THE PREVENTION OF POSTOPERATIVE VOMITING

BY

J. E. RIDING

Department of Anaesthesia, University of Liverpool, England

SUMMARY

Measures to prevent sickness which are designed to modify known and suspected influencing factors are of limited value. The anaesthetic techniques at present employed are unlikely to cause sickness to any appreciable extent. It seems that the once popular habit of using analgesic drugs such as pethidine to supplement anaesthesia is a cause of postoperative sickness and the practice can readily be avoided by the use of halothane or muscle relaxants according to the situation. Omission of pethidine or similar drugs before operation, or the employment of a reduced dose of pethidine appears to be a satisfactory way of dealing with a further influence. Of the many other factors, most are of unknown importance or else cannot be modified in any way by the anaesthetist. For specific cases, complete pre-operative avoidance of analgesics is advised and, if desired, pentobarbitone or promethazine are satisfactory alternatives. The use of haloperidol and perphenazine by injection during anaesthesia seems at present the most certain way of preventing sickness. Contributory measures can include the avoidance of rough handling in transportation and of too early movement on the part of the patient. The role of food and drinks early in the postoperative period is not well defined, but is undoubtedly a factor in causing sickness in morphinized subjects. Whether this is, in fact, due to vestibular stimulation accompanying bodily movement rather than to the actual ingestion of fluid or food is open to debate. Even after all measures have been taken, there is always the possibility that drugs given to relieve pain late in the postoperative period will excite vomiting for which treatment with anti-emetic drugs will be needed.

Attempts to prevent postoperative sickness date from the early days of anaesthesia, but contributions to the literature of the problem were rather few up to the turn of the century. In the early 1900's several methods were advocated to prevent sickness, some of which were ingenious and fanciful, while others were almost heroic. Such manoeuvres were described as squeezing the nostrils with the fingers or raising the head end of the bed 12 inches (this was said to offer mechanical difficulty to vomiting). Other methods included the use of chloroform pre-operatively, of perfumed gauze during the later stages of the operation, or of the rectal administration of mixtures of potassium bromide, aspirin and glucose. There is not much evidence to show how effective were any of these remedies. The age of the planned clinical investigation of postoperative vomiting had not yet arrived. Attempts to prevent sickness today no longer depend on remedies of this type, but upon the avoidance of factors believed to contribute to sickness and upon the use of drugs, the anti-emetic action of which is specifically against the postanaesthetic type of sickness. Prevention may, in fact, be carried out deliberately (as in patients with a history of vomiting after anaesthesia) or may simply follow upon improvements in the management of anaesthesia.

Paradoxically, interest in this subject has increased greatly at a time when, for various reasons, postoperative sickness is on average probably less frequent, and certainly less severe, than was the case twenty years ago. The increased interest is accounted for partly by the improvement in anaesthetic services which has resulted in greater safety and refinement, so that there is today an increasing interest and concern in the complications of anaesthesia which are less
THE PREVENTION OF POSTOPERATIVE VOMITING

serious (in the life and death sense) but nevertheless distressing. Other examples of these are sore throat after endotracheal intubation, and painful back and muscle pain following suxamethonium. Furthermore, patients are now more often than formerly aware that sickness is not inevitable; that it is no longer "... the just and normal price which those who invoke the great blessings of anaesthesia and surgery must pay in compensation". the terror of death under anaesthesia no longer so completely obsesses patients and, with increasing sophistication in medical matters, many of them request assurance that sickness will be prevented, particularly if previous experience has been unfortunate in this respect. Most of us have pride in our skill and ability to guard against complications of this type, and few are not glad to be told by the patient that no sickness has occurred after operation. Efforts to prevent the occurrence of nausea and vomiting can now be made with a much improved confidence because several satisfactory anti-emetic drugs are available. Early awakening is now commonplace and sickness occurring after recovery of consciousness, and especially if remembered by the patient, tends to be more obvious and objectionable, particularly when an increasing proportion of patients feel relatively well within a few hours of surgery performed under modern anaesthesia.

The decline in postoperative sickness is mainly attributable to the virtual banishment of deep anaesthesia as a method of obtaining muscular relaxation and to the decreasing use of cyclopropane and ether, these drugs having given place to halothane. It is possible, but by no means certain, that the now widespread use of intravenous barbiturates for the induction of anaesthesia assists in the decline in incidence and severity. The change in the outlook on premedication which has led to the use of promethazine and to the omission or use of a reduced dose of opiate is an important factor.

The constantly improving level of skill in administration may well be important. It is a widely held impression that sickness after anaesthesia is now quite uncommon. The pendulum has swung so far that there is a danger of underestimating the size of the problem. In most hospitals there are no grounds for such complacency, unless there are carefully compiled statistics as evidence for such a view. It is not yet widely enough appreciated that an impression of frequency based only upon the patients' spontaneous complaints (which only occasionally filter through to the anaesthetist) is so vastly different from the actual incidence, as determined by observation and careful interview of the patient, as to be misleading and worthless.

The actual incidence and severity of sickness after anaesthesia in any group of patients naturally depends upon the interaction of many factors of greater or lesser importance, according to circumstances. Further, reported results depend to a considerable extent on the length of the period for which sickness has been observed, on the method of observation and on the criteria of post-operative sickness. From the point of view of the patient's comfort, sickness which is not remembered is of little importance, except in that it may result in aesthetically displeasing soiling of clothing, hair and bedding. Anaesthetists, on the other hand, must take a more serious view of sickness occurring before the full return of consciousness, at which stage the risk of aspiration of vomitus is greater and may have embarrassing and sometimes very serious consequences. The report of the Committee on Deaths Associated with Anaesthesia appointed by the Association of Anaesthetists (Edwards et al., 1956) emphasizes the potential seriousness of postoperative vomiting in circumstances when the services of skilled persons and adequate equipment are not at hand, even in patients well prepared for non-emergency surgery. In assessing the frequency of sickness, therefore, it is preferable to take into consideration any nausea, retching or vomiting occurring after the termination of anaesthesia, irrespective of the time of return of consciousness.

The incidences of sickness reported in contemporary published papers vary greatly for the reasons stated, and an average figure obtained from large numbers of patients of both sexes, who have undergone all types of operations under all types of anaesthesia, is quite valueless, because concealed within such mass figures will be found relatively homogeneous groups with a high incidence of sickness. Riding (1960), for example, found that, even when the operation and anaesthesia were standardized in women undergoing minor gynaecological operations, incidences were
obtained which varied from 3 to 67 per cent simply as a result of changing the doses of morphine and atropine used before operation. It is clearly the patients in the high incidence groups who are more in need of preventative measures.

As to severity, while most experienced observers would agree that this is much less since deep general anaesthesia became obsolete, it is not easy to find from the literature conclusive evidence in support of this belief. The reason is that statistical analysis of qualitative data has until recently not been successfully carried out. Formerly reliance was placed on the number of vomiting episodes as an index of severity, nausea and retching being ignored. On this basis there is no doubt of the decline in severity; for example, Dyrberg (1962) published results indicating that only about 14 per cent of females and about 4 per cent of males vomit more than twice.

Of the many factors which are believed to influence postoperative sickness, some are highly speculative. In most instances little impressive proof can, in the writer's opinion, be adduced to show that the factor is of importance in a wide variety of circumstances of anaesthesia and surgery. Individual reports are at variance. The operation site, for example, was considered to be important by Bonica et al. (1958) and Dent, Ramachandra and Stephen (1955). On the contrary, Knapp and Beecher (1956) and Burles and Peckett (1957) found little evidence to support the view.

Commonly routine operating lists have been used to form large series rapidly. The data so obtained are then analyzed with respect to some factor, such as the length of the operation, without reference to any other variables. This leads to a comparison of results in series with entirely dissimilar characteristics, and to inaccurate, misleading and often meaningless conclusions. Valid conclusions concerning influencing factors cannot be reached without careful attention to the many variables involved so that the groups used for comparison are as similar as is possible in clinical practice, thus allowing a single variable to be evaluated. Boulton (1955) showed that it is insufficient to compare groups of patients on whom operations in the same broad category have been performed. He found in thoracic surgery that individual operative procedures tend to have different incidences, other factors being equal.

From the point of view of prevention, some influences will now be considered.

**The sex of the patient.**

There is very little doubt that there is a much greater tendency for women than men to vomit after operation; this tendency persists with increase in the duration of operation, and appears to remain when the level of anaesthesia is light and when similar operations are performed in both sexes (Boulton, 1953). The difference is probably more marked when powerful anaesthetics are used. Dyrberg (1962), on the contrary, found that there was little difference between the incidence of postoperative vomiting in males and females after extra-abdominal operations, although the incidence was much higher in females after abdominal operations.

**Site of operation.**

There has been disagreement in a general way on the importance of the site of operation. It has been stated that intraperitoneal procedures are more likely than extra-abdominal procedures to cause sickness, and, on the other hand, that there are no differences. It has been reported recently by Dyrberg (1962) that vomiting was more common in males after extra- than intra-abdominal procedures. The importance of the operation itself remains controversial because other factors such as the type, depth and duration of anaesthesia, and the age and sex of the patient intervene. Relatively few investigations show the influence of the precise operation, with other variables held constant. So far discussion of the importance of operation site has proved rather unhelpful. Even very minor differences in operative procedure can affect the frequency of sickness. For example, Dundee, Nicholl and Moore (1962) found that the incidence of sickness following cervical dilatation and uterine curettage was higher than after evacuation of the uterus for abortion.

**Duration of anaesthesia.**

The investigation of Smith (1945) is one of the earliest which attempted to show that when the anaesthetic technique, the type of surgery, and the sex of the patient are taken into consideration, then in adults increasing duration of anaesthesia carries with it an increased likelihood of post-
operative sickness. Bodman, Morton and Thomas (1960) noted that vomiting in out-patients after short, supplemented, nitrous oxide anaesthesia was closely linked with the duration of anaesthesia. Dundee, Nicholl and Moore (1962), after a most carefully standardized investigation, also showed that duration can be important when using contemporary anaesthetic methods. Their findings were somewhat similar to those of Gordh and Rydin (1946).

In longer operations, Dyrberg (1962) found that length of anaesthesia of up to 3 hours did not in any way influence postoperative nausea and vomiting. This is an important finding because modern anaesthetic techniques employing relaxant and nitrous oxide (of the type much used in Great Britain) were used throughout the investigation. Kvisselgaard's results (1957) support this view; again his anaesthetic technique embodied the use of muscle relaxants and light anaesthesia.

It seems probable that duration may be a factor of much importance if potent anaesthetic agents are used, especially if deep anaesthesia is obtained. Using light anaesthesia, duration is probably of itself unimportant after the operation has been extended beyond a quarter of an hour or so; other factors, such as the operation itself, probably being of greater importance in determining the occurrence of sickness.

**Agents.**

There is no possible doubt that the anaesthetic agent is an important factor in postoperative sickness. Ether particularly is an offender, although it is insufficiently appreciated by trainees that sickness after light ether anaesthesia is by no means inevitable. Nevertheless a very high incidence of sickness can occur when nitrous oxide and oxygen mixtures are used, depending on other factors such as the type of operation. The author has noted incidences as high as 80 per cent after major abdominal gynaecological operations, and 80 per cent after thoracoplasty in females, and as low as 11 per cent after pneumonectomy in male patients. In all cases thiopentone, nitrous oxide, and oxygen alone were used, together with d-tubocurarine. It is no guarantee that postoperative sickness will not occur. Bellville (1961) reported that nausea and vomiting occurred in about 16.5 per cent and 26 per cent within 2½ hours of anaesthesia with ether and cyclopropane respectively. The influence of cyclopropane is more apparent when the effect of duration of anaesthesia is considered in women; the incidence was then noted to increase from 17.5 per cent for anaesthetics lasting ½ to 1½ hours to 46.4 per cent for anaesthetics lasting 2½ to 3½ hours (Bellville, Bross and Howland, 1960).

From this and other work, it is difficult to do other than to act on the assumption that ether and cyclopropane are more likely to contribute to sickness than trichloroethylene, which in turn is more likely to do so than nitrous oxide. It is possible (Haumann and Foster, 1963) that halothane is associated with the lowest incidence, and actually has anti-emetic properties when other factors are present which favour the occurrence of vomiting. Taking into account the current emphasis on light anaesthesia, and the much reduced popularity of volatile anaesthetics other than halothane, it is not likely that the anaesthetic agent is, of itself, often of fundamental importance in determining the occurrence of postoperative sickness.

**Premedication.**

The combination of drugs used in premedication undoubtedly can influence the frequency and severity of sickness. The importance of pethidine has been shown by Dundee, Nicholl and Moore (1962) in a carefully controlled investigation in women, following earlier reports from Bellville, Bross and Howland (1960), which drew attention to the tendency for pethidine to contribute to sickness.

Pre-operative morphine has for many years been thought of as a cause of postanaesthetic sickness. Jaquenoud and Mercier (1951, 1952) in a clinical investigation showed that morphine is, in fact, important. Confirmation was provided in the results of the investigations of Riding (1960) and Phillips and his associates (1960). It is important to note that the emetic and nauseating effect of morphine may last many hours (Wangeman and Hawk, 1942; Comroe and Dripps, 1948), thus extending well into the postoperative period. Riding (1960) obtained evidence that hyoscine, and to a lesser extent atropine, can in certain circumstances exert an important effect in reducing the sickness caused by morphine premedication. It is possible that continuation of sleep after ter-
mination of anaesthesia, thus giving time for exhalation of volatile anaesthetics and lessening vestibular stimulation, is of some importance.

Other factors.

Increasing age (in adults) has been said to reduce the probability of sickness and the contrary assertion has been made. More recently Dyrberg (1962) has been unable to show a correlation.

The skill of administration has been held to be important for many years, but lack of detailed investigation prevents any firm statement on this subject. Bellville, Bross and Howland (1960) analyzed a large series and found that patients of experienced administrators had a lower incidence. It is probable that inexperienced anaesthetists tend to use deeper levels of anaesthesia than is necessary for longer than is needed.

Rough handling of the patient postoperatively is said to stimulate sickness and partly accounts for the use of anti-motion sickness remedies. To some extent sickness is related to movement in patients who have received morphine (Comroe and Dripps, 1948). Nevertheless, chlorpromazine is an effective anti-emetic for use in anaesthesia (Dyrberg and Johansen, 1958), but is not effective in motion sickness (Handford et al., 1954).

Hypoxia, hypotensive episodes, carbon dioxide retention and endotracheal intubation may all have a bearing on sickness after anaesthesia. Convincing evidence of the importance of these and an intriguing and ingenious collection of others remains to be obtained and there is, therefore, little object in discussing them in this article.

Personal factors.

An investigation by Armer (1952) indicated that patients who suffer from motion sickness are more inclined to be sick after anaesthesia. Whether this is generally true or not is not known, and the writer was unable to obtain evidence of this after examining several hundred records of patients interviewed personally after operation.

The idea that sickness after anaesthesia is due in some way to poor mental outlook or lack of moral fibre should now be dead; it is difficult to believe that patients are sick because they expect to be. There is no doubt, however, that some individuals, especially women, have a particular propensity to vomit severely after anaesthesia. Such persons are lost in statistical surveys. Nervousness and emotional upset do not appear to be important factors. This is certainly true in minor gynaecological procedures in which it was found that the operation of cervical dilatation and uterine curettage was followed by sickness more frequently than was removal from the uterus of the retained products of conception. It might reasonably be accepted that a substantial proportion of patients having evacuation of the uterus for abortion would be upset emotionally by the loss of a pregnancy. This did not appear to be the case.

THE PREVENTION OF SICKNESS

Very much more has now been discovered about the physiological and pharmacological aspects of vomiting (Borison and Wang, 1953). Nevertheless, the actual cause of sickness after anaesthesia remains unknown and, although more is now known of the factors influencing it, this naturally hampers attempts at prevention.

Emergence vomiting, that is vomiting occurring before full return of consciousness, is potentially dangerous and is certainly a common cause of embarrassment. A patient still partly under the influence of anaesthesia may be unable to clear quantities of vomitus from the mouth and pharynx and, if the larynx is unable to protect the lungs satisfactorily from the ingress of vomitus, a serious situation arises. This is a particularly serious risk in anaesthesia for obstetrical procedures and for emergency surgery. Reliance on a period of 4 hours in order to allow gastric emptying is unfortunately too often misplaced.

An attractive feature of halothane anaesthesia is the relative infrequency with which vomiting occurs on emergence. Figures collected by the author from consecutive patients in an unselected series of minor procedures suggest that emergence vomiting occurs in about 5 per cent of patients after halothane anaesthesia, compared with about 7½ per cent after trichloroethylene, and about 35 per cent after ether.

The outcome of the operation may be adversely affected by vomiting. The strain on the abdominal wound may be responsible occasionally for abdo-
minal dehiscence. Loss of vitreous or intra-ocular haemorrhage may follow vomiting after intra-ocular operations. After extensive plastic procedures affecting the mouth, jaws and pharynx (as for cancer), vomiting is extremely unpleasant to the patient and is also dangerous. The movements necessary to obtain a clear airway are hampered by anatomical deformity, oedema, pain and sometimes splinting of the teeth. Not only this, but the success of the operation may be endangered.

Electrolyte and fluid loss as a result of prolonged postanaesthetic vomiting is rare, partly because treatment with anti-emetic drugs is instituted early, and partly because other causes such as intestinal obstruction need to be considered.

Measures to prevent postoperative sickness can be designed to reduce the general level or can be directed toward preventing the occurrence of sickness in an individual. It is clear that some of the factors known to influence sickness are beyond the anaesthetist's control. The age and the sex of the patient and the operation performed are obvious examples. Others, such as the choice of anaesthetic technique or of pre-operative medication can be modified to a greater or lesser extent. Still others, as, for example, the length of the operation, can be influenced rarely and only to a limited degree. In anaesthesia for outpatient surgery, there is a tendency to regard the length of the operation as unimportant. It is quite clear, especially from the work of Bodman, Morton and Thomas (1960), that the shorter the operation the greater is the likelihood that sickness will not occur. This is an important consideration when a patient is expected to leave hospital without delay and when facilities for recovery are, in many hospitals, somewhat strained. The importance of the individual influencing factors in different sets of circumstances is so little known that it is questionable whether any action can or need be taken. Many of these supposed influences can be nullified by ensuring the most meticulous anaesthetic management of patients undergoing surgery. The prevention of postoperative sickness is not often the most important reason for the selection of a particular anaesthetic technique and indeed there may be overriding reasons for the use of anaesthetics which are likely to give rise to sickness. The avoidance of deep anaesthesia and of morphine or pethidine before or during operation undoubtedly helps to lessen the probability of sickness. Although few anaesthetists now use deep anaesthesia, many prefer to use an analgesic drug pre-operatively. It is widely believed that such drugs, especially morphine, are unrivalled in the production of a mental state characterized by relative freedom from apprehension.

The importance of swallowing saliva especially during ether anaesthesia as a cause of sickness through gastric irritation have been over-emphasized. Satisfactory evidence showing that endotracheal intubation lowers the incidence is not available. The salivary suppression caused by atropine is not likely to have any valuable effect; other anticholinergic drugs with powerful peripheral actions have proved less effective than atropine in modifying sickness. It was pointed out many years ago by Ferguson (1912) that ether drinkers are not sick. It is unlikely, therefore, that gastric irritation is of much importance. On the other hand, it is common prudence to ensure that the stomach is empty before operation in order to avoid the hazard of aspiration of vomitus.

The use of drugs in prevention.

Many anti-emetic drugs are now available and they have been shown to have a degree of activity against sickness after anaesthesia. These include motion sickness remedies, such as dimenhydrinate (Dramamine), cyclizine (Valoid), and phenothiazine derivatives such as chlorpromazine, promethazine, prochlorperazine, perphenazine, trifluromazine and fluphenazine. Other drugs, such as trimethobenzamide (Tigan) and haloperidol (Serenace) are currently undergoing trials to determine their effectiveness. These drugs have been shown to have a degree of effectiveness, in most cases on the basis of trials on series of unselected patients, the trials having the object of judging the alteration in overall frequency and severity of vomiting. The use of closely controlled trials and of carefully selected series has unfortunately not been common and has been frequently deliberately avoided.

The results of these trials need to be interpreted with some care for several reasons. It is necessary to know the criteria used for sickness (was nausea and retching included; was emergence...
vomiting counted?); the length of time for which sickness has been observed and the manner in which this has been carried out varies from trial to trial. It is most important to know whether the anti-emetic was used in conjunction with a narcotic drug in premedication or not; in some cases it may be suspected that the effect of the drug under trial has been mainly to overcome that part of postoperative sickness which is due to pre-operative morphine. Would it be simpler to omit morphine? Finally there is a danger of accepting the results at face value when, on some occasions at least, the success of the treatment may not be as obvious to the patients as to the statistician.

The use of anti-emetic drugs in all patients is not recommended. On basic principles, drugs should not be used unless there is a clear indication. The size of the problem of postoperative sickness is not so great as to require the treatment of every patient when, in any case, by no means all patients are going to be sick and few of these are likely to be severely sick. Those who are going to be sick cannot have full assurance that any drug will prevent it, and there is, too, some uncertainty about whether nausea is prevented as effectively as vomiting. With several of the effective drugs side effects may occur. These include delay in recovery of consciousness and postoperative drowsiness, arterial hypotension, occasional injection pain, and extrapyramidal reactions.

Side effects can be unpleasant. For example, Schweizer (1959) described tremors, unilateral spasm of neck muscles and muscular contractures verging on opisthotonus in a healthy female who had received a 5-mg dose of fluphenazine 20 hours previously. This drug is not recommended for use in treating postoperative vomiting (Bellville, 1961).

It is only fair to add, however, that promethazine is much used for pre-operative medication, with or without an opiate, at the present time. Usually it is given with the primary object of achieving a degree of sedation without depression rather than of preventing sickness. The popularity of the drug provides good evidence that side-effects of a disturbing sort are infrequent.

At present no drug is so supremely effective and utterly free from side effects that its use in all patients can be recommended. The balance of opinion is in favour of using anti-emetics only on occasions when it is necessary to treat vomiting which has actually occurred after operation (surgical causes having been excluded) and in the treatment of patients in whom sickness is anticipated. A previous history of severe sickness after operation may be a suitable indication. If the operation to be performed is particularly likely to be followed by sickness (cholecystectomy, for example) or when it is especially important that sickness should not occur, then anti-emetic drugs may be extremely useful.

Although several drugs are effective, what is really required is a knowledge of their relative effectiveness in different circumstances in comparison with the frequency and severity of side effects.

Among the drugs used are the following:

**Perphenazine** is highly effective and can be given in 5-mg doses by intramuscular injection. Phillips et al. (1958, 1960) reported very favourably on this drug. They commented that drowsiness commonly followed treatment and that it may be necessary to reduce the dose of analgesic drugs in the postoperative period. It can be given towards the end of anaesthesia, and when given in this way Robbie (1959) found that it did not prolong recovery for more than a few minutes. Side effects on the central nervous system are not common after single doses. It is quite effective as a pre-operative sedative.

**Trifluromazine** has been shown by Bellville, Bross and Howland (1959) to be powerful in preventing sickness. A small trial carried out by the author in which the drug was given in a dose of 10 mg as part of pre-operative medication with morphine, or alone, to females undergoing evacuation of the uterus under thiopentone anaesthesia did not suggest that the drug was very strikingly effective. No atropine was used in this series (table I).

**Promethazine** has been shown by Howat (1960) in a double blind trial, to be effective in reducing the incidence of postoperative nausea and vomiting when given by the intravenous route. Most authors are agreed that there is a tendency towards delay in recovery of full consciousness.

**Trimethobenzamide** is noteworthy for being unusually free from the danger of side effects according to current reports. The effectiveness of
TABLE I
Results obtained in women undergoing evacuation of the uterus under thiopentone anaesthesia when triflupromazine 10 mg was used in premedication either alone or with morphine. Results are compared with those obtained when either saline or morphine 10 mg was given before operation. Atropine was not used.

<table>
<thead>
<tr>
<th>Premedication</th>
<th>Number of patients</th>
<th>Nausea, retching and vomiting %</th>
<th>Nausea and retching %</th>
<th>Vomiting %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Triflupromazine 10 mg</td>
<td>54</td>
<td>9.3</td>
<td>0</td>
<td>9.3</td>
</tr>
<tr>
<td>Saline 1 ml</td>
<td>76</td>
<td>22.0</td>
<td>13.2</td>
<td>8.8</td>
</tr>
<tr>
<td>Triflupromazine 10 mg</td>
<td>54</td>
<td>48.1</td>
<td>11.1</td>
<td>37.0</td>
</tr>
<tr>
<td>Morphine 10 mg</td>
<td>87</td>
<td>66.6</td>
<td>14.9</td>
<td>51.7</td>
</tr>
</tbody>
</table>

TABLE II
Results obtained when trimethobenzamide 200 mg was given to female patients undergoing evacuation of the uterus under anaesthesia with thiopentone only.

<table>
<thead>
<tr>
<th>Premedication</th>
<th>Number of patients</th>
<th>Nausea, retching and vomiting %</th>
<th>Nausea and retching %</th>
<th>Vomiting %</th>
</tr>
</thead>
<tbody>
<tr>
<td>Morphine 10 mg</td>
<td>65</td>
<td>32.3</td>
<td>10.8</td>
<td>21.5</td>
</tr>
<tr>
<td>Atropine 0.6 mg</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Trimethobenzamide 200 mg</td>
<td>70</td>
<td>34.3</td>
<td>21.4</td>
<td>12.9</td>
</tr>
</tbody>
</table>

the drug, however, does not seem to be of the first order, although perhaps it may be particularly useful in the treatment of established sickness. The author's results are shown in table II. The trial was carried out in circumstances identical to those described above. On this occasion, however, indistinguishable ampoules were used all containing morphine 10 mg and atropine 0.6 mg and some containing trimethobenzamide 200 mg also.

Haloperidol. This newcomer is powerfully effective, as judged by the results of the splendidly controlled trial carried out on patients undergoing abdominal hysterectomy with standardized anaesthesia and morphine and atropine premedication reported by Dyrberg (1962). His results leave no doubt about the efficacy of the drug, which was given in 5-mg doses intravenously early in anaesthesia. It was reported that unfavourable circulatory responses were unusual. Amnesia was very common and seems to be a useful side effect of haloperidol. It was found to be more effective against sickness when used with morphine premedication than was chlorpromazine 50 mg when it was used in a previous series in which no preoperative morphine was given.

REFERENCES


Ferguson, R. H. (1912). The use of olive oil to prevent or relieve postanaesthetic vomiting. N.Y. med. J., 95, 1359.


**BOOK REVIEW**


This Bulletin deals with respiratory physiology and features most of the British leaders in the field. The largest group of authors are physiologists but they shade imperceptibly into the clinical field. Of the eighteen articles, eight are concerned with the regulation of breathing. These include an introduction to consideration of regulation of breathing in terms of control-system theory, and recent views on the neurones in the central nervous system which are concerned with respiration. Other articles cover the chemical and reflex control of breathing. Special papers deal with exercise and the sensation of breathlessness, two of the most difficult aspects of the subjects. Dr. Pattle gives a most excellent review of work on the lining layer of the alveoli and this is appropriately followed by a paper on the respiratory distress syndrome of the newborn.

The Hammersmith group contributes two papers on distribution of blood and gas within the lung fields. They show clearly how their remarkable new techniques have permitted the localization of the disturbances, the whereabouts of which have hitherto remained a mystery, in spite of our being able to assess their magnitude. An article on the physics of pulmonary blood flow will dispel any notion that this is simply a matter of Ohm's Law. Following articles review the factors governing the pulmonary blood and lymph flow. Finally, Dr. Roughton writes on the kinetics of gas transport in the blood, and it is fascinating to see references to his own work spanning forty years. It will be seen that the editors have achieved an excellent coverage of the subject, although it is inevitable that the level of the contributions is variable. Some are a delight to read while others will be appreciated only by the reader who is already well versed in the subject. The Bulletin is a valuable source of references and contains particularly useful book reviews and advertisements. This is undoubtedly a Bulletin which should be read, and serious students of the respiratory system will want to keep it to hand.

J. F. Nunn