Pneumatic Retinopexy

Results in Eyes With Classic vs Relative Indications

Guy Kleinmann, MD; Ehud Rechtman, MD; Ayala Pollack, MD; Edna Schechtman, PhD; Amir Bukelman, MD

Objective: To compare the results of pneumatic retinopexy in 3 groups of eyes with rhegmatogenous retinal detachment.

Methods: In this retrospective, consecutive study, 44 eyes of 44 patients who underwent pneumatic retinopexy were divided into 3 groups: eyes with vitreoretinal abnormalities (group A), pseudopakic or aphakic eyes (group B), and phakic eyes without vitreoretinal abnormalities (group C).

Results: Single retinopexy success was achieved in 10 (71%) of 14 eyes in group A, 7 (64%) of 11 eyes in group B, and 16 (84%) of 19 eyes in group C (P = .42). Final success after reoperation was achieved in 13 (93%) of 14 eyes in group A, 10 (91%) of 11 eyes in group B, and in all 19 eyes in group C (P = .44). In group B, the rate of single retinopexy success using cryotherapy was significantly higher (5/5; 100%) than when laser photocoagulation was used (1/5; 20%) (P = .015). The final visual outcome obtained in the 3 groups was similar. There were no significant intergroup differences in either early or late complications.

Conclusions: The best results were achieved in eyes with classic indications for pneumatic retinopexy, though the differences between these results and those in the non-classic indications were not significant. In pseudophakic or aphakic eyes, the rate of single operation success after cryopexy was significantly higher than the rate after laser photocoagulation.

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Methods

We retrospectively reviewed a consecutive series of patients who underwent pneumatic retinopexy as a first procedure for rhegmatogenous retinal detachment (RRD) at Kaplan Medical Center (Rehovot, Israel) between March 1983 and December 1998. In this study, we included all eyes with RRD in which the break was between clock hours 8 and 4 (superior break) and not exceeding 1 clock hour in extent, and eyes with multiple superior retinal breaks extending for not more than 1 clock hour. We excluded all eyes with long-standing RRD, eyes with RRD subsequent to trauma, and eyes of patients who did not comply with the instructions for postretinopexy positioning or who had not completed at least 3 months of follow-up. Eyes with combined pathology (pseudophakia/aphakia and vitreoretinal pathology) were also excluded from this study.

For purposes of the study, 3 groups were defined. Group A consisted of eyes with vitreoretinal abnormalities, including high myopia (defined as a spherical equivalent of 6 diopters or higher), peripheral retinal degeneration such as lattice degeneration of 1 clock hour or larger, and old retinal breaks. Group B consisted of pseudophakic or aphakic eyes without vitreoretinal abnormalities, including high myopia (defined as a spherical equivalent of 6 diopters or higher), peripheral retinal degeneration such as lattice degeneration of 1 clock hour or larger, and old retinal breaks. Group C consisted of eyes with vitreoretinal abnormalities, including high myopia (defined as a spherical equivalent of 6 diopters or higher), peripheral retinal degeneration such as lattice degeneration of 1 clock hour or larger, and old retinal breaks.
vitreoretinal pathology. Group C was composed of phakic eyes without vitreoretinal abnormalities.

Retinopexy was carried out either by laser photocoagulation after attachment of the retina or by cryotherapy performed before the gas injection. The choice of procedure was based on visibility of the retinal tear. Laser photocoagulation was the procedure of choice when the break was visible through a contact lens. Cryopexy was performed when the break was difficult to identify by contact lens because of opaque media such as opacification of the posterior capsule in pseudophakic eyes. All of the patients signed informed consent forms.

Single-operation success was defined as successful retinal attachment following the first attempt at pneumatic retinopexy. Final success was defined as successful attachment either after single-operation success or after an additional operation.

The categorical data were analyzed using chi-squared for association, and the Fisher exact test where possible. Since the expected values of some of the cells were small, the chi-squared test could serve only as an indication. Intergroup differences in visual acuity were analyzed by the Wilcoxon signed rank test (owing to the lack of normality of the data). Differences among the 3 groups were compared using the Kruskal-Wallis test.

### RESULTS

A total of 44 eyes of 44 patients were included in the study. Group A consisted of 14 eyes with vitreoretinal abnormalities; group B consisted of 11 pseudophakic or aphakic eyes; and group C included 19 phakic eyes, none of which had vitreoretinal abnormalities.

Of the 14 eyes with vitreoretinal abnormalities in group A, 9 had a high degree of myopia, 5 had lattice degeneration, and 2 had previously undergone laser photocoagulation for preexisting retinal breaks that were not in the detached retina (the breaks occurred at least one year earlier). Of the 11 eyes in group B, 9 had posterior chamber IOLs, 1 had an anterior chamber IOL, and 1 was aphakic. Two eyes in this group had undergone Nd:YAG laser capsulotomy for secondary cataract.

The clinical characteristics of the 3 groups are presented in Table 1. The groups did not differ significantly with regard to detachment characteristics (Table 2). Most of the eyes had detachment of 1 or 2 quadrants (86%, 82%, and 95% in groups A, B, and C, respectively; P = .57) and about half of the eyes (50%, 45%, and 47%, respectively) had macular involvement (P = .97). For scar formation (Table 3), cryotherapy was performed more often in group B (45%) than in the other 2 groups (14% in group A and 21% in group B), but the difference was not significant. Primary single-operation success (Table 4) was achieved more often in group C (84%) than in group A (71%) or group B (64%), but the differences between the groups were not significant. The last primary failure occurred 6 weeks after pneumatic retinopexy was performed in group A, 4 weeks in group B, and 18 days in group C. The final success rate was similar in the 3 groups (93% in group A, 91% in group B, and 100% in group C; P = .44). Failures were attributable to inoperable proliferative vitreoretinopathy.

With regard to the scar formation technique, in group B, the single operation results were better in eyes that received cryotherapy than in eyes that received laser photocoagulation (P = .02), but the 2 procedures had no differential effect on the final success rate (P = .45) (Table 5). In all 3 groups, single-operation success was greater when the macula was detached (P = .04) (Table 6). Attachment of the retina led to a significant improvement in visual acuity in each group (P = .03 in group A, P = .03 in group B, P = .02 in group C) (Table 7), and differences between the groups were not significant (P = .48). More than 60% of the eyes in each group achieved a final visual acuity of 20/60 or better (Table 8).

There were no significant differences in complications between the groups (Table 9). In the subgroup

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**Table 1. Clinical Characteristics**

<table>
<thead>
<tr>
<th>Characteristic</th>
<th>Group A (n = 14)</th>
<th>Group B (n = 11)</th>
<th>Group C (n = 19)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Male-female ratio (%)</td>
<td>8.6 (57-43)</td>
<td>7.4 (64-36)</td>
<td>13.6 (68-32)</td>
</tr>
<tr>
<td>Mean (range) age, y</td>
<td>50.6 (16-75)</td>
<td>65.6 (53-76)</td>
<td>65.1 (41-82)</td>
</tr>
<tr>
<td>Left eye-right eye ratio</td>
<td>11.3</td>
<td>6.5</td>
<td>12.7</td>
</tr>
<tr>
<td>Mean (range) follow-up, mo</td>
<td>6.6 (3-18)</td>
<td>17.4 (3-55)</td>
<td>10.5 (3-44)</td>
</tr>
</tbody>
</table>

**Table 2. Retinal Detachment Characteristics**

<table>
<thead>
<tr>
<th>No. (%) of Eyes</th>
<th>Group A (n = 14)</th>
<th>Group B (n = 11)</th>
<th>Group C (n = 19)</th>
</tr>
</thead>
<tbody>
<tr>
<td>No. of quadrants detached</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>5 (36)</td>
<td>2 (18)</td>
<td>8 (42)</td>
</tr>
<tr>
<td>2</td>
<td>7 (50)</td>
<td>7 (64)</td>
<td>10 (53)</td>
</tr>
<tr>
<td>3</td>
<td>1 (7)</td>
<td>2 (16)</td>
<td>1 (5)</td>
</tr>
<tr>
<td>4</td>
<td>1 (7)</td>
<td>0 (0)</td>
<td>0 (0)</td>
</tr>
<tr>
<td>Macula</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Attached</td>
<td>7 (50)</td>
<td>6 (55)</td>
<td>10 (53)</td>
</tr>
<tr>
<td>Detached</td>
<td>7 (50)</td>
<td>5 (45)</td>
<td>9 (47)</td>
</tr>
</tbody>
</table>

**Table 3. Technique of Scar Formation**

<table>
<thead>
<tr>
<th>No. (%) of Eyes</th>
<th>Group A (n = 11)</th>
<th>Group B (n = 14)</th>
<th>Group C (n = 19)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Laser</td>
<td>12 (86)</td>
<td>5 (45)</td>
<td>12 (63)</td>
</tr>
<tr>
<td>Cryotherapy</td>
<td>2 (14)</td>
<td>5 (45)</td>
<td>4 (21)</td>
</tr>
<tr>
<td>Combined</td>
<td>0 (0)</td>
<td>1 (11)</td>
<td>3 (16)</td>
</tr>
</tbody>
</table>

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*Group A included phakic eyes with vitreoretinal pathological features; Group B, pseudophakic/aphakic eyes without vitreoretinal pathological features; and Group C, phakic eyes without vitreoretinal pathological features.

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of early complications, 2 eyes (1 in group B and 1 in group C) developed new retinal breaks that were treated by laser photocoagulation and did not progress to retinal detachment. Residual subretinal fluid appeared in 4 eyes (1 in group A and 3 in group C), but eventually resolved. One eye in group C developed pyogenic granuloma at the injection site, which resolved on treatment with local steroids. All other early complications (ie, hypotony and vitreous hemorrhage) resolved without treatment. In the subgroup of late complications, 2 eyes in group A and 1 eye in group C developed an epiretinal membrane. Only 1 eye in group A had visually significant epiretinal membrane and was operated on. The final visual acuity in that eye was 20/50. One eye in group C developed cystoid macular edema. The final visual acuity in that eye was 20/30. One eye in each group developed proliferative vitreoretinopathy.

Table 4. Reattachment Results

<table>
<thead>
<tr>
<th>No. (%) of Eyes</th>
<th>Group A (n = 14)</th>
<th>Group B (n = 11)</th>
<th>Group C (n = 19)</th>
<th>Total (n = 44)</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary success failure ratio (%) ratio</td>
<td>10.4 (71.29)</td>
<td>7.4 (64.36)</td>
<td>16.3 (84.16)</td>
<td>33.11 (75.25)</td>
<td>.42</td>
</tr>
<tr>
<td>Operation</td>
<td>4 (29)</td>
<td>4 (36)</td>
<td>3 (16)</td>
<td>11 (25)</td>
<td>…</td>
</tr>
<tr>
<td>SB</td>
<td>2 (14)</td>
<td>0 (0)</td>
<td>2 (11)</td>
<td>4 (9)</td>
<td>…</td>
</tr>
<tr>
<td>PPV</td>
<td>0 (0)</td>
<td>2 (18)</td>
<td>0 (0)</td>
<td>2 (5)</td>
<td>…</td>
</tr>
<tr>
<td>SB + PPV</td>
<td>2 (14)</td>
<td>2 (18)</td>
<td>1 (5)</td>
<td>5 (11)</td>
<td>…</td>
</tr>
<tr>
<td>Additional operations</td>
<td>1 (7)</td>
<td>1 (9)</td>
<td>2 (11)</td>
<td>4 (9)</td>
<td>…</td>
</tr>
<tr>
<td>Final success failure ratio (%) ratio</td>
<td>13.1 (93.7)</td>
<td>10.1 (91.9)</td>
<td>19.0 (100.0)</td>
<td>42.2 (95.5)</td>
<td>.44</td>
</tr>
</tbody>
</table>

*S indicates scleral buckle; PPV, pars plana vitrectomy. Group A included phakic eyes with vitreoretinal pathological features; Group B, pseudophakic/aphakic eyes without vitreoretinal pathological features; and Group C, phakic eyes without vitreoretinal pathological features.

Table 5. Anatomical Reattachment Success According to the Technique Used for Scar Formation

<table>
<thead>
<tr>
<th>No. (%) of Eyes</th>
<th>Laser</th>
<th>Cryopexy</th>
<th>Laser + Cryopexy</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>9/12 (75)</td>
<td>1/2 (50)</td>
<td>0</td>
<td>.5</td>
</tr>
<tr>
<td>Primary success</td>
<td>1/12 (92)</td>
<td>2/2 (100)</td>
<td>0</td>
<td>.86</td>
</tr>
<tr>
<td>Final success</td>
<td>1/5 (20)</td>
<td>5/5 (100)</td>
<td>1/1 (100)</td>
<td>.015</td>
</tr>
<tr>
<td>Group B</td>
<td>1/4 (80)</td>
<td>5/5 (100)</td>
<td>1/1 (100)</td>
<td>.45</td>
</tr>
<tr>
<td>Primary success</td>
<td>11/12 (92)</td>
<td>2/4 (50)</td>
<td>3/3 (100)</td>
<td>.3</td>
</tr>
<tr>
<td>Final success</td>
<td>12/12 (100)</td>
<td>4/4 (100)</td>
<td>3/3 (100)</td>
<td>.99</td>
</tr>
<tr>
<td>Group C</td>
<td>21/29 (72)</td>
<td>8/11 (73)</td>
<td>4/4 (100)</td>
<td>.44</td>
</tr>
<tr>
<td>Total</td>
<td>27/29 (93)</td>
<td>11/11 (100)</td>
<td>4/4 (100)</td>
<td>.43</td>
</tr>
</tbody>
</table>

*Group A included phakic eyes with vitreoretinal pathological features; Group B, pseudophakic/aphakic eyes without vitreoretinal pathological features; and Group C, phakic eyes without vitreoretinal pathological features.

Table 6. Anatomical Reattachment Success According to the Initial Macular Status

<table>
<thead>
<tr>
<th>No. (%) of Eyes</th>
<th>Macula On</th>
<th>Macula Off</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A</td>
<td>4/7 (57)</td>
<td>6/7 (86)</td>
<td>.56</td>
</tr>
<tr>
<td>Primary success</td>
<td>6/7 (86)</td>
<td>7/7 (100)</td>
<td>.10</td>
</tr>
<tr>
<td>Group B</td>
<td>2/6 (33)</td>
<td>5/5 (100)</td>
<td>.06</td>
</tr>
<tr>
<td>Primary success</td>
<td>5/6 (83)</td>
<td>5/5 (100)</td>
<td>.99</td>
</tr>
<tr>
<td>Group C</td>
<td>8/10 (80)</td>
<td>8/9 (89)</td>
<td>.99</td>
</tr>
<tr>
<td>Primary success</td>
<td>10/10 (100)</td>
<td>9/9 (100)</td>
<td>.99</td>
</tr>
<tr>
<td>Group B</td>
<td>14/23 (61)</td>
<td>19/21 (91)</td>
<td>.04</td>
</tr>
<tr>
<td>Group C</td>
<td>21/23 (91)</td>
<td>21/21 (100)</td>
<td>.49</td>
</tr>
</tbody>
</table>

*Group A included phakic eyes with vitreoretinal pathological features; Group B, pseudophakic/aphakic eyes without vitreoretinal pathological features; and Group C, phakic eyes without vitreoretinal pathological features.

Table 7. Mean Visual Acuity Before and After Treatment (logMAR)

<table>
<thead>
<tr>
<th>No. (%) of Eyes</th>
<th>Pretreatment</th>
<th>Posttreatment</th>
<th>P Value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Group A (n = 14 eyes)</td>
<td>1.44</td>
<td>0.72</td>
<td>.03</td>
</tr>
<tr>
<td>Group B (n = 11 eyes)</td>
<td>2.10</td>
<td>0.91</td>
<td>.03</td>
</tr>
<tr>
<td>Group C (n = 19 eyes)</td>
<td>1.16</td>
<td>0.64</td>
<td>.02</td>
</tr>
</tbody>
</table>

*Group A included phakic eyes with vitreoretinal pathological features; Group B, pseudophakic/aphakic eyes without vitreoretinal pathological features; and Group C, phakic eyes without vitreoretinal pathological features.
This study compares our experience with pneumatic retinopexy in 19 eyes with classical indications for the procedure, with results in eyes having conditions (pseudophakic/aphakic [n = 14] or vitreoretinal abnormalities [n = 11]) formerly thought to be unsuitable for pneumatic retinopexy but that are today considered only relatively contraindicated.

The overall single-operation success rate for all of our patients (ie, whether their indications for the procedure were classic or relative) was 75% (33/45). This incidence is similar to that reported in the literature for scleral buckling. The final success rates in our 3 groups of eyes were similar, implying that initial failure to attach the retina by pneumatic retinopexy does not decrease the chances for final reattachment. The 3 groups also did not differ significantly in their final visual outcome. More than 60% of the eyes in each group achieved visual acuity of 20/60 or better (64% in group A, 60% in group B, and 61% in group C). These data are consistent with the literature reports in which 65% to 89% of eyes achieved a final visual acuity of 20/30 or better.

In the group of pseudophakic or aphakic eyes in this study, cryopexy resulted in a better single-operation success rate than the use of laser photocoagulation (P = .02). One of the many factors that may contribute to this finding is that retinal tears found in pseudophakic and aphakic eyes tend to be small and located at the distal periphery. Laser radiation is difficult to apply to these areas, whereas cryotherapy is better.

Eyes in all groups developed a few complications, but the differences in the number of complications among the 3 groups were not significant. The most common complication was residual subretinal fluid, which appeared in 9% of the resolved cases. The eyes that were operated on were closely followed up to ensure that there were no missed retinal breaks and no progression. In contrast to previous reports, the progression of extramacular retinal detachment into the macula was not seen in our study. Proliferative vitreoretinopathy and epiretinal membrane development occurred in 7% of the whole population. This incidence is consistent with data in previous reports, as well as with the rate of complications after scleral buckling. The rate of new retinal breaks seen in this study was 5%, which is in the lower range of values obtained in previous reports (7%-23%), and is similar to the rate reported after scleral buckling.

In conclusion, the results of this study suggest that pneumatic retinopexy, in addition to its use in eyes with classical indications for this procedure, is also worth considering as the method of choice in eyes with relative indications, such as in cases of pseudophakia or aphakia, or vitreoretinal abnormalities. In pseudophakic or aphakic eyes, it seems that better single-operation success rates can be achieved with cryopexy than with laser photocoagulation.

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