SCIENTIFIC REPORT

Pneumatic retinopexy: success rate and complications

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Aim: To evaluate the success rate and complications of pneumatic retinopexy performed at a university hospital and to identify which patients are best suited for pneumatic retinopexy.

Methods: This was an interventional case series. Retrospective review of 61 patients who had pneumatic retinopexy performed by two retina surgeons at two University of California, San Francisco hospitals between 1998 and 2004. Patients who had been treated for rhegmatogenous retinal detachment (RRD) with pneumatic retinopexy were identified by reviewing operative reports and billing records. The primary outcome measure was anatomical reattachment of the retina with a single intervention. Secondary outcome measures included postoperative visual acuity and postoperative complications.

Results: 33 of 61 (54%) cases were successful with a single procedure. 40 of 61 (66%) cases were successful with repeat injection of gas or laser retinopexy alone. All cases had anatomical success at final follow up. Age, myopia, lens status, and number of breaks were not proved to be risk factors for failure. The average duration of follow up was 15 months.

Conclusions: In this case series, pneumatic retinopexy was less effective for the repair of RRD than most large published reports. However, failure of pneumatic retinopexy followed by scleral buckle or pars plana vitrectomy did not negatively influence visual acuity at final follow up.

Pneumatic retinopexy (PR) was first introduced in the mid-1980s independently by Dominguez and by Hilton and Gizzard as a procedure to repair rhegmatogenous retinal detachments (RRD) using laser photocoagulation or cryotherapy in addition to injection of a gas bubble and postoperative positioning.[1 2] Although PR is popular because it is a minimally invasive outpatient procedure that is relatively simple to perform, cost effective, and has fewer surgical complications than scleral buckle (SB), it remains controversial because of uncertainty regarding its efficacy. Several studies have reported lower success rates of PR compared to SB.[3–5] However, while the initial success rate may be lower for PR, certain subgroups, such as phakic eyes with a single break in the superior fundus, may have comparable success rates.[6] Thus, case selection for PR remains an important issue. The purpose of this paper is to describe the success rates and complications of PR at a university hospital and to identify which patients are more suitable for this procedure.

METHODS

Design

Interventional case series.

Method

After obtaining approval from an institutional review board, the medical records of all patients who underwent PR at Moffitt Hospital or the San Francisco General Hospital between 1998 and 2004 were retrospectively reviewed. The following data were taken from the medical records and entered into a computer database: patient age and sex; lens status (phakic, pseudophakic, or aphakic); phakic refraction; preoperative visual acuity; location, size, and number of retinal tears; and presence of fluid beneath the fovea. There were no data recorded in the charts regarding the detachment (partial or complete) of the vitreous. Outcome data recorded included anatomical success (defined as complete anatomical attachment of the retina with a single procedure); final visual acuity; surgical complications; time and aetiology of re-detachment; location of new/missed tears; subsequent procedures performed; and duration of follow up. Cases with less than 1 month of follow up were excluded.

Each PR was performed by one of two attending retina surgeons using a technique similar to that previously described by Hilton and associates.[2] The choice of anaesthetic varied by surgeon preference, using either subconjunctival or retrobulbar lidocaine. This was followed by transconjunctival cryotherapy in the region of the retinal tear(s). An expansile concentration of sulfur hexafluoride (SF_6) gas was injected through a needle into the vitreous cavity through the pars plana. Anterior chamber paracentesis was performed when necessary to achieve an acceptable intraocular pressure. Postoperatively, patients were instructed to position themselves so that the bubble adequately covered the break for approximately 2 weeks or until the gas bubble disappeared.

Statistical analysis

Statistical analysis was performed using the Fisher exact and Mann-Whitney tests to assess overall initial success rate and to identify subgroups with higher success rates.

RESULTS

Patients

A total of 61 pneumatic retinopexies performed to treat primary rhegmatogenous retinal detachments by two retina specialists between 1998 and 2004 were identified. The average patient age was 54 (range 30–81). There were 24 right eyes and 37 left eyes. Forty (66%) of the patients were male and 21 (34%) were female. Forty three (70%) cases were phakic, 17 (28%) were pseudophakic, and one patient was aphakic. Eleven (18%) were high myopes (phakic refraction >-6). Twenty three (38%) cases had retinal detachments with subretinal fluid involving the fovea. All cases had classic indications for PR: 48 (79%) had a single break, 13 (21%) had 2–4 breaks, 48 (79%) had superior (10:00–2:00) breaks, and 13 (21%) had nasal (2:00–4:00) or temporal (8:00–10:00) breaks. In all cases with multiple breaks, the breaks were clustered within the same quadrant. Average duration of follow up was 14.9 months (range 1–66 months).

Abbreviations: PR, pneumatic retinopexy; RRD, rhegmatogenous retinal detachment; SB, scleral buckle; SF_6, sulfur hexafluoride; VA, visual acuity

Outcomes

Overall

Thirty three of 61 (54%) cases achieved anatomical reattachment of the retina with a single procedure. An additional seven cases were a qualified success—defined as anatomical reattachment with either repeat injection of gas or laser retinopexy alone—bringing the total success rate to 40 of 61 (66%). The mean visual acuity (VA) at final follow up for these cases was 20/25 versus 20/80 preoperatively. Twenty three of 28 (82%) re-detachments occurred within 1 month of the procedure. All cases that failed eventually achieved anatomical success. An average number of 1.36 operations were required to achieve reattachment. Seven of the 28 (25%) failures had repeat PR or laser alone; seven (25%) had scleral buckle alone; five (18%) had pars plana vitrectomy alone; and nine (32%) had multiple procedures. The final VA for the cases that failed and required additional retinal attachment surgery was 20/100 versus 20/300 at initial presentation.

Phakic status

Twenty five of 43 (58%) phakic eyes achieved anatomical reattachment with a single procedure compared to eight of 18 (44%) of pseudophakic or aphakic eyes. This difference was not statistically significant (Fisher's exact test, $p = 0.4269$). Twenty nine of 43 (67%) phakic eyes were qualified successes compared to 11 of 18 (61%) pseudophakic or aphakic eyes. This difference was not statistically significant ($p = 0.7690$).

Success rates did not differ according to age (<50, 51–70, >70), refractive error (>6D myopia *v* <6D myopia), and number of breaks (1 *v* multiple).

Complications

There were relatively few postoperative complications in our series. There were no cases of endophthalmitis, persistent elevated intraocular pressure, rapid cataract formation, choroidal haemorrhage or detachment, or proliferative vitreoretinopathy. Thirteen (21%) had new or missed retinal breaks. Of these, seven (54%) were in the same quadrant as the original break. One patient developed a giant retinal tear requiring scleral buckle and vitrectomy.

DISCUSSION

Our single operation success rate for pneumatic retinopexy performed at a university hospital was 54%; 66% of cases were successful with repeat injection or laser retinopexy alone. This success rate is lower than that of most previously published studies. A review of 26 studies by Grizzard *et al* in 1995 reported an average success rate of 79% (range 53–100%).[7] A subsequent study in 1998 by Lisle *et al* reported a rate of 83%.[8] In 1999, Assi *et al* reported a rate of 61%.[9] In 2000, Eter *et al* reported a rate of 65% and Abecia *et al* reported a rate of 82%[10 11] In 2002, Kleinmann *et al* found a rate of 75%.[12]

Our study did not identify risk factors for failure, such as age, lens status, myopia, or number of breaks. Although pseudophakic and aphakic eyes had a lower success rate compared to phakic eyes (44% *v* 58%) this trend was not statistically significant. Unfortunately, our small sample size limited our ability to analyse subgroups. Our study would have required 197 cases in each group to have an 80% power to detect such a difference.

Our series had a 21% rate of new or missed retinal breaks. It is likely that a majority of these tears were new tears because good preoperative visualisation of the retina with no additional breaks was a requirement for pneumatic retinopexy. The gas bubble may cause movement of the vitreous and additional retinal tears, making this high complication rate worrying.

If PR is significantly less effective than alternative procedures, the consequence to VA must be evaluated. One of the arguments justifying the use of PR is that if it fails, a subsequent retinal reattachment procedure can be performed without negative consequence on the final VA. The best way to evaluate this in our series was to look at the patients initially presenting with good vision (VA>20/50) with RRD not involving the fovea. In these 28 cases, nine failed and required additional procedures. The mean visual acuity at final follow up for these cases was 20/25− versus 20/25+ in the 19 cases that had initial success. This finding suggests that even if pneumatic retinopexy fails and alternative procedures are performed, there may be no compromise in VA.

One of the limitations of our study is that it its retrospective nature. Our study only evaluates the outcomes of PR with comparisons made against the published outcomes for the alternative procedures. It would be useful to compare outcomes at our institution between PR, SB, and PPV used for comparable retinal detachments. A retrospective comparison would be less useful because the type of detachment guides the operation selected. However, it would be useful to arrange a prospective study that randomised RRD that meet classic indications for PR to be treated with PR, SB, or PPV.

Furthermore, our study does not evaluate the cost effectiveness of PR. Our primary aim was to evaluate the success rate of PR for treatment of RDD at our institution. Only after first establishing whether or not the procedure is successful could we evaluate whether or not it is cost effective.

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REFERENCES

1 **Dominguez A**. Cirugia precoz y ambulatoria del desprendimento de retina. *Arch Soc Esp Oftalmol* 1985;**48**:47–54.
2 **Hilton GF**, Grizzard WS. Pneumatic retinopexy: a two step outpatient operation without conjunctival incision. *Ophthalmology* 1986;**93**:626–41.
3 **Tornambe PE**, Hilton GF, the Retinal Detachment Study Group. Pneumatic retinopexy: a multicenter randomized controlled clinical trial comparing pneumatic retinopexy with scleral buckling. *Ophthalmology* 1989;**96**:772–84.
4 **McAllister IL**, Meyers SM, Zegarra H, *et al*. Treatment of retinal detachments with multiple breaks by pneumatic retinopexy. *Ophthalmology* 1988;**95**:877–83.
5 **Han DP**, Mohsin NC, Guse CE, *et al*. Comparison of pneumatic retinopexy and scleral buckling in the management of primary rhegmatogenous retinal detachment. *Am J Ophthalmol* 1998;**126**:658–68.
6 **Tornambe PE**. Pneumatic retinopexy: the evolution of case selection and surgical technique: a twelve year study of 302 eyes. *Trans Am Ophthalmol Soc* 1997;**95**:551–78.
7 **Grizzard W**, Hilton GF, Hammer ME, *et al*. Pneumatic retinopexy failures: cause, prevention, timing, and management. *Ophthalmology* 1995;**102**:929–36.
8 **Lisle C**, Mortensen KK, Sjolie AK. Pneumatic retinopexy. *Acta Ophthalmol Scand* 1998;**76**:486–90.
9 **Assi AC**, Charteris DG, Pearson RV, *et al*. Pneumatic retinopexy in the treatment of primary rhegmatogenous retinal detachment. *Eye* 1999;**13**:725–8.
10 **Eter N**, Boker T, Spitznas M. Long-term results of pneumatic retinopexy. *Arch Clin Exp Ophthalmol* 2000;**238**:677–81.
11 **Abecia E**, Pinilla I, Olivan JM. Anatomic results and complications in a long-term follow-up of pneumatic retinopexy cases. *Retina* 2000;**20**:156–61.
12 **Kleinmann G**, Rechtman E, Pollack A, *et al*. Pneumatic retinopexy: results in eyes with classic vs relative indications. *Arch Ophthalmol* 2002;**120**:1455–9.