



Outcomes after Failed Pneumatic Retinopexy for Retinal Detachment

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Purpose: To provide visual and anatomic outcomes for patients with retinal detachment (RD) in whom primary pneumatic retinopexy (PR) failed.

Design: Retrospective, single-center, consecutive case series.

Participants: Eyes with RD that failed a primary PR.

Methods: Anatomic and functional outcomes were evaluated for patients receiving treatment for failed PR. Three secondary procedures were compared, including repeat PR, pars plana vitrectomy (PPV), and combined scleral buckle (SB) plus PPV (SB+PPV).

Main Outcome Measures: Anatomic reattachment and visual acuity (VA) at 1 year.

Results: Of a total of 423 primary PRs performed for RD, this study included 73 cases that failed. The overall single surgery anatomic success rate for the secondary procedure was 75%; the final success rate at 1 year was 100%. There was no statistically significant difference in success rates between repeat PR (63%), PPV (76%), and SB+PPV (88%). Improvement in VA was similar at 1 year between all 3 groups. Visual acuity at 1 year was similar between eyes undergoing PPV and SB+PPV (0.47 logMAR VA [Snellen equivalent, 20/59] for PPV and 0.52 logMAR VA [Snellen equivalent, 20/66] for SB+PPV; $P = 0.75$). Visual acuity at 1 year was better for those without macular involvement at the time of secondary procedure compared with eyes whose maculae detached (0.29 logMAR VA [Snellen equivalent, 20/39] vs. 0.73 logMAR VA [Snellen equivalent, 20/106]; $P < 0.005$). Fifty percent of PR failures underwent a secondary procedure within 1 week of primary PR; 80% occurred within 1 month.

Conclusions: Anatomic success rates for secondary PR, PPV, and SB+PPV after failed PR were lower than published success rates for their use in primary RD. This suggests that a failed primary PR selects for RDs that are inherently more difficult to reattach. There was a trend suggesting that anatomic success rates are greater with SB+PPV than PPV and, in turn, with PPV than repeat PR. However, these differences were not statistically significant and did not translate into better VA gains at 1 year for either procedure. The suitable procedure after failed PR thus depends on patient presentation, surgeon preference, and patient preference. *Ophthalmology* 2016;■:1–6 © 2016 by the American Academy of Ophthalmology.



Supplemental material is available at www.aaojournal.org.

Pneumatic retinopexy (PR) is a useful office-based procedure for treating select cases of primary rhegmatogenous retinal detachment (RD). The reported single-surgery success rate of PR ranges from 45% to 90%, with an average rate of approximately 75%.¹ Many groups have investigated preoperative factors that are predictive of success, as well as appropriate expanded inclusion criteria.^{2–5} Relatively fewer studies analyze outcomes in the patient cohort in whom primary PR fails.^{6–8} Recently, Fabian et al⁸ found no significant difference in visual acuity (VA) outcomes between successful PR cases and those with only 1 additional operation, but significantly worse outcomes in the cases requiring 2 or more additional operations. However, their results were not stratified by procedure type. After initial PR failure, the comparative anatomic and functional outcomes for secondary PR, pars plana vitrectomy (PPV), and combined scleral buckle (SB) plus PPV (SB+PPV) remains unknown. This study compares the outcomes after primary PR failure according to

secondary procedure type and preoperative characteristics at the time of PR failure.

Methods

This was a retrospective, consecutive case review conducted at a single center, Ophthalmic Consultants of Boston, Boston, Massachusetts. Institutional review board approval was obtained from Chesapeake Institutional Review Board, Columbia, Maryland. Ten surgeons performed the vitreoretinal procedures (3 of 10 surgeons are authors: C.P.S., J.S.H., and M.G.M.). All eyes demonstrating a recurrent or persistent retinal detachment after primary PR from July 1, 2009, through July 1, 2014, were included in the study. A primary PR involved cryotherapy to the break(s) followed by an intraocular gas injection. A failed PR was defined as one in which the eye required a repeat PR, PPV, or SB+PPV for persistent or recurrent retinal detachment within 1 year of the primary PR. Only 1 eye meeting inclusion criteria underwent SB without PPV after failed PR, and thus this case was excluded in analysis. Eyes requiring only additional laser or cryotherapy in the immediate

postoperative period were not considered pneumatic failures. Patients were followed up for up to 1 year. Five patients had less than 1 year, but more than 6 months, of follow-up; therefore, the last observation for these patients was carried forward to 1 year. Those who did not require an additional PR or vitreoretinal procedure for RD within 1 year were excluded.

Patients seeking treatment from July 1, 2009, through May 1, 2012 were included in a prior published study that analyzed success rates and preoperative characteristics of the primary pneumatic procedure.⁵ The current study adds patients through July 1, 2014, and differs from the prior study by evaluating outcomes specifically in patients whose primary PR failed.

Demographic variables collected included age, gender, right or left eye, and history of prior retinal laser therapy or cryotherapy. Variables collected for the presentations at initial PR and time of PR failure were macula status, lens status, presence of posterior vitreous detachment, presence of lattice degeneration, presence of vitreous hemorrhage, presence of bridging vessel, whether there was visible traction on the tear, the presence of proliferative vitreoretinopathy, and the performance of additional procedures. The reason for failure was deduced at the time of PR failure according to the surgeon's retinal examination and assessment. Reasons for failure included (1) missed or new break, (2) persistent detachment, or (3) proliferative vitreoretinopathy. Visual acuity was assessed at primary presentation, time of PR failure, and the 1-year follow-up available through July 1, 2015. Visual acuity was recorded on a Snellen chart as the better-observed vision between spectacle-corrected and pin-hole measures. Development of PVR and date of cataract surgery also were collected longitudinally for each patient.

Descriptive statistics were used to summarize the demographic features, preoperative characteristics, visual presentations, and functional and anatomic outcomes. Composite analysis on all surgeries and subgroup analysis was performed for cases undergoing PR, pars plana vitrectomy, and SB+PPV. Functional outcomes also were subanalyzed according to macula status for all procedures and lens status for PPV procedures. The latter sub-analysis was an attempt to control for cataract development among phakic patients. Anatomic success rates were compared overall and on a procedure-specific basis for all patients, phakic patients, pseudophakic patients, macula-on patients at the time of PR failure, and macula-off patients at the time of PR failure.

Statistical analyses were performed using Stata software version 12 (Stata Corp, College Station, TX) and Microsoft Excel (Microsoft, Redmond, WA). A 2-tailed test of proportion was used to compare rates and other discrete outcomes. A 2-tailed paired Student *t* test was used to compare VA presentation differences and outcomes.

Results

Demographics

Of 426 PR cases that occurred within the study period, 73 cases met inclusion and exclusion criteria. Previous publication showed that the initial PR success rate for this group of surgeons is 79%.⁵ Demographics of the included cases are displayed in Table 1 (available at www.aojournal.org) and are stratified by secondary procedure.

Preoperative characteristics at primary presentations and time of PR failure are presented in Table 2 for each type of secondary procedure. Overall, 77% and 66% of maculae were attached at the primary presentation and time of PR failure, respectively. A similar number of eyes undergoing secondary PPV or SB+PPV had attached maculae (61% vs. 63%; $P = 1$), but a

Table 2. Preoperative Characteristics of Eyes at Time of Pneumatic Retinopexy Failure

	All	Repeat	Pars Plana	Scleral Buckle
		Pneumatic Retinopexy	Vitreotomy	Plus Pars Plana Vitrectomy
Macula status				
Attached	48 (66)	13 (81)	25 (61)	10 (63)
Detached	25 (34)	3 (19)	16 (39)	6 (38)
Lens status				
Phakic	48 (66)	9 (56)	25 (60)	14 (88)
Pseudophakic	25 (34)	7 (44)	16 (40)	2 (13)
Posterior vitreous detachment	46 (63)	7 (44)	30 (73)	9 (56)
Any lattice degeneration	12 (16)	3 (31)	5 (12)	4 (25)
Proliferative vitreoretinopathy	4 (5)	0 (0)	1 (2)	3 (19)
Reason for PR failure				
Missed or new break	27 (37)	8 (50)	14 (30)	5 (31)
Persistent detachment	42 (58)	8 (50)	26 (60)	8 (50)
PVR	4 (5)	0 (0)	1 (2)	3 (19)

PR = pneumatic retinopexy; PVR = proliferative vitreoretinopathy. Data are absolute occurrence (percent). Percent of "All" cases reflects the percent of total cases. Percent for specific procedures is the percent of cases for that procedure.

nonsignificantly higher percentage of eyes undergoing repeat PR had attached maculae (81%; $P = 0.23$). A higher percentage of eyes undergoing SB+PPV had PVR compared with eyes undergoing PPV, with borderline statistical significance (19% for SB+PPV vs. 2% for PPV [$P = 0.06$]; 19% for SB+PPV vs. 0% for repeat PR [$P = 0.22$]).

Time to Failure of Initial Pneumatic Retinopexy

The cumulative 50th percentile for time to failure of the initial PR was 6 days and ranged from 1 to 250 days (Fig 1). Most PR failures (80%) occurred within 1 month of primary PR. Twelve eyes (21%) with attached maculae at the time of primary PR had a detached macula at the time of their secondary procedure. The cumulative fiftieth percentile to macula detachment was 7 days and ranged from 1 to 157 days (Fig 1).

Anatomic Outcomes

No significant differences were observed in single-surgery anatomic success rates for the secondary procedure when stratified by procedure type (75% overall; 63% repeat PR vs. 76% PPV [$P = 0.34$]; repeat PR vs. 88% SB+PPV [$P = 0.22$]; PPV vs. SB+PPV [$P = 0.48$]; Fig 2). There were no differences in the combined anatomic success rates between phakic versus pseudophakic eyes (79% vs. 68%; $P = 0.39$), nor for macula-attached versus macula-detached eyes (79% vs. 65%; $P = 0.25$).

In total, 100 surgeries after the initial failed PR were performed on the 73 eyes (7 additional procedures for the 16 eyes in the repeat PR group vs. 3 additional procedures for the 16 eyes in the SB+PPV group [$P = 0.24$]; 17 additional procedures for the 41 eyes in the PPV group vs. 3 additional procedures for the 16 SB+PPV eyes [$P = 0.24$]). One PPV eye underwent a total of 4 procedures and 1 underwent a total of 6 procedures. Final anatomic success at 1 year was 100%.

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