

Intraocular pressure during 4-hydroxybutyrate narcosis

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4-Hydroxybutyrate (Gamma-OH, Egit) is a hypnotic which can be used to produce unconsciousness by its direct cortical action. It has little medullary depressant effect and no analgesic action. Surgical stimuli must therefore be prevented from reaching the central nervous system by local analgesia. Its use in this way is described in the foregoing article (Smith, Beveridge, and Wyllie, 1972). This paper describes the changes in intraocular pressure during 4-hydroxybutyrate narcosis and compares them with those observed during conventional general anaesthesia.

Methods

87 patients undergoing cataract extraction were included in this study. 45 patients were given 4-hydroxybutyrate with local anaesthesia but without endotracheal intubation, and 42 patients were given nitrous oxide and halothane after intubation using suxamethonium. The groups were comparable for age and sex, and the ages ranged from 55 to 83 years (mean 69 : S.D. 9.96).

The intraocular pressures were measured by a Schiötz tonometer in the eye not prepared for surgery. The Schiötz tonometer was used for its simplicity and degree of accuracy. In a recent comparative trial, pressure readings with the Schiötz tonometer were found to be comparable with those using the Draeger hand-held applanation tonometer (Finlay, 1970). Robertson and Gibson (1968) also found that intraocular pressure readings by Schiötz tonometry gave results consistent with those obtained from cannulation. Proparacaine hydrochloride 0.5 per cent. (Ophthaine solution, Squibb) was used for topical anaesthesia as required. Readings were taken at the following stages:

- (a) Before premedication;
- (b) Before induction;
- (c) During induction;
- (d) Before operation;
- (e) After operation;
- (f) 1 hour after operation, with return of consciousness.

The pressures were compared in each group of patients. A further subdivision was made for those patients who had received acetazolamide (as 500 mg. Diamox Sustet, Lederle) orally on the previous evening.

Results

The Figure indicates the pattern of intraocular pressure values in both groups of patients who had not received acetazolamide.

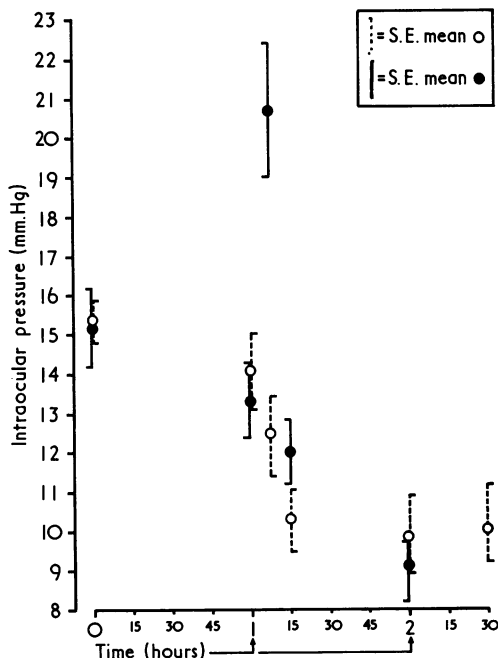


FIGURE Mean intraocular pressure values (mm.Hg)

○ 4-hydroxybutyrate group
● General anaesthesia group

BOTH GROUPS OF PATIENTS

There was a consistent fall in intraocular pressure in all patients after standard premedication of intramuscular methadone 5–10 mg., perphenazine 2.5–5 mg., and atropine 0.6 mg. given 1 hour before induction.

GROUP WITH 4-HYDROXYBUTYRATE NARCOSIS

There was a further fall in intraocular pressure during induction with 4-hydroxybutyrate and methohexitone. There was no sharp rise in intraocular pressure in this group of patients as they did not receive suxamethonium and were not intubated. The intraocular pressure continued to fall slightly throughout the operation time rising slightly 1 hour postoperatively. This rise did not exceed the preinduction levels in any patient.

GROUP WITH GENERAL ANAESTHESIA

In these patients there was the usual sharp transient rise in intraocular pressure after intravenous suxamethonium (Robertson and Gibson, 1968) and endotracheal intubation (Lewallen and Hicks, 1960). The intraocular pressure then fell to a postoperative value which was less than the preinduction level in all but three cases. The postoperative intraocular pressure values showed no statistical difference between the two groups (Mann-Whitney U Test, $Z = 0.4$; $P = N.S.$).

EFFECT OF ACETAZOLAMIDE

In the subdivisions of those patients who had received acetazolamide, the intraocular pressures were of the same pattern but lower by 10 per cent. This difference was statistically significant ($P = 0.01$; Mann-Whitney U Test, $Z = 12.8$).

Discussion

After sedative premedication, the fall in intraocular pressure was comparable in each group of patients. This confirmed the validity of the rest of the study. The consistent fall in intraocular pressure with 4-hydroxybutyrate was greatest at the beginning of the operation. This is probably due to the relaxation of the extraocular muscles. At no time during the operation was there forward bowing of the iris. The pressure fell slightly during the operation, but preoperative levels were regained during the recovery period. As these measurements were taken in the non-operated eye, the reduction in intraocular pressure would of course be greater in the operated eye because of the retrobulbar anaesthesia (Duke-Elder, 1962).

The transient rise in intraocular pressure after suxamethonium is well known and is not detrimental unless the corneo-scleral incision is made before the eye is again normotensive. In the general anaesthesia series, the intraocular pressure had returned to within normal limits immediately preoperatively. The level was higher than the preinduction value, however, in six patients. The preoperative values were also significantly higher than the corresponding values in the 4-hydroxybutyrate series (Mann-Whitney U Test, $Z = 2.9$; $P = 0.01$). This difference was shown to be associated with the previous suxamethonium-induced rise (Spearman's rank order correlation coefficient $r = 0.64$; $P = 0.01$).

Summary

In a series of 45 patients rendered unconscious with 4-hydroxybutyrate, the intraocular pressure was found to be reduced by 10 to 40 per cent. of the preinduction level. This reduction was compared with the effect of general anaesthesia in a similar series of patients. Intraocular pressure was consistently reduced during 4-hydroxybutyrate narcosis with no rise corresponding to that found with anaesthesia involving endotracheal intubation and suxamethonium. The intraocular pressure taken immediately preoperatively showed a greater reduction with 4-hydroxybutyrate than with general anaesthesia. The reduction of intraocular pressure extended into the postoperative period.

In each series, those patients who had received acetazolamide on the previous evening were considered as a separate subgroup. They showed a pattern of intraocular pressure changes similar to that described, but lower by 10 per cent.

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References

- DUKE-ELDER, S. (1962) "System of Ophthalmology", vol. 7, p. 597. Kimpton, London
 FINLAY, R. D. (1970) *Trans. ophthal. Soc. U.K.*, **90**, 887
 LEWALLEN, W. M., and HICKS, B. L. (1960) *Amer. J. Ophthal.*, **49**, 773
 ROBERTSON, G. S., and GIBSON, P. F. (1968) *Anaesthesia*, **23**, 342
 SMITH, I., BEVERIDGE, M. E., and WYLLIE, A. M. (1972) *Brit. J. Ophthal.*, **56**, 429