VOMITING

By L. R. BROSTER, O.B.E., D.M., M.Ch. (Oxon), F.R.C.S.(Eng.), Hon. F.A.S.A.,
(*Surgeon, Charing Cross Hospital*)

Vomiting is a common, unpleasant and distressing symptom. It is associated with a large number of medical conditions, and although the facility for vomiting varies in different individuals, it may be a symptom of negligible importance, but on the other hand it may be a symptom of gravest importance to the patient. It is one of those ingrained and natural reflexes which occurs spontaneously, and is associated primarily with the instinct of growth, and its corollary, nutrition, in which it forms a natural defence against the ingestion of harmful and poisonous substances. Consequently, it is necessary for the surgeon, to whose province the most important and serious aspects of vomiting belong, to be familiar with its more obscure origins in order to appraise the relative importance of its differential diagnosis.

Physiology

In the first place it is necessary to recall some of the main factors in the physiology of vomiting. It is understood to mean the ejection of stomach contents via the mouth. It differs from retching by the fact that the cardiac sphincter is open and relaxed, whereas in retching it is closed and contracted. The vomitus from an empty stomach is a clear, slimy fluid with a foetid and acid odour, or it may be coloured and contain the remnants of the previous meal. It turns a slip of congo red, blue, and litmus paper, red. This strongly acid reaction is its most important distinguishing feature. If it turns litmus paper blue then it either comes from the gullet, or contains alkaline juices regurgitated into the stomach from the duodenum and small intestine. During the act of vomiting the pyloric end of the stomach contracts strongly, the cardiac end with its sphincter relaxes, and the contents are evacuated by the synergic contraction of the diaphragm and abdominal muscles. At the same time the post-nasal space becomes shut off by raising the soft palate, and the respiratory tract is closed and safeguarded by holding the breath, closing the glottis, and drawing the larynx and hyoid forwards. This complicated series of actions is controlled by the vomiting centre situated in the medulla oblongata. Destruction of this centre in animals prevents vomiting. Like the respiratory, cardiac and vasomotor centres, which lie next to it, and are concerned with carrying on the primitive and vital bodily functions, the vomiting centre expresses its humble heritage in the evolution of higher cerebral functions by being the first to recover after such conditions as concussion, where they all have been temporarily suspended. Vomiting under these conditions makes its only welcome appearance, for it is then reassuring to the clinician, and without nausea to the patient.

Anatomically, afferent impulses come to the vomiting centre from the cortex and special senses. Afferent fibres from and efferent fibres to it pass to the stomach and abdominal viscera and are carried in the vagi and autonomic system. From neural linkages in the spinal cord, efferent fibres pass to the diaphragm in the phrenic nerves, to the abdominal muscles via the intercostals, and in the ninth cranial nerve to the palate and pharynx. The normal onward waves of peristalsis in the alimentary system are seldom reversed in vomiting, and this is generally only seen in intestinal obstruction, overfeeding in infants, hysterical vomiting, and in anorexia nervosa.

The sensitiveness of the vomiting centre, apart from individual variation, varies according to the state of the health and the mind. Emotional strain, shock, fear and fatigue are well-known exciting causes, more especially in women than in men. Certain substances may stimulate the vomiting centre directly, or its threshold of stimulation may be lowered and thus render it more responsive to stimuli, which in the ordinary way would not be appreciated. Apomorphine is a drug which acts in this way. Consequently the vomiting centre is considerably influenced by substances in the circulating blood, and apart from drugs, toxins and hormones from the endocrine system must be included in this category. Thus from an analysis of the physiology and anatomy of the vomiting centre we may classify the symptom of vomiting as follows.

1. Functional or psychical.
2. Cerebral.
3. Reflex.
4. Blood stream.

The cause of surgical vomiting is mainly to be looked for in the last two categories.

Functional Vomiting

This type of vomiting most often occurs in young, neurotic women. There is generally a family history of neurosis. Attacks of vomiting are easily provoked by excitement, fear, mental strain or depression, shock and overwork. The vomiting is periodic, there is no loss of appetite, and it may continue for a long time without affecting the general health of the patient. The prodromal signs, such as nausea, trembling, fainting, cold sweats, are usually absent, and the vomiting bears no relation to the amount or kind of food, but generally occurs from a quarter to one hour after it. In such patients the threshold of the vomiting centre is lowered. They are much more conscious of negative stimuli from the viscera, stimuli which are subminimal, and are not felt by normal people. There may follow secondary symptoms, such as depression of the sex functions. Such people recover if put on a special regime and given psychotherapy.

Cerebral Vomiting

Vomiting is one of the cardinal symptoms of increased intracranial pressure from cerebral disease of whatever cause. This is especially so when it is accompanied by headache. As we have already seen, it often heralds the recovery from concussion. It occurs without nausea, pain or discomfort in the abdomen, and is often precipitated by changes in posture. Stimuli from the special senses are well-known causes of vomiting. In labyrinthine vertigo it may be incessant and exhausting. In sea-sickness it is due to fatigue of the semi-circular canals; in train and car sickness it is partly due to ocular tiredness, and certain odours may evoke it. Treatment in this class is directed towards its cause.

Reflex Vomiting

This, the commonest form of vomiting, is due to irritation of the stomach. It is accompanied by nausea, a sense of epigastric fullness and pain, and vomiting relieves the symptoms. The common causes are over-eating and over-drinking, especially of rich and indigestible food-stuffs. A number of strong acids and alkalis cause gastritis, produce vomiting, and must be treated by their corresponding antidotes. Certain drugs have a strong emetic effect, such as tartar emetic, ipecachuana, mustard, strong salt, etc. They act by irritating the vagal and autonomic fibres in the gastric mucosa, and such impulses stimulate the vomiting centre. Various forms of food poisoning, certain gases and anaesthetic vapours when swallowed have a strong irritating effect, and in all these cases the history settles the diagnosis. The treatment is to wash the stomach out.

More remote reflex causes, are often to be found in intra-abdominal, intra-thoracic and cardiac disease. The possibility of such coincident disease must be sought for in the accompanying history and symptoms, and excluded by careful examination.

As in the case of headache with cerebral vomiting, severe pain in any part of the body may produce reflex vomiting. This is especially so when the pain originates in the abdominal cavity, but it may equally be present with intense pain from injury or such extraneous cause as tabes dorsalis.

Bloodstream Vomiting

In this category must be placed a miscellaneous number of causes for vomiting. In many their precise action is not clear. They may act directly upon the vomiting centre, decrease its threshold of stimulation, or increase the tone of the sympathetic. To this class belong:—

- (a) *Drugs* when given by hypodermic injection with no obvious irritating effect on the stomach.
- (b) *Toxins*.—Toxic vomiting occurs in the early stages of the acute infective diseases, the exanthameta, pneumonia, uraemia, septicæmia, and malaria.

- (c) *Endocrine*.—Severe vomiting may occur in hyperthyroidism and Addison's disease. The vomiting of pregnancy, so often considered toxic, occurs at the time of foetal endocrine integration, and it is possible that its cause is mainly hormonal.

Surgical Vomiting

In spite of its familiarity no surgeon can afford to show his contempt for vomiting until he has explored every source of its origin, for an early appreciation of its significance is the true measure between disaster and success. From the preceding classification it is obvious that it is mainly to be found in the class of reflex vomiting, but although this is not entirely so, it is wise to proceed from this point of view in order to assess its clinical importance.

1. There are first of all those surgical conditions arising from the stomach and its adjoining structures. In the stomach the commonest lesions are ulcer and carcinoma. The vomiting from ulcer follows upon pain, and relieves it, usually within a half to two hours of taking food. Because of the relief it brings patients will sometimes induce vomiting by artificial means. Its classical picture occurs in pyloric stenosis as in congenital pyloric stenosis, waves of peristalsis heave up across the epigastrium from left to right, and the vomiting is copious, forceful and full of undigested food. When the vomitus contains blood it may be bright red, or dark red with clotted lumps. When less copious, as in carcinoma, it is partly digested, black and granular—resembling coffee-grounds. In the vomiting from duodenal ulcer the vomitus contains bile. It is important to distinguish vomiting from retching. Here the cardiac sphincter remains closed, and fluid, either clear, frothy and alkaline, or mixed with undigested food is regurgitated up. There is no nausea, and the patient is conscious of retrosternal soreness of obstruction. Such symptoms are recognised as dysphagia and accompany such disorders of the gullet as cardiospasm, carcinoma, stricture, and diverticulum.
2. The next group is the most important, where vomiting is excited reflexly by some lesion outside the stomach and generally within the abdominal cavity. This is the vomiting typical of the surgical emergency, and may be traced according to three main types of lesion:—
 - (a) In peritonitis the cause of vomiting is twofold. In the first place it is reflex and accompanies the pain and shock of a perforation, such as that of an ulcer or acute appendix or any other hollow organ. It is capricious and uncertain, and there is a dangerous interval before it recurs due to a spreading peritonitis when the vomiting centre is stimulated by toxic products carried in the bloodstream. Such vomiting is characteristic, it is persistent, frequent, and of small amount—rather an effortless regurgitation of dark coloured fluid, becoming black, the precursor of death.
 - (b) In internal haemorrhage vomiting plays no significant part. It is abrupt, accompanying the onset of the haemorrhage, although it may be persistent in that form of acute haemorrhagic pancreatitis mimicking small gut obstruction.
3. In no lesion is vomiting more characteristic, significant, and occasionally so deceptive as in intestinal obstruction. It is first strongly acid, then bile stained, later dark coloured and malodorous and recurrent, voluminous and forceful. It may be the only symptom, but when it turns litmus paper blue is the time to act, rather than wait for the so-called "faecal vomiting" of the textbooks, a term appropriate to gastro-colic fistula which is extremely rare. Such vomiting, with a rapid decline in the general condition of the patient, is obvious, but when less urgent and repeated at longer intervals with little or slow deterioration of the patient's condition and no obvious physical signs, it is a state to be regarded with anxiety. The temptation is to temporise and talk of functional vomiting, when the real condition is one of intussusception, a ball valve obstruction by a gallstone, a band across the stomach or a carcinoma of the splenic flexure with proximal distension compressing the stomach. But as a rule the prevailing signs and symptoms of a sudden onset of colicky pain, followed by vomiting, peristalsis,

distension, and absolute constipation make the picture of intestinal obstruction clear, and it is the exception for vomiting to precede pain in the majority of intra-abdominal lesions.

Post-operative Vomiting

Vomiting as a symptom after operation is concerned with the effects of anaesthesia, and the condition of paralytic ileus often so difficult to distinguish from peritonitis and intestinal obstruction. At the outset it can be said that if vomiting persists for more than twenty-four hours after operation, some other cause than anaesthesia must be sought for.

(a) *Post-anaesthetic vomiting* is modified by the type of anaesthesia and the nature of the operation. Russell Davies found that vomiting occurred in about 40 per cent of cases after operation, and that it was more frequent after nitrous oxide, oxygen and ether, but was reduced considerably by the preliminary addition of pentothal. Cyclopropane had little effect on post-anaesthetic vomiting.

This type of vomiting is more frequent in females than males, and more especially after gynaecological operations. Treatment is mainly preventative, and requires three factors: an empty stomach, plenty of fluid with glucose, and the avoidance of excessive purgation.

Some authorities recommend the preliminary use of glucose with insulin. Post-operatively tincture of iodine, oil of cajuput, or pineapple juice by mouth are helpful, and copious draughts of sodium bicarbonate help to dissolve the anaesthetic laden mucus. This, if vomited, helps to wash the stomach out. Glucose saline per rectum or intravenously may be necessary.

(b) *Post-Operative Dilatation of the Stomach and Ileus* are dreaded complications, and are not necessarily confined to abdominal operations. In both there is distension, diminished peristalsis, the pulse rate is raised, and the vomiting persistent, foul smelling and effortless, causing exhaustion, dehydration, ketosis, and loss of chlorides from the body fluids.

(c) *Acute Dilation of the Stomach* occurs after twenty-four hours. Prompt treatment is necessary. A large stomach tube is passed and the stomach promptly washed out with sodium bicarbonate. This often suffices, but if not a Ryle's tube should be passed and retained, and the contents of the stomach aspirated off at intervals. At the same time glucose saline is given rectally or intravenously,

(d) *Post-Operative Ileus and Peritonitis* must be considered as synonymous terms. Although ileus may be present without peritonitis, the latter gives rise to ileus. The signs of ileus are abdominal distension, diminished peristalsis, ballooning of the rectum, and a raised pulse rate, but the usual infective signs of peritonitis—pain, pyrexia, and rigidity—are absent. In both, vomiting starts about the second or third day, it is dark, foul smelling, copious, and effortless.

Treatment of the vomiting follows that for acute dilatation of the stomach, and further relief may be obtained by passing a Miller Abbot's tube into the duodenum and small intestine and syphoning the contents as in the case of Ryle's tube in the stomach. About eight pints of glucose saline should be given during twenty-four hours.

Complications of Vomiting

Such treatment given for the control of vomiting would appear empirical without mentioning its ill-effects, for it is because of these that the patient's health and strength are undermined. Vomiting oft repeated brings ill consequences of its own and often loss of life. One of the first effects of repeated vomiting is the depletion of the glycogen store of the body with resulting ketosis. This is especially so in children and the vomiting of pregnancy. Consequently one of the important factors in treatment is the administration of glucose in adequate amount.

Another important factor is that of dehydration. This is recognised by a dry skin, dry tongue, a shrunk appearance, loss of weight, and the passing of little or no urine. Dehydration is particularly noticeable in acute dilatation of the stomach and paralytic ileus, where large quantities of fluid are secreted into the bowel, in which they either stagnate or are vomited. Apart from this loss of fluid, chlorides are lost in the vomitus and the reserves of it in the body tissues may be seriously depleted. Loss of chlorides by vomiting, in turn leads to alkalosis, renal failure, and uraemia.

Alkalosis is liable to occur with anaemia and where the patient has been treated with alkalis,

as in gastric or duodenal ulcer, and the giving of acids under such conditions is liable to have a deleterious effect upon the renal function. A high blood urea will correct itself with the restoration of body fluid and chlorides to the tissues. Consequently the ill-effects of continued vomiting are prevented by the timely administration of sufficient fluid containing glucose and saline. In a severe adult case it is estimated that about eight pints—four pints of 5 per cent glucose and four of normal isotonic saline, should be given intravenously within twenty-four hours.

Treatment of Special Cases of Vomiting

In operations on the stomach vomiting is treated by withholding fluids by mouth and substituting an intravenous drip, giving four to five pints of glucose and two pints of normal saline in the twenty-four hours. After it has ceased, fluids by mouth are increased gradually starting with small amounts, and if retained the intravenous drip is discontinued.

Vicious vomiting after gastro-enterostomy is bile-stained, alkaline, and persistent, and is due to oedema or kinking of the efferent loop of small intestine. It should be treated at first as for paralytic ileus, for which it may be mistaken, fluids by mouth being withheld, the stomach washed out, and an intravenous drip started. The vomitus does not become brown, and if there is no severe epigastric pain and collapse such as occurs in obstruction, a diagnosis of vicious vomiting can be made and operation undertaken for its relief.

Haematemesis

The vomiting of small quantities of blood is not uncommon after gastric operations. It may be vomited in large quantities after being swallowed, especially after fractures of the base of the skull. But when large in amount and accompanied by signs of gastric haemorrhage, such as pallor, restlessness, sighing respiration, and a rising pulse rate, fluids by mouth must be withheld and morphia given. Blood transfusion replaces not only fluids lost, but promotes clotting. Occasionally removal of a clot by washing out the stomach by means of a Ryle's tube will allay the vomiting. If the bleeding and vomiting are progressive, laparotomy must be undertaken to ligature the bleeding point.

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SURGICAL CAUSES OF CONSTIPATION

By HUGH REID, F.R.C.S.(Eng.)

(Hon. Surg. Liverpool Royal Infirmary, Cons. Surg. N. Wales San., etc.)

Among the many disorders to which the flesh is heir it would be difficult to find one so prevalent, so productive in complications, and so far-reaching in its effects as constipation. The scope of this article is to discuss the subject from its surgical aspect, keeping in mind that constipation may be reflex from almost any other organ in the abdomen, as well as direct from conditions outside, in the wall, or in the lumen of the large bowel.

Recent obituary notices in the *B.M.J.* and the *P.-G.M.J.* bring to our mind the bygone controversies of Lane's disease and the supposed effects of colon stasis. Twenty years ago it was enough to think of the diagnosis of chronic intestinal stasis in order to make it. A French textbook of that period graphically describes the chronics who swarm the consulting rooms suffering from "the great disease" from which proceeds more than half pathology. "The