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# Result of pneumatic retinopexy in the treatment ofrhegmatogenous retinal detachment

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# Result of pneumatic retinopexy in the treatment of rhegmatogenous retinal detachment

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Objective : *To determine the anatomic result and complications of pneumatic retinopexy in the treatment of rhegmatogenous retinal detachment (RRD) in King Chulalongkorn Memorial Hospital*

Design : *Retrospective descriptive study*

Setting : *Department of Ophthalmology, Faculty of Medicine, Chulalongkorn University*

Materials and Methods : *The medical records of 47 new cases of RRD who had undergone pneumatic retinopexy (between January 1995-June 1998) were reviewed for preoperative data and postoperative results (as classified into 3 groups: reattachment, recurrent detachment and failure)*

Results : *Fourty-one (87%) RRD eyes were sucessfully reattached while the recurrent detachment and initial failure groups had 8 eyes (17%) and 6 eyes (12%). Of the 14 non-reattached patients, 13 eyes were reoperated on by scleral buckling or vitrectomy and had 12 successful reattachments (92%). Overall, 45 of 47 (96%) RRD eyes were reattached by pneumatic retinopexy and additional operations. The complications were proliferative vitreoretinopathy (PVR) 5 eyes, new break 3 eyes and epiretinal membrane 3 eyes.*

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Conclusions : *Pneumatic retinopexy is an alternative procedure to treat RRD with high success rates*

Key words : *Pneumatic retinopexy, Rhegmatogenous retinal detachment.*

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**เพชร พิศาลก่อสกุล. ผลการรักษาจอประสาทตาฉีกขาดและหลุดลอกโดยวิธีการจี้ความเย็นและฉีดก๊าซเข้าในลูกตา. จุฬาลงกรณ์เวชสาร 2543 ก.พ; 44(2): 85 - 91**

**วัตถุประสงค์** : *เพื่อศึกษาผลการรักษาจอประสาทตาฉีกขาดและหลุดลอก โดยวิธีการจี้ความเย็น และฉีดก๊าซเข้าในลูกตา และผลข้างเคียงของการรักษา*

**รูปแบบของการศึกษา** : *การศึกษาย้อนหลังแบบพรรณนา*

**สถานที่ทำการศึกษา** : *ภาควิชาจักษุวิทยา คณะแพทยศาสตร์ จุฬาลงกรณ์มหาวิทยาลัย*

**วิธีการ** : *ศึกษาย้อนหลังจากทะเบียนประวัติผู้ป่วยที่ได้รับการรักษาจอประสาทตาฉีกขาดและหลุดลอก โดยวิธีการจี้ความเย็นและฉีดก๊าซเข้าในลูกตาตั้งแต่ มกราคม พ.ศ. 2538 ถึง มิถุนายน พ.ศ. 2541 ซึ่งได้ผลการรักษาเป็น 3 กลุ่ม คือ จอประสาทตาติดเข้าที่ เกิดการหลุดลอกใหม่ และล้มเหลว*

**ผลการศึกษา** : *ผู้ป่วย 47 ตา ได้รับการเลือกเพื่อรักษาโดยวิธีจี้ความเย็นและฉีดก๊าซเข้าในลูกตา ผลปรากฏว่าสามารถทำให้จอประสาทตาติดเข้าที่ในระยะแรก 41 ตา (87%) แต่มีการหลุดลอกขึ้นใหม่ 6 ตา (17%) และไม่ได้ผล 6 ตา (12%) ซึ่งในรายที่หลุดลอกใหม่และที่ไม่ได้ผลตั้งแต่แรก ก็จะได้รับการผ่าตัดด้วยการรัดลูกตา (Scleral buckling procedure) และการผ่าตัดน้ำวุ้นตา ทำให้จอประสาทตาติดเข้าที่มีผลรวมเป็น 96% ผลแทรกซ้อนของการผ่าตัดที่ทำให้มีจอประสาทตาหลุดลอกขึ้นใหม่ ได้แก่การหดและดึงตัวของน้ำวุ้นตา (Proliferative Vitreoretinopathy) (5 ตา) การพบรอยฉีกขาดใหม่ (3 ตา) และผลแทรกซ้อนอื่น ๆ ได้แก่การเกิดแผ่นเนื้อเยื่อที่พื้นผิวจอประสาทตา (Epiretinal membrane) (3 ตา)*

**สรุป** : *การรักษาโดยวิธีนี้เป็นการรักษาอีกรูปแบบหนึ่งที่ได้ผลดี*

The most popular operation for retinal detachment during the last three decades has been scleral buckling. Between 75% and 85% of cases achieve permanent reattachment with one operations[1] although this often involves considerable tissue trauma, major complication,[2] high expense and hospitalization. In an attempt to minimize these problems, especially the complications many ophthalmologists have used a two-step out-patient procedure for retinal reattachment consisting of transconjunctival cryotherapy and intravitreal gas injection, follow by post operative positioning.[3]

In 1973, Norton [4] reported favorable results with use of sulfurhexafluoride ($SF_6$) for various surgical retinal breaks, and the first report on the intraocular injection of perfluoropropane ($C_3F_8$) was by Vygantas and associates.[5]

## Objective

To determine the anatomic result and complication of pneumatic retinopexy, a two-step out-patient procedure consisting of transconjunctival cryotherapy and intravitreal expandable gas injection for treatment of selected rhegmatogenous retinal detachment.

## Materials and Methods

The medical records of 47 new cases of rhegmatogenous retinal detachment (RRD) who had been treated by pneumatic retinopexy at King Chulalongkorn Memorial Hospital from January 1995 to June 1998 were retrospectively reviewed. Most patients had been managed in the out-patient department but selected patients were better managed by admission to the hospital for a few days.

## Results

Thirty-four eyes were of male and 13 eyes were of female patients. The average age at the time of operation was 48.5 years (range 16-78). The duration of symptom of the retinal detachment before surgery had been noticed for 1 day to 36 weeks (mode, 2 weeks).

The retinal breaks located at superior for 3 eyes, superonasal 8 eyes , superotemporal 23 eyes, temporal 10 eyes and 3 eyes with multiple breaks at superonasal and superotemporal quadrants.

Forty-five eyes were treated with $SF_6$ and 2 eyes with $C_3F_8$. Mean gas volume was 0.5 ml. (range 0.4 -1 ml.). Good results were noted with both gases. The total procedure was accomplished in one session in all cases.

Many features commonly seen in series of retinal detachment treated with scleral buckling were also seen in this study, such as pseudophakia, multiple breaks, long durations, total detachment and ocular trauma. (Table 1)

Eighty-seven percent of the eyes were reattached at the first attempt, but there were eight recurrences yielding a final anatomic cure rate with pneumatic retinopexy of 70% with a 6 month follow-up.

**Table** 1. Pre - operative features, 47 eyes.

| | |
|---|---|
| Sex male: female | 34 : 13 |
| Pseudophakic | 1 |
| Multiple breaks | 3 |
| Duration $\geq$ 1 month | 12 |
| Total detachment | 1 |
| Blunt Ocular trauma | 1 |
| Aphakia | 1 |

Among the initial failures, an additional 26% were subsequently reattached with scleral buckling and vitrectomy, there by yielding an overall cure rate of 96%. (Table 2)

Table 2. Anatomic results, 47 eyes.

| Result | Percentage |
|---|---|
| Reattached first week post operative | 87 |
| Recurrent detachment , first 3 months | 17 |
| Reattached > 6 months | 70 |
| Reattached with subsquence Scleral buckle and vitrectomy | 26 |
| Total reattached > 6 months | 96 |

The causes of the recurrences were new breaks (three eyes) and proliferative vitreoretinopathy (five eyes). A complication was epiretinal membrane (three eyes).

**Discussion**

Successful retinal detachment repair is achieved by closure of the retinal break by creation of chorioretinal adhesion or retinopexy to seal the breaks.

Pneumatic retinopexy, a term introduced by Hilton in 1985, describes revised and modified operations used for primary rhegmatogenous retinal detachment.

Hilton and Gizzard [3] presented the first series of 20 consecutive eyes treated with pneumatic retinopexy. Their cases were limited to retinal detachments with one or more breaks within one clock hour located in the superior eight clock hour of the fundus, and without signs of proliferative vitreoretinal retraction (PVR) greater than grade B, according to the classification of the Retina Society Terminology Committee.[6] The final cure rate for the simple pneumatic procedure with six months follow up was 90%.

The preliminary report prompted a collaborative pilot study by six surgeons in three cities utilizing pneumatic retinopexy for 100 cases [7] and their report was also limited to the same conditions of retinal detachment. That series included cases with pseudophakia (34 %) aphakia (10%), macula detachment (52 %), macula breaks (2%), vitreous hemorrhage (12%), trauma (4%), and old detachment (14 %). Sulfur hexafluoride was used in 77 % of cases and perfluoropropane was used in 23 %. Initially, 91 % were reattached , but seven recurrences yielded a six-month follow-up cure rate of 84 % and with subsequent scleral buckling 98 % were reattached. Postoperative complications included PVR (3 %), macula pucker (3 %) mild uveitis (1 %), and new / missed breaks (7 %).

The Retinal Detachment Study Group reported the similar initial success rate when compared with the scleral buckling groups in 1989 [8] (81% in the pneumatic retinopexy group and 84% in the scleral buckling group). The overall reattachment rate with additional surgery (scleral buckle or vitrectomy) was 99%. In 1991,[9] The Retinal Detachment Study Group reported 2-year follow-up information on 179 of 198 eyes (90%) that were initially enrolled in the study. The anatomic reattachment rate was similar, with only one redetachment occuring in each group after 6 months.

In this study, the initial reattachment rate was 87%, but eight recurrences yields a six-month follow-up cure rate of 70%. The overall reattachment rate

with additional surgery was 96%. Both are similar to other previous reports.

Pneumatic retinopexy has been used successfully to treat complex retinal detachment. McAlister[10] reported four patients with retinal detachments involving multiple breaks up to 3 clock hours apart treated successfully with pneumatic retinopexy. Tornambe[11] reported one case of bilateral retinal detachment associated with multiple breaks up to five clock hours apart repaired with bilateral pneumatic retinopexy.

Both $SF_6$ and $C_3F_8$ have been found to be nontoxic and have been used effectively and safely in vitreoretinal surgery over the last twenty years. $SF_6$ (100%) doubles its volume within 1 to 2 days , maintain an effective volume for 3 to 5 days , and lasts for 10 to 14 days. $C_3F_8$ (100%) more than triples its volume within 3 to 4 days , maintains an effecive volume for 21 to 25 days , and lasts for 4 to 6 weeks. The 120 patients reported in the first two pneumatic retinopexy studies[3,7] have shown no ill effects from the $SF_6$ or $C_3F_8$. Only one case developed mild uveitis suggesting that if the gases do alter the blood retinal barrier,[12] it is subclinically. Furthermore, the pneumatic retinopexy PVR rate is comparable to that found in other series, [13,14] suggesting that if the gases do stimulate membrane formation, [15] it is not clinically harmful.

The movement and expansion of the gas bubble may result in traction, contraction, or further separation of the vitreous base, resulting in iatrogenic tears, There have been reports of new breaks noted immediately or shortly after injection of a vitreous gas bubble[16,17] in up to 30 % of cases. However a search of the literature revealed that the incidence of new breaks was 3-20 % after conventional scleral buckling procedures.[2,18,19]

## Conclusions

Pneumatic retinopexy is theoretically a method of first choice in the treatment of a large number of retinal detachments, taking into account the final anatomic and functional success rate, the simplicity and cost-effectiveness of the technique, the patient comfort and very early functional rehabilitation. Success with pneumatic retinopexy, as with other surgical procedures, depends upon proper case selection and surgical technique. This study confirmed the benefit of pneumatic retinopexy the same as many previous studies.

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