Management of Inferior Breaks in Pseudophakic Rhegmatogenous Retinal Detachment With Pars Plana Vitrectomy and Air

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Objective: To determine the role of pars plana vitrectomy without scleral buckling and air as a tamponade with 24 hours of prone positioning in the management of inferior breaks in primary pseudophakic rhegmatogenous retinal detachment.

Methods: Prospective, noncomparative, interventional case series. Fifteen consecutive eyes (15 patients) with primary pseudophakic rhegmatogenous retinal detachment with causative breaks located between the 4-o’clock and 8-o’clock positions underwent pars plana vitrectomy with air tamponade. The prone position was maintained for 24 hours. Anatomic and functional results are presented.

Results: The anatomic reattachment rate was 93.3% after 1 procedure and 100% at the 6-month visit. Mean preoperative best-corrected visual acuity was 20/60 (range, 20/400 to 20/25) and mean postoperative best-corrected visual acuity was 20/30 (range, 20/100 to 20/20). In 1 case the retina redetached at the second week because of an undetected break. Postoperative epiretinal membrane was observed in 1 case.

Conclusion: Pars plana vitrectomy and air tamponade with only 24 hours of prone positioning postoperatively is effective in the management of primary pseudophakic rhegmatogenous retinal detachment with causative breaks between the 4-o’clock and 8-o’clock positions.

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RHEGMATOGENOUS RETINAL detachment (RRD) remains a major problem after cataract surgery because it occurs in approximately 1% of eyes.1 The use of pars plana vitrectomy (PPV) in pseudophakic RRD has gained increasing popularity over the last decade.2 It can be used alone or in combination with scleral explants.2-13 Pars plana vitrectomy improves the visualization of peripheral retina and identification of retinal breaks and enables the removal of vitreous traction.7

Few works have specifically studied the management of inferior breaks during PPV without scleral buckle procedures. In such cases, it is recognized that strict postoperative prone positioning is essential for tamponade inferior breaks when gas or silicone oil is used. This positioning is difficult and uncomfortable for many patients. Posturing periods in the literature vary from 8 to 12 days.14

The current study was conducted to determine the efficacy and safety of PPV and air in pseudophakic RRD with inferior breaks. To our knowledge, this is the first report on the use of PPV for inferior breaks with 24 hours of prone positioning.

METHODS

We included 15 consecutive patients (15 eyes) of 24 consecutive patients with primary pseudophakic RRD and causative inferior breaks between the 4-o’clock and 8-o’clock positions over a 1-year period. Inferior RRD with subretinal fibrosis or demarcation lines and RRD with proliferative vitreoretinopathy B or greater were excluded. All patients had acute symptoms. Extensive lattice degeneration was not an exclusion criterion. Patients were fully informed of all aspects of the procedure, and all provided written informed consent. We obtained local ethics committee approval for this study.

Preoperative evaluation included slitlamp biomicroscopy fundus examination and peripheral retinal evaluation with the binocular indirect ophthalmoscope. The number, type (opercule or horseshoe tear), position (anterior to the equator, equatorial, and posterior to the equator), and size of breaks were determined preoperatively. During postoperative follow-up, the relationship between the air bubble and retinal breaks was established by slitlamp examination.
All procedures were performed under retrobulbar anesthesia by the same surgeon (V.M.-C.). Three-port PPV was performed using a wide-angle viewing system. After central and peripheral vitreous removal, all eyes underwent intraoperative scleral depression for 360° for trimming of the vitreous base and removal of all vitreous traction on retinal tears. Vitreous was removed over the pars plana. Perfluoro-n-octane (C8F18; Adato-octa, Adatomed, München, Germany) was injected over the posterior pole through a 20-gauge blunt cannula in all cases. Once it reached the posterior border of the break, a fluid-air exchange was performed to drain the subretinal fluid through the causative break. Sclerotomies were carefully reviewed before the fluid-air exchange. Two rows of diode laser retinopexy (IRIS Medical Inc, Mountain View, Calif) were applied to treat causative breaks after the fluid-air exchange; 360° prophylactic laser was not used. No drainage retinotomy was performed. At the end of the procedure, fluid was aspirated with a flute needle to ensure complete air-fill of the cavity.

Air was used as an internal tamponade in all cases. Sclerotomies were carefully closed to avoid air loss during the first postoperative hours. No complications developed during the surgical procedure. Patients were instructed to maintain the prone position for 24 hours postsurgery. No break had tamponade for more than 3 days. Patient demographic data and RRD characteristics are listed in Table 1 and Table 2. All patients maintained the prone position for 24 hours postsurgery.

Preoperative visual acuity for the entire population ranged from 20/400 to 20/25 (mean, 20/60). Postoperative visual acuity ranged from 20/100 to 20/20 (mean, 20/30) at the final follow-up visit. In 1 patient (case 14) the retina redetached at the second week because of an undetected opercule at the 6-o’clock position anterior to the primary break and was treated with PPV and 25% sulfur hexafluoride. Another patient developed an epiretinal membrane that required PPV. We observed an inferior break in 1 patient (Figure). No major postoperative complications occurred.

RESULTS

Seven eyes of 7 men (46.66%) and 8 eyes of 8 women (53.33%) composed our study population. Mean follow-up was 8 months (range, 7-10 months). Mean patient age was 58.33 years (range, 29-79 years). On preoperative examination, all eyes had a posterior chamber intraocular lens. The posterior lens capsule was intact in 11 (73.33%) of 15 eyes and broken at the time of cataract surgery or postoperatively with a Nd-YAG laser capsulotomy in 4 eyes (26.66%). The mean number of quadrants affected was 2 (range, 1-5). Thirty breaks were treated: 25 anterior to the equator, 4 equatorial, and 1 posterior to the equator. Twenty-one breaks were less than 1 clock hour and 9 were 1 clock hour or larger. Nine breaks were opercules and 21 horseshoe tears. The average size of the air bubble on postoperative day 1 was 79%, and the range was 60% to 90%. Five breaks located at the 6-o’clock position were not covered by air at 24 hours postsurgery without prone positioning. No break had tamponade for more than 3 days.

Pars plana vitrectomy for pseudophakic RRD has gained popularity over the last decade. The advantages of PPV are the removal of all vitreous traction on retinal tears and improved microscope visualization of peripheral retina. This advantage is very important in patients with pseudophakia because preoperative examination is more difficult than in phakic patients. Other advantages are the removal of posterior capsular lens opacities for better visualization of the peripheral retinal tears and minimal changes induced in refractive error.

Two potential disadvantages of repairing pseudophakic retinal detachments with primary PPV are the need...
for postoperative positioning and the restriction from air travel.14

When causative breaks are located inferiorly (between the 4-o’clock and 8-o’clock positions), 1 inherent problem in the use of PPV is the difficulty in maintaining a direct tamponade on inferior breaks for at least 8 days using different currently available gases.14 Indeed, perfluorocarbon liquids and different types of silicone oil have been used to tamponade these breaks in RRD.15,16 However, the minimum number of days in the prone position required to ensure tamponade of inferior breaks remains to be determined.

Different authors have reported on the management of inferior breaks with PPV alone.2–8 Tanner et al2 reported an 89% anatomic success rate in a pilot study with 3 different tamponade agents (30% sulfur hexafluoride, 12%-14% perfluoropropane, and silicone oil). All patients were instructed to maintain the prone position for 10 days. Escoffery et al3 identified 2 cases; however, no information is given on the results in these 2 cases. Heimann et al8 treated 6 patients with primary RRD and inferior breaks with PPV and sulfur hexafluoride. They reported a 50% retinal redetachment rate. All these series included both inferior and superior causative breaks. There is no consensus on the type of tamponade agent and the duration of prone posture. In cases with gas, a minimum of 8 to 10 days prone posture has been recommended.14

In this series, it proved possible to manage inferior breaks in pseudophakic RRD with PPV alone and 24 hours of prone positioning. The present study included only inferior RRD with causative breaks located between the 4-o’clock and 8-o’clock positions to determine the minimum time of tamponade required for the retinopexy to be effective. Our overall success rate of reattachment with 1 procedure was 93.3%. Mean postoperative best-corrected visual acuity was 20/30 (range, 20/100 to 20/20). No major complications developed during postoperative follow-up. These results compare favorably with those of previous series.2,10 However, careful case selection and the limited number of eyes may have influenced these results.

Yoon and Marmor17 provided direct experimental evidence that fresh laser burns produced a greater-than-normal adhesive bond between the retina and retinal pigment epithelium at 24 hours posttreatment. They also stated that the adhesive force of the photocoagulated areas continued to increase for 2 weeks.17 Folk et al19 reported similar results in a different experimental model and 1 human eye. Kita et al19 measured the retinal adhesive force after laser photocoagulation in living eyes and observed rapid enhancement at 24 hours. This is the reason for maintaining postoperative prone positioning for 24 hours.

The concept of performing PPV with air and 24 hours of prone posturing arose from clinical observations made in the first 24 hours post-PPV without scleral buckling in pseudophakic RRD with perfluoropropane tamponade. We observed that breaks in 2 patients located between the 5-o’clock and 7-o’clock positions were not covered by the gas at 24 hours postsurgery. These patients maintained only 1 day of prone posturing and the retina reattached without complications. On the basis of these observations, we decided to use air to reduce morbidity and enable rapid visual recovery.

In our series, 5 of the 30 breaks were located at the 6-o’clock position. In all these cases, air was effective for retinal reattachment. In these cases, the process of chorioretinal adhesion was not influenced by the position of the breaks and retinal reattachment was achieved. The efficacy of a tamponade agent lies in its ability to make contact with the retina.20,21 We believe that the size of the air bubble during the first hours is most important for tamponade of inferior retinal breaks. Peripheral vitreous removal and pseudophakia are the main factors influencing the bubble size because they both permit complete filling of the vitreous cavity. In this series, the final reattachment rate of 100% was not affected by break size or type. Tamponade of inferior breaks for the first 24 hours postsurgery suffices for chorioretinal adhesion.

In summary, the implications of this study are that 24 hours of prone positioning is effective for the man-

### Table 2. Characteristics of Rhegmatogenous Retinal Detachments

<table>
<thead>
<tr>
<th>Patient No.</th>
<th>Quadrants</th>
<th>Macula</th>
<th>Breaks, No. (Types)</th>
<th>Break Size in Disc Diameter</th>
<th>Break Position in Clock Hour</th>
<th>Break Position in Relation to Equator</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>2</td>
<td>Off</td>
<td>5 (H, O, O, H, H)</td>
<td>½, ¼, ¼, 1½, 1¼</td>
<td>4, 3½, 5, 6, 7</td>
<td>Anterior</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Off</td>
<td>1 (H)</td>
<td>½</td>
<td>7</td>
<td>Anterior</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>On</td>
<td>2 (D, O)</td>
<td>½, ¼</td>
<td>6, 8</td>
<td>Anterior</td>
</tr>
<tr>
<td>4</td>
<td>2</td>
<td>Off</td>
<td>3 (H, H, H)</td>
<td>¼, ¼, ½</td>
<td>4, 3½, 5-½</td>
<td>Anterior</td>
</tr>
<tr>
<td>5</td>
<td>2</td>
<td>On</td>
<td>2 (H, H)</td>
<td>½</td>
<td>4, 5½</td>
<td>Anterior</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>On</td>
<td>1 (H)</td>
<td>½</td>
<td>6</td>
<td>Anterior</td>
</tr>
<tr>
<td>7</td>
<td>2</td>
<td>Off</td>
<td>2 (H, H)</td>
<td>½, ¼</td>
<td>4, 7</td>
<td>Anterior, at equator</td>
</tr>
<tr>
<td>8</td>
<td>2</td>
<td>Off</td>
<td>1 (O)</td>
<td>1</td>
<td>5</td>
<td>Anterior</td>
</tr>
<tr>
<td>9</td>
<td>2</td>
<td>Off</td>
<td>1 (O)</td>
<td>½</td>
<td>5</td>
<td>Anterior</td>
</tr>
<tr>
<td>10</td>
<td>3</td>
<td>On</td>
<td>2 (H, H)</td>
<td>½, ¼</td>
<td>4, 5</td>
<td>Anterior</td>
</tr>
<tr>
<td>11</td>
<td>1</td>
<td>Off</td>
<td>2 (H, H)</td>
<td>½, ¼</td>
<td>4</td>
<td>Anterior-posterior</td>
</tr>
<tr>
<td>12</td>
<td>2</td>
<td>Off</td>
<td>3 (H, O, H)</td>
<td>¼, ¼, 1</td>
<td>4, 3½, 5, 6</td>
<td>Anterior-anterior</td>
</tr>
<tr>
<td>13</td>
<td>2</td>
<td>Off</td>
<td>1 (H)</td>
<td>1</td>
<td>5</td>
<td>Anterior</td>
</tr>
<tr>
<td>14</td>
<td>2</td>
<td>Off</td>
<td>2 (H, O)</td>
<td>½, ¼</td>
<td>6, 3½</td>
<td>Anterior, at equator</td>
</tr>
<tr>
<td>15</td>
<td>2</td>
<td>On</td>
<td>2 (H, O)</td>
<td>½, ¼</td>
<td>4, 3½</td>
<td>Anterior, at equator</td>
</tr>
</tbody>
</table>

Abbreviations: H, horseshoe tear; O, opercula.
The combination of excellent patient selection, meticulous peripheral vitrectomy, and laser retinopexy account for the anatomic results in this series. The results are encouraging and, if reproducible in a larger series, might persuade surgeons to reduce postoperative posturing time in these patients.

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REFERENCES


Figure. A, Case 5: fundus photography showing a primary break before surgery. Horseshoe tear from the 5-o’clock to 7-o’clock positions. B, Postoperative day 7: fundus photography showing the same break photocoagulated. C, Postoperative 1 month: fundus photography showing the primary break pigmented.