OBSERVATIONS ON POSTOPERATIVE VOMITING*

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NAUSEA AND VOMITING in the postoperative period is a well-attended problem and much literature has accumulated during recent years concerning the evaluation of a group of drugs with anti-emetic properties. Almost all the anti-emetic agents known have been investigated and most of them have been advocated as being effective against postoperative nausea and vomiting. The method of investigation appeared relatively uniform; most investigators have employed the "double-blind" method in order to obtain unbiased observations for statistical evaluation.

If one compares any number of studies on postoperative vomiting, one is surprised by the wide disparity in the incidence of vomiting in the various centres where such studies have been conducted. In a random selection of recent papers (Table I) an incidence between 60 per cent and 9 per cent was

TABLE I

INCIDENCE OF VOMITING IN EIGHT RECENT INVESTIGATIONS

Author	No. of cases	Agent	Controls, %	Treated, %
Bonica *et al.*,[4] 1958	2,827	Cyclizine	60	27
Bellville *et al.*,[3] 1959	2,214	Cyclizine	19 4	11
		Trifluprom azine	19 0	5 9-3 4
Denson & Elesh,[5] 1960	2,362	Pipamazine	9 7	4 6
Bellville *et al.*,[2] 1960	345	Perphenazine	14 2	6 6
		Trimethobenzamide	14 0	12 0
Ouellette,[9] 1962	228	Trimethobenzamide	26 3	14 3
Sobel,[11] 1961	110	Trimethobenzamide	38 0	38 0
Wolfson *et al.*,[12] 1962	870	Trimethobenzamide	39 4	35 6
Dyrberg,[6] 1962	417 (M)	Haloperidol	14 3	3 4
	772 (F)		32 2	10 8

found.[2-6,9,11,12] Such a wide variation leads to the assumption that different criteria have been used in regard to the observation of vomiting by the various investigators. This lack of uniform criteria makes an assessment of the magnitude of the problem of postoperative vomiting very difficult and reduces the significance of the reported data even if sound statistical methods have been employed.

In the studies listed in Table I, the number of patients vomiting in spite of treatment with potent anti-emetic drugs varies from 2.4 and 35.6 per cent. A reduction in the incidence of vomiting is interpreted as a significant therapeutic effect and many authors advocate the routine use of these agents in conjunction

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with anaesthesia. Such recommendations have not remained uncriticized; Keats[7] felt that in 80 to 90 per cent of the surgical patients treatment with anti-emetics was unnecessary and Adriani *et al.*[1] found vomiting severe enough to require treatment in only 3.5 per cent of their patients. An assessment of the side-effects of anti-emetic drugs is equally unsatisfactory; prolongation of recovery from anaesthesia, drowsiness, depression, hypotension, etc. have been reported and, depending on the view of the author, have been thought negligible, advantageous, or objectionable.

A recently developed agent, trimethobenzamide (Tigan), has been reported as an effective anti-emetic with almost no side-effects. This drug has been tried in various types of vomiting and reports considering the effectiveness range from excellent to poor; the criteria employed in order to arrive at these results differed from paper to paper.[2,8–12]

In order to get an understanding of the magnitude of the problem of postoperative vomiting in our hospital we have tried to use a different approach in an attempt to find an answer to the following questions:

1. How much of postoperative vomiting is transitory and how often is vomiting sufficiently severe to require treatment?

2. Are anti-emetic drugs, in particular trimethobenzamide, effective in controlling severe vomiting once it has commenced?

For this study we have selected patients in the recovery room who vomited twice after regaining consciousness. After the second bout of vomiting these received an intramuscular injection of an anti-emetic drug. One group of anaesthetists agreed to use trimethobenzamide routinely during the study period for all their patients that fulfilled the above criteria, while others were requested to order the anti-emetic agent of their choice for the same purpose. The following agents and dosages were used: trimethobenzamide (Tigan) 200 mg., prochlorperazine (Stemetil) 10 mg., dimenhydrinate (Gravol) 50 mg., and the cyclizine (Marzine) 50 mg., all injected intramuscularly. After the drug was given the incidence of vomiting was carefully charted by the nurse in the recovery room and for the first 48 hours postoperatively by the nurses on the ward. Only episodes of actual vomiting were recorded in this study; nausea and retching were not considered. Children under the age of 16 and patients on gastric suction were excluded.

During a period of eight months we have collected 123 cases of significant postoperative vomiting according to the above criteria, an incidence of approximately 3.6 per cent. There were 105 female and 18 male patients in this group. A comparison of the relative frequency of the type of surgery in these patients with severe vomiting and 1,000 consecutive patients selected on the same basis (i.e. no children or patients with gastric suction) is shown in Table II. The high incidence of vomiting after caesarian section and ophthalmic surgery is worth noting. Gynaecological operations have a proportionally higher incidence, while the percentage for abdominal surgery was surprisingly low. The low figure in urologic surgery reflects the frequent use of conduction anaesthesia. The main anaesthetic agents used are shown in Table III, and this distribution corresponds reasonably well with the general use of anaesthetic agents in our hospital.

TABLE II

SURGERY IN 123 CASES OF POSTOPERATIVE VOMITING

Type of surgery	% of patients with postop. vomiting	% of 1,000 consecutive patients at Victoria Hospital with similar types of surgery
Gynaecology (vaginal and abdominal)	35	23.0
Surgery in extremities	17	15.4
Orthopaedics	9	6 7
Abdominal surgery	8	17 1
Caesarian section	8	1 8
Surgery on head and neck	4	7 0
Ophthalmology	4	1 8
Otorhinolaryngology	3	5 2
Urology	4	10 4
Surgery on the trunk	3	4 1
Neurosurgery	3	4 1
Proctology	2	3 4

TABLE III

ANAESTHESIA IN 123 CASES WITH POSTOPERATIVE VOMITING

Agent used for maintenance	%
Cyclopropane	27
Fluothane	39
Nitrous oxide + I.V. agent	21
Ether	3
Penthrane	3
Regional	7
	100

Premedication consisted mostly of various combinations of meperidine or morphine with atropine or hyoscine and had no detectable influence on the incidence of vomiting. Eight of the patients had received phenothiazine derivatives as premedication. The duration of surgery and the position of the patients during surgery did not reveal any contributory factors.

Of the 123 cases selected 66 were first treated with trimethobenzamide, 40 with prochlorperazine, and 9 with dimenhydrinate or cyclizine. Owing to the smaller number, we have listed the patients treated with the two latter agents under the headings "others" in our tables. The result of the treatment is shown in Table IV. Of the patients treated with trimethobenzamide 39 per cent did not vomit within a 6-hour period following the injection; of those treated with prochlorperazine 63 per cent had no further emesis. The difference is probably statistically significant. Analysis of the records of patients in whom treatment was unsuccessful showed a recurrence of vomiting more often during the first 2 hours following the treatment than during the subsequent 4 hours. Eight patients classified as vomiting in accordance with our criteria received no anti-emetic treatment; only two had a recurrence of vomiting. Of the 115 patients treated, 37 received a second dose of an anti-emetic and 10 a third during the postoperative period.

In order to show the further course of these patients during the first 48 hours

after operation, they were divided according to their response to the first injection of an anti-emetic agent (Table IV). Treatment was considered effective in 55 patients (see Table V). Of these, 48 received no further treatment, and in only

TABLE IV

RESULT OF TREATMENT

Agent	No. of patients treated	Treatment effective. No recurrence of vomiting within 6 hours after treatment		Treatment ineffective. No. of patients vomiting after treatment	
		No.	%	0–2 hours	2–6 hours
Trimethobenzamide	66	26	39*	30	18
Prochlorperazine	40	25	63*	10	6
Others	9	4	45	2	4
No treatment	8	6	75	2	0
Total	123	61	50	44	28

*Significant at 5 per cent level

TABLE V

RECURRENCE OF VOMITING AFTER POSTOPERATIVE TREATMENT WITH ANTI-EMETIC DRUGS

		No. of patients vomiting during the following time interval (hours) after the initial treatment			
		0–6	6–12	12–24	24–48
Treatment effective in 55 cases					
No further treatment	48	0	2	0	0
Repeat treatment	7	0	2	1	1
Total	55	0	4*	1†	1
Treatment ineffective in 60 cases					
No further treatment	30	30	6	2	3
Repeat treatment	30	30	16	5	1
Total	60	60	22*	7†	4

*Significant at 0.1 per cent level
†Significant at 5 per cent level

2 was an episode of vomiting reported during the period between 6 and 12 hours after treatment. Treatment was repeated in 4 patients for recurrence of vomiting and in 3 for nausea only. Sixty patients had a recurrence of vomiting during the first 6 hours after treatment and in these we have considered the treatment ineffective. One-half of this group received no further treatment. In 6 of these an episode of vomiting was recorded during the 6–12-hour period postoperatively after treatment, in 2 during the 12–24-hour period, and 3 vomited on the second postoperative day. In the remaining 30 patients vomiting was apparently so severe that the attending surgeon or anaesthetist felt that a repetition of the treatment with the same or another anti-emetic agent was indicated; of these 16 were still reported vomiting during the 6–12-hour period, 5 during the 12–24-hour period, and one on the second day. In the 8 patients not treated initially, there was no recurrence of vomiting after the 6-hour period. As indicated in

TABLE VI

RESPONSE TO REPEAT TREATMENT WITH ANTI-EMETIC

	No. treated	Recurrence of vomiting
Trimethobenzamide	9	7
Prochlorperazine	18	12
Others	10	6

Table VI, 37 patients had a second injection of the same or another anti-emetic. In the majority of the patients so treated, recurrent vomiting was reported in a 6-hour period following the second administration, irrespective of the drug used.

There was a slight difference in regard to the behaviour of our patients in relation to the time of administration of the anti-emetic drug after the operation. Patients who regained consciousness rapidly and thus had their anti-emetic agent given within the first hour following surgery had a lower incidence of recurrence of vomiting after treatment than those who received their first treatment with an anti-emetic during the second or third hour after the end of the operation. Our numbers are too small to make such a difference appear significant, but it would appear to reflect to a certain extent upon the anaesthetic management.

DISCUSSION

We are in agreement with the views presented by Keats,[7] Adriani and others,[1] and Simonsen and Vandewater[10] concerning the routine preoperative or intraoperative administration of anti-emetics. While these drugs probably reduce the incidence of vomiting during emergence from anaesthesia, their effect on severe postoperative vomiting is less evident.

In only a small percentage of all surgical patients is vomiting severe enough to require treatment and this number would be even smaller if one applied stricter criteria for the degree of severity.[6] The incidence of cases with severe vomiting diminished with an increasing time interval after surgery.

According to our observation one could divide patients with postoperative vomiting into two groups: (1) those vomiting during recovery from anaesthesia, (2) patients who persistently vomit for some time after recovery from anaesthesia.

The high incidence of vomiting reported by some investigators is most likely due to the inclusion of all patients in group 1. This was demonstrated by Dyrberg,[6] who recorded the number of occurrences of vomiting in a group of 267 untreated female patients during the first 6 hours after operation. The total incidence of vomiting was 32.2 per cent; but 21.8 per cent vomited only once or twice, 4.3 per cent three or four times, while 6.1 per cent vomited over five times. By omitting group 1, one will obtain figures roughly of the same order as those reported by authors critical of the routine use of anti-emetics[1,6,7] and also approximating those reported as failures in several studies where preventive treatment was used. It appears that judicious waiting will reduce the number

of vomiting patients quite as effectively as costly drugs. There is no good evidence that patients in whom vomiting presents a significant postoperative complication would respond better to preventive treatment than to therapy.

According to our observation, about one-half of the patients with significant vomiting responded well to anti-emetic medication; of these very few had a recurrence of vomiting later on. In patients where the first injection of an anti-emetic drug had not controlled vomiting, subsequent treatment with the same or another agent gave unsatisfactory results. It is our impression that patients who do not respond to anti-emetic treatment deserve our special attention, since vomiting may become a complicating factor in their recovery.

The anti-emetic drugs used in this study differed in their effectiveness: prochlorperazine appeared to be superior to trimethobenzamide. In patients with recurrent vomiting the effects of both drugs were disappointing. Whether the intravenous use of a higher dosage of trimethobenzamide would be effective deserves further investigation.

We did not obtain any indications of why vomiting persisted in a small number of patients. No obvious factor related to anaesthesia could be found. The high incidence of persistent vomiting after caesarian section, ophthalmic surgery, and gynaecological surgery is of interest, pointing to the possible influence of pre-existing biochemical changes or reflex action. As in many other studies, the predominance of female patients is the most significant finding and suggests perhaps constitutional or hormonal factors associated with recovery from anaesthesia and surgery that make these patients prone to vomit.

Summary

We have selected 123 patients who vomited twice following complete recovery from anaesthesia; these were then treated with anti-emetic drugs. Children and patients with gastric suction were excluded. The incidence of this degree of vomiting was 3.6 per cent. Most of our patients were females. There was a higher incidence of vomiting than expected following caesarian section, ophthalmic surgery, and gynaecological operation but not after abdominal operations. The duration of the operation, the type of anaesthesia, the position of the patient, and the preoperative medication did not appear to have a significant influence. About 50 per cent of the patients did not vomit after receiving treatment. Of the two main drugs used, prochlorperazine proved to be more effective than trimethobenzamide. In patients where an initial injection of anti-emetic had not abolished vomiting, subsequent treatment with the same drug or with another anti-emetic was less effective. Since vomiting may develop into a major post-operative complication in patients of this last group special attention should be directed to their management and these patients should be taken into consideration when the therapeutic value of an anti-emetic drug is investigated.

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RÉSUMÉ

On a choisi 123 malades qui avaient vomi deux fois après réveil complet à la suite d'une anesthésie; on les traita alors avec des anti-émétiques. Les enfants et les malades avec une succion gastrique ont été exclus de l'expérience. La fréquence des vomissements a été de 3.6 pour cent. La plupart de nos malades étaient des femmes A la suite de césariennes, de chirurgies ophtalmiques et gynécologiques, la fréquence des vomissements fut plus élevée que celle à laquelle on s'attendait, mais non après les interventions abdominales. Il ne semble pas que la durée de l'opération, le genre d'anesthésie, la position du malade et la prémédication aient exercé une influence marquée. Environ 50 pour cent des malades ne vomirent pas apres traitement. Des deux principaux médicaments employés, la prochlorpérazine s'avéra plus efficace que la triméthobenzamide. Quand une première injection d'anti-émétique n'a pas arrêté les vomissements, on a constaté qu'un traitement subséquent avec le même médicament, ou un autre anti-émétique, était encore moins efficace. Comme les vomissements peuvent provoquer des complications post-opératoires sérieuses chez les malades réfractaires aux anti-émétiques, on doit les entourer de soins plus attentifs et se le rappeler quand on recherche la valeur thérapeutique d'un anti-émétique

REFERENCES

1 ADRIANI, J, SUMMERS, F W, & ANTONY, S. O Is the Prophylactic Use of Antiemetics in Surgical Patients Justified? J A M A *175*: 666 (1961)
2 BELLVILLE, J W, BROSS, J. D, & HOWLAND, W S Post-operative Nausea and Vomiting V. Antiemetic Efficacy of Trimethobenzamide and Perphenazine Clinic Pharmacol & Therap *1* 590 (1960)
3 ——— The Antiemetic Efficacy of Cyclizine (Marezine) and Triflupromazine (Vesprin) Anesthesiology *20* 761 (1959).
4 BONICA, J. J, CREPPS, W, & MONK, B Post Anaesthetic Nausea, Retching and Vomiting Evaluation of Cyclizine (Marezine) Suppositories for Treatment Anesthesiology *19*. 532 (1958).
5 DENSON, J S. & ELESH, W E A Double Blind Study of a New Antiemetic Drug, Sc-9387 Anesth & Analg *40*. 430 (1961)
6 DYRBERG, V Haloperidol (Serenase) in the Prevention of Post-operative Nausea and Vomiting Acta Anaesth Scand. *6*. 37 (1962).
7. KEATS, A. S. Editorial Anesthesiology *21*. 213 (1960)
8 NATHAN, L A Pediatric Use of Trimethobenzamide, a Specific Antiemetic Curr Therap & Research 2 6 (1960)
9 OUELLETTE, R D Control of Post-operative Nausea and Vomiting with Trimethobenzamide. Anesth & Analg. *41*. 148 (1961).
10 SIMONSEN, L. E & VANDEWATER, S. L. Post-operative Vomiting. A Review and Present Status of Treatment Canad. Anaesth Soc J 9 51 (1961)
11. SOBEL, A Control of Post-anaesthetic Emesis with Trimethobenzamide. Anesthesiology 2 492 (1961)
12. WOLFSON, B, TORRES-KAY, M, & FOLDES, F. F. Investigation of the Usefulness of Trimethobenzamide (Tigan) for the Prevention of Post-operative Nausea and Vomiting Anesth & Analg *41* 172 (1962).