Outcomes of air descemetopexy for Descemet membrane detachment after cataract surgery

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PURPOSE: To analyze the outcomes of post-cataract surgery descemetopexy for Descemet membrane detachment using intracameral air injection.

SETTING: Cornea Department, LV Prasad Eye Institute, Hyderabad, India.

DESIGN: Interventional case series.

METHODS: The clinical data of patients who had descemetopexy from August 2010 to February 2011 for Descemet membrane detachment after cataract surgery using intracameral (100%) air injection were reviewed after institutional review board and ethics committee approval was obtained.

RESULTS: Of the 14 patients, 9 had manual small-incision cataract surgery using the Blumenthal and Moisseiev technique, 4 had phacoemulsification, and 1 had combined phacoemulsification with trabeculectomy. The mean duration between cataract surgery and descemetopexy was 19.5 days (range 2 to 49 days). Successful reattachment of Descemet membrane and resolution of corneal edema occurred in all except 1 patient. Two patients had elevated intraocular pressure 1 day postoperatively due to appositional angle closure in 1 and pupillary block in the other. Of the 13 patients with successful Descemet membrane reattachment, the corrected distance visual acuity was 20/40 or better in 11 cases, 20/80 in 1 case, and 20/160 in 1 case. Three of the 13 patients had comorbidity factors affecting vision.

CONCLUSION: Air descemetopexy was a safe option in the management of Descemet detachment after cataract surgery.

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Descemet membrane detachment is a well-known, potentially sight-threatening complication of cataract surgery. Detached Descemet membrane causes accumulation of fluid in the pre-Descemet space and stromal edema, which leads to loss of vision. The natural history and prognosis of Descemet membrane detachment are uncertain. There are some reports of spontaneous reattachment of Descemet membrane detachment; however, surgical intervention to reattach a detached Descemet membrane has been shown to hasten the process of visual recovery. Successful reattachment of Descemet membrane has been observed with the intracameral use of air, sulfur hexafluoride (SF6), and perfluoropropane (C3F8). In this report, we describe our experience with post-cataract surgery descemetopexy using intracameral air injection.

PATIENTS AND METHODS

This was a retrospective chart review of patients who had surgical intervention for Descemet membrane detachment after cataract surgery from August 2010 to February 2011. Institutional review board and ethics committee approval was obtained.

The method of cataract extraction was manual small-incision cataract surgery (MICS) using the Blumenthal and Moisseiev technique or phacoemulsification. Patients were operated on by cataract surgery trainees or were referred from elsewhere.
The patients’ medical records were reviewed for demographic and clinical features, Descemet membrane detachment characteristics, surgical approach, and postoperative outcomes. The characteristic features of the Descemet membrane detachment documented on slitlamp examination were the area of corneal edema, extent of separation from the posterior stromal layer, and other associated features, such as folds or wrinkling in Descemet membrane. In eyes in which visualization of the anterior segment was poor because of severe corneal edema, anterior segment optical coherence tomography (Visante, Carl Zeiss Meditec AG) was performed to delineate Descemet membrane.

Surgical Technique

Descemetopexy was performed using intracameral air (100%) injection under local or topical anesthesia. The air was injected at the limbal site where the cornea was relatively compact and Descemet membrane appeared apposed, at least in close relation to the posterior stroma. A 29-gauge needle was introduced with the bevel down to reach beneath the plane of the detached Descemet membrane, and slow injection of air was attempted to tamponade Descemet membrane. The needle was then gently withdrawn and the site of entry sealed with a surgical sponge for 1 minute to prevent the air from escaping. In eyes in which there was poor visualization of the anterior chamber, an endoilluminator was used to determine the orientation of Descemet membrane.

In all eyes, complete air fill of the anterior chamber was targeted and a supine position was maintained for 15 to 20 minutes, similar to the practice when attaching a posterior lamellar graft in endothelial keratoplasty. After 15 to 20 minutes, partial, controlled release of air was performed in all eyes to maintain an air fill of approximately two-thirds of the anterior chamber. One drop of tropicamide and phenylephrine was instilled in most cases to prevent pupillary block in the immediate postoperative period.

Postoperative Assessment

The patients were examined postoperatively at 1 day, 1 week, and after 4 to 6 weeks. Visual acuity measurement,
slitlamp examination, and intraocular pressure (IOP) assessment were performed at each visit.

RESULTS

The study comprised 14 patients. The mean age of the 6 men and 8 women at the time of cataract surgery was 68 years (range 50 to 80 years). Nine cases had surgery by cataract surgery trainees and 5 were referred from elsewhere. Table 1A shows the patients’ preoperative demographics, clinical characteristics, and surgical data. Table 1B shows the outcomes after air descemetopexy. Figure 1, Figure 2, and Figure 3 show the clinical photographs of patient 7, patient 8, and patient 9, respectively. The mean duration between the cataract surgery and descemetopexy was 19.5 days (range 2 to 49 days).

Nine patients had manual SICS using the Blumenthal-Moisseiev technique, 4 had phacoemulsification, and 1 had combined phacoemulsification with trabeculectomy. Of the 9 patients who had manual SICS, the Descemet membrane detachment originated at the site of the anterior chamber maintainer in 6 eyes and at the site of the main incision in 1 eye; the site could not be ascertained in 2 eyes. In 5 eyes that had phacoemulsification, Descemet membrane detachment emanated from the side ports during bimanual irrigation and aspiration.

In patient 9, Descemet membrane was lying close to the posterior chamber intraocular lens due to air between the stroma and Descemet membrane. In this case, air was aspirated first and Descemet membrane was repositioned; this was followed by air injection. Patients 12, 13, and 14 did not receive a drop of tropicamide and phenylephrine to prevent pupillary block in the immediate postoperative period. Successful reattachment of Descemet membrane and resolution of corneal edema occurred in all except patient 6. In this patient, the Descemet membrane had fixed folds that were severed with microscissors before descemetopexy, which was performed 49 days after the cataract surgery; the fixed folds in Descemet membrane led to persistence of the central detachment. Endothelial keratoplasty was planned in this case; however, the patient refused the surgery. Patient 12 had elevated IOP due to appositional angle closure resulting from air migration behind the iris. This patient had anterior chamber decompression and synechialysis, after which the IOP and anterior chamber normalized. Patient 14 had mildly elevated IOP (25 mm Hg) on the immediate postoperative day due to pupillary block. This resolved after pupil dilation.

The visual acuity after cataract surgery ranged from counting fingers close to the face to 20/160. In all patients, the Descemet membrane detachment involved the central visual axis.

After successful reattachment of Descemet membrane, the corneal stroma was compact in 8 eyes on the first postoperative day. In the remaining eyes with attached Descemet membrane, stromal edema decreased rapidly in the 1-week postoperative period.

<table>
<thead>
<tr>
<th>Pt</th>
<th>Outcome of D-pexy</th>
<th>1 Wk</th>
<th>4–6 Wk</th>
<th>Comorbidities Affecting Vision</th>
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</thead>
<tbody>
<tr>
<td>1</td>
<td>Attached, cornea compact, air bubble ½ AC</td>
<td>20/100</td>
<td>20/80</td>
<td>PC plaque</td>
</tr>
<tr>
<td>2</td>
<td>Attached, few paracentral DM folds, cornea compact, air bubble ½ AC</td>
<td>20/80</td>
<td>20/20</td>
<td>—</td>
</tr>
<tr>
<td>3</td>
<td>Attached, few paracentral DM folds, corneal edema, air bubble &lt;½ AC</td>
<td>CF 2 m</td>
<td>20/30</td>
<td>—</td>
</tr>
<tr>
<td>4</td>
<td>Attached, cornea compact, air bubble &lt;½ AC</td>
<td>CF 2 m</td>
<td>20/40</td>
<td>Spheroideal degeneration</td>
</tr>
<tr>
<td>5</td>
<td>Attached, cornea edema, air bubble ½ AC</td>
<td>20/160</td>
<td>20/160</td>
<td>CME, superficial haze</td>
</tr>
<tr>
<td>6</td>
<td>Partially settled, central detachment persistent, corneal edema</td>
<td>CF 1 m</td>
<td>CF 1 m</td>
<td>—</td>
</tr>
<tr>
<td>7</td>
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<td>20/80</td>
<td>20/30</td>
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<td>8</td>
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<td>20/25</td>
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<tr>
<td>9</td>
<td>Attached, cornea compact, air bubble ½ AC</td>
<td>20/100</td>
<td>20/25</td>
<td>—</td>
</tr>
<tr>
<td>10</td>
<td>Attached, folds in DM in periphery, corneal edema, air bubble &lt;½ AC</td>
<td>20/126</td>
<td>20/40*</td>
<td>—</td>
</tr>
<tr>
<td>11</td>
<td>Attached, cornea compact, air bubble ½ AC</td>
<td>20/80</td>
<td>20/20</td>
<td>—</td>
</tr>
<tr>
<td>12</td>
<td>Attached DM, appositional angle closure due to air migration behind iris relieved after AC decompression and synechialysis</td>
<td>20/30</td>
<td>20/30</td>
<td>—</td>
</tr>
<tr>
<td>13</td>
<td>Attached, cornea compact, air bubble &lt;½ AC</td>
<td>20/80</td>
<td>20/40</td>
<td>—</td>
</tr>
<tr>
<td>14</td>
<td>Attached, cornea compact, air bubble 2/3 AC bubble, mildly elevated IOP (25 mm Hg) relieved after pupil dilation</td>
<td>20/80</td>
<td>20/30</td>
<td>—</td>
</tr>
</tbody>
</table>

AC = anterior chamber; CDVA = corrected distance visual acuity; CF = counting fingers; CME = cystoid macular edema; DM = Descemet membrane; D-pexy = Descemetopexy; PC = posterior chamber; Pt = patient

*With aphakic correction
and continued to decrease progressively over the subsequent 4- to 6-week follow-up visits in all eyes. At 4 to 6 weeks, the corrected distance visual acuity was 20/40 or better in 11 of 13 eyes, 20/80 in 1 eye, and 20/160 in 1 eye. In some eyes (patients 7, 9, and 12), faint Descemet membrane folds were observed in the midperipheral location. No corneal haze or scar was noted. The comorbidity factors affecting vision in 13 eyes with successfully attached Descemet membrane were posterior capsular plaque in patient 1, cystoid macular edema in patient 5, and spheroidal degeneration in patient 4.

**DISCUSSION**

The management of Descemet detachment depends on various factors, such as the location and area of the detachment, the degree of anteroposterior separation from the posterior stroma, and the duration of watchful observation. Although spontaneous reattachment has been reported, the factors that favor this are not clearly known. In addition, visual rehabilitation may be delayed in these cases. Therefore, in patients with involvement of the visual axis, surgical intervention to promote attachment may be the preferred approach.

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**Figure 1.** A: Slitlamp photograph of patient 7 shows diffuse corneal edema. B: One day after air descemetopexy. C: One month postoperatively.

**Figure 2.** A: Slitlamp photograph of patient. B: One day postoperatively (diffuse). C: Corneal edema involving the visual axis (slit view).
Furthermore, early attachment leads to better visual reliability because prolonged Descemet membrane detachment can result in corneal opacification, fibrosis, and wrinkling of Descemet membrane, thereby affecting visual recovery. Surgical repair aims to reapproximate Descemet membrane against the stroma using a tamponading agent until it adheres well so that it does not redetach after removal of the tamponade. Tamponading agents successfully used for this purpose include 100% air, 20% SF₆, and 14% C₃F₈.

We prefer to use 100% air over other long-standing gases (SF₆ or C₃F₈) for many reasons. Air is absorbed in the shortest time (1 to 3 days). It has a lower risk for endothelial toxicity than the gases. Furthermore, the need for a long-standing tamponade is also questionable. It is well known that the attachment of a posterior lamellar disk in Descemet-stripping endothelial keratoplasty (DSEK) is successfully achieved by maintaining a complete air fill and good air tamponade for a few minutes. In fact, it is a common practice to partially evacuate air at the conclusion of surgery. Applying the same analogy, it is logical to believe that reapproximation of the Descemet membrane with the use of air to completely fill the anterior chamber should be adequate to obtain the desirable outcome.

One argument against this is that the health of the endothelium may be affected in Descemet membrane detachment after cataract surgery. This may affect the endothelial pump function, which is of paramount importance in the reattachment process. In our series of 14 patients who had descemetopexy using air, 13 had successful reattachment and rapid resolution of corneal edema. In one case (patient 6), fixed folds prevented Descemet membrane reattachment. It is unclear whether longer tamponade using long-standing gases would have achieved a better outcome in this patient. Based on the results in most of our patients, we believe that descemetopexy using air should be the preferred choice over long-standing gases in cases devoid of structural alterations in the Descemet membrane.

In the earlier study by Mahmood et al., some patients required multiple air and/or SF₆ injections for Descemet membrane detachments. None of the 13 patients in our series required a repeat air injection because the first attempt successfully reattached the Descemet membrane. We attribute this successful outcome to using only a single injection to attain complete air fill, similar to the practice in DSEK. One anticipated and undesirable complication of any intracameral air or gas injection is IOP elevation in the postoperative period. The risk for IOP elevation may be lower with the use of air than with long-standing gases because air is absorbed more quickly. Other measures that can help prevent this complication are pupil dilation at the conclusion of the surgery and partial evacuation of air, as performed in DSEK.

The time period of corneal edema resolution after successful reattachment was variable. In our cases, we observed that after successful reattachment of Descemet membrane, there was remarkable improvement in corneal clarity within 1 week of descemetopexy. Theoretically, the time required for resolution of corneal edema after Descemet membrane reapproximation depends on the health of the endothelium.

In conclusion, the results in this series suggest that air descemetopexy is a safe and viable option in management of Descemet detachment after cataract surgery.

**WHAT WAS KNOWN**
- Descemet membrane detachment after cataract surgery is a potentially sight-threatening complication. Surgical management of Descemet membrane detachment involves reapproximating the membrane against the stroma using intracameral instillation of 100% air, 20% SF₆, or 14% C₃F₈. Compared with SF₆ and C₃F₈, air is a short-acting tamponading agent.

**WHAT THIS PAPER ADDS**
- Descemetopexy using 100% air injection to achieve a complete air fill in the anterior chamber for 15 to 20 minutes, similar to that performed in Descemet-stripping endothelial keratoplasty, is an effective method of managing post-cataract surgery Descemet membrane detachment.

**REFERENCES**
1. Minkovitz JB, Schrenk LC, Pepose JS. Spontaneous resolution of an extensive detachment of Descemet’s membrane.