Comparative study of aqueous and oily pilocarpine in the production of ocular hypotension

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SUMMARY The effective use of aqueous and oily pilocarpine was studied in 19 glaucomatous eyes. The aqueous drops were used 4 times a day while the oily drops were used only twice. It was found that the oily drops were better than the aqueous drops in lowering the mean intraocular pressure and the maximum pressure reached during the day. No statistically significant difference was found between the 2 pilocarpine treatments in the reduction of daily variation of intraocular pressure. It is felt that oily drops used only twice a day would lead to better patient compliance and better control of chronic simple glaucoma.

Pilocarpine is the most commonly used drug in the management of open-angle glaucoma. It is used as a nitrate or a hydrochloride with methylcellulose¹ or 1.4% polyvinyl alcohol.^{2,3} It has a short duration of action of 4-6 hours. This necessitates its being administered 4 times a day, causing discomfort because of its side effects each time it is instilled. Spasm of the ciliary muscle reduces accommodation and affects the refractive state, and rapid miosis causes dimming of vision.

A continuous-release preparation of pilocarpine will not only require infrequent instillations, so important to elderly patients, but will also reduce the symptoms associated with each instillation. Its efficacy in gel⁴ once a day was found to be effective and more convenient than drops 4 times a day. We compared the use of pilocarpine in castor oil twice a day with its aqueous form 4 times a day in 19 eyes with chronic simple glaucoma.

Materials and methods

Nineteen eyes of 11 patients ranging in age from 57 to 81 years were studied. Each patient had been receiving treatment for chronic simple glaucoma for over 2 years. All the patients studied were chosen from the Eye Outpatient Department, University Hospital, Nottingham.

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The patients were admitted to hospital, and the aqueous pilocarpine drops were discontinued for 24 hours. All other antiglaucomatous medications, if prescribed, were unaltered throughout the trial. On the second day of admission a controlled phasing was done 4 times a day with a Goldmann applanation tonometer. On the third day of admission the tensions were taken in a similar manner, with 9 eyes receiving aqueous pilocarpine drops 4 times a day and 10 eyes receiving oily pilocarpine drops twice a day. The percentage concentration of aqueous and oily pilocarpine was the same as the patient had been taking before the trial. Topical application of pilocarpine was withheld on the third day and the intraocular pressures were not recorded. On the final day the tensions were recorded with 9 patients receiving oily pilocarpine drops and 10 patients receiving the aqueous form.

The intraocular tensions were measured on the same tonometer by the same examiner, and the mean of 3 readings was taken. The examiner was unaware of the type of pilocarpine instilled, and the patients were asked to note any difference in the 'first' and 'second' medications.

Results

The mean daily pressure in 19 eyes (Table 1) was 21 mmHg when oily drops were used as against 23.7 mmHg when the aqueous drops were used. The mean intraocular pressure without the use of pilocarpine was 27.3 mmHg. The maximum, minimum,

DF=degrees of freedom.

Table 5 Treatment comparison regarding daily maximum intraocular pressure

Treatment comparison	Mean diff.	DF	t value	p Value (2-tailed)
Pilo. in oil vs. control	7.84	18	7.42	0.001
Aqueous pilo. vs. control	5.74	18	6.82	0.001
Pilo. in oil vs. aqueous pilo.	2.10	18	2.46	0.05

Table 6 Treatment comparison regarding maximum daily variation of intraocular pressure

Treatment comparison	Mean diff.	DF	t Value	p Value (2-tailed)
Pilo. in oil vs. control	3.79	18	2.31	0.05
Aqueous pilo. vs. control	3.32	18	3.85	0.002
Pilo. in oil vs. aqueous pilo.	0.47	18	0.45	NS

NS=not significant.

shows that the maximum daily variation of intraocular pressure was statistically significantly greater in the control period. No statistical difference was found between aqueous and oil pilocarpine.

Discussion

Reduced patient compliance can be disastrous in the medical management of chronic simple glaucoma. A considerable number of patients in whom medical management has failed have been found to

have been careless in putting in drops. Goldberg *et al.*⁴ showed that pilocarpine in gel once a day improved patient compliance.

Pilocarpine in oil used twice a day reduced the mean intraocular pressure more than aqueous pilocarpine 4 times a day. The maximum pressure during the day was significantly lower on oily pilocarpine drops twice a day than on aqueous drops 4 times a day. Although we were unable to get a statistically favourable difference in variation of the intraocular pressure on the 2 pilocarpine treatments, the need to use the oily drops only twice a day was an advantage.

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