Acta Scientific Ophthalmology (ISSN: 2582-3191)

Volume 6 Issue 12 December 2023

Research Article

Out Patient Two Step Pneumatic Retinopexy Associated with Postoperative Laser for the Treatment of Retinal Detachment

Zidi Mohamed*, Soukaina Homaide, Fatine Alami, Sara Idmane, Soukaina Amrani Joutey and Benbachir Salma

Nour Clinic of ophthalmology of Casablanca, Morocco

***Corresponding Author:** Zidi Mohamed, Nour Clinic of ophthalmology of Casablanca, Morocco.

Received: November 02, 2023

Published: November 22, 2023

Abstract

Pneumatic retinopexy was first described by Hilton in the late 1980s. it is a minimally invasive procedure that can be offered to treat localized retinal detachments with many advantages over conventional surgery. We report cases of retinal detachment, treated by pneumatic retinopexy associated with laser. The aim of this study is to describe and discuss the preoperative factors that may influence the results of pneumatic retinopexy associated with laser. A total of 12 pneumatic retinopexies combined with laser were performed to treat primary rhegmatogenous retinal. All cases had anatomical success at final follow up. This procedure may be an effective approach to treat retinal detachment with a good success rate and visual acuity recovery.

Keywords: Pneumatic Retinopexy; Retinal Detachment; Laser; Retinal Tear

Introduction

Pneumatic retinopexy is a minimally invasive procedure that can be offered to treat certain clinical forms of rhegmatogenous retinal detachments. The procedure was described by Hilton in the late 1980s [1], where its efficacy was established for localized retinal detachments. Pneumatic retinopexy has become an accepted method for retinal detachment repair as an alternative to vitrectomy or scleral buckling. in selected patients with specific preoperative criteria.

Patient selection is a key factor in the success of the pneumatic retinopexy technique, which is traditionally proposed for localized retinal detachments with superior retinal tear in phakic patients. The limitations of this technique are represented by unfavorable anatomical considerations such as the absence of an identifiable tear, pseudophakia, advanced proliferative vitreoretinopathy (PVR), intravitreal hemorrhage, wide or giant retinal tears.

This technique offers many advantages over conventional surgery, including reduced morbidity and complications associated with surgery and anesthesia, the possibility of better visual results, and reduced cost. Disadvantages include the need for strict postoperative positioning for 5-7 days, with the possibility of complication, failure or recurrence, hence the need for careful preoperative examination.

Materials and Methods

This is a Retrospective study of a case series of 12 patients who had pneumatic retinopexy performed by the same retina surgeon at Nour ophthalmology clinic, between 2018 and 2020 Patients who had been treated for rhegmatogenous retinal detachment (RRD) with pneumatic retinopexy were identified by reviewing operative reports. The primary outcome measure was anatomical reattachment of the retina. Secondary outcome measures included postoperative visual acuity and postoperative complications.

The technique

Pneumatic Retinopexy were performed under topical anesthesia, before that, intraocular pressure was reduced by intravenous 20% mannitol 5 mL/kg and an anterior chamber paracentesis. After that, 0.4 to 0.6 mL of 100% sulfur hexafluoride (SF_6) is injected intravitreally, at 4mm of the superior limbus, after introducing at least 10 mm of the needle, and in one single shot In order to obtain one single large gas bubble and to prevent multiple fish eggs or inadequate volume of gas injection. At the end of the procedure, The patient's light perception is checked. And a head positioning is indicated according to the site of the retinal tear. The day after, Laser retinopexy were performed through the gas bubble using as parameters :200 µm spot size, 400 to 600 mW power, and 0.1 s duration.

Results

A total of 12 pneumatic retinopexies combined with laser were performed to treat primary rhegmatogenous retinal. The average patient age was 54 (range 30–81). There were 5 right eyes and 7 left eyes. 8 (66.6%) of the patients were male and 4 (33.3%) were female. 10 (83.3%) cases were phakic, 2 (16.6%) were pseudophakic. seven (58.3%) were high myopes (phakic refraction >−6). All cases had classic indications for PR: 9 (75%) had a single break, 3 (15%) had 2–4 breaks and all of them had superior (09:00–03:00) breaks. Average duration of follow up was 12 months. 11 of 12 (91.6%) cases were successful with injection of gas combined with laser retinopexy. 1 of 12 (8.3%) of cases had needed reinjection of gas. All cases had anatomical success at final follow up.

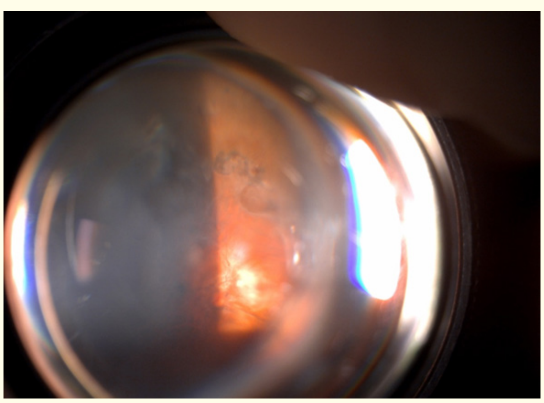

Figure 1: Nasal tear treated with sulfur hexafluoride (SF6) gas injection and laser around the tear.

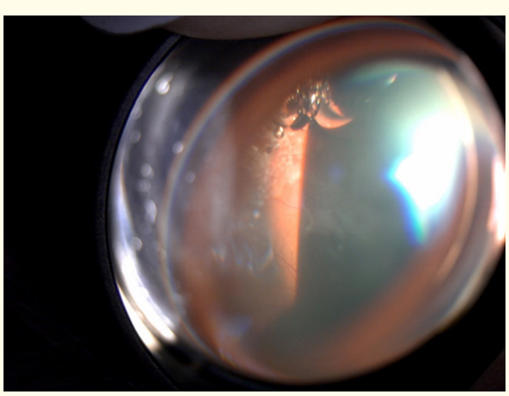

Figure 2: Laser retinopexy were performed at slit lamp through the gas bubble for a superior tear.

Discussion

Pneumatic retinopexy was first described by Hilton and Grizzard. It has essentially been described as an in-office procedure to manage recent rhegmatogenous retinal detachment. Its use, until now, has remained limited due to its limited indications (traditional criteria). However, it remained an option for those seeking a rapid, outpatient procedure with relatively little or no morbidity.

Technological advances in sutureless vitrectomy have improved the success rates of retinal detachment surgery with a single; rapid procedure with a comfortable postoperative course. This raises a question about the role of pneumatic retinopexy in the current era.

Pneumatic retinopexy is an effective, minimally invasive, inexpensive and rapid procedure, classically indicated for recent retinal detachments in phakic eyes over the upper 8 clock hours of the retina, with a tear not exceeding 2 clock meridians (traditional criteria).

According to some series, even when performed according to non-traditional criteria, pneumatic retinopexy can obviate the need for surgical intervention, so the indications for pneumatic retinopexy have become increasingly widespread.

The principle of pneumatic retinopexy is to inject a bubble of gas tamponade into the vitreous cavity to block the passage of vitreous through a retinal tear into the subretinal space [4]. This procedure requires strict positioning of the head, which will vary according to the site of the retinal tear [12], and may be difficult to achieve in some patients. Choice of gases: Sulfur hexafluoride (SF6) is the most widely used gas for pneumatic retinopexy, followed by perfluoropropane (C3F8). Other perfluorocarbon gases, such as C2F6, are currently in use, and there have been a number of successes.

It's important to understand the longevity and expansion characteristics of gases. In our experiment, we use SF6 gas, which doubles in volume in the eye, reaching its maximum size at around 36 hours. It will generally disappear within 5 to 10 days, depending on the quantity injected. A gas bubble large enough to cover all detached ruptures, either simultaneously or alternately, is generally required, and should be kept covered for three to five days, with an additional volume as a safety margin. Most of the time, we inject 0.5 ml of 100% SF6. Because of its greater expansion, C3F8 allows a smaller quantity of gas to be injected initially, eliminating the need for paracentesis. C3F8 quadruples in volume, reaching its maximum size in around three days. The bubble will remain in the eye for 30 to 45 days, which has one drawback.

Two characteristics explain the effectiveness of Pneumatic retinopexy: surface tension and buoyancy, which provides the force that pushes the upper retina against the eye wall. The forces exerted by the gas in contact with the retinal surface occlude the retinal tear and restrict the passage of vitreous into the subretinal space. At the same time, the Na+ / K+-ATPase, located in the apical membrane of the retinal pigment epithelium (RPE), allows the passage of subretinal fluid existing in the intravascular space, inducing reapplication of the retinal detachment. The best pushing force is exerted at the apex of the bubble, hence the strict positioning [5].

In addition to the preoperative clinical examination, evaluation of the patient's profile is necessary.

- Is the patient mentally capable of following the positioning directions?
- Is the patient physically able to maintain positioning as required, particularly with regard to neck and back problems?
- Will he/she be able to return for frequent check-ups and follow-up if necessary?
- Does the patient plan to travel by air in the days following the procedure?

Anatomical results are comparable to those of scleral buckling or vitrectomy.

Pneumatic retinopexy failures most often occur in the event of vitreoretinal traction or the development of a PVR, or following the development of new retinal tears or vitreoretinal traction [2]. Some studies admit that the success rate in aphakic and pseudophakic patients (rate limited to 41%) is lower than in phakic patients. We explain this difference by the presence of peripheral traction or the presence of peripheral atrophic holes not seen at the initial ophthalmological examination. Other pivotal studies have shown no significant differences between phakic and pseudophakic patients in terms of anatomical and functional results [2].

non-traditional preoperative criteria, such as pseudophakia, minimal vitreous hemorrhage, absence of identifiable tear, inferior tears, should not be considered as a contraindication to laser-associated pneumatic retinopexy.

Some authors have demonstrated in comparative studies that anatomical and visual results are similar for traditional and non-traditional preoperative inclusion criteria, as well as for phakic and pseudophakic eyes. inferior tears (less than 4 hours retina) and visible vitreous traction on a tear-predicted rupture. Increased use of pneumatic retinopexy would offer significant cost savings while maintaining the same results.

Pneumatic retinopexy may present complications, such as gas passing in front of the anterior hyaloid or into the anterior chamber, gas passing into the sub-retinal space, hypertonia, iatrogenic cataract, PVR, appearance of new tears, vitreous incarceration at the gas injection site.

There are few publications comparing pneumatic retinopexy with sutureless vitrectomy. Reports of "Pneumatic retinopexy versus vitrectomy for primary rhegmatogenous retinal detachment trial" were presented at the American Society of Retinal Specialists 2017.and which showed surprising results in which patients undergoing pneumatic retinopexy had better final visual acuity compared with vitrectomy. In addition, both groups had a similar reapplication rate and cataract surgery was much less frequently required in the pneumatic retinopexy group compared with vitrectomy [7].

The anatomical success rate of PR combined with laser retinopexy through the gas bubble is variable according to the series, ranging from 70–88% [8-12]. In fact, laser has also the advantage of producing quicker and stronger chorioretinal adhesion comparing with cryopexy [13].

Failure of this procedure to achieve retinal attachment may be due to an initially undetected retinal tear or a new one, requiring surgical management [14]. Furthermore, the disadvantages described in the literature include the need of maintaining the head position for a longer period if it's an expansible gas with prolonged longevity, and also the risk of cataract formation and vitreo-retinal traction is increased which may induce new retinal breaks [15].

Cryotherapy is frequently used in previous studies [16-18] but it may be associated with a higher incidence of PVR, and it creates a weaker adhesion the first days, comparing to laser [19]. Another disadvantage of cryopexy is the formation of large retinal scars, which may lead to the rhegmatogenous retinal detachment years after treatment [20].

These results encourage us to broaden the indications of pneumatic pexia on non-traditional preoperative criteria on larger samples in order to demonstrate its usefulness and effectiveness in terms of visual recovery and postoperative quality and cost. This may be of capital importance for a developing country such as ours.

Conclusion

Pneumatic retinopexy is an effective method for the treatment of many retinal detachments, given its minimally invasive nature, comfort for both surgeon and patient, rapid functional rehabilitation and low cost. Indications can be successfully extended to certain non-conventional retinal detachments.

The only essential element to bear in mind is that the success of pneumatic retinopexy is directly linked to the initial assessment of the retinal examination and the choice of patients who can adhere to the positioning and follow-up, which may lead some surgeons to change their habits.

Conflict of Interest

The authors declare no conflict of interest.

Contribution of the Authors

All the authors participated in the care of the patient and the writing of the manuscript. All authors have read and approved the final version of the manuscript.

Bibliography

1. Hilton GF and Grizzard WS. “Pneumatic retinopexy: a two-step outpatient operation without conjunctival incision”. *Ophthalmology* 93 (1986): 626-641.
2. Darin R Goldman., *et al*. “Expanded Criteria for Pneumatic Retinopexy and Potential Cost Savings”. *Ophthalmology* 121 (2014): 318-326.
3. Abecia E., *et al*. “Anatomic results and complications in a long-term follow-up of pneumatic retinopexy cases”. *Retina* 20 (2000): 156-161.
4. Seno Y., *et al*. “Compliance with the face-down positioning after vitrectomy and gas tamponade for rhegmatogenous retinal detachments”. *Retina* 35 (2015): 1436-1440.
5. Rahat F., *et al*. “Pneumatic retinopexy for primary repair of rhegmatogenous retinal detachments”. *Retina* 35 (2015): 1247-1255.
6. Goldman DR., *et al*. “Expanded criteria for pneumatic retinopexy and potential cost savings”. *Ophthalmology* 121.1 (2014): 318-326.
7. Muni RH. Presented at ASRS 35th Annual Meeting 11-15 August. Boston: Randomised trial comparing Pneumatic retinopexy vs. vitrectomy in the management of primary rhegmatogenous retinal detachment (2017).
8. Tornambe PE and Hilton GF. “Pneumatic retinopexy. A multicenter randomized controlled clinical trial comparing pneumatic retinopexy with scleral buckling. The Retinal Detachment Study Group”. *Ophthalmology* 96 (1989): 772-783; discussion 784.
9. Hillier RJ., *et al*. “The Pneumatic Retinopexy versus Vitrectomy for the Management of Primary Rhegmatogenous Retinal Detachment Outcomes Randomized Trial (PIVOT)”. *Ophthalmology* 126 (2019): 531-539.
10. Murphy DC., *et al*. “Infographic: The Pneumatic Retinopexy versus Vitrectomy for the Management of Primary Rhegmatogenous Retinal Detachment Outcomes Randomized Trial (PIVOT)”. *Eye* 36 (2022): 913-914.
11. Yanyali A., *et al*. “Steamroller versus basic technique in pneumatic retinopexy for primary rhegmatogenous retinal detachment”. *Retina* 27 (2007): 74-82.
12. Tiepei Zhu., *et al*. “Pneumatic Retinopexy Involving the Use of Intravitreal Air Injection and Laser Photocoagulation for Rhegmatogenous Retinal Detachment in Phakic Eyes”. *Journal of Personalized Medicine* 13 (2023): 741.
13. Folk JC., *et al*. “Early retinal adhesion from laser photocoagulation”. *Ophthalmology* 96 (1989): 1523-1525.
14. Chan CK., *et al*. “Pneumatic retinopexy for the repair of retinal detachments: A comprehensive review (1986-2007)”. *Survey on Ophthalmology* 53 (2008): 443-478.
15. Lincoff H., *et al*. “The perfluorocarbon gases in the treatment of retinal detachment”. *Ophthalmology* 90 (1983)546-551.

16. Hillier RJ., *et al*. "The Pneumatic Retinopexy versus Vitrectomy for the Management of Primary Rhegmatogenous Retinal Detachment Outcomes Randomized Trial (PIVOT)". *Ophthalmology* 126 (2019): 531-539.

17. Fabian ID., *et al*. "Pneumatic retinopexy for the repair of primary rhegmatogenous retinal detachment: A 10-year retrospective analysis." *JAMA Ophthalmology* 131 (2013): 166-171.

18. Chan CK., *et al*. "Pneumatic retinopexy for the repair of retinal detachments: A comprehensive review (1986-2007)". *Survey on Ophthalmology* 53 (2008): 443-478.

19. Kita M., *et al*. "Photothermal, cryogenic, and diathermic effects of retinal adhesive force in vivo". *Retina* 11 (1991): 441-444.

20. Chen SN and Hwang JF. "Treatment of rhegmatogenous retinal detachment in teenagers by pneumatic retinopexy technique". *American Journal of Ophthalmology* 143 (2007): 217-221.