Miotics in closed-angle glaucoma

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The initial treatment of acute primary closed-angle glaucoma (CAG) is directed towards lowering intraocular pressure (IOP) to normal levels as rapidly as possible. To this end, aqueous inflow is reduced by a drug such as acetazolamide (Diamox), and aqueous outflow is increased *via* the trabecular meshwork by opening the closed angle with miotics. The use of miotics is of respectable lineage and hal- lowed by usage, but regimes vary from "intensive" (*i.e.* frequent) to "occasional" (*i.e.* infrequent) instilla- tions. Finally, osmotic agents are used after a variable interval of time if the IOP remains raised. The pur- pose of this paper is to investigate the value of miotics in the initial treatment of CAG.

Material and methods

Twenty patients with acute primary closed-angle glau- coma were treated, alternately, in one of two ways detailed below:

- (1) Intravenous Diamox 500 mg. stat, plus gutt. Pilo- carpine 2 per cent. every minute for 5 min., every 5 min. for 15 min., every 15 min. for 1 hr, and thereafter 6-hrly.
- (2) Intravenous Diamox 500 mg. stat, plus one drop Pilocarpine 2 per cent. repeated after 1 hr and thereafter 6-hrly.

The next ten patients with CAG were treated as follows:

- (3) Intravenous Diamox 500 mg. stat, then 3 hrs later 500 mg. Diamox orally and one drop Pilocarpine 2 per cent.

If after 7 hrs IOP was greater than 21 mm. Hg, the treatment was considered a failure.

Results

The results for each of the three treatment groups are given in the Table. Duration equals the interval between onset of symptoms and presentation at hospital. IOP refers to either the first recorded normal pressure at the time stated after starting treatment, or to the raised pressure at 7 hrs.

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Table 1 *Dosage in Groups 1, 2, and 3*

Group	Case no.	Duration (days)	IOP (mm. Hg)	Time (hrs)
1	1	12	8	5
	3	7	21	3
	5	14	48	7
	7	8	14	5
	9	10	18	6
	11	2	12	6
	13	5	20	6
	15	14	18	6
	17	14	16	6
	19	6	02	2
2	2	8	21	5
	4	20†	20	6
	6	1	18	5
	8	4	18	5
	10	6	18	6
	12	10	20	6
	14	21	10	5
	16	10	18	5
	18	3	10	3
	20	15 hrs	48*	7
3	21	2	12	5
	22	3	16	4
	23	2	10	3
	24	28	20	6
	25	4	21	5
	26	4	20	4
	27	2 hrs	40†	7
	28	7	4	6
	29	5 hrs	22	6
	30	21	20	6

* Intravenous Diamox was repeated at 10 hrs and IOP was 12 mm. Hg.

† Oral Diamox was inadvertently omitted at 3 hrs

Groups 1 and 2 each had one failure; the failure in Group 2 had a normal IOP after 10 hrs. Group 3 had one failure, in whom the oral Diamox was omitted at 3 hrs. In this case the pressure was sub- sequently controlled with further intravenous Diamox.

Discussion

The results indicate that no significant difference exists between the three methods of treatment. The constant feature in each group was intravenous Diamox; the variable was the frequency of Pilocarpine instillation. It is therefore a necessary consequence that multiple doses of Pilocarpine are unnecessary for the treatment of acute CAG.

This conclusion is predictable from theoretical considerations alone. Established CAG is characterized by sphincter ischaemia and variable ciliary body function. It is illogical to suppose that an atonic sphincter can be goaded into activity by a parasympathomimetic drug. Again, ciliary muscle contraction will not produce an increase in aqueous outflow since the angle is closed. What is necessary is a lowering of aqueous production by an already ischaemic ciliary body using a carbonic anhydrase inhibitor.

Why therefore give Pilocarpine at all? There would appear to be no logical reason for its use in the early treatment of an acute attack. However, once the IOP has been reduced to a lower level by Diamox, it seems reasonable to suppose that the return of sphincter muscle activity—at least in part—and the ensuing miosis, will open a closed angle. This means, in effect, that Pilocarpine instillation should be delayed for about 3 to 4 hrs.

References

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Are there any advantages in abandoning an intensive Pilocarpine regime? It is probable that:

- (1) The incidence of variable degrees of Pilocarpine toxicity (Greco and Kelman, 1973; Epstein and Kaufman, 1965) is reduced to zero.
- (2) In the presence of a mid-dilated pupil and *normally* functioning ciliary body, Pilocarpine can precipitate an acute angle closure (Mapstone, 1974). While there is no evidence of its occurrence in any patient described here, it could—theoretically—prevent the medical termination of an acute attack.
- (3) A few litres of Pilocarpine will be saved annually.

It is therefore concluded that one drop of Pilocarpine 3 to 4 hours after intravenous Diamox is all that is necessary in the initial treatment of acute primary CAG.

Summary

The use of intravenous Diamox with variable doses of Pilocarpine was investigated in the treatment of primary closed-angle glaucoma. It was concluded that one drop of Pilocarpine 3 to 4 hrs after intravenous Diamox is the only parasympathomimetic drug necessary to terminate an acute attack.