

Normal response to pilocarpine and phenylephrine

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SUMMARY Fifty-eight eyes from 58 patients in which there was no evidence of glaucoma were provoked with pilocarpine and phenylephrine drops. The result was a significant reduction in intraocular pressure and a significant increase in outflow facility. The 58 eyes were randomised and 19 submitted to a 'dummy' provocative test. There was no significant change in either pressure or outflow facility. The effect of the pilocarpine/phenylephrine provocative test in normal eyes is to produce a response that is the opposite of a positive provocative test in eyes at risk of developing closed-angle glaucoma.

The interpretation of provocative tests in eyes at risk of developing closed-angle glaucoma is made difficult by false positive results. For example, homeostatic drive may induce a spontaneous change that appears as a positive test. Again, some normal eyes can respond to the particular drugs used with an increase in pressure or reduction in outflow without developing angle closure.

It would seem, therefore, that the power of a test would be enhanced if homeostatic drive was nullified by the drugs used and if the effect of the drug in normal eyes was the opposite of a positive test. In previous papers (Mapstone, 1974; Mapstone, 1976a, b) the effect of a provocative test using pilocarpine and phenylephrine has been described in eyes at risk of developing closed-angle glaucoma. This paper records the result of provoking a group of normal eyes in a similar fashion and also describes the spontaneous variation they may be expected to undergo in the absence of provocation.

Material and methods

Fifty-eight eyes from 58 patients, in which there was no evidence of glaucoma, were provoked as follows: At zero hours pilocarpine drops 2% and phenylephrine drops 10% were instilled and the intraocular pressure was recorded. Subsequently, at approximately half-hourly intervals, phenylephrine 10% was instilled and the intraocular pressure recorded. After approximately 1½ hours an additional drop of pilocarpine 2% and phenylephrine 10% was instilled and the intraocular pressure recorded. Finally the pressure was recorded 1 hour later and the test terminated by the instillation of thymoxamine drops ½%. Facility of outflow was

measured at the start of the test, at the time of instillation of the second dose of pilocarpine and phenylephrine, and at the termination of the test.

The 58 patients were then randomised and 19 selected for a 'dummy' provocative test—i.e., the procedure was as described above except that no autonomic drugs were instilled.

Results

PROVOCATIVE TESTS IN 58 NORMAL EYES

Fig. 1 records the results of provoking 58 normal eyes with pilocarpine and phenylephrine. After the first dose, and before the instillation of the second, pressure fell from a mean of 14.9 mmHg to a mean of 13.7 mmHg. At the same time the facility of outflow (C) increased from a mean of 0.25 μ l/mmHg/min to 0.33. Both results are significant (paired *t* test, $P < 0.001$). After the instillation of the second dose of pilocarpine and phenylephrine pressure did not change significantly, from 13.7 to 13.6 mmHg, but C increased from 0.33 to 0.38 ($P < 0.001$).

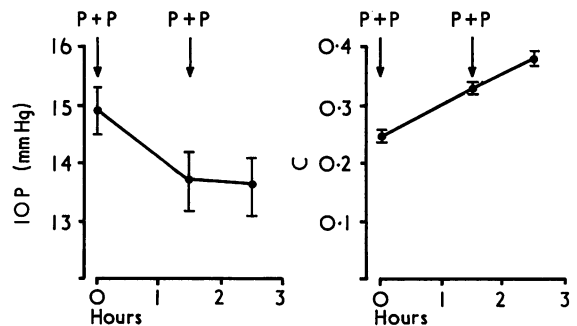


Fig. 1 Response of 58 normal eyes to provocative testing with pilocarpine and phenylephrine. Mean values and standard error recorded. P+P=pilocarpine and phenylephrine

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Overall 55 eyes showed an increase in C, in one there was no change, and two showed a decrease—of 0.7 and 0.1.

Fig. 2 shows a plot of the total change in pressure (ΔP) on the total change in outflow (ΔC). The equation of the regression line is $\Delta P = -6.2\Delta C - 0.49$; the correlation coefficient is not significantly different from zero (-0.25).

'DUMMY' PROVOCATIVE TEST IN 19 EYES

Fig. 3 shows the result of a dummy provocative test in 19 of the 58 eyes. Pressure decreased from a mean of 15.3 mmHg to a mean of 14.6 mmHg. At the same time C decreased from a mean of 0.25 to 0.23. Neither change is significant (paired *t* test, $P > 0.1$). The correlation coefficient between the overall change in pressure and outflow is -0.25, which again is not significantly different from zero.

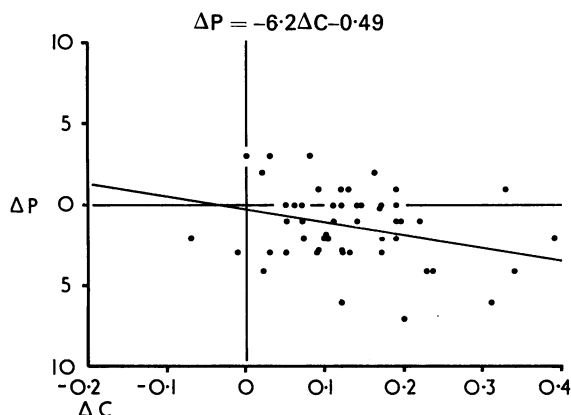


Fig. 2 A plot of the total change in pressure (ΔP) against the total change in C (ΔC) in 58 normal eyes provoked with pilocarpine and phenylephrine. The equation of the regression line is $\Delta P = -6.2 \Delta C - 0.49$; the correlation coefficient is 0.25

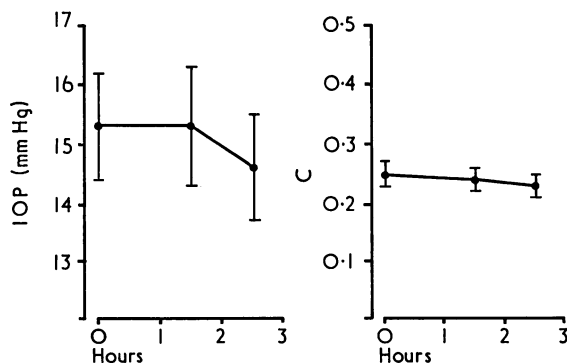


Fig. 3 Response of 19 normal eyes to a 'dummy' provocative test. Mean values and standard error recorded

Discussion

The rationale for this approach to provocative testing has been described in previous papers (Mapstone, 1974; Mapstone 1976a, b). There it was shown that eyes developing a positive result fall into two groups: (1) In the first, one dose of pilocarpine and phenylephrine is sufficient to provoke an acute attack. (2) In the second, the first dose of pilocarpine and phenylephrine produces a response similar to that described here for normal eyes. The second dose of pilocarpine and phenylephrine then provokes an acute attack.

The results described indicate that the overall response is the opposite of what happens in a positive provocative test. At first sight the absence of significant correlation between the change in pressure and change in outflow is somewhat paradoxical. The known effects of pilocarpine and phenylephrine (Kronfeld, 1964; Harris and Galin, 1970) are such that one would expect a normal eye to respond with a fall in pressure and an increase in outflow—which happens. But as pressure is inversely proportional to outflow it would be reasonable to expect large increases in C to be associated with large decreases in pupillary pressure (P) and vice-versa—that is, a significant negative linear correlation. This does not happen presumably because of changes in uveoscleral outflow, aqueous inflow, and pseudo-facility.

Additionally, too, homeostatic drive might be expected to counteract to some extent the effect of a fall in pressure. However, parasympathetic drive has been largely superseded by pilocarpine, and the α -sympathetic by phenylephrine. β -mediated drive alone is unaffected.

The results of the 'dummy' tests indicate that in normal eyes homeostatic drive produced no significant change in either pressure or outflow when measured under identical conditions to those for a genuine test. The changes produced by pilocarpine and phenylephrine in normal eyes are therefore the opposite of those occurring in a positive provocative test in eyes at risk of developing closed-angle glaucoma.

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References

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