Research

Repairs of Prolonged Descemet’s Membrane Detachments with Intracameral Injection of Long-Acting Gases

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Abstract
Many types of intraocular surgery make use of a corneal incision to permit access to the anterior chamber of the eye. Detachments of Descemet’s membrane are among the rare, but potentially devastating complications of surgery involving a corneal incision. Descemet’s membrane consists of endothelial cells, which ensure the transparency of the cornea by actively pumping fluid from the stroma into the anterior chamber. When detached, fluid accumulates within the corneal stroma leading to edema and impaired visual acuity. In this case series, we report successful reattachment and improved visual acuity in two cases of prolonged Descemet’s membrane detachment following cataract surgery. Intracameral injections of long-acting gases (10% SF6 and 14% C3F8) create a tamponade of the detached membrane, bringing it into re-apposition with the cornea when the patient complies with supine positioning. Other case reports have utilized intracameral injections for this purpose without outlining a technique. The method, which we describe in detail, employs a single-injection port for installation of long-acting gas into the anterior chamber and aspiration of aqueous humour at the slit-lamp. We demonstrate that visual acuity and corneal clarity can be significantly restored using this technique even after prolonged Descemet’s membrane detachments of up to three months.

Descemet’s membrane is a specialized basement membrane composed of endothelial cells, which plays a critical role in maintaining the transparency of the cornea. When detached, the normally desiccate overlying stroma becomes edematous and opaque. Involvement of the central cornea may severely affect visual acuity. Detachment of Descemet’s membrane leading to corneal decompensation is a rare complication of many types of intraocular surgery involving the anterior chamber, including extracapsular cataract extraction (2.6%), phacoemulsification (0.5%), as well as trabeculectomy, viscoanastomosis, and deep anterior lamellar keratoplasty.1 It is believed that eyes with shallow anterior chambers and weak adhesions between the corneal stroma and Descemet’s membrane are predisposed to detachment during surgery.2 While the vast majority of Descemet’s membrane detachments are subclinical and resolve spontaneously, a number of techniques have been used to repair more substantial detachments. Topical hyperosmotics and steroids may be used to decrease the intervening fluid between the stroma and the detached Descemet’s membrane.3 Intracameral injection of long-acting gases with subsequent positioning has been shown to be a successful repair strategy.4 Surgical repair using sutures to fasten the detached membrane to the peripheral cornea has been attempted for larger detachments. When these possibilities have been exhausted, penetrating keratoplasty may become necessary. Here, we report successful repair of two cases of two- and three-month-old detachments of Descemet’s membrane following intraocular surgery using intracameral gas injection.

Attempts at intracameral injection of air may be unsuccessful due to the rapid rate of systemic absorption and injection of viscoelastic is often complicated by a prolonged elevation of intraocular pressure. The use of gas mixtures, such as 10% Sulfur Hexafluoride (SF6) or 14% Perfluoropropane (C3F8), may be preferred as the bubble ensures a longer-lasting tamponade of the detached Descemet’s membrane without expanding in the eye. SF6 has been reported to last 2-3 weeks before being reabsorbed, while C3F8 may last up to 6 weeks; therefore, both choices may be preferable to air, which lasts only 3-4 days.5 Initial fears of toxicity to the corneal endothelium were allayed by in vivo studies in rabbits.6 Here, we report two cases of attempted Descemet’s membrane re-attachment using intracameral injection of either SF6 or C3F8 at the slit-lamp.

Case 1
An 83-year-old man underwent an uncomplicated phacoemulsification for his right eye on May 15th, 2007. Postoperatively, he complained of blurred vision. On June 20th, 2007, slit lamp biomicroscopy revealed a central Descemet’s membrane loss with a detached flap. The overlying cornea was edematous. Visual acuity was counting fingers. On July 10th, 2007, visual acuity was 20/200. 10% SF6 was injected into the anterior chamber using the procedure outlined below. The patient was instructed to maintain supine positioning. On July 19th, 2007, visual acuity had improved to 20/70-1. Residual corneal edema and wrinkling of Descemet’s membrane were observed. On August 15th, visual acuity improved to 20/60 without correction. Although a persistent Descemet’s membrane tear was identified at the slit-
lamp, the area of corneal edema had significantly decreased and this correlated with improved visual acuity.

Case 2

A 69-year-old woman underwent uncomplicated right phacoemulsification in February 2007. She reported no improvement in her vision after surgery. On June 12th, 2007, a tear of Descemet’s membrane was noted on clinical examination. UBM of the anterior segment confirmed central and inferonasal Descemet’s membrane detachment with superotemporal gap that extended into the pupillary axis (see Figure 2). On June 13th, 2007, uncorrected visual acuity in the right eye was 20/200+1 and intraocular pressure was 11mmHg. Anterior chamber paracentesis and injection of 14% C3F8 was performed. On June 14th, 2007, the bubble was identified behind the iris. The patient was non-compliant with the supine position. Intraocular pressure rose to 34mmHg which was immediately treated with anti-glaucoma medication. On June 15th, 2007, a shallow anterior chamber and apposition of the iris and cornea were observed. The anterior chamber was reformed with balanced salt solution and the gas was removed. On June 28th, 2007, visual acuity was 20/100+1 with pinhole. Folds of detached Descemet’s membrane were seen and irido-corneal adhesions were observed inferiorly. On July 13th, 2007, YAG synechialysis was performed and an air bubble was injected in the right eye. On April 23rd, 2008, visual acuity was 20/50+1 with pinhole. The cornea was noted to be centrally clear with some persistent superotemporal edema.

Method

Local anaesthesia was achieved with a pledget soaked in topical Proparacaine that was placed over limbus at the six o’clock position. After five minutes, a sterile wire lid speculum was placed in the eye and the inferior limbus prepped with 5% Proviodine solution (see Figure 3). A 10cc syringe with diluted gas (10% SF6 or 14% C3F8) and a 27 Gauge needle was then used to enter the anterior chamber through the limbus at the six o’clock position with the patient at the slit-lamp. Once in the

![Figure 1. Ultrasound Biomicroscopy image of central Descemet’s membrane detachment with folds (see arrow).](image1)

![Figure 2. Ultrasound Biomicroscopy image of a central and inferonasal Descemet’s membrane detachment with superotemporal gap extending into the pupillary axis (see arrows).](image2)

![Figure 3. Technique for Injection of Long-Acting Gas into the Anterior Chamber: (a) A 27 Gage needle is advanced into the anterior chamber at the corneal-scleral limbus at the 6 o’clock position and gas is slowly infused; (b,c) The needle tip is withdrawn into the aqueous and fluid is aspirated until at least 50% of the anterior chamber is filled with gas.](image3)
anterior chamber, gas was injected to over-inflate the chamber. The needle was then withdrawn into the aqueous portion of the anterior chamber and fluid was aspirated till at least 50% of the anterior chamber was filled with a gas bubble. Patients were instructed to maintain supine positioning and use topical antibiotic drops q.i.d. for five days post-injection. The single-port technique for gas installation and aqueous humour aspiration may reduce the need for multiple injection or suture sites used in previous attempts. 7,8

Discussion

In the above cases, we demonstrate the successful restoration of visual acuity after intracameral injection of long-acting gases for the repair of latent Descemet’s membrane detachment using a single injection site. A complaint of a progressive decline in visual acuity after uncomplicated intraocular surgery involving corneal incision should increase the index of clinical suspicion for a tear or detachment of Descemet’s membrane. Ultrasound biomicroscopy and anterior segment optical coherence tomography can be used successfully to visualize the defect.

Clinicians do not need to achieve a complete reattachment of Descemet’s membrane in every case to achieve improvements in vision. As demonstrated in Case 1, a significant improvement in vision can be attained with resolution of corneal edema, even when persistent folds or detachment is noted after attempted repair.

In Case 2, patient non-compliance with supine positioning instructions led to a shallow anterior chamber and subluxation of the gas bubble posterior to the iris. The formation of iridocorneal adhesions and elevated intraocular pressure required immediate treatment and re-injection. Thus, the importance of strict adherence to supine positioning must be emphasized to patients receiving intracameral injections.

Descemet’s membrane detachments are best treated quickly to prevent vision-threatening persistent stromal edema, adhesions or permanent wrinkling of the membrane, or the formation of hyaline networks, which may lead to difficulties in manipulation and repair. 9 Few case reports have reported successful resolutions for Descemet’s membrane detachments beyond one month. 10 However, we report successful reattachment and improvement in vision after detachment of approximately two and three months. To the best of our knowledge, the longest successfully treated detachment of Descemet’s membrane was diagnosed fourteen months after phacoemulsification and was repaired using intracameral injection of 14% Perfluoropropane gas after conservative medical management. 11 The improved visual outcome achieved in these cases suggests that the pumping action of endothelial cells of Descemet’s membrane continues even after prolonged detachments, making intracameral injection of long-acting gas an attractive treatment possibility for latent and visually debilitating detachments.

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References