

# Subconjunctival Retention of Perfluoropropane (C<sub>3</sub>F<sub>8</sub>) Gas Increases the Success Rate of Trabeculectomy in Young People

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Perfluoropropane (C<sub>3</sub>F<sub>8</sub>), which is frequently used in retinal surgery, is an inert, relatively non-toxic gas which expands and remains *in situ* for several weeks after intravitreal injection. Subconjunctival retention of C<sub>3</sub>F<sub>8</sub> gas after trabeculectomy has been found to be effective and safe in increasing the success rate of trabeculectomy in young patients with glaucoma.<sup>1</sup> The main aim of this study was to evaluate the clinical effectiveness and safety of subconjunctival retention of C<sub>3</sub>F<sub>8</sub> gas after trabeculectomy.

## Patients and Methods

Between May 1994 and June 1996, 32 patients (32 eyes) were enrolled in the study. To be eligible for the study, patients were aged between 18 and 35 years, had a diagnosis of primary open angle glaucoma or steroid-induced glaucoma, had no history of prior ocular surgery or laser therapy, and had an intraocular pressure (IOP) that was uncontrolled below 21 mm Hg after maximum medical therapy. Patients were excluded if they had autoimmune diseases with ocular involvement, or if close follow-up was not

possible. Only one eye of each patient was included in the study. The patients were randomised into 2 study groups for trabeculectomy. Patients in group A (n = 16) received trabeculectomy only and patients in group B (n = 16) received trabeculectomy and subconjunctival retention of C<sub>3</sub>F<sub>8</sub> 0.5 mL. Since the morphologies of filtering blebs of the 2 groups were totally different after surgery, the study was designed in a randomised but unmasked manner.

Trabeculectomy was performed in a standard manner, with a limbus-based conjunctival flap and a mid-thickness triangular scleral flap. The surgical techniques were identical in each group, except that patients in group B received additional pure C<sub>3</sub>F<sub>8</sub> 0.5 mL injected

subconjunctivally with a 27-gauge needle after the operation. Postoperatively, all patients received topical antibiotics for 2 weeks; topical atropine for 2 to 4 weeks, and topical fluorometholone for 3 weeks. All patients were examined at 2 and 4 weeks and 3, 6, 9 and 12 months postoperatively. Successful IOP control was defined as follows:

- complete success — IOP of 21 mm Hg or lower without medication
- qualified success — IOP range of 22 to 25 mm Hg without medication or IOP lower than 21 mm Hg with medication.

Failure of surgery was defined as IOP greater than 25 mm Hg without medication or IOP greater than 21 mm Hg with medication, or when further glaucoma surgery was indicated.

## Results

Typical characteristics of a C<sub>3</sub>F<sub>8</sub>-associated filtering bleb are an extensive bulging conjunctival cyst in the early postoperative period followed by gradual flattening and diffusion. The average duration for the presence of C<sub>3</sub>F<sub>8</sub> gas within the conjunctival cyst was 28 ± 6 days (range, 12 to 35 days). Mean postoperative IOP measurements at different time intervals are shown in table 1. Mean IOPs were found to be significantly different between the 2 groups at months 9 and 12 postoperatively. The total success rate was not significantly different

Table 1. Intraocular pressure at different postoperative intervals

Time postoperatively	Group A (mm Hg)	Group B (mm Hg)	p value
Baseline	31.2 ± 4.1 (n = 16)	29.3 ± 5.1 (n = 16)	0.25
2 weeks	13.2 ± 2.9 (n = 16)	12.3 ± 2.1 (n = 16)	0.32
4 weeks	15.6 ± 3.1 (n = 16)	16.2 ± 3.5 (n = 16)	0.61
3 months	16.8 ± 5.5 (n = 16)	13.7 ± 4.2 (n = 16)	0.08
6 months	17.8 ± 6.2 (n = 16)	14.6 ± 5.7 (n = 16)	0.14
9 months	21.3 ± 7.7 (n = 15)	14.8 ± 6.2 (n = 16)	0.02
12 months	24.2 ± 9.2 (n = 13)	16.4 ± 5.5 (n = 15)	0.02

**Table 2. Surgical outcome at different postoperative intervals**

Time postoperatively	Outcome								p Value
	Group A				Group B				
	CS	QS	F	Total (%) success	CS	QS	F	Total (%) success	
2 weeks	16	0	0	16 (100)	16	0	0	16 (100)	1.0
4 weeks	14	1	1	15 (94)	14	2	0	16 (100)	1.0
3 months	12	2	2	14 (88)	12	4	0	16 (100)	0.484
6 months	9	3	4	12 (75)	12	4	0	16 (100)	0.084
9 months	8	2	6	10 (63)	10	5	1	15 (94)	0.083
12 months	6	2	8	8 (50)	10	5	1	15 (94)	0.016

Abbreviations: CS = complete success; QS = qualified success; F = failure.

between the 2 groups during the first 9 months. At 12 months postoperatively, the total success rate was 50% in group A and 94% in group B — a significant difference ( $p = 0.016$ , Fisher's exact test) [table 2]. In addition, none of the patients in group B developed a shallow anterior chamber, while 2 patients in group A did. The incidence of Tenon's cyst in group A was also higher than that in group B ( $p = 0.083$ ). Visual acuity results were not significantly different between the 2 groups. Both groups had 2 patients who

lost 2 or more lines, but most patients experienced no change.

### In Summary

The normal wound healing process after trabeculectomy often leads to external fibrosis and eventual closure of a surgical scleral fistula, which results in failure of the surgery. The failure rate is even higher when trabeculectomy is performed in young people. In this study,  $C_3F_8$ , an inert but long-lasting gas, was found to

augment the formation of a filtering bleb when retained subconjunctivally after trabeculectomy. The total success rate for patients receiving trabeculectomy and  $C_3F_8$  subconjunctival retention is significantly higher than that for patients receiving trabeculectomy alone. In addition, the incidence of encapsulated Tenon's cyst was lower in the group receiving  $C_3F_8$ . The mechanism for such results is still not clear, but decreased contact between the conjunctiva and sclera in the early postoperative period may be an important factor. It was also noted that due to the air tamponade effect of  $C_3F_8$  on the scleral flap, the frequency of postoperative shallow chamber also decreased.



### Reference

1. Lu DW, Tai MC, Chiang CH. Subconjunctival retention of perfluoropropane ( $C_3F_8$ ) gas increased the success rates of trabeculectomy in young people. *J Ocul Pharmacol Ther* 1997;13:235-242.

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