

Glycopyrrolate Compared with Atropine in Patients Undergoing Intraocular Operations with Local Anesthesia

ELSIE F. MEYERS, M.D.,* AND PREMILA CHARLES, M.D.†

The oculocardiac reflex is a trigeminal-vagal reflex manifested by bradycardia, dysrhythmias, sinoatrial arrest, and even cardiac arrest. It may be initiated by pressure on the eyeball or orbit, by traction on the iris or extraorbital muscles, or by intraorbital injection.^{1,2}

Methods of prevention have included 1) retrobulbar block with local anesthesia and 2) atropine administration. However, problems may arise with both methods. Retrobulbar block may fail to prevent the oculocardiac reflex; it can itself elicit the reflex. Atropine iv may reduce the incidence of bradycardia and arrhythmias, but can also produce arrhythmias. In small doses atropine may induce bradycardia, and in larger doses, tachycardia.³⁻⁵

Theoretically, the anticholinergic drug, glycopyrrolate, a quaternary ammonium compound, should be advantageous for ocular surgical patients. Reportedly, it has the advantage of producing a greater and more prolonged vagal blocking action than atropine and is associated with minimal tachycardia and arrhythmias. Other advantages cited are little or no central nervous system effect, marked antisialogogue effect, and reduction of gastric secretion.⁶⁻⁸ This report compares atropine and glycopyrrolate with regard to incidences of problems during and after intraocular operations.

METHODS

Three hundred adult patients scheduled for intraocular operations with local anesthesia were studied. None received atropine or hyoscine eye drops. The patients were evaluated preoperatively by either of the authors. On arrival at the operating room suite, with minimal premedication of prochlorperazine, 5-10 mg, or hydroxyzine, 25-75 mg, a baseline pulse rate was recorded and intravenous infusion established. Then, 1 ml of a solution, the identity of which was unknown by the anesthesiologist, was given iv. Atropine, 0.4 mg, glycopyrrolate, 0.2 mg, or saline solution, 1 ml, was administered, according to a randomized schedule. A minute later the pulse rate was recorded. Within 5 minutes, after placement of moni-

TABLE 1. Distribution

	Number of Subjects	Age (Years) (Mean)	Male	Female
Saline solution	100	67.7	39	61
Glycopyrrolate	100	66.4	41	59
Atropine	100	66.8	44	56

TABLE 2. Pulse (Mean)

	Baseline	One Minute Following IV Dose	Increase*
Saline solution	73.4	78.4	+5.3
Glycopyrrolate	76.6	88.1	+11.5
Atropine	75.6	86.6	+11.0

* Significant difference, saline solution vs. atropine and glycopyrrolate, $P = 0.002$.

tors, iv fentanyl, 0.025-0.05 mg, iv, was given. Four minutes later the surgeon administered a retrobulbar injection of 10 ± 5 ml of mepivacaine hydrochloride, 2 per cent, with bupivacaine hydrochloride, 0.75 per cent, hyaluronidase, and epinephrine, 1:400,000, or lidocaine, 2 per cent, with or without hyaluronidase and epinephrine, 1:400,000.

Blood pressure, ECG and pulse rate were monitored. Changes in vital signs or other problems were recorded. At the postoperative visit, the patient was questioned according to a fixed format regarding nausea, vomiting, dryness of the mouth, and other difficulties occurring during or after the surgical procedure.

Dryness of the mouth was graded: 0 = no dryness; 1+ = slight dryness; 2+ = quite dry without discomfort; 3+ = very dry and uncomfortable; 4+ = tongue felt dry enough to crack and stick to top of mouth.

The data were analyzed utilizing standard chi-square methods; only P values are reported; $P < .05$ was considered significant.

RESULTS

The 300 subjects were similar with regard to age and sex distributions (table 1) ($P > .10$). The median age was 70 years in each group. Baseline pulse rates in the three groups (table 2) were similar ($P > .10$).

* Assistant Professor of Anesthesiology.

† Resident in Anesthesiology.

Received from the Department of Anesthesiology, Washington University School of Medicine, 660 South Euclid Avenue, St. Louis, Missouri 63110. Accepted for publication March 5, 1978.

Address reprint requests to Dr. Meyers.

TABLE 3. Cardiac Complications

	Number of Subjects	Tachycardia* Pulse \geq +20/Min	Bradycardia Pulse \geq -10/Min	Arrhythmias	Total Patients with Problems
Saline solution	100	7	5	4	16
Glycopyrrolate	100	25	4	7†	33
Atropine	100	19	3	7†	26

* Significant difference, atropine and glycopyrrolate vs. saline solution, $P = 0.02$.

† Three also had tachycardia.

TABLE 4. Postoperative Complications

	Number of Subjects	Nausea	Vomiting	Dryness					Total Dryness 3+ and 4+*
				0	1+	2+	3+	4+	
Saline solution	100	8	2	30	27	23	15	5	20
Glycopyrrolate	100	9	5	18	24	20	26	12	38
Atropine	100	3	1	18	31	32	15	4	19

* Significant difference, glycopyrrolate vs. atropine or saline solution, $P = 0.001$.

A minute following iv drug administration (table 2) there was a greater mean pulse rate increase in patients receiving glycopyrrolate and atropine than in those receiving saline solution ($P = 0.002$).

Intraoperatively (table 3), the incidences of bradycardia and arrhythmias were similar in the three groups. However, the extents of tachycardia with increases of ≥ 20 bpm were greater with glycopyrrolate and atropine than with saline solution ($P = 0.02$).

Postoperatively (table 4), patients receiving glycopyrrolate vomited more than those receiving atropine or saline solution, but the difference was not significant. However, the incidence of 3+ to 4+ dryness was greater in patients receiving glycopyrrolate than in those receiving atropine or saline solution ($P = .001$).

DISCUSSION

The present study indicates that patients undergoing intraocular operations with local anesthesia and receiving no anticholinergic drug have less tachycardia and no increase in the incidence of oculocardiac reflex.

Postoperatively, patients receiving saline solution or atropine had less marked dryness of the mouth and less vomiting than those receiving glycopyrrolate. That a larger number of patients receiving glycopyrrolate vomited seems incongruous, since glycopyrrolate decreases gastric secretions. It is our impression that because of discomfort caused by prolonged dryness of the mouth, there was increased fluid intake, although this was not measured. Perhaps patients having local anesthesia for minor operations are more

aware of dryness of the mouth than those in previous studies who were given general anesthesia for various procedures, including abdominal and thoracic operations. Perhaps general anesthesia used in the previous studies tended to decrease the incidence of intraoperative tachycardia resulting from glycopyrrolate.

We conclude that glycopyrrolate offers no advantage over atropine for patients undergoing intraocular operations with local anesthesia; patients receiving no premedicant anticholinergic drug had the least intraoperative and postoperative complications.

Data analysis was done in consultation with the Division of Biostatistics, Washington University School of Medicine.

REFERENCES

1. Katz RL, Bigger JT: Cardiac arrhythmias during anesthesia and operation. *ANESTHESIOLOGY* 33:193-213, 1970
2. Pöntinen PJ: The importance of the oculocardiac reflex during ocular surgery. *Acta Ophthalmol suppl* 86:7-66, 1966
3. Deacock ARdeC, Oxer HF: The prevention of reflex bradycardia during ophthalmic surgery. *Br J Anaesth* 34:451-457, 1962
4. Mendelblatt FI, Kirsch RE, Lemberg L: A study comparing methods of preventing the oculocardiac reflex. *Am J Ophthalmol* 53:506-512, 1962
5. Taylor C, Wilson FM, Roesch R, et al: Prevention of the oculocardiac reflex in children—comparison of retrobulbar block and intravenous atropine. *ANESTHESIOLOGY* 24:646-649, 1963
6. Franko BV, Alphin RS, Ward JW, et al: Pharmacodynamic evaluation of glycopyrrolate in animals. *Ann NY Acad Sci* 99:131-149, 1962
7. Oduro KA: Glycopyrrolate methobromide. 2. Comparison with atropine sulfate in anaesthesia. *Can Anaesth Soc J* 22: 466-473, 1975
8. Wyant GM, Kao E: Glycopyrrolate methobromide: Effect on salivary secretion. *Can Anaesth Soc J* 21:230-241, 1974