McGILL UNIVERSITY EXPERIENCES WITH METHOXYFLURANE*

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THIS REPORT covers preliminary studies with methoxyflurane from hospitals connected with the Department of Anaesthesia at McGill University. When the department was presented with this new anaesthetic agent, evidence of its over-all safety was available from animal and clinical studies. A clinical report had indicated that the anaesthetic features were a fair reflection of the physical properties.¹

The Department at McGill decided that it would be of benefit to estimate the clinical usefulness of the agent under ordinary working conditions in each hospital. Specific features of the agent might merit more detailed examination at a later date. The total number of cases being small—314—it was realized that any opinions formed were the result of clinical impressions and unlikely to stand up to statistical analysis. Each of five groups of anaesthetists answered seven questions and an attempt to embody the replies is made in this paper.

The operations may be classified by site as follows:

Intracranial	7
Intrathoracic (lungs)	18
Abdominal	65
Oropharangeal	38
Perineal	22
Orthopaedic (including spine)	47
Peripheral Structures (trunk and limbs)	117
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TOTAL	314

The age distribution of the patients was four months to 83 years. The weight distribution was 17½ lbs. to 224 lbs. The longest duration of operation was seven hours.

The first question the investigators were asked was, "*Can the agent be used in conventional apparatus?*" The ether vaporizer on the Boyle's machine was used with satisfaction in all the hospitals. One hospital replaced the ether bottle by the trilene bottle for this purpose. The usual practice was to open the tap fully and then to vary the concentration by raising or depressing the plunger. The highest concentration reported was 2.9 per cent when 7 L. of gas were bubbled through the agent per minute, with the ether bottle in place. With the plunger fully raised concentrations as low as 0.5 per cent were found at this flow. One anaesthetist used a gas flow of 4 L. per min. through this apparatus with satisfaction. Another used a Heidbrink wick ether vaporizer. With this vaporizer com-

*Presented at the Annual Meeting of the Canadian Anaesthetists' Society, May 15-18, 1961.

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pletely open concentrations of 1.6 per cent could be obtained. Another group used the agent with the Vernitrol vaporizer. With a 1,500-c.c. oxygen flow through the vaporizer they obtained a 3 per cent concentration. This was diluted to any desired concentration by adding gases from the by-pass. All these concentrations are approximate. In the vast majority of cases the gas flow from these vaporizers was fed into a circle absorption semiclosed system. In a few cases a non-return system was used, and occasionally the Magill attachment of the Boyle's machine. All these methods of administration were considered satisfactory. In 15 cases the agent was administered in a closed Coxeter-Mushin absorber system. No measurements of concentration were obtained here, but it was noted that condensation of water on the agent in the vaporizer appeared to seal it off.

The second question asked was, "*Are there any dangers or contra-indications to this agent?*" It was agreed by all groups that hypotension *might* occur. However, the degree of hypotension experienced by each group varied greatly. All groups reported falls in systolic blood pressure of 20 mm. Hg as being not unusual. In nine cases, falls greater than this were reported, the greatest being a seventy mm. drop, from 160 to 90, when the patient was manually ventilated with 2 per cent methoxyflurane. In only two other cases were drops greater than 50 mm. recorded and in none of these three cases did the systolic blood pressure fall below 90 mm. Hg.

Slight bradycardia was common, but none severe enough to need atropine. One patient developed extrasystoles after 25 minutes of 0.8 per cent methoxyflurane. The rhythm did not revert to normal with 0.4 mgm. atropine I.V. and the arrhythmia lasted 60 minutes after the agent had been discontinued. One other patient developed extrasystoles in the recovery room.

Operations not requiring relaxation are not associated with undue respiratory depression, but increasing depths of anaesthesia will produce depression to the point of apnoea. Neither laryngeal nor bronchial spasms were reported with the agent. Surgical stimulation in light stages of anaesthesia did not produce laryngeal spasms even if marked limb movements were present. Two diabetics were given the agent and were satisfactorily controlled on their normal insulin requirements. In 22 cases adrenalin was used in combination with the agent without arrhythmias.

The third question was, "*What are the characteristics of methoxyflurane as an inducing agent?*" It was agreed by all groups that induction was slow with methoxyflurane; generally at least 15 minutes were required before an adequate state of anaesthesia was attained. The vapour did seem to be non-irritant and rapid increases in concentration were possible without producing coughing or laryngospasm. Relaxation of the jaw muscles occurs early but the tracheal reflexes are much more slowly obtunded. Laryngeal irritability disappears early and once adequate surgical anaesthesia has been reached hurried intubation is unnecessary.

The fourth question was, "*Is it best used alone or in combination?*" It was generally agreed that the slowness of the agent as a substance for induction is best overcome by using thiopentone or nitrous oxide. Maintenance with methoxyflurane alone is satisfactory but the addition of nitrous oxide was preferred.

ACKNOWLEDGMENT

It is not possible to give the names of all the doctors who participated in this study, but I wish to thank the following who reported for their respective hospitals: Royal Victoria Hospital, Dr. C. A. Sheridan; Montreal Children's Hospital, Dr. H. T. Davenport; Montreal General Hospital, Dr. W. I. Neilson; Queen Mary Veterans' Hospital, Dr. N. W. B. Craythorne; St. Mary's Hospital, Dr. D. J. Power.

Methoxyflurane was kindly supplied by Dr. Peter H. Nash, Medical Director, Abbott Laboratories Limited, Montreal, under the name of Penthrane®.

REFERENCE

1. ARTUSIO, J. F., JR., *et al.* A Clinical Evaluation of Methoxyflurane in Man, *Anesthesiology* 21: 5 (Sept.-Oct. 1960).