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MINIMALLY INVASIVE MANAGEMENT OF RETINAL DETACHMENT: INSIGHTS FROM A PNEUMATIC RETINOPEXY CASE REPORT

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Abstract

***Introduction**: Rhegmatogenous Retinal Detachment (RRD) caused by a tear in the retina, causes fluid accumulation and separation of neurosensory retina from retinal pigment epithelium which can lead to blindness. The goal for treatment is to reduce vitreoretinal tension and fix retinal tears and holes. The case report discusses about management in uncomplicated RRD.*

***Case Report**: Patient came with blurry vision on his right eye (RE) since two weeks ago. Four days before, He was seeing black curtain on lower left direction while working, but it did not get any wider. No complaints on his left eye. Patient has hypertension only known recently. No history of trauma, spectacles. His occupation was labourer. General examination within normal limits. Visual acuity (VA) RE 6/24. Anterior segment within normal limits. Posterior segment, detachment at 9-2 o'clock, horse shoe tear at 11 o'clock and a small hole at 1 o'clock. Lattice degeneration at 8-12 o'clock, macula on. Patient then underwent pneumatic retinopexy. Intraocular pressure (IOP) 13mmHg.*

***Discussion**: Retinal detachment occurs when subretinal fluid accumulates between the neurosensory retina and the retinal pigment epithelium. This can happen in three ways, and the cause for our patient was a tear of retina, for that reason we diagnosed with RRD. Prognosis for patients with RRD depends on the condition off the macula, and the symptom onset.*

***Conclusion**: Optimization of retinal detachment detection and the success of rapid-onset retinopexy still need improvement. Proliferative Vitreoretinopathy (PVR) remains a common cause of failure, necessitating new strategies for its management. However, the choice of technique is still influenced by the considerations and experience of each vitreoretinal surgeon.*

Keywords: rhegmatogenous retinal detachment, retinal detachment, pneumatic retinopexy, vitrectomy
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INTRODUCTION

Retinal detachment (RD) is a critical ophthalmologic condition characterized by the separation of the neurosensory retina from the underlying retinal pigment epithelium (RPE), leading to potential vision loss if not promptly addressed. The retina's detachment from the RPE disrupts its access to essential nutrients and oxygen, resulting in impaired visual function[1]. The incidence of rhegmatogenous retinal detachment (RRD), the most common form of RD, varies globally, with studies indicating an annual occurrence ranging from 6.3 to 17.9 per 100,000 individuals[2]. Males appear to have a slightly higher risk than females. Additionally, populations of Southeast Asian descent may exhibit a heightened risk, potentially linked to higher rates of myopia and increased axial length in these groups[3,4].

At presentation, several risk factors are known, including male gender, age, myopia, retinal lattice degeneration, history of intraocular surgery (e.g., cataract surgery), ocular trauma, family history, seasonal variation, and race/ethnicity; Caucasian and Asian populations are at relatively higher risk[4]. The goal of surgical retinal detachment treatment is to reduce vitreoretinal tension and fix retinal tears and holes. Pneumatic retinopexy, a less invasive method and cost effective, allows for the correction of some detachments in a clinic or office setting[5]. The case report discusses about management in uncomplicated RRD with pneumatic retinopexy.

CASE REPORT

The patient came to outpatient clinic with chief complaint blurry vision on his right eye since two weeks ago. He also saw floating threads. Four days before came to outpatient, He was seeing black curtain on lower left direction while working, but it did not get wider. There was no complaints on his left eye. The patient went to an ophthalmologist and was told that the layer of the eye nerve was detached. He had hypertension but only known recently, no diabetic mellitus. No History of trauma, spectacles, and never had a surgery. His occupation was laborer.

General examination within normal limits. In ophthalmology examination, VA RE 6/24 and 6/6 for left eye (LE) with correction. IOP for right left eye (RLE) were within normal limits. Anterior segment RLE also within normal limits. Posterior segment examination for RE, we found retinal detachment at 9-2 o'clock, horse shoe tear at 11 o'clock and a small hole at 1 o'clock. Lattice degeneration at 8-12 o'clock, macula on. As for LE was within normal limits.

Patient then underwent pneumatic retinopexy. VA RE after pneumatic retinopexy was 6/20, and for the posterior segment, retinal was attached.

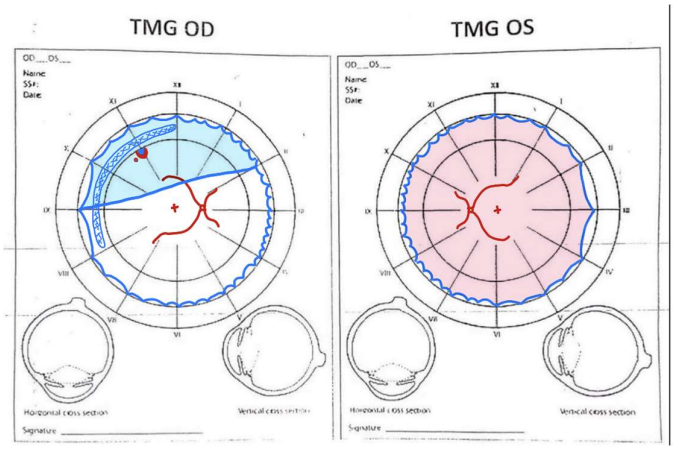

Figure 1. *Retina schematic RLE. Detachment at 9-2 o'clock, horse shoe tear at 11 o'clock and a small hole at 1 o'clock. Lattice degeneration at 8-12 o'clock. LE within normal limits*

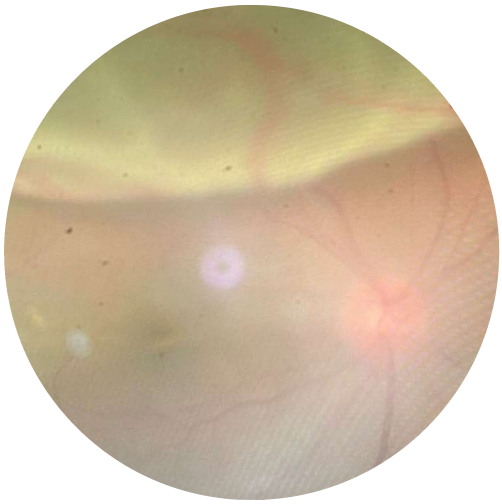

Figure 2. *Funduscopic photograph for RE. It showed retinal detachment. (Courtesy: Ophthalmology Department Soetomo Hospital)*

DISCUSSION

Pneumatic retinopexy (PR) is a minimally invasive surgical procedure used to treat specific cases of rhegmatogenous retinal detachment (RRD). This condition occurs when a tear or break in the retina allows fluid from the vitreous cavity to accumulate beneath it, causing the retina to separate from the underlying retinal pigment epithelium (RPE). If left untreated, retinal detachment can lead to permanent vision loss. PR involves injecting a gas bubble into the vitreous cavity to push the detached retina back into place. Once the retina is reattached, either cryotherapy (freezing) or laser photocoagulation is used to seal the retinal tear and prevent further fluid ingress. The procedure offers a less invasive alternative to scleral buckling and pars plana vitrectomy for select patients who meet specific anatomical and clinical criteria. PR is typically performed in an outpatient setting under local anesthesia, making it a cost-effective and convenient option for appropriate cases[8].

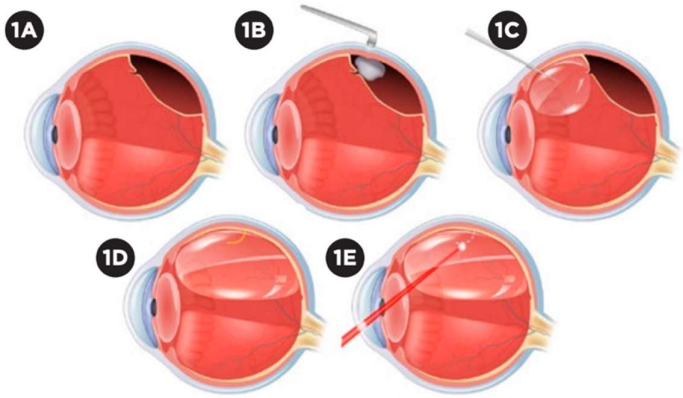

Figure 3. *Steps in Pneumatic retinopexy in general cases.*

The success of pneumatic retinopexy is largely dependent on careful patient selection. It is most effective in patients with a primary, uncomplicated rhegmatogenous retinal detachment involving the superior (upper) two-thirds of the retina. Additionally, the procedure is best suited for cases with a single or small number of retinal breaks, especially when the total extent of the detachment is limited to less than one quadrant. Patients must also be capable of adhering to strict postoperative positioning, as maintaining a specific head position is crucial to ensure the gas bubble remains in contact with the retinal tear. This prolonged contact promotes reattachment and allows the therapeutic effects of cryotherapy or laser photocoagulation to take hold. However, PR is contraindicated in patients with large, multiple, or inferior retinal breaks, extensive retinal detachment, or proliferative vitreoretinopathy (PVR)—a condition characterized by the formation of scar tissue that can prevent successful reattachment. Furthermore, patients with significant vitreous hemorrhage or those unable to comply with postoperative positioning requirements are not ideal candidates for this procedure[9].

The surgical technique of pneumatic retinopexy involves several critical steps to ensure successful retinal reattachment. Following comprehensive preoperative evaluation and informed consent, local anesthesia is administered via a retrobulbar or subconjunctival injection to numb the eye. Under sterile conditions, a fine-gauge needle is used to inject an expanding gas bubble into the vitreous cavity. The most commonly used gases are sulfur hexafluoride (SF_6), which persists for approximately two weeks, and perfluoropropane (C_3F_8), which lasts between six to eight weeks. The gas bubble applies internal tamponade pressure against the detached retina, facilitating its repositioning against the RPE. Once the retina is reattached, the retinal tear is sealed using cryopexy or laser photocoagulation to form a chorioretinal scar, preventing further detachment. Throughout the postoperative period, patient compliance with strict head positioning is critical. For example, patients with superior retinal detachments are typically instructed to maintain a face-down position to ensure the gas bubble remains in contact with the retinal break[10].

Postoperative care following pneumatic retinopexy is integral to achieving a successful outcome. Patients must adhere to specific head positioning for one to two weeks, depending on the gas used and the location of the retinal tear. This position allows the gas bubble to exert continuous pressure on the detached retina, facilitating its permanent reattachment. Additionally, patients are advised to avoid air travel and high-altitude environments while the gas bubble is present, as changes in atmospheric pressure can cause the bubble to expand and increase intraocular pressure (IOP), leading to pain and potential vision loss. Regular follow-up appointments are required to monitor the

reattachment process and assess for potential complications. Vision may remain blurred during the initial postoperative period until the gas bubble gradually resorbs, a process that can take several weeks. If the retina fails to reattach, more invasive surgical options, such as pars plana vitrectomy or scleral buckling, may be necessary[10].

The efficacy of pneumatic retinopexy is well-documented, with studies reporting a primary success rate of approximately 70-80%. Success depends on factors such as early intervention, the absence of significant PVR, and proper patient compliance. In cases where PR is unsuccessful, additional surgical procedures can achieve retinal reattachment. Compared to scleral buckling and vitrectomy, PR is associated with fewer surgical complications and a shorter recovery period. However, it also carries specific risks, including the possibility of new retinal tears, persistent detachment, and elevated intraocular pressure[11,12]. Cataract progression is another recognized complication, particularly in older patients or those requiring prolonged gas bubble presence. In rare cases, infection (endophthalmitis) may occur, necessitating prompt medical intervention. Despite these risks, PR remains a valuable and effective treatment for appropriately selected patients.

When comparing pneumatic retinopexy with other surgical techniques, several key differences emerge. Scleral buckling involves placing an external silicone band around the eye to create indentations that close retinal breaks. This approach is more invasive and may require general anesthesia but offers high success rates, particularly for inferior and complex detachments. Pars plana vitrectomy, on the other hand, involves removing the vitreous gel to directly manipulate and reattach the retina. Although highly effective, vitrectomy carries a greater risk of complications such as cataract formation and intraocular scarring. PR, by contrast, is less invasive and can be performed in an office setting. It is particularly advantageous for localized, superior retinal detachments and provides an effective treatment option for patients who are poor surgical candidates for more invasive procedures[8,12].

CONCLUSION

In this case, pneumatic retinopexy successfully reattached the retina with improvement of visual acuity from 6/24 to 6/20 in the right eye, demonstrating the effectiveness of intraocular gas tamponade in relieving vitreoretinal traction and sealing retinal breaks. The gas bubble provided internal support to appose the detached retina against the retinal pigment epithelium, allowing subsequent chorioretinal adhesion from cryotherapy/laser to stabilize the reattachment. This highlights the role of pneumatic retinopexy as a minimally invasive and effective option in carefully selected patients with superior retinal tears and macula-on detachments.

Although rhegmatogenous retinal detachment is a common presentation in vitreoretinal practice, the highlight of this case lies in the favorable outcome achieved in a resource-limited setting using a minimally invasive, office-based procedure. The patient's occupation as a laborer and lack of previous ophthalmic care also emphasize the importance of timely detection and the practicality of pneumatic retinopexy in providing vision-preserving treatment without the need for more invasive surgery. This case underscores how appropriate patient selection and adherence to postoperative positioning can optimize outcomes even in uncomplicated but vision-threatening detachments.

In summary, pneumatic retinopexy not only preserved macular function in this patient but also demonstrated its role as a cost-effective, vision-saving technique with shorter recovery time compared to alternative procedures. Further efforts to improve early detection and address complications such as proliferative vitreoretinopathy are needed to expand its success rate in broader patient populations.

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