in the morning.

At last follow-up, 8 months after surgery, the left VA was 6/7.5 best corrected and the eye quiet with a deep AC, a partly encapsulated bleb and an IOP of 14 mmHg.

Discussion

PMS is a 8.5 mm-long, valve-less and plate-less tube made of an inert, biocompatible and thermoplastic material called

poly (styrene-block-isobutylene-block-styrene) or SIBS. The device is inserted ab-externo, via a fornix based conjunctival pocket, 3 mm from the limbus and connects the anterior chamber with the sub-Tenon's space. As with other bleb forming procedures, MMC is used to prevent fibrosis around the external aperture. Among the advantages of this device is a reduced surgical time and a more controlled and standardised postoperative outcome. Moreover, the 70 micron diameter lumen of the device avoids hypotony in the majority of patients.

Preliminary trial results are encouraging, with one study of 23 patients reporting a qualified success of 95% at 3 years.¹ Among the reported complications were transient hypotony, shallow AC and iris touch in three eyes (13% of the cases), with choroidal detachment in two of them (8.7%). These hypotony-related complications were noted in the first weeks after surgery and all were self-limiting. A recent retrospective study of 164 eyes found transient postoperative AC shallowing in 5.5% and choroidal detachment in 6.7% of the cases.² To the best of the authors' knowledge there is only one case reported of malignant glaucoma following PMS implant.³

Malignant glaucoma is characterised by axial AC shallowing and raised IOP without posterior segment changes. The absence of iris convexity and presence of axial shallowing, differentiates it from pupillary block, where the AC tends to be deeper centrally and shallow or absent peripherally.

The incidence of malignant glaucoma is low, with reported rates of 2%–4% of patients operated for angle-closure glaucoma.⁴ Although cases have been described following a variety of treatments including laser iridotomy,⁵ most result from either glaucoma or cataract surgery,

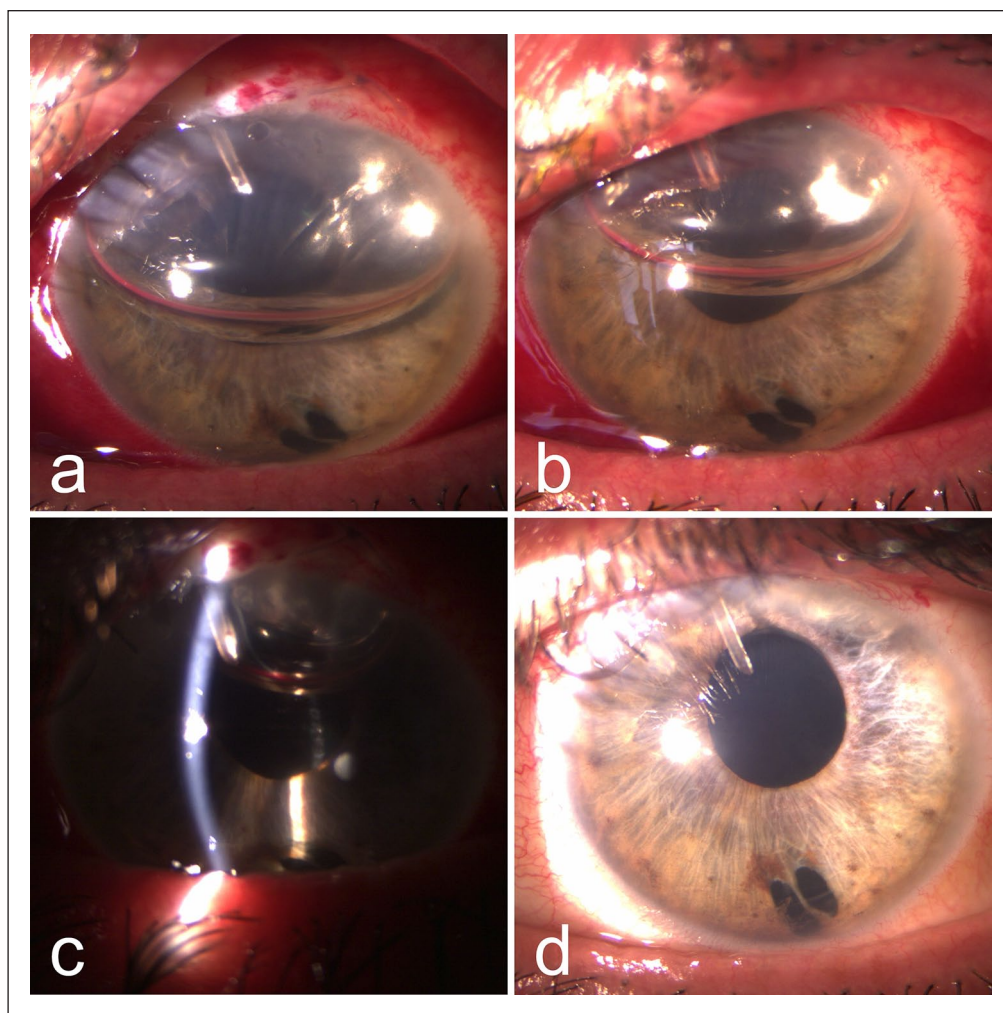


Figure 3. Slit-lamp picture collage showing the progressive reabsorption of the AC air bubble at 1, 3, 10 and 14 days (a–d) after combined pars-plana vitrectomy (PPV), phacoemulsification with intraocular lens (IOL) implantation and irido-zonulo-hyaloidectomy.

often in association with marked, albeit transient, ocular decompression.

Two different mechanisms have been proposed to describe the pathogenesis of the disease: aqueous misdirection, namely an aqueous diversion to the posterior segment in a ball-valve like mechanism⁶; and abnormal choroidal permeability in the setting of poor vitreous flow conductivity, leading to an increasing pressure gradient from the vitreous cavity to the anterior chamber.⁷

Regardless of the underlying mechanism, treatment options include medical therapy, laser treatment and surgery. Cycloplegics such as atropine push the lens-iris diaphragm posteriorly and tighten the zonule; topical and systemic aqueous suppressants such as β -blockers, α -agonists, topical and systemic carbonic anhydrase inhibitors reduce IOP; osmotic agents such as mannitol shrink the vitreous volume, while topical steroids dampen the associated inflammation. Medical therapy alone seems to be effective in about 50% of cases,⁸ however long-term use of cycloplegics may be required to prevent recurrence.

When medical therapy fails, laser sometimes re-establishes the correct aqueous flow pathway. Nd:YAG laser may be used to disrupt the anterior hyaloid and release pockets of fluid trapped in the vitreous cavity. Transscleral diode laser cyclophotocoagulation, applied to one or two quadrants, has also been reported to break aqueous misdirection, supposedly by a coagulative shrinkage and therefore posterior rotation of the treated ciliary processes.⁹

Despite sporadic reports of successful treatment using both the medical and laser approach, there is a high recurrence rate and definitive treatment is surgical removal of the anterior vitreous and creation of a pathway between the anterior and posterior segments. The aim is to remove as much anterior vitreous as possible and ideally to make a surgical peripheral irido-zonulo-hyaloidectomy to establish a direct communication between the anterior and posterior chamber, thus achieving an unicameral eye. This approach has been found to increase the success rates compared to a sole core vitrectomy from 25%–50% to 65%–90%.¹⁰

Our patient presented 1 day after left PMS insertion with typical signs of malignant glaucoma. Medical treatment with IOP lowering agents and atropine 1% led to an unanticipated complication: PMS obstruction with iris, though the shallow anterior chamber would have been a predisposing factor. A temporary resolution was achieved by means of Nd:YAG iridotomy and zonulo-hyaloidotomy, however only complete PPV and surgical zonulo-iridectomy proved effective in preventing further recurrence.

We believe sharing this case and its management will help in dealing with similar scenarios.

Declaration of conflicting interests

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Consent

Patient gave consent to the discussion and publication of this case.

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